

CARL CLOOS Schweißtechnik GmbH
Industriestrasse
D-35708 Haiger
Tel.(+49) 2773/85-0
Fax.(+49) 2773/85-275
mail: info@cloos.de
www.cloos.de



Document: QIGL302DC

Month/Year 01/13

**EC-Declaration of Conformity
in accordance with EC Directives 2006/95/EG (low voltage) and 2004/108/EG (EMV)**

We herewith certify that the welding machine mentioned below has been developed, designed and

Designation of machine des Gerätes: TIG welding machine
Type: QINEO GL 302 DC
Serial number: see type plate (on the rear of the machine)

The following EC Directives have been applied:

- EC Low voltage directives (2006/95/EG)
- EC Directives on Electromagnetic compatibility (2004/108/EG)
- EC Directives RoHS (2011/65/EU)

The following harmonised standards have been applied:

- EN 60974-1: Arc welding equipment
Part 1: Welding power sources
- EN 60974-3: Arc welding equipment
Part 3: Arc striking and stabilizing devices
- EN 60974-10: Arc welding equipment
Part 10: Electromagnetic compatibility (EMC) requirements

Any significant modifications or extensions on the machine which are not carried out by the above

Manufacturer's signature:
Information on the signatory:

Dipl.-Kfm. Ralf Pulverich
Managing Director

1	INTRODUCTION	4	14	TECHNICAL DATA	23
2	FRONT PANEL	4	15	SPARE PARTS	24
3	REAR PANEL	5	16	ELECTRICAL DIAGRAM	26
4	INSTALLATION	5	16.1	GL 302 DC	26
4.1	CONNECTIONS TO THE ELECTRICAL MAINS NETWORK	5	16.2	TORCH CONNECTOR	27
4.2	PREPARING FOR MMA WELDING	5	16.3	REMOTE CONTROLLER CONNECTOR	27
4.3	PREPARING FOR TIG WELDING	6			
5	USER INTERFACE	8			
6	UNIT POWER-UP	9			
7	RESET (LOAD FACTORY SETTINGS)	9			
7.1	PARTIAL RESET	9			
7.2	TOTAL RESET	10			
8	SET-UP (INITIAL SET-UP OF THE WELDING POWER SOURCE)	10			
8.1	TORCH LOADING	12			
9	ALARMS MANAGEMENT	12			
	THERMAL ALARM!	12			
	COOLING DEVICE ALARM	12			
10	WELDING PARAMETERS	13			
	Welding current	13			
	Max welding current	13			
	Hot-start	13			
	Arc-force	13			
	VRD	13			
	Long arc voltage	13			
	Remote control	13			
	Dynamic arc	13			
	Second current Bi-level	13			
	Base current	13			
	Peak time	14			
	Base time	14			
	Pulse frequency	14			
	Slope down	14			
	Final current	14			
	Post-gas	14			
	Pre-gas	14			
	Start current	14			
	Slope up	14			
	Spot TIG time	14			
	HF arc start	14			
	Minimum pedal current	14			
	Q-start	14			
	Multi-tack	14			
10.1	PARAMETERS ACTIVATION	15			
11	WELDING SETTINGS	16			
11.1	ELECTRODE WELDING (MMA)	16			
11.1.1	MMA PARAMETERS SETTING (1ST LEVEL).....	16			
11.1.2	MMA PARAMETERS SETTING (2ND LEVEL)	16			
11.1.3	MMA SPECIAL FUNCTIONS	16			
11.2	DC TIG WELDING	17			
11.2.1	DC TIG PARAMETERS SETTING (1ST LEVEL)	17			
11.2.2	DC TIG PARAMETERS SETTING (2ND LEVEL)	17			
11.2.3	DC TIG SPECIAL FUNCTIONS MENU	18			
12	JOBS MANAGEMENT	19			
12.1	SAVING A JOB	19			
12.2	LOADING A USER JOB OF FACTORY SET JOB	19			
12.3	DELETING A JOB	19			
13	TORCH TRIGGER MODES	20			
13.1	2T LIFT-ARC WELDING	20			
13.2	2T HF WELDING	20			
13.3	4T LIFT-ARC WELDING	20			
13.4	4T HF WELDING	21			
13.5	BI-LEVEL LIFT WELDING	21			
13.6	BI-LEVEL HF WELDING	21			
13.7	2T SPOT WELDING	21			
13.8	2T SPOT HF WELDING	22			
13.9	PILOT ARC WELDING	22			

1 INTRODUCTION

IMPORTANT!

This handbook must be consigned to the user prior to installation and commissioning of the unit.

Read the "General prescriptions for use" handbook supplied separately from this handbook before installing and commissioning the unit.

The meaning of the symbols in this manual and the associated precautionary information are given in the "General prescriptions for use".

If the "General prescriptions for use" are not present, it is mandatory to request a replacement copy from the manufacturer or from your dealer.

Retain these documents for future consultation.

KEY	
	This symbol identifies an action that occurs automatically as a result of a previous action.
	This symbol identifies additional information or a reference to a different section of the manual containing the associated information.
	This symbol identifies a reference to a chapter of the manual.
	This symbol accompanies important information concerning the execution of the relevant operations.

GL 302 DC is an inverter-based welding power source complete with all the functions required for DC TIG and MMA welding with excellent arc characteristics.

The solidity of the components of this unit makes it a reliable working companion for workshop and outdoor applications.

This unit is ideal for maintenance, food industry, hydraulics, oil pipelines and chemical plants.

The parameters preset in the DC TIG pulsed synergic curve simplify welding by regulation exclusively of the current.

The current is adjustable also from the Up-Down torch.

The simply and intuitive interface allows high precision adjustments with 50 storable programs.

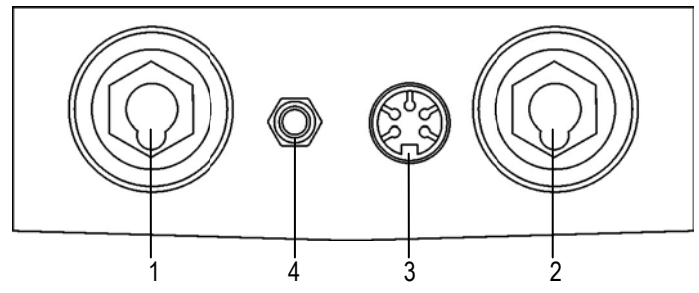
The wide range of adjustable pulsed frequency in combination with the complementary parameters (base current and duty cycle) makes it possible to weld in slow and fast pulsed mode.

The welding modes and procedures available are those indicated in the table.

MODE	PROCEDURE	PROCEDURE
MMA		
TIG CONTINUOUS	 	2T SPOT 2T SPOT + HF
TIG PULSED	 	2 STEP LIFT-ARC (2T) 2 STEP + HF (2T HF) 4 STEP LIFT-ARC (4T) 4 STEP + HF (4T HF)
SYN SYNERGIC TIG	 	4 STEP BI-LEVEL (4T B-LEVEL) 4 STEP BI-LEVEL + HF (4T B-LEVEL HF)

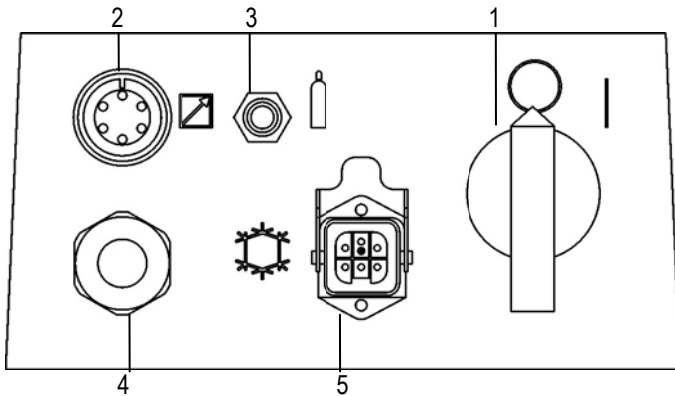
- Accessories that can be connected to the unit:
- manual remote controller for remote adjustment of the welding current.
 - foot-pedal remote controller for TIG torch arc striking and remote adjustment of welding current.
 - UP/DOWN torch or torch with potentiometer.
 - liquid cooler for TIG torches.

2 FRONT PANEL



- 1: Negative pole welding socket.
- 2: Positive pole welding socket.
- 3: Connector for logic signals of TIG torch.
- 4: Connector for gas feed hose: power source → torch

3 REAR PANEL



- 1: Welding power source ON/OFF switch.
- 2: Remote controller connector.
- 3: Connector for gas feed hose:
cylinder → power source
- 4: Power cable.

Total length (including internal part)	2.5 m
Number and cross section of wires	4 x 1.5 mm ²
Type of plug supplied	Not supplied

- 5: Cooler power feeding connector.

Voltage	230 V~
Current output	1.35 A
IP protection rating	IP20 (cap open) IP66 (cap closed)

WARNING!
High voltage!

