M2, MA4, MA6, U6

Aristo ™

Service manual

0740 800 152 061012

READ THIS FIRST

Maintenance and repair work should be performed by an experienced person, and electrical work only by a trained electrician. Use only recommended replacement parts.

This service manual is intended for use by technicians with electrical/electronic training for help in connection with fault-tracing and repair.

This manual contains details of design changes that have been made up to and including September 2006.

WARNING !

STATIC ELECTRICITY can damage circuit boards and electronic components.

- **Observe precautions for handling electrostatic-sensitive devices.**
- **Use proper static-proof bags and boxes.**

INTRODUCTION

The MMC module consists of a control panel and a welding data board.
The power source, the wire feed unit and control panel each have their own microprocessor for control. The control panel is the central unit in the system: in addition to setting and controlling welding data, it also has overall control of the entire system.

The M2 panel, with knobs for all settings. See page 15 for a description of operation. The function description below refers to various fault codes. However, the M2 panel indicates faults by means of an LED, which can either flash or light steadily to indicate a fault. The fault indication function is described in the section on FAULT CODES: see Page 8.

The MA4 panel, with knobs for setting welding voltage and wire feed speed / current. Other settings are controlled by pushbuttons and symbols in the display panel. See page 16 for a description of operation.

The MA6 and U6 panels, with knobs for setting welding voltage and wire feed speed / current. Other settings are controlled by pushbuttons and text in the display panel. See page 22 for a description of operation.

DESCRIPTION OF OPERATION

1AP1 Welding data board

The hardware of the printed circuit board is the same for the MA4, MA6 and U6 panels. For the M2 panel the same board is used, but there are some differences in the hardware.

Circuit board identity

The welding data board has a machine ID, a hardware ID and a unit type number. To read this you need the **ESAT** service kit, see page 13.

- The machine ID defines which type of control panel the board is intended for. If the board is to be used for another type of control panel, the machine ID can be changed by ESAT. Spare part boards can be delivered with or without machine ID, see page 14.
- The hardware ID shows design and type of circuit board.
- The unit type is used for identification on the CAN bus.

The ID numbers of the control panels are:

M2 machine ID = 4
MA4 machine ID = 7
MA6 machine ID = 9
U6 machine ID = 10

Hardware ID = 1
Unit type = 0

1AP1:1 Power supply

Circuit board 1AP1 receives a 12 V power supply from the control board in the power source. This is regulated to 5 V, which supplies all the circuits in the control panel. The 12 V and 5 V supplies are monitored by a reset circuit: tolerance values are 12 V +2/–3 V and 5 V ±0.25 V. Monitoring the voltages makes sure that, in the event of loss of power, the processor has time to save the current data to RAM and to shut down the current processes in a controlled manner.

Loss of power supply does not generate a fault code. If the 12 V supply drops below 9 V, either momentarily or indefinitely, but does not fail entirely, the background lighting to the display will go out, followed by display of fault code 4. The machine must be turned off, and then on again, to reset the system.

The RAM memory requires a power supply even when the machine is turned off. This is provided by battery BA1, see the component positions on page 7. The battery is connected by the reset circuit when the mains power supply is turned off or lost. The battery voltage is monitored by the processor: fault code 8 is displayed if it drops below 2.4 V.

Replacing the battery

The battery is soldered to the circuit board. Removing it causes the RAM memory to lose all stored data, e.g. the machine's fault log. When the new battery has been fitted, and the machine restarted, the panel will be in its default state, i.e. as it originally left the factory.

It is possible to prevent data from being lost if a 12 V supply is maintained to the board while the battery is being changed.

Warning: the circuit board is sensitive to ESD.

1AP1:2 Communication

Communication between the control panel and the machine is via the system's CAN bus.
Resistor R3 is the terminating resistor (120 Ω) for the bus. Read more about the CAN bus in the service manual for the power source.

1AP1:3 Fault indication, panel M2

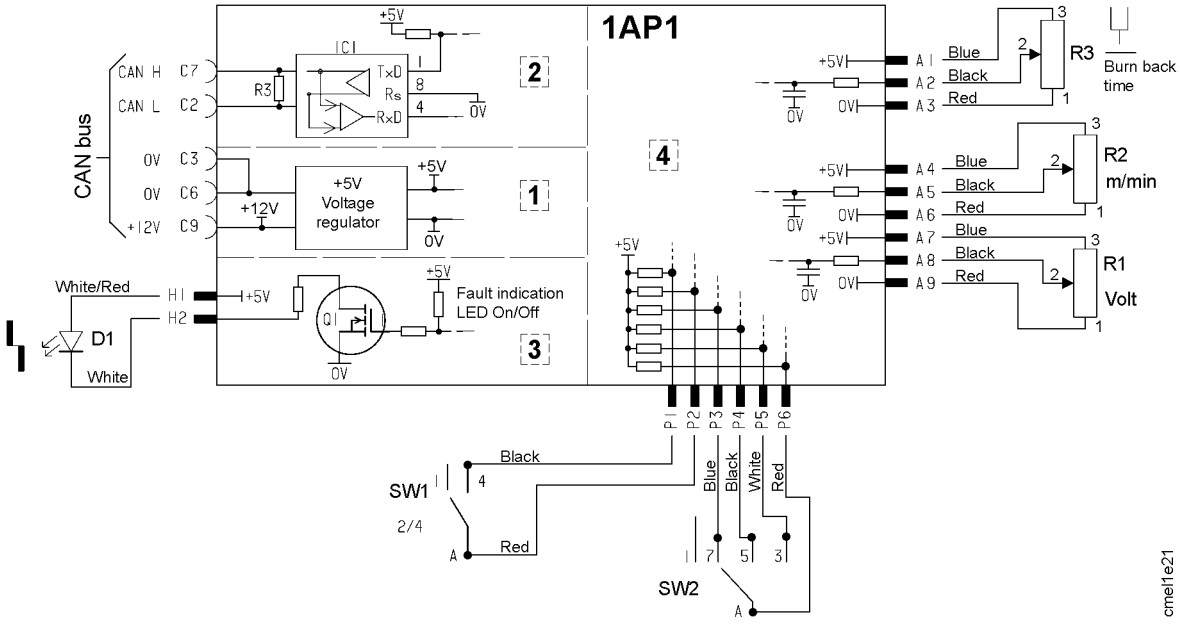
The **M2** panel has a single fault-indicating LED, which is controlled by transistor Q1. The faults indicated by the LED are described on page 8.

1AP1:4 Settings, panel M2

Welding settings from the **M2** panel are made by rotary potentiometers and switches:

R1: welding voltage
R2: wire feed speed
R3: burnback time

SW1: 2-stroke or 4-stroke control
SW2: inductance



Wiring diagram for the M2 panel.

