



OPERATING INSTRUCTIONS
TIG inert gas welding units

INVERTIG.PRO *digital* 240 – 450 DC / AC/DC

REHM SCHWEISSTECHNIK



Operating instructions

Description	TIG inert gas welding units
Type	INVERTIG.PRO <i>digital</i> 240 DC, 240 AC/DC INVERTIG.PRO <i>digital</i> 280 DC, 280 AC/DC INVERTIG.PRO <i>digital</i> 350 DC, 350 AC/DC INVERTIG.PRO <i>digital</i> 450 DC, 450 AC/DC
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1. Introduction

1.1 Preface

Dear Customer,

You have purchased a REHM inert gas welding unit, a branded German product. We would like to take this opportunity to thank you for putting your trust in our quality products.

Only the highest quality components are used in the development and manufacturing of INVERTIG.PRO *digital* welding units. In order to guarantee high durability, even under the toughest of conditions, all REHM welding units contain components that live up to strict REHM quality requirements. The INVERTIG.PRO *digital* welding unit has been designed and built in accordance with established safety requirements. All of the relevant legal requirements have been taken into account and are supported by the conformity declaration and the CE mark.

REHM welding units are produced in Germany and carry the "Made in Germany" quality mark.

As REHM is constantly developing its products in line with technical progress, we reserve the right to adapt and modify this welding unit at any time, in order to meet the latest technical requirements.

1.2 General description



Figure 1: INVERTIG.PRO digital

1.2.1 Principle of the TIG inert gas welding procedure

When TIG welding, the arc burns freely between a tungsten electrode and the work piece. The shielding gas used is an inert gas like Argon, Helium or a mix of these.

One pole of the energy source is at the tungsten electrode, the other on the work piece. The electrode is the conductor and the arc carrier (permanent electrode). The additional material is introduced in stick format by hand, or in wire format using a separate cold wire feed unit. The tungsten electrode and the pool crater as well as the liquid melting end of the additional materials are all protected from the oxygen in the air by the inert gas employed which is released from the nozzles arranged concentrically around the electrode.

1.2.2 Areas of application of the TIG welding units

INVERTIG.PRO *digital* DC welding units are direct current power sources. They are suitable for welding all alloyed and non-alloyed steels, stainless steels and non-ferrous metals.

INVERTIG.PRO *digital* AC/DC welding units are both direct and alternating current sources. They can be used to process all alloyed and non-alloyed steels, stainless steels, non-ferrous metals, aluminium and aluminium alloys.

1.2.3 Functional principle of the TIG welding units

Our TIG INVERTIG.PRO *digital* welding units are primary-clocked power sources in which the welding current is switched by one of the most modern high-performance transistor switches. The On/Off switch relationship of the high-performance transistor switch regulates the set welding current. In conjunction with the high switching frequency of 100 kHz this generates an extreme stable and quiet arc. A precise processor controller guarantees constant welding current even when the distance between the torch and the work piece changes or the power supply fluctuates. The INVERTIG.PRO *digital* units have the frequency automation developed by REHM which ensures for optimum adaptation of the welding current frequency of the welding current when using alternating current. With the new REHM AC-Matic, the AC curve shape is automatically adapted to the current strength. A sine wave curve shape is automatically selected for low currents, and the square wave curve shape is automatically used for higher currents

The use of the most modern transistor switching technology means that these power sources are extremely effective.

1.2.4 Correct use

REHM welding units are designed to weld various metals such as non-alloyed and alloyed steel, stainless steel and aluminium. You should also pay attention to the special regulations pertaining to your area of application.

REHM welding units are designed for use with hand-controlled and machine-controlled operations.

REHM welding units are, unless explicitly permitted in writing by REHM; only for sale to commercial and industrial users and only for use by such. They may only be operated by persons trained in the use and maintenance of welding units.

Welding current sources may not be set up in areas with increased electrical risk.

These operating instructions contain rules and guidelines for the correct use of your unit. Only when these are adhered to can it be described as correct use.

Risks and damaged caused as a result of a different type of use is the responsibility of the operator. In the event of special requirements, it may be necessary for additional special conditions to also be taken into account.

If anything is unclear, consult your safety officer or contact REHM's customer service department.

You should also pay attention to the special notes regarding correct use set out in the suppliers documentations.

National regulations regarding the operation of the unit are valid with no restrictions .

Welding current sources may not be used to defrost tubes.