If the socket is not connected to any devices always close the cap:
presence of hazardous voltage levels!

4 INSTALLATION

WARNING!
Lifting and positioning

Read the warnings highlighted by the following symbols in the
"General prescriptions for use".

4.1 CONNECTIONS TO THE ELECTRICAL MAINS NETWORK

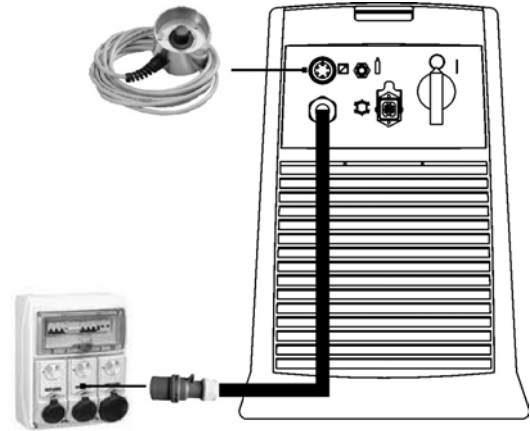
The characteristics of the mains power supply to which the equipment shall be connected are given in the section entitled "technical data" on page 23.

The machine can be connected to motorgenerators provided their voltage is stabilised.

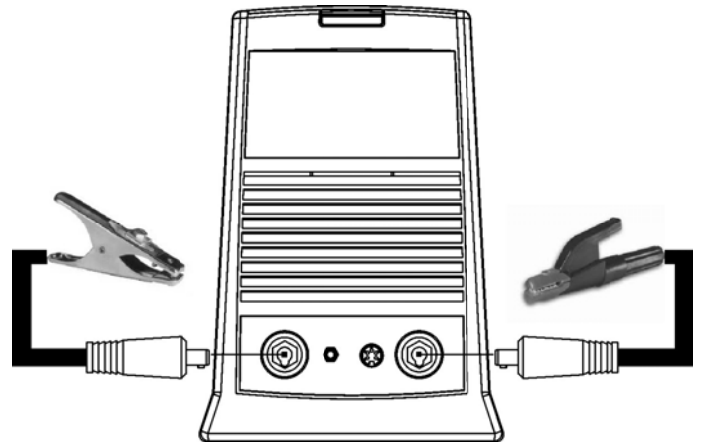
Connect/disconnect the various devices with the machine switched off.

4.2 PREPARING FOR MMA WELDING

1. Set the welding power source ON/OFF switch to "O" (unit de-energized).
2. Plug the power cable plug into a mains socket outlet.



3. Choose the electrode based on the type of material and thickness of the workpiece to be welded.
4. Insert the electrode in the electrode holder.
5. Connect the electrode holder clamp plug to the following welding socket: Positive pole welding socket.
6. Connect the earth clamp plug to the following welding socket: Negative pole welding socket.
7. Connect the earth clamp to the workpiece being processed.



WARNING!
Electric shock hazard!

Read the warnings highlighted by the following symbols in the
"General prescriptions for use".

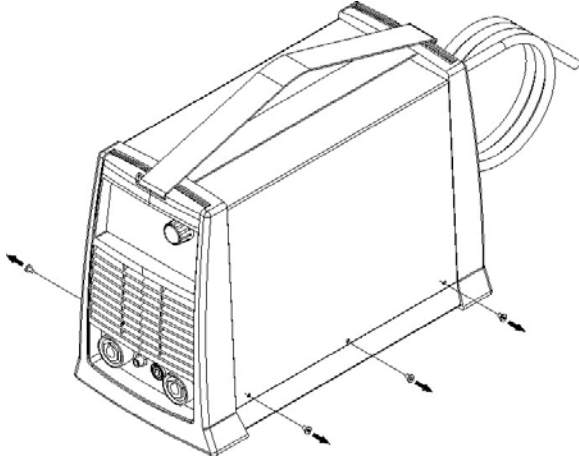
8. Set the welding power source ON/OFF switch to "I" (unit powered).
 9. Select the following welding mode on the user interface: MMA
 10. Set the required welding parameter values on the user interface.
- ⓘ When the remote controller [RC] is connected and the relative locking screw is tightened, welding current can be adjusted using the remote controller.

The system is ready to start welding.

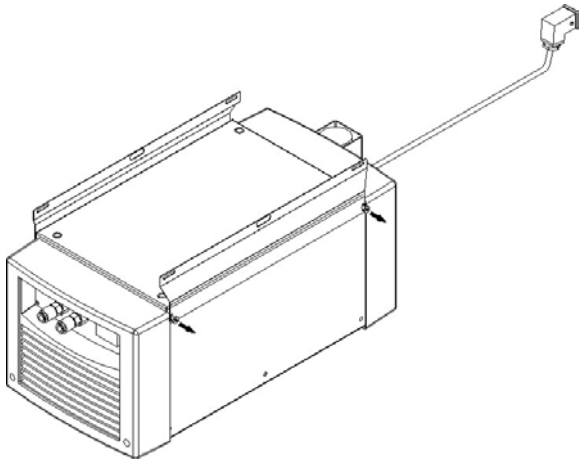
4.3 PREPARING FOR TIG WELDING

Installation with cooling unit

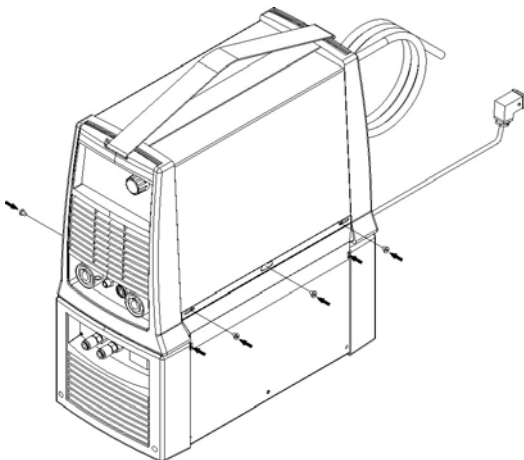
1. Set the welding power source ON/OFF switch to "O" (unit de-energized).
2. Remove the screws from the power source cabinet.



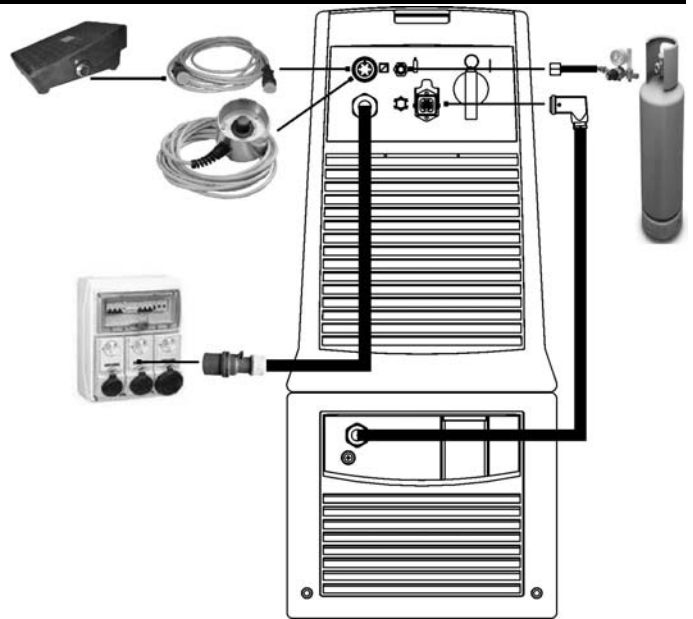
3. Loosen the screws of the upper brackets of the cooler and open out the brackets slightly.



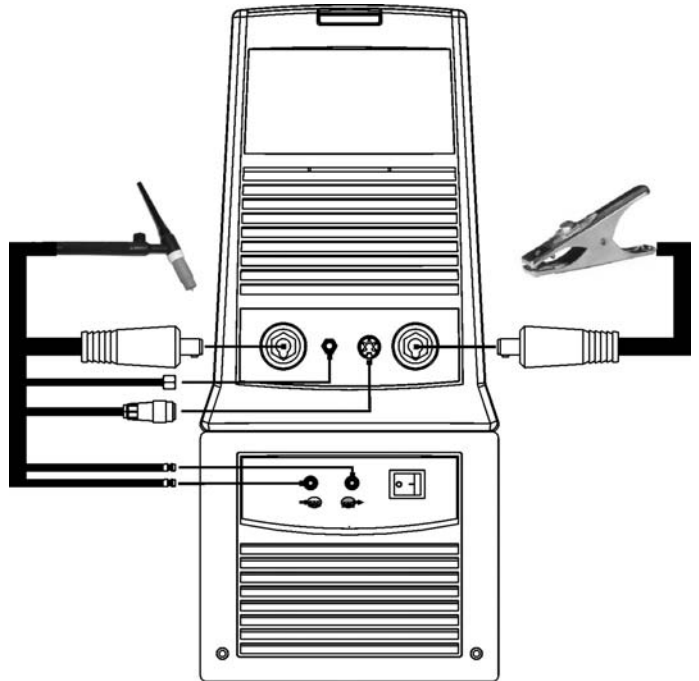
4. Place the power source on top of the cooler.
5. Secure the cooler brackets to the power source using the previously removed screws.