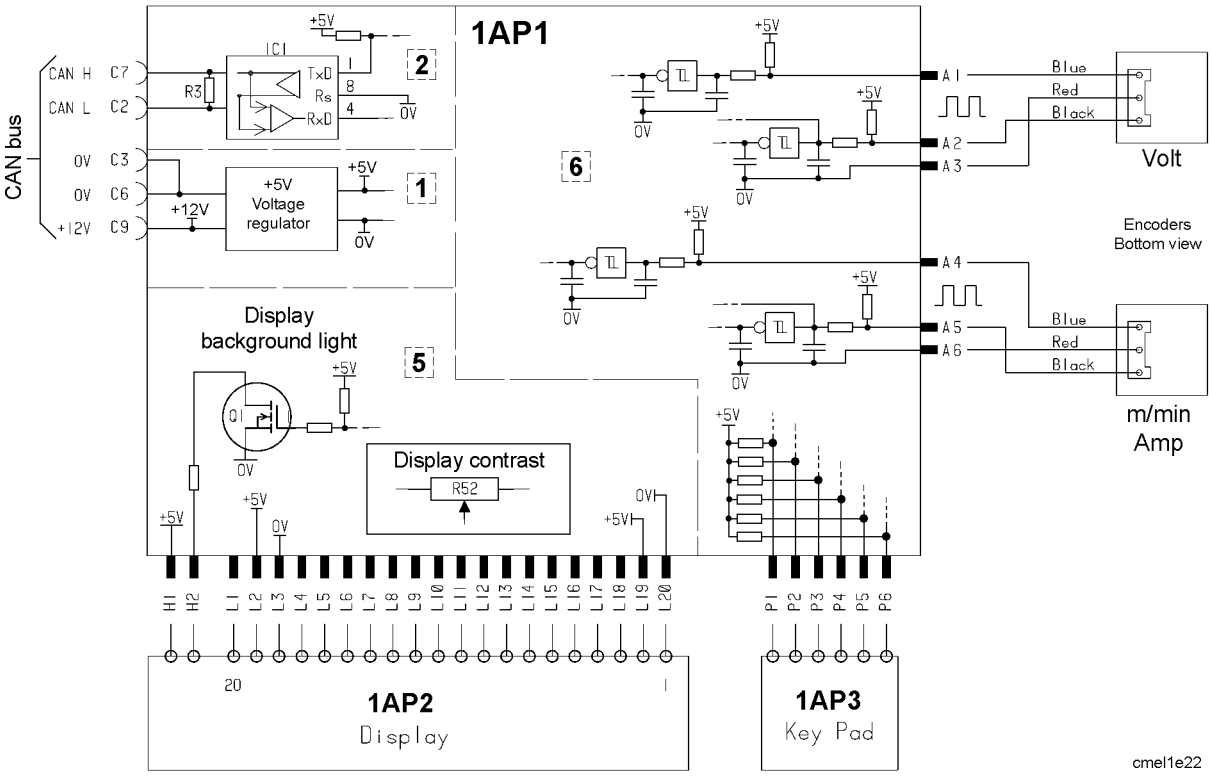
1AP1:5 Display, panels MA4, MA6 and U6

The **MA4**, **MA6** and **U6** display panels are backlit by parallel-connected LEDs, controlled by transistor Q1. Display contrast can be adjusted by potentiometer R52: see the component positions diagram on page 7.

1AP1:6 Settings, panels MA4, MA6 and U6

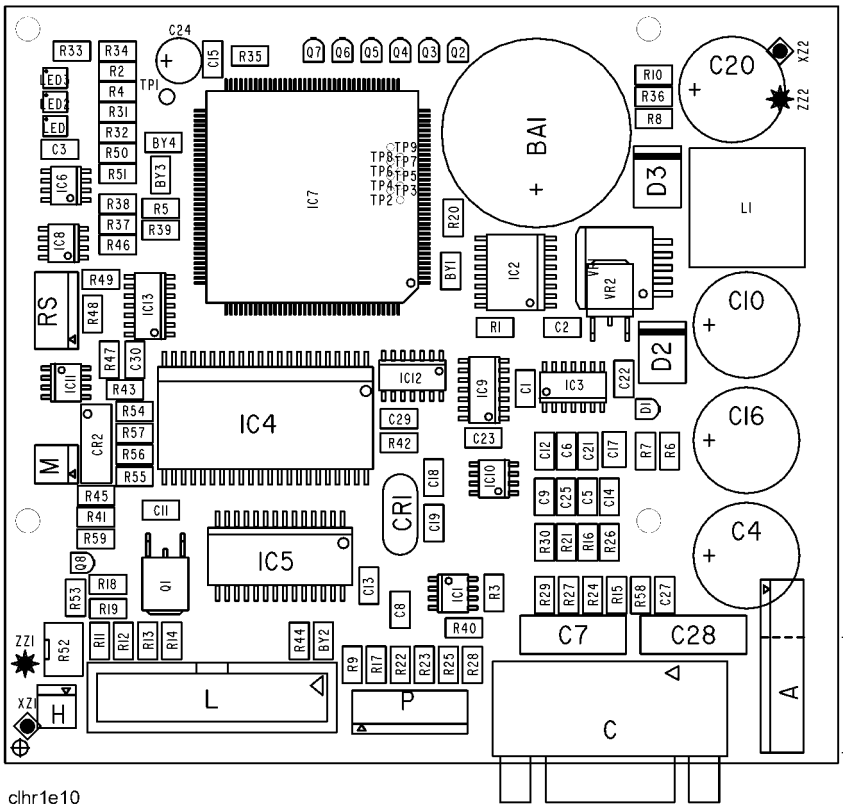
The **MA4**, **MA6** and **U6** panels have pulse generators (encoders) for setting the welding voltage and wire feed speed, with pushbuttons for other functions. Turning the voltage adjustment pulse generator briefly connects contact A3 (0 V) to contacts A1 and A2, but with a slight time difference between them. This generates pulses that are displaced by about 90° relative to each other. The processor senses which contact was first connected to 0 V, and decides whether the voltage is to be increased or decreased.

When the pulse generator knob is not being turned, the voltage on contacts A1 and A2 is +5 V. The wire feed speed pulse generator operates in a similar manner.



Wiring diagram for the MA4, MA6 and U6 panels.

1AP1 Component positions



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The printed circuit board is the same, regardless of which type of panel it is used for. The picture above shows all the components with which the board may be fitted: the exact choice of components varies, depending on the panel.

FAULT CODES

Fault log

All faults that occur when using the welding equipment are documented as error messages in the fault log: up to 99 error messages can be saved. When 99 messages have been saved, the oldest message will automatically erase when the next fault occurs.

Only the most recent fault message is displayed on the control panel. To read the entire fault log, the machine must be connected to the ESAT: see service aid on page 13.

Faults are monitored/detected in two ways: by test routines that are run on initiation and by functions that can detect a fault when it occurs.

The control panel displays a unit number to indicate which unit has generated the fault.

Fault indication on the M2 control panel

The M2 control panel has no text or symbol display, and so faults are indicated by an LED. The LED is extinguished if there are no faults, but either flashes or lights steadily to indicate a fault. See the specification of fault codes on page 10 for a detailed description of the various fault codes.

The LED flashes for the following faults:

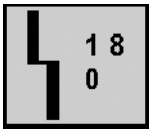
Fault code	Description
17	The control panel has lost contact with the wire feed unit.
18	The control panel has lost contact with the control board in the power source.
27	Out of wire.
29	No cooling water flow.
32	No gas flow.

The LED lights continuously for other faults.

The LED lights / flashes as long as the fault is present, it can only be reset if the fault is repaired and the machine is restarted.

Fault codes for the MA4, MA6 and U6 panels

Fault codes are updated every three seconds. They are shown on the display in the form of a symbol, as follows:



The upper figure in the symbol is the number of the particular fault code. The lower figure indicates where the fault is:

0 = control panel **1** = cooling unit **2** = power source
3 = wire feed unit **4** = remote control unit

The above symbol show that the control panel (0) has lost contact with the power source. Symbols may be steady or flashing, depending on the type of fault. Flashing symbols are indicaded with “o” in the table below.

If several faults have been detected, the code of only the most recent fault is displayed.

Press any of the function keys in order to clear the symbol from the display.

Summary of fault codes

Fault code	Description	Control panel	Cooling unit	Power source	Wire feed unit	Remote control unit
1	Memory error, EPROM	x	x	x	x	x
2	Memory error, RAM	x	x	x	x	
3	Memory error, external RAM	x	x	x		
4	+5 V power supply	x		x		
5	Intermediate DC voltage outside limits			x		
6	High temperature		x	x		
8	Power supply 1	x	x	x	x	x
9	Power supply 2			x	x	x
10	Power supply 3			x		
11	Wire feed speed servo				x	
12	Communication error (warning)	x	x	x	x	x
14	Communication error (bus off)	x				
15	Lost messages	x		x	x	x
16	High open-circuit voltage			x		
17	Lost contact with the wire feed unit	o				
18	Lost contact with the power source	o				
19	Incorrect setting values in external RAM	x				
22	Transmitter buffer overflow	x	x			
23	Receiver buffer overflow	x	x			
26	Program operating fault	x		x	x	
27	Out of wire				o	
28	Stack overflow	x	x	x	x	
29	No cooling water flow		o	o		
31	No reply from the display unit	x				
32	No gas flow				o	

Fault code descriptions, control panel

The fault codes for the cooling unit, power source, wire feed unit and the remote control unit are described in the manuals for these units. This manual describes the fault codes for the control panel.