Correct use also covers the observation of the correct measures with regard to mounting, removal and remounting, taking into service, operation and maintenance as well as disposal. Please pay special attention to the specifications in Chapter 2 Safety notes and Chapter 8.4 Correct disposal.

The unit may only be operated under the conditions set out above. Any other use is not correct. The consequences are the responsibility of the operator.

1.3 Symbols used

Typographic symbols



Safety symbols

- Lists with bullets: General lists
- ☐ Lists with a square: Work or operational steps that must be carried out in the sequence listed.

➔ Chapter 2.2, Warning symbols on the unit

Cross-references: In this case, to Chapter 2.2 Warning symbols on the unit

Bold is used for emphasis

Note!

... Refers to tips and other useful information.

The safety symbols used in this manual: ➔ Chapter 2.1

2. Safety notes

2.1 Safety symbols used in these operating instructions

Warning notes and symbols



This or a symbol more specific to the danger can be found with all safety notes in these operating instructions which carry a risk to life and limb.

One of the following signalling words (Danger! Warning! Caution!) indicate the degree of danger:

Danger! ... indicates immediate threat of danger.

If this is not avoided it may lead to death or serious injury.

Warning! ... indicates a potentially dangerous situation.

If this is not avoided it may lead to death or serious injury.

Caution! ... indicates a situation in which damage may occur.

If this is not avoided it may lead to slight or minor injuries and damage to property.

Important!



Indicates a potentially damaging situation. If this is not avoided it may lead to damage to the product or to something in the vicinity.



Materials that may be hazardous to health or environment. Materials that must be treated/disposed of in accordance with the law.

2.2 Warning symbols on the unit

indicate dangers and sources of danger on the unit.

Danger!

Dangerous electrical voltage!



Ignoring may lead to death or injury,

2.3 Notes and requirements

Dangers of non-observation



The unit has been developed and constructed in accordance with recognised technical knowledge.

However, using the unit may hold dangers for the life and limb of the user or third parties or influence the unit or cause damage to other property.

None of the safety measures may be removed or put out of action, as this causes risks and correct use of the unit cannot be guaranteed. Removing the safety features during set up, repairs and maintenance is described specially. As soon as this work is completed, the safety features must be replaced.

When using additional products (for example, solution for cleaning) the operator of the unit is to ensure that the unit is safe for the product to be used.

All safety and danger notes as well as the type panel on the unit are to be maintained, kept in a readable state and observed.

Safety instructions



Safety notes serve to protect when working and to prevent accidents. They must be observed.

The safety notes listed in this chapter must be observed along with the special notes made in running text.

In addition to the instructions in these operating instructions, general safety and accident prevention regulations (in Germany including UVV BGV A3, TRBS 2131 and BGR 500 Chapter 2.26 (formerly VGB15): "Welding, cutting and associated processes" and in particular the references to arc welding and cutting and the appropriate national regulations) must be observed.

Please also note the safety notices in the workplace of the operator.

Areas of use



REHM welding units are, unless explicitly permitted in writing by REHM; only for sale to commercial and industrial users and only for use by such.

The INVERTIG.PRO *digital* inert gas welding units are designed in accordance with EN 60974-1 Arc welding equipment - Welding power sources for overvoltage category III and pollution level 3 and with EN 60974-10 Arc welding equipment - Electromagnetic compatibility for Group 2 Class A, and are suitable for use in all areas, except residential, which are directly connected to a public low voltage power supply. Due to the cable-related and radiated interferences it may be difficult to guarantee the electromagnetic compatibility in these areas. For this purpose, the observation of suitable measures to fulfil the requirements (filter for network connection, shielding using, for example, screened lines, shortest possible welding lines, grounding the work piece, equipotential bonding) as well as the evaluation of the environment (for example, computers, control units, radio and television masts, neighbouring persons, for example, those using a pacemaker) should all be carried out. The responsibility for interferences lies with the operator. See DIN EN60974-10:2008-09, Appendix A for more notes and recommendations.

Requirements made of the main power supply

High performance units may affect the main power supply thanks to their high power consumption. For certain units types, there may be connection restrictions, requirements regarding the maximum permitted net impedance or requirements regarding the minimum required available power at the point of connection to the main power supply (see technical data) In these cases, the user of such a unit must ensure, if necessary by consulting the power suppliers, whether the unit may be connected.

INVERTIG.PRO *digital* TIG gas-shielded welding units should only be used

- for the specified uses
- in a safety-related correct condition

Qualifications of the operating personnel

REHM welding units may only be operated and maintained by persons who have been educated and trained to operate and maintain welding units. Only qualified, authorised and trained personnel may work on and with the units.