6. Connect the plug of the cooler power cable to the cooler power socket on the rear panel of the welding power source.
7. Set the cooler ON/OFF switch to "I" (unit powered).
8. Plug the power cable plug into a mains socket outlet.



9. Connect the gas hose from the welding gas cylinder to the rear gas socket.
10. Open the cylinder gas valve.

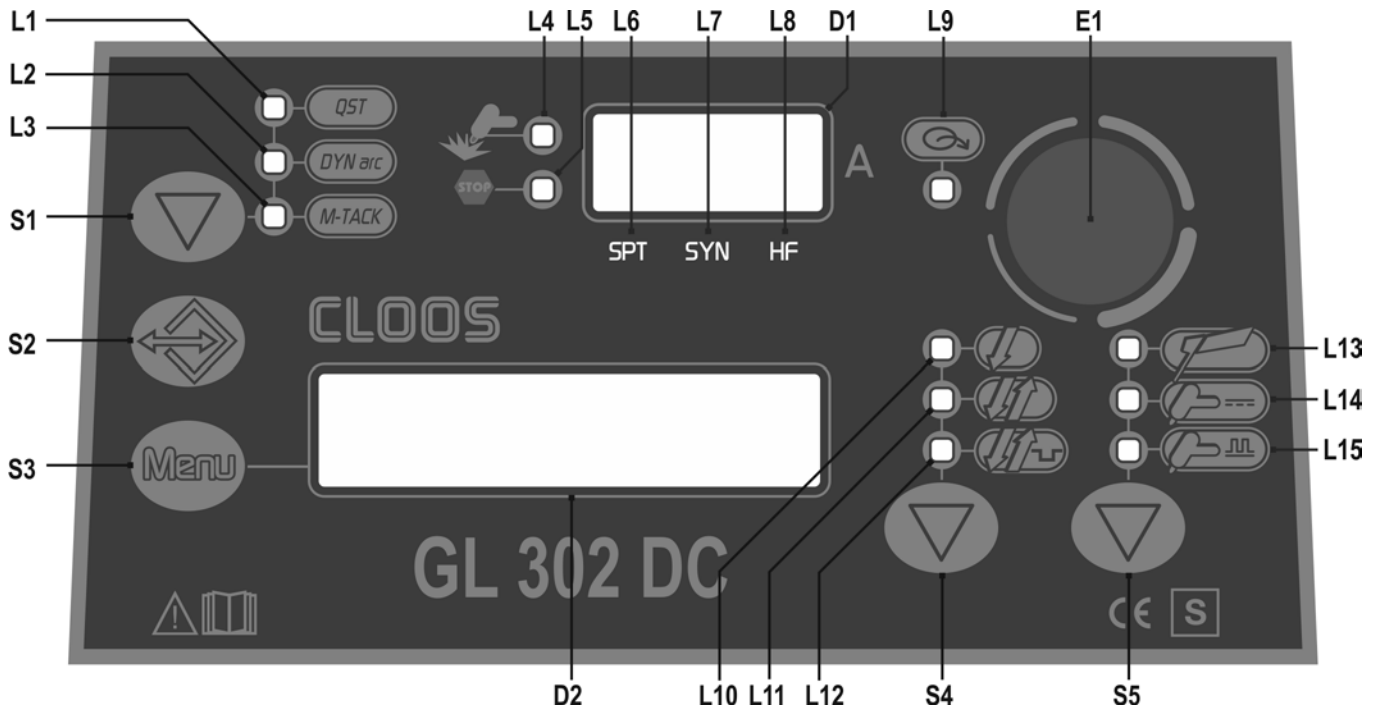


11. Connect the gas hose from the welding torch to the front gas socket.
12. Connect the torch plug to the following welding socket: Negative pole welding socket.
13. Choose the electrode based on the type of material and thickness of the workpiece to be welded.
14. Insert the electrode in the TIG torch.
15. Connect the torch plug to the following welding socket: Positive pole welding socket.
16. Connect the earth clamp to the workpiece being processed.
17. Set the welding power source ON/OFF switch to "I" (unit powered).
18. Select the following welding mode on the user interface: DC TIG
19. Press the torch trigger with the torch well clear of any metal parts. This serves to open the gas solenoid valve without striking the welding arc.





-
20. Use the flow control valve to adjust the flow of gas as required while the gas is flowing out.
 21. Set the required welding parameter values on the user interface.
 - ⓘ When the remote control pedal is connected and the relative locking screw is tightened the welding current will vary in relation to the pressure exerted on the pedal.

The system is ready to start welding.

5 USER INTERFACE




CODE	SYMBOL	DESCRIPTION
L1	QST	Illumination shows that the following function has been activated: Q-START
L2	DYN arc	Illumination shows that the following function has been activated: DYNAMIC ARC
L3	M-TACK	Illumination shows that the following function has been activated: MULTI TACK
L4		This LED illuminates to confirm the presence of power on the output sockets.
L5		This LED illuminates to show an anomaly in the operating conditions. ⓘ See "ALARMS MANAGEMENT" (§ 9 page 12).
L6	SPT	Illumination shows that the following function has been activated: 2 times Spot procedure ⓘ § 13.7 page 22 / § 13.8 page 22
L7	SYN	When this LED illuminates the following parameter can be set: TIG SYNERGIC PULSE When this is on, it means that the synergic mode is active and that the operator can set just the welding current while the other parameters are automatically regulated by the machine. The synergy is optimised by angle welding.
L8	HF	Illumination shows that the following function has been activated: High frequency arc strike (HF)
L9		This LED indicates that the current reference setting is imposed by the remote controller.
L10		Illumination shows that the following function has been activated: 2 times procedure ⓘ § 13.1 page 20 / § 13.2 page 20
L11		Illumination shows that the following function has been activated: 4 times procedure ⓘ § 13.3 page 20 / § 13.4 page 21
L12		Illumination shows that the following function has been activated: 4 times Bi-level procedure ⓘ § 13.5 page 21 / § 13.6 page 21
L13		This LED illuminates to show that the following welding mode is selected: MMA
L14		This LED illuminates to show that the following welding mode is selected: TIG CONTINUOUS
L15		This LED illuminates to show that the following welding mode is selected: TIG PULSED
D1		Parameters/functions setting: 1st level menu: The displays show the value of the following parameter: WELDING CURRENT Parameters/functions setting: 2nd level menu: The displays show "L.2". Welding: The displays show the value of the following parameter: WELDING CURRENT
D2		Parameters/functions setting: The displays show the selected parameter and its value. Welding: The displays show the average instantaneous voltage value. HOLD function: The displays show the average voltage value of the last weld executed. The "HOLD" value is cleared when a new weld is started, or when any action is performed on the user interface.
S1		DC TIG mode: Press the button to select the parameter to be set. Possible choices: - Q-START - DYNAMIC ARC - MULTI-TACK
S2		Press the button once to open the JOB upload menu. Hold down the button for 3 seconds to gain access to the JOB save/delete menu.
S3		Press the button once to select the parameters of the first level menu.


CODE	SYMBOL	DESCRIPTION
		Hold down the button for 3 seconds to gain access to the second level menu. Hold down the button at the time of power-on to gain access to the SETUP menu.
S4		DC TIG mode: This button selects the torch trigger procedure.  § 13 page 20
S5		This button selects the welding mode.
E1		Parameters/functions setting: The encoder provides the facility to alter the selected parameter. Welding: The encoder allows the welding current to be modified.

6 UNIT POWER-UP

Set the welding power source ON/OFF switch to "I" to switch on the unit.

-  **300T**
Fx.x The message appears on the following displays: D2
x.x= software version

First power-up or power-ups following a RESET procedure

-  The welding power source sets up for welding with the factory presets.

Subsequent power-ups

-  The welding power source sets up for welding in the latest stable welding configuration that was active at the time of power-off.

7 RESET (LOAD FACTORY SETTINGS)

The reset procedure involves complete restoration of the default values, parameters and memory settings set in the factory.

The reset procedure is useful in the following cases:



- Too many changes made to the welding parameters so user finds it difficult to restore defaults.
- Unidentified software problems that prevent the welding power source from functioning correctly.

7.1 PARTIAL RESET


The reset procedure involves restoration of the parameter values and settings, except the following settings:

- settings of the SETUP menu
- saved JOBS
- set language

Set the welding power source ON/OFF switch to "O" to switch the unit off.



- S3  S5  Hold down both buttons simultaneously.

Set the welding power source ON/OFF switch to "I" to switch on the unit.



-  **RECALL PARTIAL SETUP ?** The message appears on the following displays: D2



Exit without confirmation

-  Press any button (except S2).
 This action will automatically close the menu.