Code	Description
1	**EPROM check sum error – program memory error** This indicates a fault in the check sum test of the program memory, which is run only when initiating the unit after power-up. This fault does not disable any functions. The program memory is damaged. This is a serious fault, that can have unforeseen effects. **Action:** Restart the machine. If the fault persists, load new software via ESAT. If the fault still persists, replace circuit board 1AP1 that carries the memory chip.
2	**Microprocessor RAM error** The microprocessor is unable to read/write from/to a particular memory address in its internal memory. This test is preformed only as part of initiation after power-up. This fault does not disable any functions. **Action:** Restart the machine. If the fault persists, replace circuit board 1AP1 that carries the microprocessor chip.
3	**Error in external RAM** Read/write test of the processor's external RAM. This test is preformed only as part of initiation after power-up. The microprocessor is unable to read/write from/to a particular memory address in its external memory. This fault does not disable any functions. **Action:** Restart the machine. If the fault persists, replace circuit board 1AP1 that carries the RAM memory.
4	**5 V power supply too low** The unregulated power supply voltage for the processor is too low: the smoothing capacitors cannot keep the voltage up enough for the processor to continue to operate. The processor stops all normal activities, expecting to be shut down. **Action:** Turn off the mains power supply to reset the unit. If the fault persists, check the power supply to circuit board 1AP1.
8	**Low battery voltage +3 V** This test is preformed only as part of initiation after power-up. This fault does not disable any functions. Replace the battery on circuit board 1AP1. If it is not replaced, the entire contents of the battery-backed memory will be lost.
12	**Communication error (warning)** The load on the system CAN bus is temporarily too high. **Action:** Check the equipment to ensure that only one wire feed unit and/or remote control unit is connected.
14	**Communication error (bus off)** The system's CAN bus has temporarily ceased to work due to excessive load. The current welding process is stopped. **Action:** Check the equipment to ensure that only one wire feed unit and/or remote control unit is connected. Turn off the mains power supply to reset the unit.

Code	Description
15	**Lost messages** The bus CAN circuit indicates that a message has been lost. No functions are disabled by this fault. **Action:** Check that all units are correct connected to the CAN bus.
17	**Lost contact with the wire feed unit** Current activities will be stopped: see Fault Code 18. This fault can be caused by a break in the connection (i.e. the CAN cable) between the wire feed unit and the control panel. **Action:** Check the CAN cables.
18	**Lost contact with the power source** Current activities will be stopped and welding start is prevented. This fault can be caused by a break in the connection (i.e. the CAN cable) between the power source and the control panel. It is possible, with the machine on, to break the connection between units and then to reconnect them without problems. The control panel “knows” if it has lost contact with any unit. When it establishes contact again, the power source is updated with all the settings that applied before the break. **Action:** Check the CAN cables.
19	**Memory error in data memory** This fault will be detected if the information in the battery–backed memory has become corrupted. **Action:** This fault corrects itself, but stored data in the current memory section will be lost. If the battery voltage is correct, and if the fault recurs each time the unit is started, there is a fault in the RAM memory. Replace the welding data board, 1AP1, in the control panel.
22	**Transmitter buffer overflow** The control panel is unable to transmit information to the other units at a sufficiently high speed. **Action:** A break in the bus line can cause this fault. Check the CAN cabling. Turn off the mains power supply to reset the unit.
23	**Receiver buffer overflow** The control panel is unable to process information from the other units at a sufficiently high speed. This fault is caused by abnormal loading of the microprocessor in the control panel. **Action:** Turn off the mains power supply to reset the unit.
26	**Program operatiing fault** Something has prevented the processor from performing its normal program duties. The program restarts automatically. The current welding process will be stopped. This fault does not disable any functions. This fault should never occur in reality. Contact ESAB if the fault does occur.
28	**Stack overflow** The program execution does not work. This fault should never occur in reality: the fault code is intended as an aid during development work. Contact ESAB if the fault does occur.
31	**No reply from the display unit** The microprocessor has no contact with the display board. **Action:** Check the ribbon cable and connectors between the welding data board (1AP1) and the display board (1AP2).

WARNING !

STATIC ELECTRICITY can damage circuit boards and electronic components.

- **Observe precautions for handling electrostatic-sensitive devices.**
- **Use proper static-proof bags and boxes.**

What is ESD?

A sudden transfer or discharge of static electricity from one object to another. ESD stands for Electrostatic Discharge.

How does ESD damage occur?

ESD can cause damage to sensitive electrical components, but is not dangerous to people. ESD damage occurs when an ungrounded person or object with a static charge comes into contact with a component or assembly that is grounded. A rapid discharge can occur, causing damage. This damage can take the form of immediate failure, but it is more likely that system performance will be affected and the component will fail prematurely.

How do we prevent ESD damage?

ESD damage can be prevented by awareness. If static electricity is prevented from building up on you or on anything at your work station, then there cannot be any static discharges. Nonconductive materials (e.g. fabrics), or insulators (e.g. plastics) generate and hold static charge, so you should not bring unnecessary nonconductive items into the work area.
It is obviously difficult to avoid all such items, so various means are used to drain off any static discharge from persons to prevent the risk of ESD damage. This is done by simple devices: wrist straps, connected to ground, and conductive shoes.

Work surfaces, carts and containers must be conductive and grounded. Use only antistatic packaging materials. Overall, handling of ESD-sensitive devices should be minimized to prevent damage.

Service aid

We can offer a number of service tools that will simplify the service.

Antistatic service kit

Ordering no. 0740 511 001

The kit makes it easier to protect sensitve components from electrostatic discharge.

Contents:

- A conductive mat (size 610 x 610 mm)
- A 1.5 metre long ground cable with a crocodile clip
- An adjustable wrist strap and cable with an inbuilt protective resistor

Antistatic service kit

Esat service kit

Ordering no. 0458 847 880

The software update is made from a PC, it has to be managed by a trained serviceman. For this a computer program called Esat, **E**SAB **s**oftware **a**dministration **t**ool, is needed. The PC is connected to the welding equipment by a cable connector and a CAN reader. From the Esat it is possible to update the software in power source, wire feeder and control panel. Esat contains also service functions by which it is possible to control, change or read the different functions in the equipment.

For the installation and use of Esat program you need a computer with operating system Windows 9x, NT4, 2000 or XP.

The Esat service kit contents:

- CAN adapter PPCAN
- Connection Cable between CAN reader and power source
- CAN adapter software and Esat software on CD
- Instruction manual for Esat

Exchange circuit boards

Exchange circuit boards are repaired and tested circuit boards. We offer those boards to a lower price than new circuit boards. When an exchange circuit board is ordered, **the defect board must be sent back to ESAB. Use only antistatic packaging materials for the circuit board**. If we do not receive the defect board, or if it is not packed in antistatic packaging, the price for the exchange board will be 30 to 50% higher than the normal price.

Some boards must have a machine ID, for this you need the Esat service kit. In order to make the service of the machines easy, we offer the boards with individual ordering numbers, where machine-ID is needed (plug and play). Machine ID is needed for the boards in the control panels (MMC module).

There are three price levels for the circuit boards, level 1. is the cheapest:

1. Exchange board without machine ID
2. New circuit board without ID
3. Exchange board with machine ID

During the warranty period we only accept the warranty costs for circuit boards without machine ID.

All circuit boards in the spare parts list are new circuit boards without machine ID. Below is a list of the exchange boards for the M2, MA4 and MA6 control panels.

Complete exchange control panels with machine ID

Panel	Ordering no.	Panel	Ordering no.	Panel	Ordering no.
M2	E458 535 882	MA4	E458 535 884	MA6	E458 535 886
U6	E458 535 890			MA6	

Exchange circuit boards for control panels

Panel	ID	Ordering no.	Panel	ID	Ordering no.	Panel	ID	Ordering no.
M2	no	E486 819 887	MA4	no	E486 819 880	MA6	no	E486 819 880
M2	yes	E486 819 882	MA4	yes	E486 819 884	MA6	yes	E486 819 886
U6	no	E486 819 880						
U6	yes	E486 819 890						

INSTRUCTIONS M2

This chapter is an extract from the instruction manual for the M2 control panel.

The control panel

1 Knob for selecting 2 / 4-stroke control mode
2 Knob for setting the burn-back time
3 Yellow indicating lamp - non-specific fault indication
4 Knob for setting the inductance
5 Knob for setting the wire feed speed
6 Knob for setting the arc voltage

Remote control unit

Using a remote control unit, the primary parameters of the welding process can be controlled from a device other than the control panel.

The remote control unit must be connected via a remote control adapter.

When the remote control adapter is connected, everything is controlled from the remote control unit, and the knobs on the control panel are out of operation.