Purpose of the document

These operating instructions contain important notes regarding how to operate this unit safely, correctly and economically. A copy of the operating instructions should always be kept on site in a suitable location. Please make sure that you read the information summarised in this operating manual before using the equipment. It contains important notes regarding use of the device which enables you to fully use the technical advantages of this REHM devices. In addition, you will also find information regarding maintenance and upkeep of the units as well as the operational and functional safety.



These operating instructions do not replace the instructions by REHM's service personnel.

The documentation for any additional options must also be taken into consideration.

Changes to the unit

Changes to the unit or the addition or installation of additional elements is not permitted. This would expire all guarantee and liability claims.

All third-party changes or deactivation of safety features renders all guarantee claims invalid.

3. Functional description

3.1 Description of controls

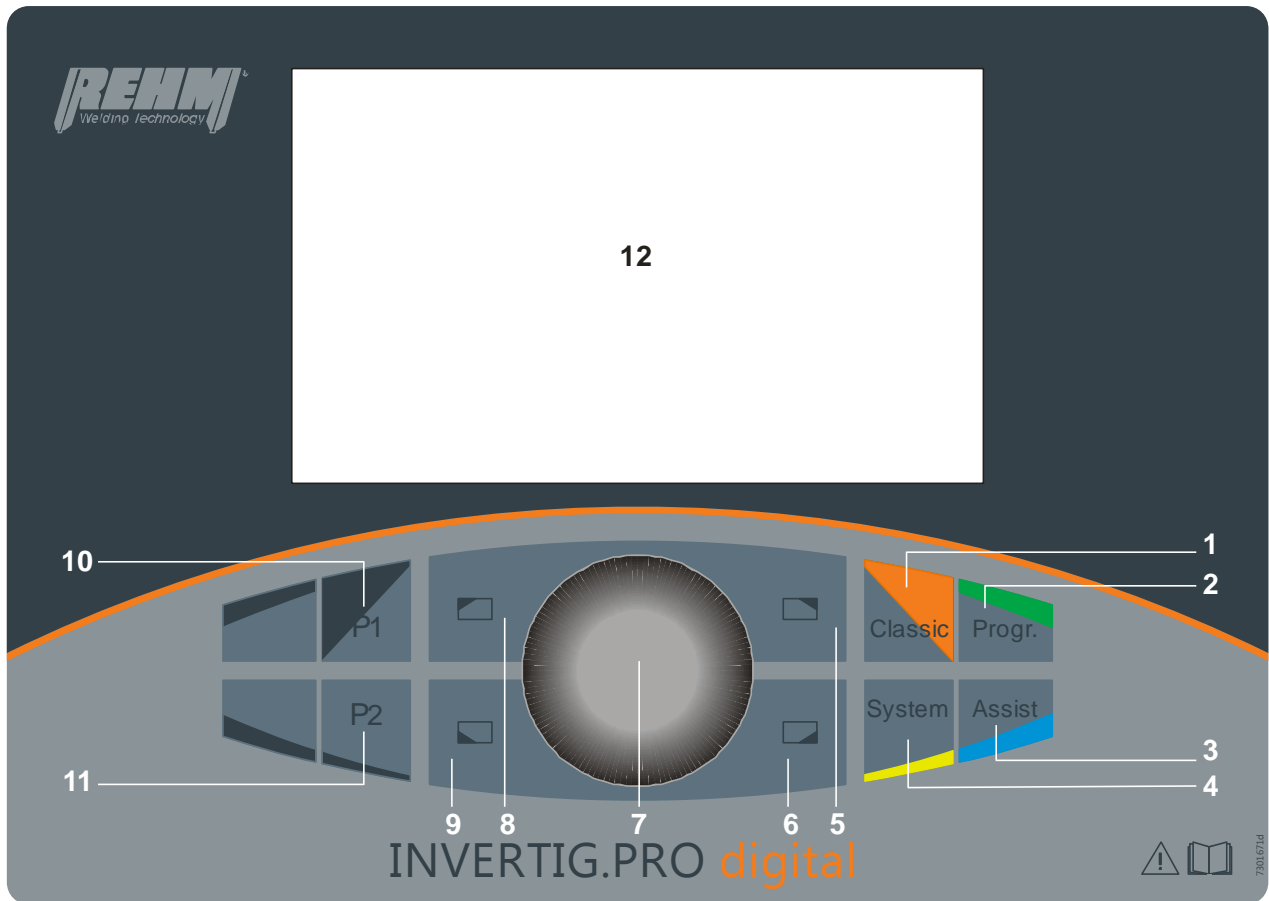


Figure 2: INVERTIG.PRO digital control panel

1	Classic application button	Page 16
2	Program application button (Progr.)	Page 37
3	Assist application button	Page 46
4	System application button	Page 50
5	Multifunction button for top right TFT display	Page 15 et seq.
6	Multifunction button for bottom right TFT display	Page 15 et seq.
7	Push and rotate knob (R Pilot)	Page 15
8	Multifunction button for top left TFT display	Page 15 et seq.
9	Multifunction button for bottom left TFT display	Page 15 et seq.
10	Quick Choice button P1	Page 37
11	Quick Choice button P2	Page 37
12	High resolution TFT display	Page 16

3.1.1 Application buttons

The application buttons are used to go directly to the required applications (Classic [1], Program [2], Assist [3] and System [4]). All application buttons are assigned to a particular colour, which can be found again on the screen. The user therefore knows which application he is in immediately.

3.1.2 Multifunction buttons

Certain activities can be called up with the multifunction buttons (e.g. Load, Save) or settings can be made (e.g. welding procedure, polarity). These activities are dependent on the selected parameters of the respective application.

In the corners of the display there are pull-down menus with control functions. Call-up takes place using the multifunction buttons [5 + 6] [8 + 9] which are located around the push and rotate knob (R Pilot) [7].