Exit with confirmation

- S3  Press the button.
 This action will automatically close the menu.
Wait for the memory clear procedure to terminate.

7.2 TOTAL RESET

The reset procedure involves complete restoration of the default values, parameters and memory settings set in the factory. All memory locations will be reset and hence all your personal welding settings will be lost!

Set the welding power source ON/OFF switch to "O" to switch the unit off.


S3  S5  Hold down both buttons simultaneously.



Set the welding power source ON/OFF switch to "I" to switch on the unit.


 **RECALL PARTIAL SETUP ?**

The message appears on the following displays: D2

E1  Select the following setting with the encoder:


RECALL FACTORY SETUP ?


Exit without confirmation

 Press any button (except S2).

 This action will automatically close the menu.

Exit with confirmation

S3  Press the button.


 **MEMORY RESETTING NOW.....** The message appears on the following displays: D2

 This action will automatically close the menu.

Wait for the memory clear procedure to terminate.

8 SET-UP (INITIAL SET-UP OF THE WELDING POWER SOURCE)


Set the welding power source ON/OFF switch to "O" to switch the unit off.


S3  Hold down the button.


Set the welding power source ON/OFF switch to "I" to switch on the unit.




SET UP The message appears for a few seconds on the following displays: D2

 **SELECT LANGUAGE:** The message appears on the following displays: D2

S3  Use this button to scroll the settings to edit.

E1  Using the encoder, edit the value of the selected setting.

 Press any key (except S3) to save the setting and quit the menu.

Tab. 1 - Setup settings

SETTING	MIN	DEFAULT	MAX	
SELECT LANGUAGE:				ITALIANO ENGLISH FRANÇAIS DEUTSCH ESPAÑOL DUTCH PORTUGUES SUOMI CESKY POLSKI
COOLER ACTIVATION	OFF	AUT	ON	
START CURRENT	%	A	A	*1
FINAL CURRENT	%	A	A	*1
CURRENT HF	20 A	SYN	300 A	
KIND OF PULSE	SLOW (*2)	SLOW	FAST (*3)	
PILOT ARC	OFF	OFF	ON	

*1: The value of this parameter can be set as a percentage of the welding current or as an absolute value expressed in Amperes.

*2: This setting enables slow pulsed mode.

*3: This setting enables fast pulsed mode.

Cooler activation

- ON= The cooler is always running when the power source is switched on. This mode is preferable for heavy duty and automatic welding procedures.
- OFF= The cooler is always disabled because an air-cooled torch is in use.
- AUT= When the unit is switched on the cooler is switched on for 16 s. During welding procedures the cooler runs constantly. When welding is terminated the cooler continues to run for 90 s + a number of seconds equivalent to the average current value shown using the HOLD function.

Current HF

This parameter establishes the current value during HF discharge. The value of this parameter can be set as an absolute value or in SYN. With SYN setting the HF current value is calculated automatically on the basis of the preset welding current value.

Consequences of a higher value:

- Arc striking is facilitated, even on very dirty workpieces.
- Risk of piercing excessively thin gauge workpieces.

Pilot arc

The function enables the output of a low current between the 1st and 2nd times of the torch trigger to shield the mask in advance and avoid the risk of blinding flashback caused by the welding current.

8.1 TORCH LOADING



WARNING!

Make sure the torch in use is correctly sized in relation to the welding current required and for the available and selected cooling type. This prevents the risk of burns to which the operator is potentially exposed, potential faults, and irreversible damage to the torch and the system. If a torch is installed or replaced while the unit is running, the circuit of the newly installed must be filled with coolant to avoid the risk of damage to the torch in the case of high voltage arc strikes without any liquid in the circuit.

Power-up with operation of the cooler set to "ON" or "AUT" mode

A check is performed automatically of the presence of liquid in the cooling circuit and the cooler is switched on for 15 seconds.

If the coolant circuit is full, the power source sets up in the most recent stable welding configuration.

If the coolant circuit is not full, all functions are inhibited and there will be no output power present.

- ☞ **COOLING DEVICE ALARM** The message appears on the following displays: D2
 - (any) ☑ Press the button or torch trigger to repeat the checking procedure for an additional 15 seconds.
 - If the problem persists rectify the cause of the alarm.

Power-up with operation of the cooler set to "OFF"

- ☞ Operation of the cooler and the cooler alarm are disabled.
- ☞ Welding is performed without liquid cooling of the torch.

Torch change-over with operation of the cooler set to "ON"

Press and release the torch trigger.

- ☞ This serves to start the cooler for 15 seconds to fill the torch cooling circuit.

9 ALARMS MANAGEMENT

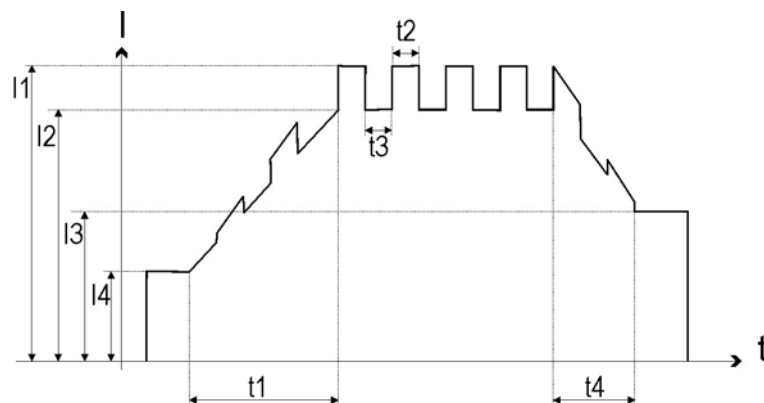
- ☞ This LED illuminates if an incorrect operating condition occurs.
- ☞ An alarm message appears on the following display: D2

Tab. 2 - Alarm messages

MESSAGE	MEANING	EVENT	CHECKS
THERMAL ALARM!	<p>Overheating alarm Indicates tripping of the welding power source thermal protection. Leave the unit running so that the overheated components cool as rapidly as possible. When the unit has cooled, the welding power source will reset automatically.</p>	<p>All functions disabled. Exceptions: - cooling fan. - cooler (if switched on).</p>	<ul style="list-style-type: none"> - Make sure that the power required by the welding process is lower than the maximum rated power output. - Check that the operating conditions are in compliance with the welding power source data plate specifications. - Check for the presence of adequate air circulation around the welding power source.
COOLING DEVICE ALARM	<p>Cooler alarm Indicates insufficient pressure in the torch liquid cooling circuit.</p>	<p>All functions disabled. Exceptions: - cooling fan. The alarm message persists on the display until the first operation is performed on the user interface. Cooler ON: the alarm is signalled as long as the unit alarm is active and the cooler presence signal persists. Cooler OFF: the alarm is never signalled, irrespective of the circumstances. Cooler AUT: the alarm is signalled at the times in which the unit is running; the alarm signal occurs as long as the unit presence signal persists.</p>	<ul style="list-style-type: none"> - Check that the connection to the cooler is correct. - Check that the O/I switch is set to I and that it illuminates when the pump is running. - Check that the cooler is filled with coolant. - Check that the cooling circuit is liquid tight, notably the torch hoses and the internal connections of the cooler.

10 WELDING PARAMETERS

For a better understanding of the parameter functions described in the table, refer to the following diagram.



(I1) TIG WELDING CURRENT

(I2) BASE CURRENT

(I3) FINAL CURRENT

(I4) STARTING CURRENT

(t1) UP SLOPE TIME

(t2) PEAK TIME

(t3) BASE TIME

(t4) DOWN SLOPE TIME

$(1/t2+t3)$ PULSED CURRENT FREQUENCY

Welding current

Output current value during welding.

Max welding current

Maximum output current value that can be achieved with remote controller external reference.

Hot-start

This parameter aids electrode melting at the time of arc striking.

Consequences of a higher value:

- Easier arc strike.
- Increased spatter at welding start.
- Increase of strike area.

Consequences of a lower value:

- More difficult arc strike.
- Less spatter at welding start.
- Smaller strike area.

Arc-force

This parameter helps to avoid electrode sticking during welding.

Consequences of a higher value:

- Fluidity during welding.
- Welding arc stability.
- Greater electrode fusion in workpiece.
- More welding spatter.

Consequences of a lower value:

- The arc is extinguished more easily.
- Less welding spatter.

VRD

This parameter reduces the potential across the welding sockets when welding is not in progress.

The arc strike procedure is as follows:

- Touch the workpiece with the electrode tip.
- Raise the electrode.

Power is released for several seconds.

- Touch the workpiece with the electrode tip.

The welding arc will strike.

Long arc voltage

This parameter inhibits power output when the potential between electrode and workpiece exceeds the preset threshold level.

Consequences of a higher value:

- The welding arc persists even with a significant distance between the electrode and the workpiece.

Consequences of a lower value:

- Faster exit from weld.