Setting ranges

Welding parameter	Setting range	Adjustment steps
2/4-stroke	2-stroke or 4-stroke	-
Gas pre-flow	preset on 0.1 s	not adjustable
Gas post-flow	preset on < 0.1 s	not adjustable
Burn-back time	0.01 - 0.35 s	stepless
Inductance	30, 50, 70 and 90% of max inductance	4 positions
Wire feed speed	0.8 - 25.0 m/min	stepless
Arc voltage	8 - 42 V	stepless

2-stroke

With **2-stroke**, the gas pre-flow begins when the welding gun trigger switch is pressed. The welding process begins after this. When the trigger switch is released, welding is stopped and gas post-flow starts.

4-stroke

With **4-stroke**, the gas pre-flow begins when the welding gun trigger switch is pressed. When the welding gun trigger switch is released, the welding process starts. When the trigger switch is pressed again, the welding data is reduced to a lower value. When the gun trigger switch is released, welding is stopped and gas post-flow starts.

INSTRUCTIONS MA4

This chapter is an extract from the instruction manual for the MA4 control panel.

INTRODUCTION

Control panel

1 Display

2 Knob for setting the voltage

3 Knob for setting the wire feed speed and welding current

4 Increase (+) or Decrease (–) selected by the function pushbuttons. →

5 First, second and third function pushbuttons

Remote control unit

Using a remote control unit, the primary parameters of the welding process can be controlled from a device other than the control panel.

Machines with intergral control panels should have program version 1.21 or higher, in order for the remote control to function correctly.

Control panel's behaviour on connection of the remote control adapter

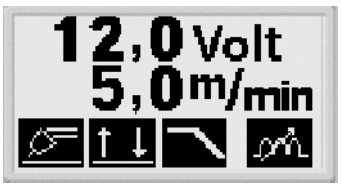
- The display freezes in the menu showing when the remote control is connected.

  Measurement and setting values are updated, but only shown in those menus in which the values can be displayed.
- If a fault code symbol is displayed, it cannot be removed until the remote control has been disconnected.

MENUS

The control panel uses several different menus. They are the main, measurement and settings menus.

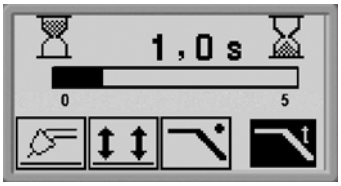
Main and measurement menus



The main menu is always displayed immediately after the machine is started. The menu shows the values which have been set. If the main menu is displayed when welding begins, it switches over automatically to show the measured values (measurement menu). The measured values will be displayed even after welding has been completed.

The settings menu can be accessed without losing the measurement values. It is only when the knob is turned that the setting values are displayed instead of the measured values.

Settings menu



Different values can be entered in the settings menu.

To access the settings menu, press  ,  ,  or  .

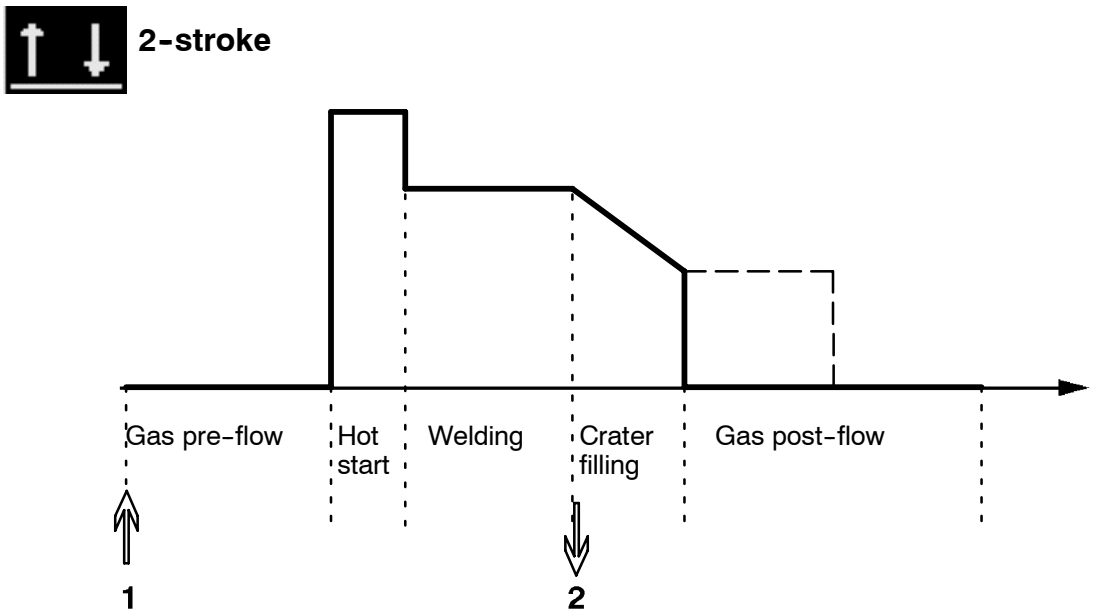
When the power source is switched off and restarted, the last values to be set are recalled.

MIG/MAG WELDING

Settings

Settings	Setting range	In steps of:	Default setting
Welding method	MIG/MAG, MMA or Arc-air gouging	-	MIG/MAG
2/4-stroke*	2-stroke or 4-stroke	-	2-stroke
Crater filling*	ON or OFF	-	OFF
Crater filling time	0 - 5 s	0.1 s	1.7 s
Inductance	0 - 100	1	70
Gas pre-flow	0.1 - 25.0 s	0.1 s	0.1 s
Creep start	ON or OFF	-	ON
Burnback time	1 - 350 ms	10 ms	100 ms
Gas post-flow	0.1 - 20 s	1 s	0.5 s
Voltage	8 - 60 V	0.25 V (displayed with one decimal)	12 V
Wire feed speed	0.8 - 25.0 m/min	0.1 m/min	5 m/min

**) These functions cannot be changed while welding is in progress.*

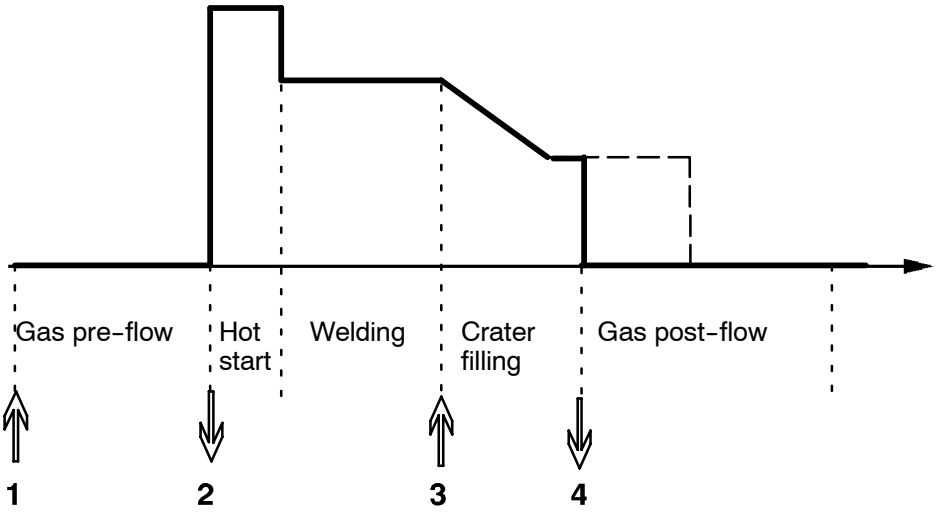


Functions when using 2-stroke control of the welding gun.

Gas pre-flow (if used) starts when the welding gun trigger switch is pressed (1). The welding process then starts. When the trigger switch is released (2), crater filling starts (if selected) and the welding current is stopped. Gas post-flow starts (if selected).

TIP: Pressing the trigger switch again while crater filling is in progress continues crater filling as long as the switch is held depressed (the dotted line). Crater filling can also be interrupted by quickly pressing and releasing the trigger switch while it is in progress.

4-stroke



Functions when using 4-stroke control of the welding gun

Gas pre-flow starts when the welding gun trigger switch is pressed (1): releasing the trigger switch starts the welding process. Pressing the trigger switch again (3) starts crater filling (if selected) and reduces the welding data to a lower value. Releasing the trigger switch (4) stops welding entirely and starts gas post-flow (if selected).

TIP: Crater filling stops when the trigger switch is released. Keeping it held in instead continues crater filling (the dotted line).