Fig. 3: INVERTIG.PRO digital / Classic application control panel

- ① View of Polarity pull-down menu
- ② Multifunction button for calling up the Polarity pull-down menu

3.1.3 Push and rotate knob (R Pilot)

The push and rotate knob [7] is centrally located and can be operated by both right and left handed persons. Due to the special holder, it is extremely well protected from mechanical effects. The push and rotate knob does not have a stop, meaning that over-rotating is not possible.

The push and rotate knob [7] is used for navigating in the screen display area.

Rotating the push and rotate knob always selects or modifies a setting.

Pressing the push and rotate knob makes the selection that has been made or confirms the change.

3.1.4 High-resolution TFT display

The high-resolution TFT display shows a quick and clear display of the welding parameters, all relevant information and also error messages (see Chap. 7) in high-quality graphics. The TFT display is protected by an impact-resistant plastic screen.

The graphical display has a resolution of 800 * 400 pixels.

3.2 Switching on

The INVERTIG.PRO *digital* welding system is started up using the main switch. The machine model appears on the TFT display [12] for approx. 10 seconds (e.g. INVERTIG.PRO *digital* 450 AC/DC). Subsequently you are automatically in the Classic application [1], and all settings from the previous welding procedure or the factory settings are displayed.

3.3 Special features of the control panel



Provided that the arc has been ignited, all selected parameters are saved in the device when the power is switched off at the main switch. After the device has been switched on, all settings are displayed clearly and comprehensively.

Only the parameters that are currently required are displayed, e.g. TIG parameters such as 2/4 step with HF or Lift-Arc etc. are suppressed during electrode welding. Similarly, the parameters for frequency and balance are suppressed during DC welding.

3.4 Classic application

The Classic application [1] contains all of the parameters that are needed for the welding process, the welding procedure selection, the polarity, the high frequency and the pulses. All parameters can be individually adjusted for the respective welding task. The currently selected parameter value is always displayed in the middle at the top.

The orange border colour indicates that you are in the Classic application.