Remote control

This parameter enables the unit to receive the current reference signal from a remote control.

Dynamic arc

Welding power remains constant even when the distance between electrode and workpiece changes.

Consequences of a higher value:

- The welding arc concentration remains unchanged.
- Prevents electrode sticking.
- Thin workpieces may become deformed more easily.

Second current Bi-level

With a rapid press and release (less than 0.5 seconds) of the torch trigger during welding, the output current value switches to the value set by means of the "bi-level second current" parameter.

In DC TIG welding, the parameter is useful when welding different gauge workpieces during the same pass; when moving between different gauges the output current can be changed simply by pressing the torch trigger.

In AC TIG welding the parameter is useful to change the heat output during welding; when the workpiece heats up to the point at which there is a risk of deformation, the current value (= heat) can be reduced simply by pressing the torch trigger.

Base current

Pulsed wave minimum current.

Consequences of a higher value:

- Faster creation of weld pool.
- Increase of heat-affected zone.

Peak time

Time for which the current pulse is at the maximum value.

Consequences of a higher value:

- Greater weld penetration.
- Facility to make deeper cuts.

Consequences of a lower value:

- Reduction of heat-affected zone.
- Difficult to create a weld pool.

Base time

Time during which current output is at the base value.

Consequences of a higher value:

- The filler material is spread more evenly.
- Increase of heat-affected zone.

Pulse frequency

Consequences of a higher value:

- Slower melt speed.
- Reduction of heat-affected zone.

Slope down

Time during which the current changes from the welding value to the end value by means of a slope.

Final current

During electrode welding the parameter makes it possible to obtain a uniform deposit of filler material from the start to the end of the welding process, closing the deposition crater with a current such as to deposit a final droplet of filler material.

By keeping the torch trigger pressed during the 3rd time, the crater filler current is maintained thereby ensuring optimal crater filling, until the POST GAS time is started by releasing the torch trigger (4Th time).

Post-gas

Time of post gas delivery when the welding arc is extinguished.

Consequences of a higher value:

- More effective pickling (improved appearance of workpiece at the end of the welding pass).
- Higher gas consumption.

Consequences of a lower value:

- Lower gas consumption.
- Oxidation of electrode tip (more difficult arc strike).

Pre-gas

Time of gas delivery before the arc strike.

Consequences of a higher value:

- This parameter allows a shielded environment to be created, thereby eliminating contaminants at the start of the welding pass.

Start current

Unit current output value immediately after the arc strike.

Slope up

Time during which the current changes from the starting value to the welding value by means of a slope.

Spot TIG time

When the torch trigger is pressed the welding arc persists for the time set in the parameter.

Press the torch trigger again to resume the welding process.

The arc strike procedure is as follows:

Positioning of the torch with the electrode on the workpiece.

Press the torch trigger and keep it pressed.

Lift the torch slightly.

As soon as the electrode is lifted then the HF ignition starts.

The arc ignites for few hundredths of a second (time can be set up).

The result of this is a very precise, not oxidized welding spot without any plastic deformation of the sheet.

HF arc start

This parameter enables the arc strike in the TIG welding procedure by means of a high frequency (HF) current discharge.

The parameter prevents the inclusion of impurities at the start of the weld pass.

This parameter can harm electronic boards when welding is performed on equipment that incorporates such devices.

Minimum pedal current

Minimum output current value with foot pedal controller external reference.

The current is set as a percentage with respect to the "maximum foot pedal current" parameter.

Q-start

This parameter allows the unit to start in synergic pulsed TIG mode for the preset time interval, before switching automatically to the welding procedure selected on the interface panel.

The parameter creates a weld pool faster with respect to the standard starting procedure.

This parameter is useful when spot welding thin gauge sheet.

Multi-tack

This parameter allows thin gauge sheet to be welded without deformation.

Consequences of a higher value:

- Welding of thinner gauge sheet without deformation.
- Less melting of material, slower welding process.

10.1 PARAMETERS ACTIVATION

The welding parameters are available in accordance with the selected welding mode and procedure.

Certain parameters are available only after other parameters or functions of the unit have been enabled or set.

The table shows the settings required to enable each parameter.

✓: always available

1: Available with the user interface reference active

2: Available with "REMOTE CONTROL"= ON and remote controller connected

3: Available when "HF ARC START" parameter =ON

4: Not available with "MULTI TACK" active



5: Available with "KIND OF PULSE"= SLOW

6: Available with "KIND OF PULSE"= FAST





MENU	MODE →	P	S				M				SYN			
			↙	SPT	↗	↗	↙	SPT	↗	↗	↙	SPT	↗	↗
↓	PROCEDURE →													
	PARAMETER ↓													
1°	WELDING CURRENT	1	1	1	1	1	1	1	1	1	1	1	1	1
1°	MAX WELDING CURRENT	2	2	2			2	2			2	2		
1°	HOT-START	✓												
1°	ARC-FORCE	✓												
1°	PRE-GAS		3	3	3	3	3	3	3	3	3	3	3	3
1°	START CURRENT		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1°	SLOPE UP		4	4	4	4	4	4	4	4	4	4	4	4
1°	SECOND CURRENT BI-LEVEL													✓
1°	BASE CURRENT						✓	✓	✓	✓	✓	✓	✓	✓
1°	PEAK TIME DUTY CYCLE						✓	✓	✓	✓	✓	✓	✓	✓
1°	PULSE FREQUENCY						6	6	6	6	6	6	6	6
1°	BASE TIME						5	5	5	5	5	5	5	5
1°	SLOPE DOWN		4	4	4	4	4	4	4	4	4	4	4	4
1°	POST-GAS		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2°	VRD	✓												
2°	LONG ARC VOLTAGE	✓												
2°	REMOTE CONTROL	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2°	FINAL CURRENT		4	4	4	4	4	4	4	4	4	4	4	4
2°	SPOT TIG TIME			✓				✓				✓		
2°	MINIMUM PEDAL CURRENT		2	2			2	2			2	2		
2°	HF ARC START		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SPECIAL	Q-START		3+4		3+4	3+4	3+4		3+4	3+4				
SPECIAL	DYNAMIC ARC	✓	4		4		4		4					
SPECIAL	MULTI-TACK		3		3		3		3		3		3	

11 WELDING SETTINGS

11.1 ELECTRODE WELDING (MMA)

S5  This button serves to select the following welding mode:  MMA

11.1.1 MMA PARAMETERS SETTING (1ST LEVEL)







- S3  Press this button to scroll the list of settings to edit.
-  The selected parameter and its value are shown on the following displays: D2
- E1  Using the encoder, edit the value of the selected setting.
The value is saved automatically.
-  Press any key (except S3) to save the setting and quit the menu.

Tab. 3 - Parameters of the 1st level menu in MMA mode

PARAMETER	MIN	DEFAULT	MAX	
WELDING CURRENT	10 A	80 A	300 A	
MAX WELDING CURRENT	5 A	80 A	300 A	
HOT-START	0 %	50 %	100 %	*1
ARC-FORCE	0 %	30 %	100 %	*1

*1: This parameter is set as a percentage referred to the value of the following parameter: WELDING CURRENT

11.1.2 MMA PARAMETERS SETTING (2ND LEVEL)

- S3  Hold down the button for 3 seconds to gain access to the 2nd level menu.
-  **L.2** The message appears on the following displays: D1
L.2= LEVEL.2= 2ND LEVEL MENU
-  The selected parameter and its value are shown on the following displays: D2
- S3  Press this button to scroll the list of settings to edit.
- E1  Using the encoder, edit the value of the selected setting.
The value is saved automatically.
-  Press any key (except S3) to save the setting and quit the menu.

Tab. 4 - Parameters of the 2nd level menu in MMA mode

PARAMETER	MIN	DEFAULT	MAX	
VRD	OFF	OFF	ON	*3
LONG ARC VOLTAGE	37	SYN	65	*4
REMOTE CONTROL	OFF	OFF	ON	*2

*2: The activation is suitable for the following welding modes:

- MMA
- DC TIG
- AC TIG

Compatible remote control types:





- manual remote controller.

*3: The activation is suitable for the following welding modes:

- MMA

*4: SYN: This code indicates that parameters control is synergic. The optimal value of this parameter is set automatically by the microprocessor on the basis of the preset welding current value. This value can be displayed but it is not user-adjustable.











11.1.3 MMA SPECIAL FUNCTIONS

- S1  Press this button to scroll the list of settings to edit.
-  The selected parameter and its value are shown on the following displays: D2
- E1  Using the encoder, edit the value of the selected setting.
The value is saved automatically.
-  Press any key (except S1) to save the setting and quit the menu.