Symbols in the display

Function symbols


MIG/MAG

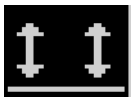

2-stroke


Gas pre-flow


Crater filling


Creep start


Inductance


4-stroke

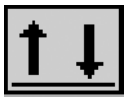

Gas post-flow

Crater filling time


Burnback time

Explanation of the symbols

 Active symbol (dark background). Active means that the function which the symbol represents can be activated. New values can only be set when the symbol is active.

 Inactive symbol (light background). Inactive means that settings for the function which the symbol represents cannot be changed.

From the settings menu, pressing an inactive symbol will return the machine to the main menu.

 A dot in the upper right-hand corner indicates that crater filling is ON.

Value symbols

The value symbols are displayed in the settings menu for each function.

 Lower inductance  Higher inductance

 No gas flow time  Long gas flow time

 Creep start ON  Creep start OFF

 Shorter burnback time  Longer burnback time

MMA WELDING

Settings

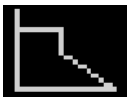
Settings	Setting range	In steps of	Default setting
Welding method	MIG/MAG, MMA or Arc-air gouging	-	MIG
Hot start*	ON or OFF	-	OFF
Hot start time	1 - 30	1	10
Arc force	0 - 10	0.5	3
Current, depending on machine type	16 - 500 A	1 A	100 A

**) This function cannot be changed while welding is in progress.*

Symbols in the display

Function symbols

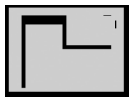
 MMA welding

 Arc force

 Hot start

Explanation of the symbols

 Active symbol (dark background). Active means that the function which the symbol represents can be activated. New values can only be set when the symbol is active.

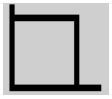
 Inactive symbol (light background). Inactive means that settings for the function which the symbol represents cannot be changed.

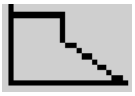
From the settings menu, pressing an inactive symbol will return the machine to the main menu.

 A dot in the upper right-hand corner indicates that “Hot start” is ON.

Value symbols

The value symbols are displayed in the settings menu for each function.

 No arc force

 Higher arc force

 Short hot start time

 Long hot start time

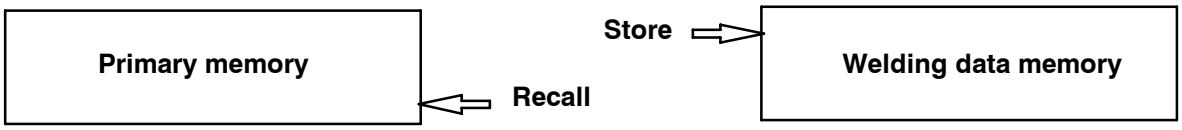
INSTRUCTIONS MA6 and U6

This chapter is an extract from the instruction manuals for the MA6 and U6 control panels.

INTRODUCTION

Control panel's working method

The control panel can be said to comprise two units: the primary memory and the welding data memory.



In the primary memory, a complete set of welding data settings are created which can be stored in the welding data memory.

When welding, it is always the content of the primary memory which controls the process. It is therefore also possible to recall welding data settings from the welding data memory to the primary memory.

Note that the primary memory always contains the most recently set welding data settings. These can be recalled from the welding data memory or individually altered settings. In other words, the primary memory is never empty or "reset"

Control panel

1 Display
2 Knob for setting the voltage
3 Knob for setting the wire feed speed and current
4 Soft pushbuttons (function keys)
5 MENU button

Soft pushbuttons 

The functions of these buttons (i.e. what each one does) change, depending on the sub-menu shown on the display. The particular function for each button is shown by the text in the bottom line of the display, corresponding to the buttons. (A white dot beside the text indicates that the button is active.)

MENU pushbutton 

This pushbutton brings you to the selection menu if you are in the main menu. If you are in some other menu, it moves you back up one menu.

Symbols in the display

Back to the main menu.

Move the cursor down to a new setting parameter.

Change the function in the selected line.

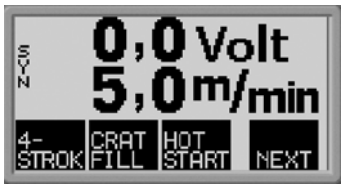
Increase the value.

Decrease the value.

MENUS

The control panel uses several different menus: the main menu, the measurements menu, the selection menu, the process menu, the settings menu, the configuration menu and the memory menu. A startup display is also shown when starting, with information on the type of panel and the software version in use.

The main menu and the measurements menu

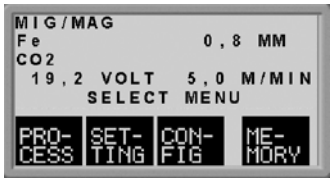


The main menu always appears immediately after starting, showing the values that are set. If you are in the main menu when you start to weld, the menu changes automatically to show the measured values (the measurements menu). The measured values remain on the display even after welding stops.

Other menus can be accessed without losing the measured values.

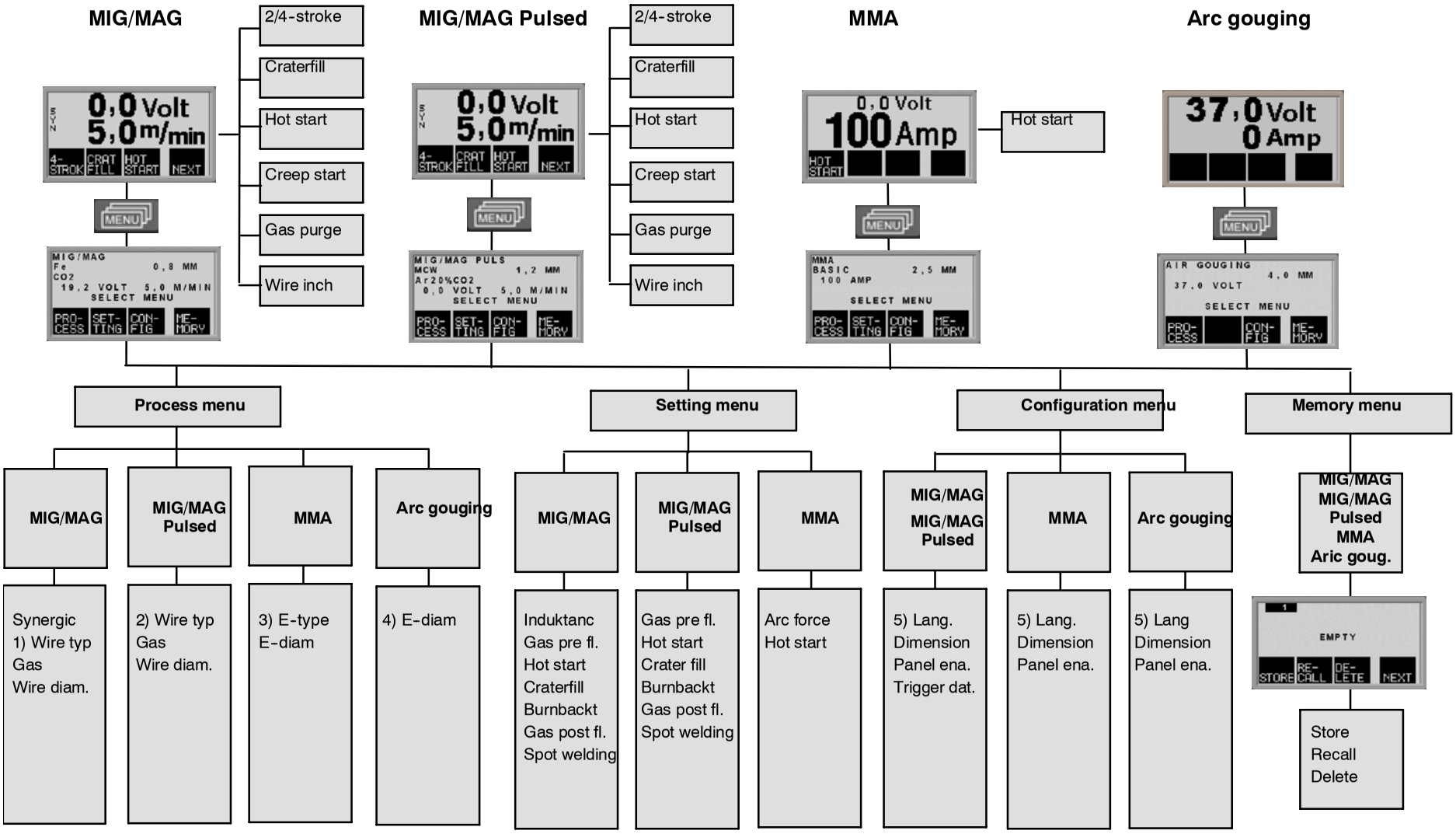
It is only when a knob is turned or the welding method changed that the setting values are displayed instead of the measured values.

The selection menu

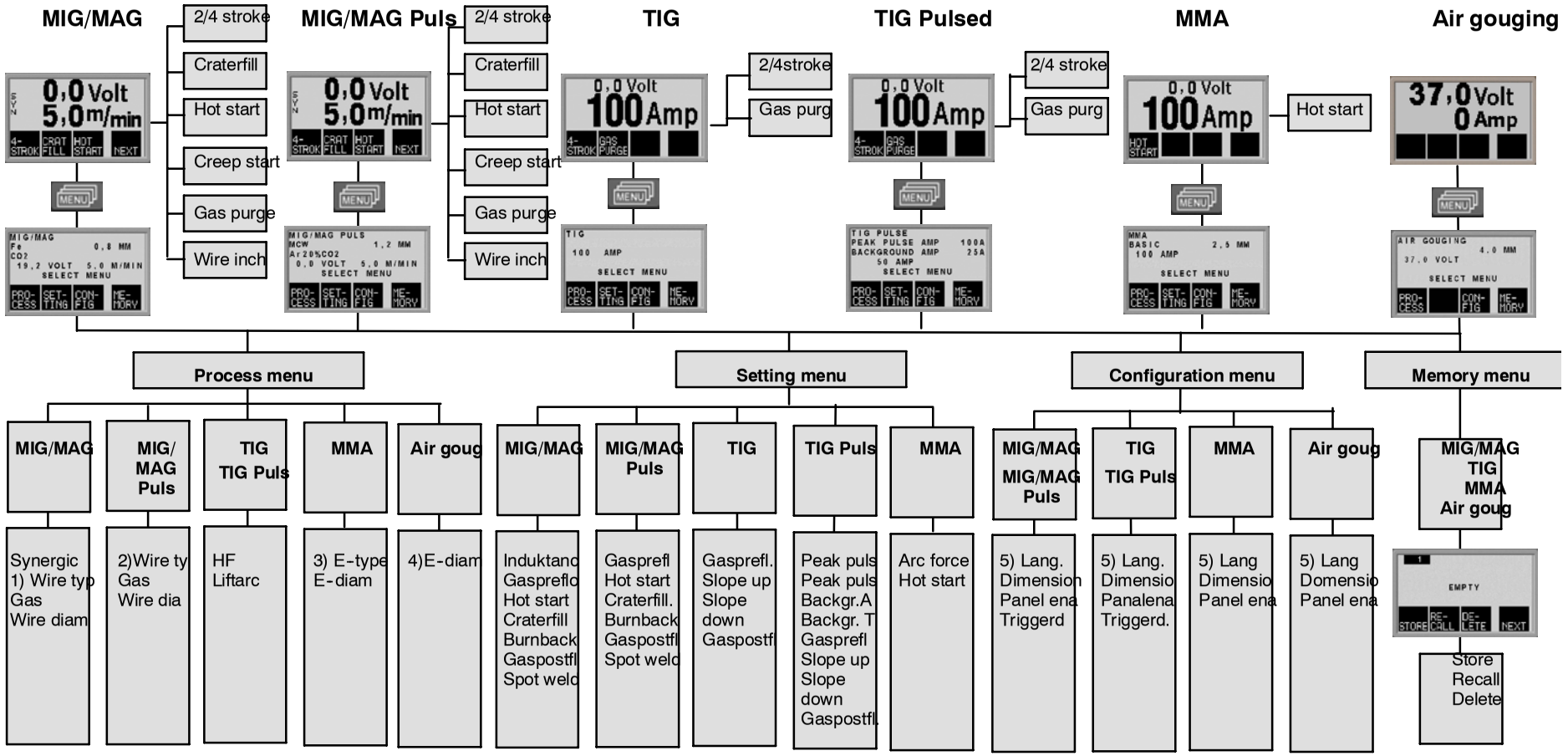


Use the selection menu to select the next level of menu to which you want to go: process, settings, configuration or memory.

Menu structure, panel MA6



Menu structure, panel U6



MIG/MAG WELDING

Settings for MIG/MAG welding without pulsing

Settings	Setting range	In steps of	Default setting
2/4-stroke [1]	2-stroke or 4-stroke	-	2-stroke
Crater filling	OFF or ON	-	OFF
Crater fill time	0 - 5 s	0.1 s	1.0 s
Hot start	OFF or ON	-	OFF
Hot start time	0 - 10 s	0.1 s	1.5 s
Creep start	OFF or ON	-	ON
Gas purging [1]	-	-	-
Cold wire feed	-	-	-
Synergy	OFF or ON	-	ON [2]
Inductance	0 - 100	1	70
Gas pre-flow	0.1 - 25 s	0.1 s	0.1 s
Burnback time	0 - 0.35 s	0.01 s	0.10 s
Gas post-flow	0.1 - 20 s	1 s	1 s
Spot welding	OFF or ON	-	OFF
Spot welding time	0.1 - 25 s	0.1 s	0.1 s
Voltage	8 - 60	0.25 (displayed with one decimal)	synergy deviation $\pm$ 0
Wire feed speed*	0.8 - 25.0 m/min	0.1 m/min	5 m/min
Trigger data	OFF, ON or ARC OFF	-	OFF
Dimensions	METRIC or INCH	-	METRIC
Panel enable	OFF or ON	-	OFF
Automatic save [3]	OFF or ON	-	OFF
AVC feeder [3]	OFF or ON	-	OFF
Limits [3]	OFF or ON	-	OFF
Lock code [3]	OFF or ON	-	OFF

[1] *These functions cannot be changed while welding is in progress.*

[2] *The synergy line on delivery: solid wire (Fe), shielding gas CO_2 with wire 0.8 mm.*

[3] *Contact an authorised ESAB service engineer to activate this function.*

Settings for MIG/MAG welding with pulsing

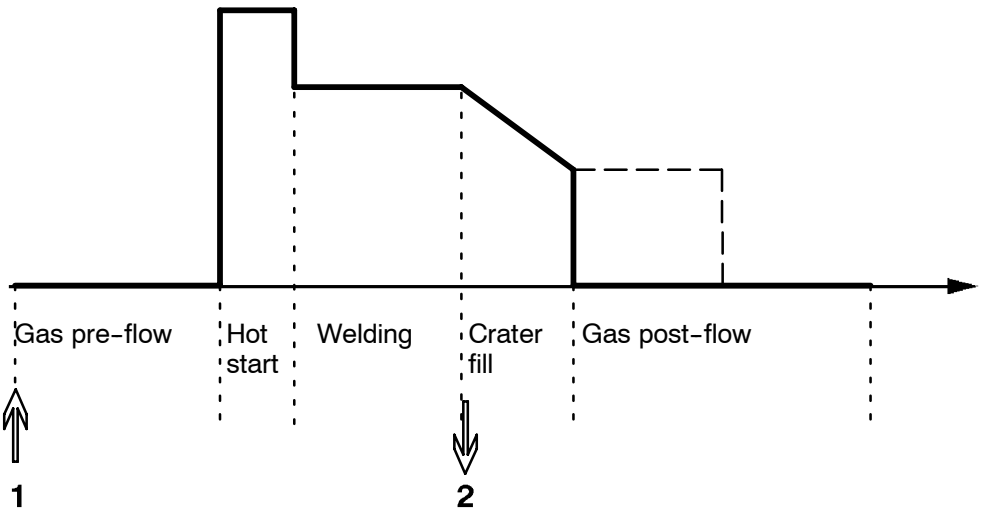
Settings	Setting range	In steps of	Default setting
2/4-stroke [1]	2-stroke or 4-stroke	-	2-stroke
Crater filling	OFF or ON	-	OFF
Crater fill time	0 - 5 s	0.1 s	1.0 s
Hot start	OFF or ON	-	OFF
Hot start time	0 - 10 s	0.1 s	1.5 s
Creep start	OFF or ON	-	ON
Gas purging [1]	-	-	-
Cold wire feed	-	-	-
Gas pre-flow	0.1 - 25 s	0.1 s	0.1 s
Burnback time	0 - 0.35 s	0.01 s	0.10 s
Gas post-flow	0 - 20 s	1 s	1 s
Spot welding	OFF or ON	-	OFF
Spot welding time	0.1 - 25 s	0.1 s	0.1 s
Voltage	8 - 60	0.25 (displayed with one decimal)	synergy deviation $\pm$ 0
Wire feed speed	0.8 - 25.0 m/min	0.1 m/min	5 m/min
Trigger data	OFF, ON or ARC OFF	-	OFF
Dimensions	METRIC or INCH	-	METRIC
Panel enable	OFF or ON	-	OFF
Automatic save [2]	OFF or ON	-	OFF
AVC feeder [2]	OFF or ON	-	OFF
Limits [2]	OFF or ON	-	OFF
Lock code [2]	OFF or ON	-	OFF

[1] *These functions cannot be changed while welding is in progress.*

[2] *Contact an authorised ESAB service engineer to activate this function.*

The synergy line on delivery: solid wire (Fe), shielding gas Ar 8% CO_2 with wire 1.0 mm.