Tab. 5 - Special functions in MMA mode

PARAMETER	MIN	DEFAULT	MAX
DYNAMIC ARC	OFF	OFF	ON

11.2 DC TIG WELDING

- S5  Use this button to select one of the following welding modes:  DC TIG |  PULSED DC TIG |  SYN |  SYNERGIC TIG
- S4  Use this button to select one of the following torch trigger procedures:  2 STEP |  2T SPOT |  4 STEP |  4 STEP BI-LEVEL

11.2.1 DC TIG PARAMETERS SETTING (1ST LEVEL)

- S3  Press this button to scroll the list of settings to edit.
-  The selected parameter and its value are shown on the following displays: D2
- E1  Using the encoder, edit the value of the selected setting.
The value is saved automatically.
-  Press any key (except S3) to save the setting and quit the menu.

Tab. 6 - 1st level menu parameters in DC TIG mode

PARAMETER	MIN	DEFAULT	MAX	
WELDING CURRENT	5 A	80 A	300 A	
MAX WELDING CURRENT	5 A	80 A	300 A	
SECOND CURRENT BI-LEVEL	10 %	50 %	200 %	*1
BASE CURRENT	1 %	40 %	200 %	
	SYN	SYN	SYN	*3
PEAK TIME	0.1 s	5.0 s	5.0 s	*5
	1 %	50 %	99 %	*4
DUTY CYCLE	SYN	SYN	SYN	*3
	0.1 s	5.0 s	5.0 s	*5
BASE TIME	0.1 Hz	100 Hz	2.5 kHz	*4
	0.1 Hz	5.0 Hz	5.0 Hz	*5
PULSE FREQUENCY	SYN	SYN	SYN	*3
	0.0 s	0.0 s	25.0 s	
SLOPE DOWN	0.0 s	0.0 s	25.0 s	
FINAL CURRENT	5 %	5 %	80 %	*2
	5 A	5 A	300 A	*2
POST-GAS	0.0 s	10.0 s	25.0 s	
PRE-GAS	0.0 s	0.1 s	10.0 s	
START CURRENT	2 %	50 %	200 %	
	5 A	50 A	300 A	
SLOPE UP	0.0 s	0.0 s	25.0 s	

*1: This parameter is set as a percentage referred to the value of the following parameter: WELDING CURRENT







*2: The value of this parameter can be set as a percentage of the welding current or as an absolute value expressed in Amperes.

*3: SYN: This code indicates that parameters control is synergic. The optimal value of this parameter is set automatically by the microprocessor on the basis of the preset welding current value. This value can be displayed but it is not user-adjustable.

*4: Available when "KIND OF PULSE" parameter= FAST

*5: Available when "KIND OF PULSE" parameter= SLOW

11.2.2 DC TIG PARAMETERS SETTING (2ND LEVEL)

- S3  Access the 2nd level menu by holding the button down for 3 seconds.
-  L.2 The message appears on the following displays: D1
L.2= LEVEL.2= 2ND LEVEL MENU
- S3  Press this button to scroll the list of settings to edit.
-  The selected parameter and its value are shown on the following displays: D2
- E1  Using the encoder, edit the value of the selected setting.
The value is saved automatically.
-  Press any key (except S3) to save the setting and quit the menu.

Tab. 7 - 2nd level menu parameters in DC TIG mode

PARAMETER	MIN	DEFAULT	MAX	
SPOT TIG TIME	0.01 s	0.1 s	10.0 s	
HF ARC START	ON	ON	OFF	
REMOTE CONTROL	OFF	OFF	ON	*1
MINIMUM PEDAL CURRENT	1 %	50 %	90 %	*2

*1: The activation is suitable for the following welding modes:

- MMA
- DC TIG
- AC TIG

Compatible remote control types:

- manual remote controller.
- UP/DOWN or potentiometer TIG torch.
- foot pedal controller.

The maximum and minimum TIG welding current values can be set with the foot pedal controller.

The up slope and down slope cannot be controlled via the foot pedal.

The following welding procedures can be selected with the foot pedal:



If both remote controllers are connected, the foot pedal assumes priority over the UP/DOWN or potentiometer TIG torch.

When this function is active welding is performed without the following parameters:

- SLOPE UP
- SLOPE DOWN
- All special functions

*2: This parameter is set as a percentage referred to the value of the following parameter: WELDING CURRENT

11.2.3 DC TIG SPECIAL FUNCTIONS MENU

- S1 Press this button to scroll the list of settings to edit.
- The selected parameter and its value are shown on the following displays: D2
- E1 Using the encoder, edit the value of the selected setting.
The value is saved automatically.
- Press any key (except S1) to save the setting and quit the menu.

Tab. 8 - Special functions in DC TIG

PARAMETER	MIN	DEFAULT	MAX	
DYNAMIC ARC	OFF	OFF	ON	*3
Q-START	0.1 s	OFF	10.0 s	*3
MULTI-TACK	0.5 Hz	OFF	6.0 Hz	*2 *3

*2: When this function is active welding is performed without the following parameters:

- SLOPE UP
- SLOPE DOWN
- START CURRENT
- FINAL CURRENT
- DYNAMIC ARC
- Q-START

*3: When "REMOTE CONTROL"= ON and a foot pedal is connected the functions are all inhibited.

12 JOBS MANAGEMENT







Personalised welding settings, or JOBS, can be saved in memory locations and subsequently uploaded.

Up to 50 jobs can be saved (j01-j50).


The settings of the SETUP menu are not saved.

12.1 SAVING A JOB


This function is available when welding mode is not active.

- S5  Hold down the button for 3 seconds.
 **JOB STORAGE SELECTION** The message appears on the following displays: D2
- S5  Press the button to confirm.
 **STORE JOB N.xx** The message appears on the following displays: D2
 xx= number of the first free job.
 **JOB MEMORY FULL** When there are no free memory locations the message appears on the following displays: D2
- E1  Use the encoder to select the required job number.
 On selecting a currently occupied memory location, the job number flashes.
 If you confirm at this point, the new job will overwrite the previously saved settings.

Exit without confirmation





-  Press any button (except S2).
 This action will automatically close the menu.

Exit with confirmation


- S2  Press the button.
 This action will automatically close the menu.

12.2 LOADING A USER JOB OF FACTORY SET JOB



This function is available when welding mode is not active.

- S2  Press and release the button.
 **LOAD JOB N.xx** Only when the jobs have been uploaded, the message is shown on the following displays: D2
 xx= number of the latest job used.
 **NO JOB LOADED** If there are no jobs in the memory the message is shown on the following displays: D2
- E1  Use the encoder to select the number of the job to be uploaded.

Exit without confirmation

-  Press any button (except S2).
 This action will automatically close the menu.







Exit with confirmation

- S2  Press the button.
 **LOADED JOB N.xx** The message appears on the following displays: D2
 This action will automatically close the menu.

When a job is loaded and an UP/DOWN torch is installed, press the torch triggers to select the saved jobs.


12.3 DELETING A JOB

This function is available when welding mode is not active.


- S2  Hold down the button for 3 seconds.
 **JOB STORAGE SELECTION** The message appears on the following displays: D2
- E1  Select the following setting with the encoder:
 **JOB ERASURE SELECTION** The message appears only if there are saved JOBS, on the following displays: D2
- S2  Press the button to confirm.
 **ERASE JOB N.xx** The message appears on the following displays: D2
 xx= number of the latest job used.

NO STORED JOB

The message appears only if there are saved JOBS, on the following displays: D2

- E1  Use the encoder to select the number of the job to be deleted.

Exit without confirmation

-  Press any button (except S2).

This action will automatically close the menu.





Exit with confirmation

- S2  Press the button.






This action will automatically close the menu.

13 TORCH TRIGGER MODES






13.1 2T LIFT-ARC WELDING

1. Touch the workpiece with the torch electrode.
2. Press (1T) and keep the torch trigger pressed.
3. Slowly lift the torch to strike the arc.
 -  The welding current reaches the preset value, by way of a up slope time, if programmed.
4. Release (2T) the trigger to start the weld completion procedure.
 -  The current reaches the end current value in the time set in the down slope time parameter.
 -  The arc is extinguished.
 -  Gas delivery continues for the time set in the post gas parameter.

13.2 2T HF WELDING

1. Bring the torch up to the work until the electrode tip is approximately 2 or 3 mm away.
2. Press (1T) and keep the torch trigger pressed.
 -  The arc strikes without contact with the workpiece and the voltage discharges (HF) cease automatically.
 -  The welding current reaches the preset value, by way of a up slope time, if programmed.
3. Release (2T) the trigger to start the weld completion procedure.
 -  The current reaches the end current value in the time set in the down slope time parameter.
 -  The arc is extinguished.
 -  Gas delivery continues for the time set in the post gas parameter.

13.3 4T LIFT-ARC WELDING

1. Touch the workpiece with the torch electrode.
2. Press (1T) and release (2T) the torch trigger.
3. Slowly lift the torch to strike the arc.
 -  The welding current reaches the preset value, by way of a up slope time, if programmed.
4. Press (3T) the trigger and keep it pressed to start the weld completion procedure.
 -  The current reaches the end current value in the time set in the down slope time parameter.
 -  The arc continues and the current output will be the value set in the end current. parameter.
 -  In these conditions the weld pool can be closed (crater filler current).
5. Release (4T) the trigger to extinguish the arc.
 -  Gas delivery continues for the time set in the post gas parameter.