2-stroke



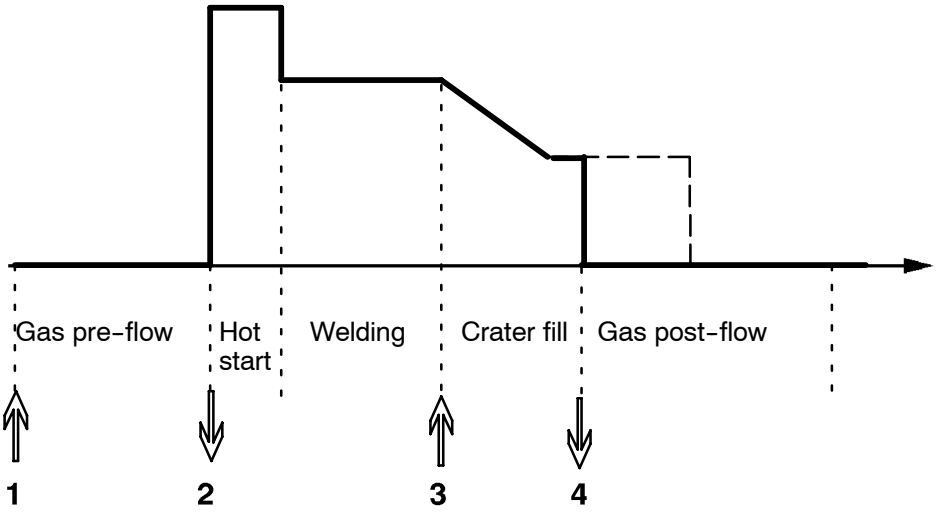
Functions when using 2-stroke control of the welding gun.

In the 2-stroke control mode, pressing the welding gun trigger switch starts gas pre-flow (if used) (1) and strikes the arc. Releasing the trigger switch (2) starts crater filling (if in operation), extinguishes the arc and starts gas post-flow (if in operation).

TIP: If the welding gun trigger switch is pressed again during the crater fill time, welding can be continued for as long as required (shown by the dotted line), using the crater fill data. Crater filling can also be interrupted by quickly pressing and releasing the trigger switch while crater filling is in progress.

Activation of 2-stroke performed in the main menu.

4-stroke



Function when using 4-stroke control of the welding gun.

In the 4-stroke control mode, pressing the welding gun trigger switch starts gas pre-flow (1). Releasing the trigger switch (2) starts the welding process. At the end of welding, the welder presses the trigger switch again (3), which starts crater filling (if in operation) and reduces the welding data to a lower value. Releasing the trigger switch again (4) extinguishes the arc and starts gas post-flow (if used).

TIP: Crater filling stops when the trigger switch is released. Keeping the button pressed continues welding at the lower data of the crater filling function (dotted line). Activation of 4-stroke performed in the main menu.

Synergy

Every combination of wire type, wire diameter and gas mixture requires a unique relationship between wire feed speed and voltage (arc length) in order to ensure a stable arc. The arc voltage (arc length) is automatically controlled in accordance with the preprogrammed synergy line that has been selected by the welder, which makes it much easier quickly to find the optimum welding parameters. The relationship between the wire feed speed and the other parameters is referred to as the synergy characteristic or synergy line.

Synergy ON:
the main menu shows the set wire feed, as well as positive and negative deviation from the synergy line's voltage.

Positive deviation is displayed with a bar above SYN, negative is displayed below.

Synergy OFF:
the main menu shows the set value for voltage and wire feed.

Activation of synergy performed in the main menu.

Synergy line package

The synergy line package supplied with the machine is called "**Standard** synergic lines" and contains the 33 most frequently used synergy lines.

It is also possible to order other packages of synergy lines, but these must be installed by an authorised ESAB service engineer.

Change of trigger data

Using this function, it is possible to switch to various pre-set welding data alternatives by double-clicking on the welding gun's trigger.

Switching takes place between the memory positions 1, 2 and 3 (see under chapter "memory management"). If there is no data in memory position 2, switching takes place instead between positions 1 and 3.

ON - Switching between memory positions can take place before, after or during welding.

ARC OFF - Switching between memory positions can only take place before or after welding.

- Activation of trigger data switching performed in the configuration menu.

AVC feeder

When this function is activated it is possible to use an Arc Voltage Controlled or Off-The-Arc feeder, where the arc voltage from the power source is used to power the feed unit.

- Activation of AVC feeder performed in the configuration menu.

TIG WELDING, panel U6

Settings for TIG welding without pulsing

Settings	Setting range	In steps of	Default setting
2/4-stroke [1]	2-stroke or 4-stroke	-	2-stroke
HF / Liftarc	HF or Liftarc	-	HF
Gas purging [1]	-	-	
Gas pre-flow	0 - 5 s	0.1 s	0.5 s
“Slope up” time	0 - 5 s	0.1 s	0.0 s
”Slope down” time	0 - 10 s	0.1 s	2.0 s
Gas post-flow	0 - 25 s	0.1 s	5.0 s
Current [2]	4 - 500 A	1 A	100 A
Trigger data	OFF, ON or ARC OFF	-	DISABLE
Dimensions	METRIC or INCH	-	METRIC
Panel enable	OFF or ON	-	ON
Automatic save [3]	OFF or ON	-	OFF
Limits [3]	OFF or ON	-	OFF
Lock code [3]	OFF or ON	-	OFF

Settings for TIG welding with pulsing

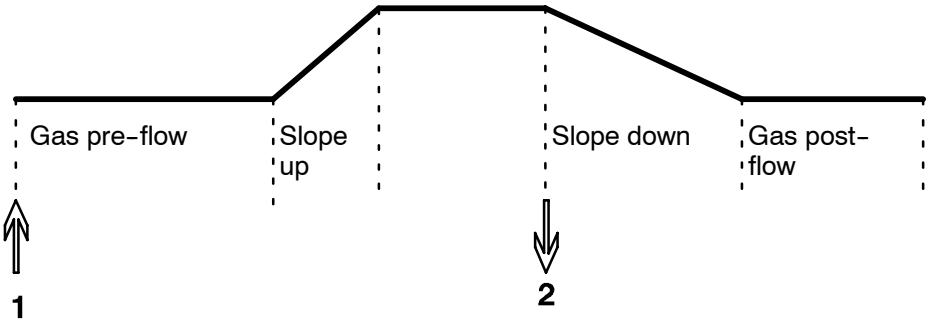
Settings	Setting range	In steps of	Default value
2/4-stroke [1]	2-stroke or 4-stroke	-	2-stroke
HF / Liftarc	HF or Liftarc	-	HF
Gas purging [1]	0 - 5 s	0.1 s	0.5 s
Gas pre-flow	0 - 5 s	0.1 s	0.5 s
“Slope up” time	0 - 5 s	0.1 s	0.0 s
”Slope down” time	0 - 10 s	0.1 s	2.0 s
Gas post-flow	0 - 25 s	0.1 s	5.0 s
Pulse duration	0.001 - 0.1 s	0.001 s	0.100 s
	0.1 -5 s	0.1 s	
Background duration	0.001 - 0.1 s	0.001 s	0.200 s
	0.1 -1 s	0.1 s	
Pulse current [2]	4 - 500 A	1 A	100 A
Background current [2]	4 - 500 A	1 A	25 A
Trigger data	OFF, ON or ARC OFF	-	DISABLE
Dimensions	METRIC or INCH	-	METRIC
Panel enable	OFF or ON	-	ON
Automatic save [3]	OFF or ON	-	OFF
Limits [3]	OFF or ON	-	OFF
Lock code [3]	OFF or ON	-	OFF

[1] *These functions cannot be changed while welding is in progress.*

[2] *Maximal current depends on which machine type is used.*

[3] *Contact an authorised ESAB service engineer to activate this function.*

2-stroke

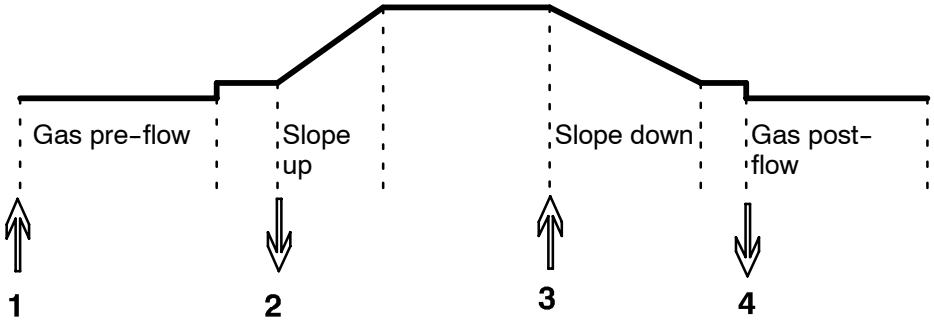


2-stroke operation of the welding gun switch button.

In the **2-stroke** control mode, pressing the welding gun switch button starts gas pre-flow (if used) and strikes the arc (1). The current rises to the set value (as controlled by the "slope up" function, if in operation). Releasing the switch button (2) reduces the current (or starts "slope down" if in operation) and extinguishes the arc. Gas post-flow follows if it is in operation.

- Activation of 2-stroke performed in the *main menu.*

4-stroke



4-stroke operation of the welding gun switch button.

In the 4**-stroke** control mode, pressing the switch button starts gas pre-flow (if used) (1). At the end of the gas pre-flow time, the current rises to the pilot level (a few ampere), and the arc is struck. Releasing the switch button (2) increases the current to the set value (with "slope up", if in use). At the end of welding, the welder presses the switch button again (3), which reduces the current to pilot level again (with "slope down", if in use). Releasing the switch button again (4) extinguishes the arc and starts gas post-flow (if used).

- Activation of 4-stroke performed in the *main menu.*

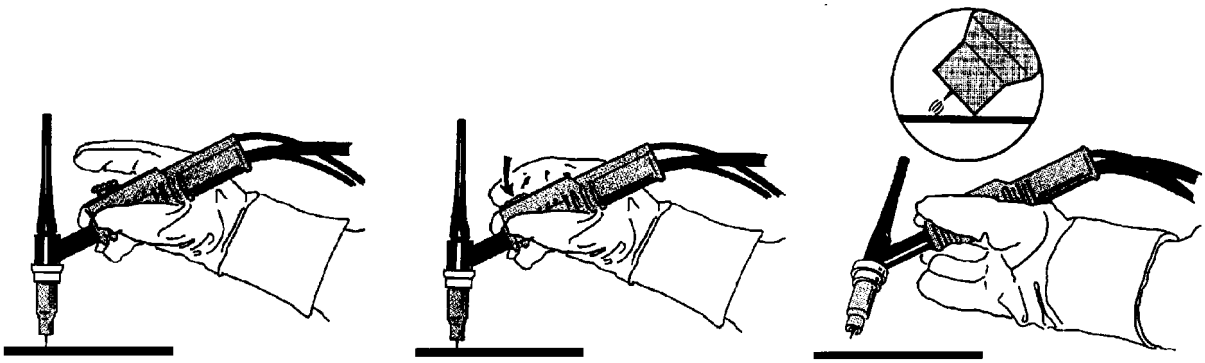
HF

The HF function strikes the arc by a spark produced when the tungsten electrode is brought to within a certain distance from the workpiece.

- Activation of HF performed in the *process menu.*

Lift Arc

The “Lift Arc” function strikes the arc when the electrode comes into contact with the workpiece and is then lifted off.



Striking the arc with the “Lift Arc” function. Step 1 shows the electrode in contact with the workpiece. The button is then pressed (Step 2), and a low current flows. The arc strikes when the welder lifts the gun away from the workpiece (Step 3), which causes the current to rise automatically to the set value.

- Activation of “Lift-Arc” performed in the *process menu.*

Change of trigger data

Using this function, it is possible to switch to various pre-set welding data alternatives by double-clicking on the welding blowpipe’s trigger.

Switching takes place between the memory positions 1, 2 and 3 (see under chapter NO TAG “memory management”). If there is no data in memory position 2, switching takes place instead between positions 1 and 3.

ON - Switching between memory positions can take place **before**, **after** or **during** welding.

ARC OFF - Switching between memory positions can only take place **before** or **after** welding.

- Activation of trigger data switching performed in the *configuration menu.*

MMA WELDING

Settings

Settings	Setting range	In steps of	Default setting
Hot start [1]	ON or OFF	–	OFF
Hot start time	1 – 30	1	10
Arc force	0 – 10	0.5	3
Current [2]	16 – 500 A	1 A	164 A
Dimensions	METRIC or INCH	–	METRIC
Panel enable	OFF or ON	–	ON
Automatic save [3]	OFF or ON	–	OFF
Limits [3]	OFF or ON	–	OFF
Lock code [3]	OFF or ON	–	OFF

[1] This function cannot be changed while welding is in progress.

[2] Maximal current depends on which machine type is used.

[3] Contact an authorised ESAB service engineer to activate this function.

The synergy line on delivery rutile electrode 4.0 mm.

ARC-AIR GOUGING

Settings

Settings	Setting range	In steps of	Default setting
Wire diameter	4.0–8.0 mm	1 mm	4.0 mm
Voltage	8–60 V	0,25 V (Displayed with one decimal.)	37.0 V

GENERAL FUNCTIONS

Remote control unit

Machines with intergral control panels should have program version 1.21 or higher, in order for the remote control to function correctly.

Control panel's behaviour on connection of the remote control adapter

- The display freezes in the menu showing when the remote control adapter is connected.

  Measurement and setting values are updated, but only displayed in those menus in which the values can be shown.
- If a fault code symbol is displayed, it cannot be removed until the remote control adapter has been disconnected.
- With 10–programme remote control units, it is possible to switch between memory positions 1 to 10. If memory position 2 is empty, the values from position 1 are retained.

Settings

Panel enable

When a remote control unit is connected it is possible to set current or voltage and wire feed speed by the control panel or the remote control unit.

Note: this function must be activated before the remote control unit is connected.

- Activation of panel enable performed in the configuration menu.

Auto save

If a welding data setting is recalled from the welding data memory and the settings are adjusted, the changed settings will automatic be saved when a new welding data setting is recalled from the memory.

Contact an authorised ESAB service engineer to activate this function.

- Activation of auto save performed in the *configuration menu.*

Limits

By this function max. and min. values for wirefeed / current or voltage can be set. The limits can be saved in the first 5 memory positions of the welding data memory.

Contact an authorised ESAB service engineer to activate this function.

- Activation of limits performed in the *configuration menu.*

Lock code

By this function the settings menu can be locked, then it is only possible to select the main menu and the measurements menu, see chapter “Lock code”.

Contact an authorised ESAB service engineer to activate this function.

- Activation of lock code performed in the *configuration menu.*

MEMORY MANAGEMENT

Various welding data created in the primary memory can be stored in the memory menu. Up to 10 different welding data settings can be stored.

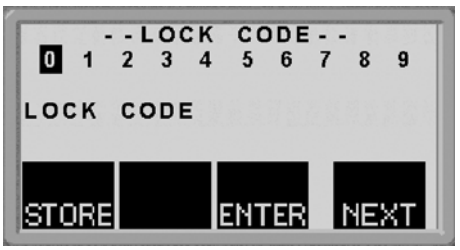
LOCK CODE

Contact an authorised ESAB service engineer to activate the lock code.

- Press 

to access the lock code menu.
- Press 

until the first digit of the PIN code is selected.



- Press STORE, to store the first digit of the code. Repeat the procedure for the remaining digits.
- Press ENTER to unlock the control panel.

SPARE PARTS

The spare parts lists are published in a separate document that can be downloaded from the Internet: www.esab.com/login/

Product	**filename**
M2, MA4, MA6, U6	0458 818 990

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