13.4 4T HF WELDING

1. Bring the torch up to the work until the electrode tip is approximately 2 or 3 mm away.
2. Press (1T) and release (2T) the torch trigger.
 - ⊖ The arc strikes without contact with the workpiece and the voltage discharges (HF) cease automatically.
 - ⊖ The welding current reaches the preset value, by way of a up slope time, if programmed.
3. Press (3T) the trigger and keep it pressed to start the weld completion procedure.
 - ⊖ The current reaches the end current value in the time set in the down slope time parameter.
 - ⊖ The arc continues and the current output will be the value set in the end current. parameter.
 - ⓘ In these conditions the weld pool can be closed (crater filler current).
4. Release (4T) the trigger to extinguish the arc.
 - ⊖ Gas delivery continues for the time set in the post gas parameter.

13.5 BI-LEVEL LIFT WELDING

1. Touch the workpiece with the torch electrode.
2. Press (1T) and release (2T) the torch trigger.
3. Slowly lift the torch to strike the arc.
 - ⊖ The welding current reaches the preset value, by way of a up slope time, if programmed.
4. Press and immediately release the torch trigger to switch to the second welding current.
 - ⓘ The trigger must not be pressed for more than 0.3 seconds; otherwise, the weld completion stage will start.
 - ⓘ When the trigger is pressed and released immediately, the system returns to the welding current.
5. Press (3T) the trigger and keep it pressed to start the weld completion procedure.
 - ⊖ The current reaches the end current value in the time set in the down slope time parameter.
 - ⊖ The arc continues and the current output will be the value set in the end current. parameter.
 - ⓘ In these conditions the weld pool can be closed (crater filler current).
6. Release (4T) the trigger to extinguish the arc.
 - ⊖ Gas delivery continues for the time set in the post gas parameter.

13.6 BI-LEVEL HF WELDING

1. Bring the torch up to the work until the electrode tip is approximately 2 or 3 mm away.
2. Press (1T) and release (2T) the torch trigger.
 - ⊖ The arc strikes without contact with the workpiece and the voltage discharges (HF) cease automatically.
 - ⊖ The welding current reaches the preset value, by way of a up slope time, if programmed.
3. Press and immediately release the torch trigger to switch to the second welding current.
 - ⓘ The trigger must not be pressed for more than 0.3 seconds; otherwise, the weld completion stage will start.
 - ⓘ When the trigger is pressed and released immediately, the system returns to the welding current.
4. Press (3T) the trigger and keep it pressed to start the weld completion procedure.
 - ⊖ The current reaches the end current value in the time set in the down slope time parameter.
 - ⊖ The arc continues and the current output will be the value set in the end current. parameter.
 - ⓘ In these conditions the weld pool can be closed (crater filler current).
5. Release (4T) the trigger to extinguish the arc.
 - ⊖ Gas delivery continues for the time set in the post gas parameter.

13.7 2T SPOT WELDING

1. Touch the workpiece with the torch electrode.
2. Press (1T) and keep the torch trigger pressed.
3. Slowly lift the torch to strike the arc.
4. Release (2T) the torch trigger.
 - ⊖ The welding current reaches the preset value, by way of a up slope time, if programmed.
 - ⊖ The welding procedure continues, at the preset current, for the time set with the spot time parameter.
 - ⊖ The current reaches the end current value in the time set in the down slope time parameter.
 - ⊖ The arc is extinguished.
 - ⊖ Gas delivery continues for the time set in the post gas parameter.

13.8 2T SPOT HF WELDING

1. Bring the torch up to the work until the electrode tip is approximately 2 or 3 mm away.
2. Press (1T) the torch trigger.
 - ➡ The arc strikes without contact with the workpiece and the voltage discharges (HF) cease automatically.
3. Release (2T) the torch trigger.
 - ➡ The welding current reaches the preset value, by way of a up slope time, if programmed.
 - ➡ The welding procedure continues, at the preset current, for the time set with the spot time parameter.
 - ➡ The current reaches the end current value in the time set in the down slope time parameter.
 - ➡ The arc is extinguished.
 - ➡ Gas delivery continues for the time set in the post gas parameter.

Keep pressed torch trigger procedure

1. Bring the torch up to the work until the electrode tip is approximately 2 or 3 mm away.
2. Press (1T) the torch trigger.
 - ➡ The arc strikes without contact with the workpiece and the voltage discharges (HF) cease automatically.
 - ➡ The welding current reaches the preset value, by way of a up slope time, if programmed.
 - ➡ The welding procedure continues, at the preset current, for the time set with the spot time parameter.
 - ➡ The current reaches the end current value in the time set in the down slope time parameter.
 - ➡ The arc is extinguished.
 - ➡ Gas delivery continues for the time set in the post gas parameter.
3. Touch the workpiece with the torch electrode.
4. Slowly lift the torch to strike the arc.

13.9 PILOT ARC WELDING

The pilot arc can be activated in the following torch trigger procedures:

- 4T LIFT-ARC WELDING
- 4 TIMES + HF WELDING (4T HF)
- 4 TIMES BI-LEVEL + HF WELDING (4T BI-LEVEL HF)

The welding procedure with pilot arc differs with respect to the procedure without pilot arc in the part of the torch trigger procedure described below.

LIFT-ARC Welding



1. Touch the workpiece with the torch electrode.
 2. Press (1T) and keep the torch trigger pressed.
 3. Slowly lift the torch to strike the arc.
 - ➡ The arc strikes, the welding current assumes the pilot current value.
 4. Release (2T) the torch trigger.
 - ➡ The welding current reaches the preset value, by way of a up slope time, if programmed.
- etc.

Welding with HF

1. Press (1T) and keep the torch trigger pressed.
 - ➡ The arc strikes without contact with the part and the voltage discharges (HF) cease automatically, the welding current will assume the pilot current value.
 2. Release (2T) the torch trigger.
 - ➡ The welding current reaches the preset value, by way of a up slope time, if programmed.
- etc.

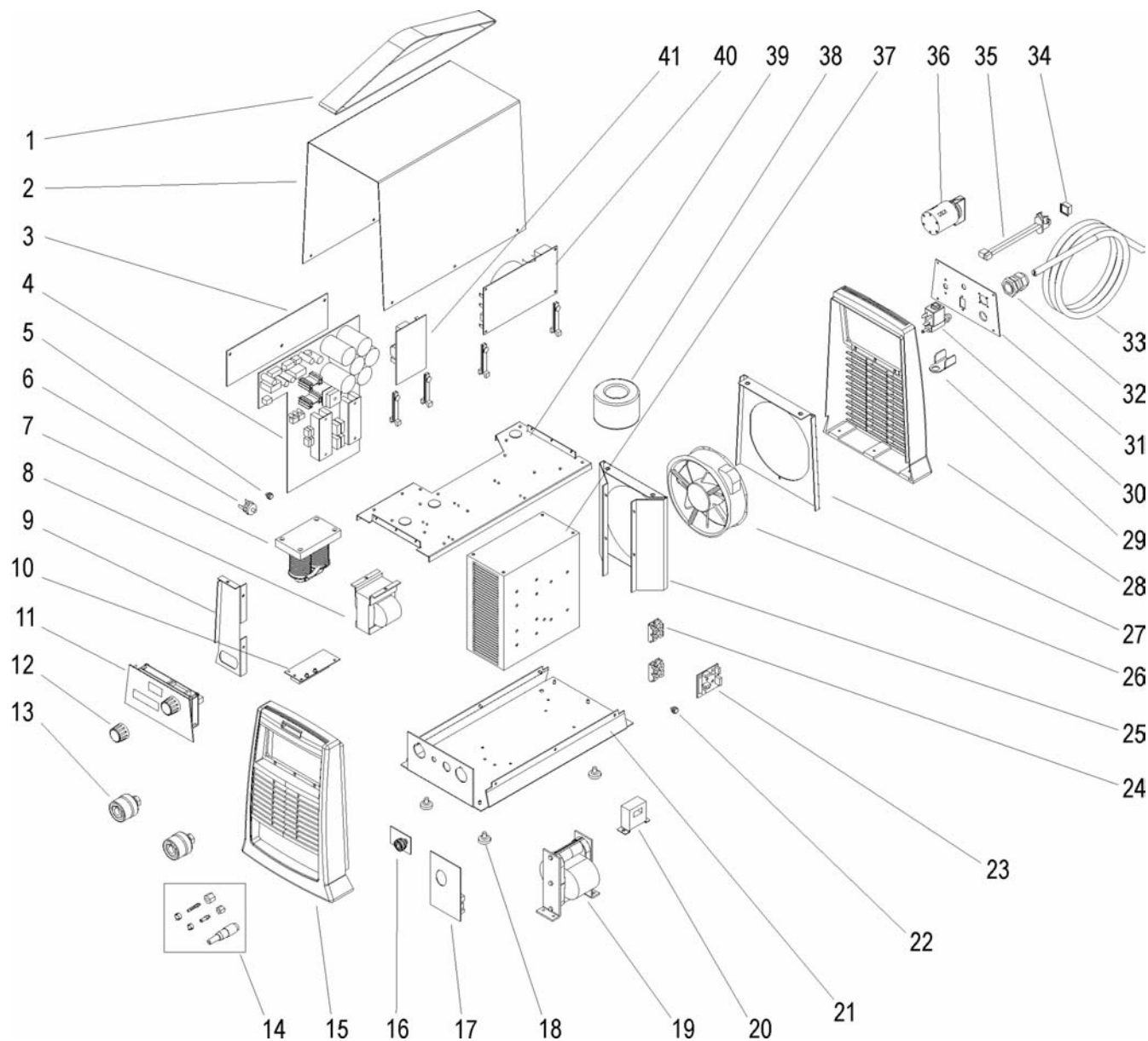
14 TECHNICAL DATA

Model	GL 302 DC
Construction standards	EN 60974-1 EN 60974-3 EN 60974-10 Class A
Supply voltage	3 x 400V \pm 15 % / 50-60 Hz
Mains protection	20 A Delayed
Dimensions (L x D x H)	460 x 230 x 325 mm
Weight	19.0 kg
Insulation class	H
Protection rating	IP23S
Cooling	AF
Maximum gas pressure	0.5 MPa (5 bar)
Z _{max}	*

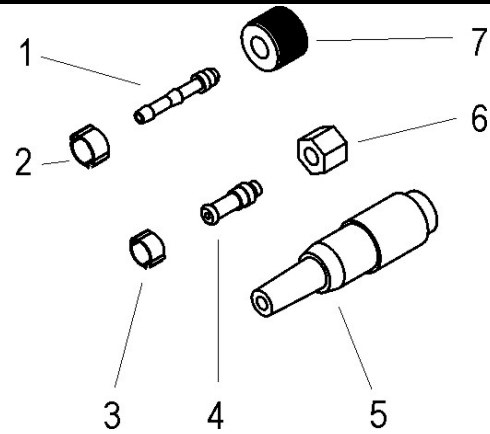
Temperature of the environment	40°C					
Welding mode	MMA			TIG		
Static characteristic						
Work cycle	40 %	60 %	100 %	50 %	60 %	100 %
Welding current	300 A	230 A	200 A	300 A	250 A	210 A
Working voltage	32.0 V	29.2 V	28.0 V	22.0 V	20.0 V	18.4 V
Maximum input power	13.3 KVA	9.9 KVA	8.4 KVA	10.3 KVA	8.4 KVA	6.7 KVA
	10.7 KW	7.9 KW	6.6 KW	7.9 KW	6.2 KW	4.8 KW
Maximum supply current	19.1 A	14.3 A	12.3 A	14.8 A	12.2 A	9.4 A
Maximum effective current	12.0 A	11.0 A	12.3 A	10.4 A	9.5 A	9.4 A
Open-circuit voltage (U ₀)	76 V			76 V		
Reduced no-load voltage (U _r)	9 V			9 V		
Arc striking device designed to work with manual guided torch.						
Rated HF peak voltage				12.6 kV		

*If this equipment is connected to a public low voltage system, it is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment may be connected.

15 SPARE PARTS

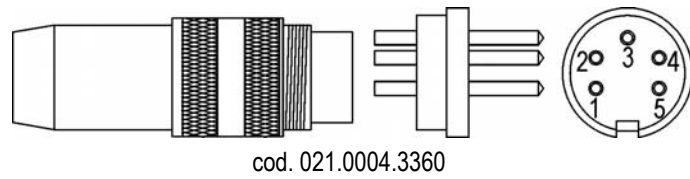


N°	CODE	BESCHREIBUNG
1	0835 22 00 01	BELT
2	0835 23 00 02	UPPER COVER
3	0835 23 00 03	ELECTRICAL INSULATION
4	0835 23 00 04	POWER BOARD
5	0835 23 00 05	THERMAL SWITCH L=200mm
6	0835 23 00 06	THERMAL SWITCH
8	0835 21 00 05	HF TRANSFORMER
8	0835 23 00 07	OUTPUT INDUCTANCE
9	0835 21 00 07	LATERAL PLATE
10	0835 23 00 08	PRIMARY CAPACITOR
11	0835 23 00 09	LOGIC FRONT PANEL
12	0835 21 00 10	KNOB
13	0835 21 00 11	FIXED SOCKETS 400A
14	0835 21 00 12	KIT FOR GAS CONNECTORS
15	0835 21 00 08	FRONT PLASTIC PANEL
16	0835 22 00 07	AMPHENOL CONN. BOARD
17	0835 21 00 14	OUTPUT FILTER BOARD
18	0835 23 00 10	RUBBER FOOT
19	0835 23 00 11	POWER TRANSFORMER
20	0835 21 00 18	HALL SENSOR
21	0835 21 00 22	LOWER COVER
22	0835 23 00 12	THERMAL SWITCH L=300mm
23	0835 23 00 13	SNUBBER BOARD
24	0835 23 00 14	DIODE
25	0835 22 00 12	INTERNAL FAN SUPPORT
26	0835 23 00 15	Fan
27	0835 21 00 27	EXTERNAL FAN SUPPORT
28	0835 21 00 28	REAR PLASTIC PANEL
29	0835 21 00 37	SOLENOID VALVE PLATE
30	0835 23 00 16	SOLENOID VALVE
31	0835 21 00 30	REAR PANEL
32	0835 21 00 31	CABLE CLAMP
33	0835 23 00 17	SUPPLY CABLE
34	0835 21 00 34	ILME CONNECTOR CAP
35	0835 23 00 18	CU POWER SUPPLY CABLE
36	0835 23 00 19	THREE POLE SWITCH
37	0835 21 00 20	HEAT SINK
38	0835 23 00 20	TOROIDAL TRANSFORMER
39	0835 23 00 21	UPPER PLATE
40	0835 23 00 22	LINE FILTER BOARD
41	0835 22 00 03	HF BOARD

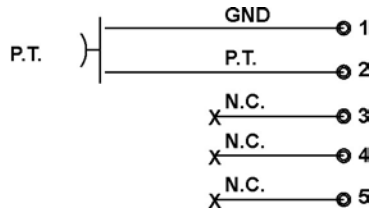


N°	CODE	BESCHREIBUNG
1	0835 21 00 43	SLEEVE HOSE ADAPTER FOR RUBBER HOSE 1/4
2	0835 21 00 44	HOSE CLAMP Ø=11-13
3	0835 21 00 45	HOSE CLAMP Ø=07-09
4	0835 21 00 46	SLEEVE HOSE ADAPTER FOR RUBBER HOSE M10
5	0835 21 00 47	AMPHT3360-001 M/5V. VOL. CONNECTOR
6	0835 21 00 48	NUT M10
7	0835 21 00 49	NUT 1/4

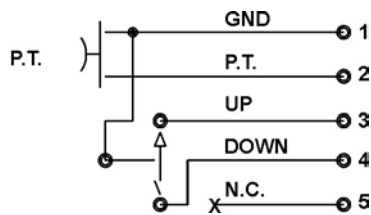
16.2 TORCH CONNECTOR



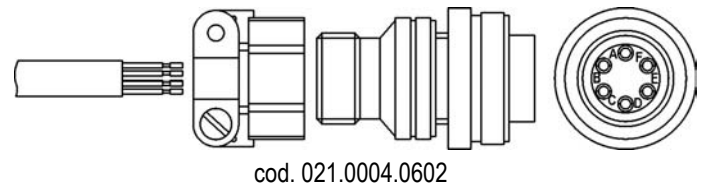
Torch



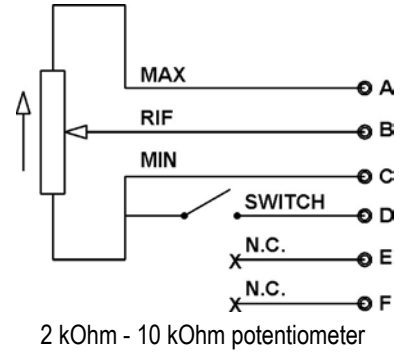
Up & Down Torch



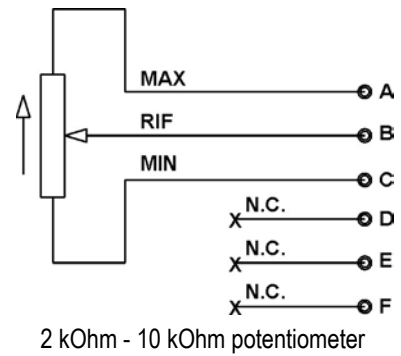
16.3 REMOTE CONTROLLER CONNECTOR



Torch with potentiometer



Remote Controller



Foot pedal controller