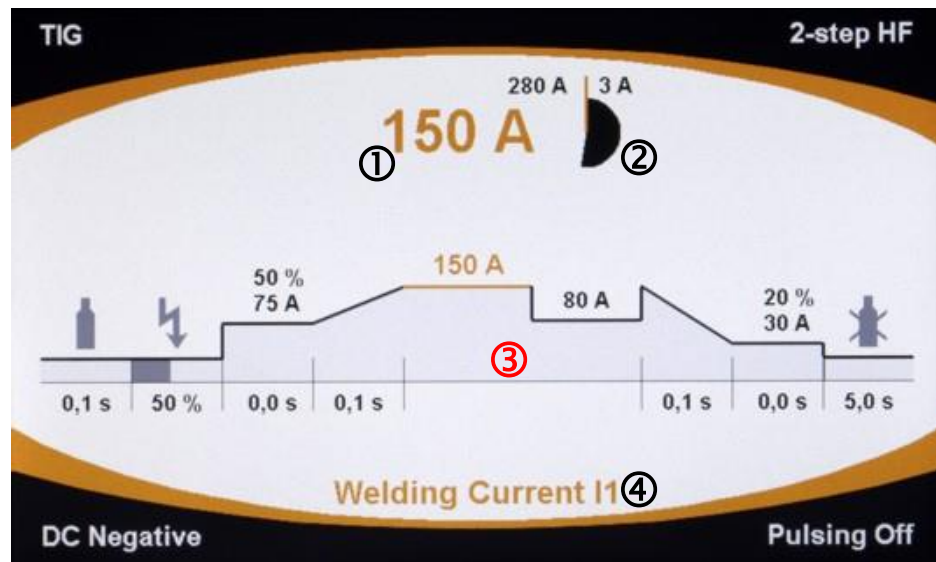


Fig. 4: INVERTIG.PRO digital / Classic application control panel

- ① Set value of selected parameter
- ② Min./max. value range display / Graphical display of selected value of currently selected parameter
- ③ Overview of all welding parameters, including all currently set values
- ④ Designation of selected parameter

3.4.1 Multifunction buttons of the Classic application

The multifunction buttons [5 + 6] and [8 + 9] can be used to select the 2 / 4 step function, high frequency [5], pulsing [6], the welding procedure [8] and the polarity [9].

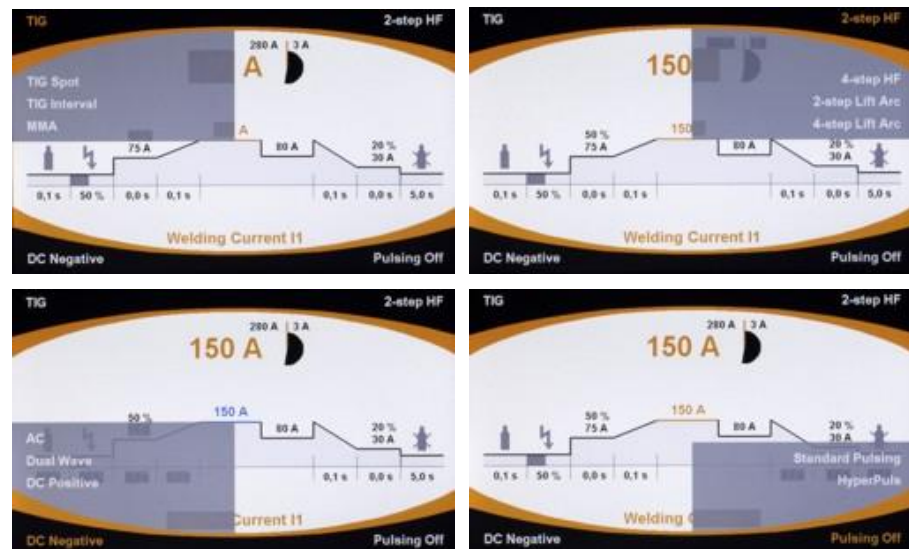


Fig. 5: INVERTIG.PRO digital / Classic application control panel
View of pull-down menus of multifunction buttons

3.4.2 Basic settings of the multifunction buttons

- Selection takes place by pressing the required multifunction buttons [5, 6, 8 or 9]. The selection options can then be seen in a pull-down menu on the screen.
- Rotate the push and rotate knob [7] to the required setting option (e.g. TIG points).
- Press the push and rotate knob [7] to confirm the setting option.
- The selection facility can be exited by pressing the relevant multifunction button without having made a selection. If no activity takes place for 20 seconds, the selected pull down menu is exited automatically.

3.5 Welding procedure multifunction button

The welding procedure is selected by pressing the multifunction button [8], as described in chapter 3.4.2.

3.5.1 TIG welding

The welding parameters for TIG welding are set as described in Chapter 3.4.2.

For an explanation of the TIG inert gas welding procedure, see Chapter 1.2.1 et seq.

3.5.2 TIG points

The welding parameters for TIG spot welding are set as described in Chapter 3.4.2.

Welding in spot welding mode is recommended for welding with a fixed spot welding time setting starting at 0,01 seconds.

The stationary welding process runs using the selected spot welding time, unless the torch button is released prematurely during welding.

After the selected spot welding time has elapsed or the torch button has been released during welding, the end program runs.

Because less heat is introduced into the materials that are being welded, with TIG welding there is less distortion and only a small amount of heat tinting.

3.5.2.1 TIG spot welding, 2-step

2-step spot welding

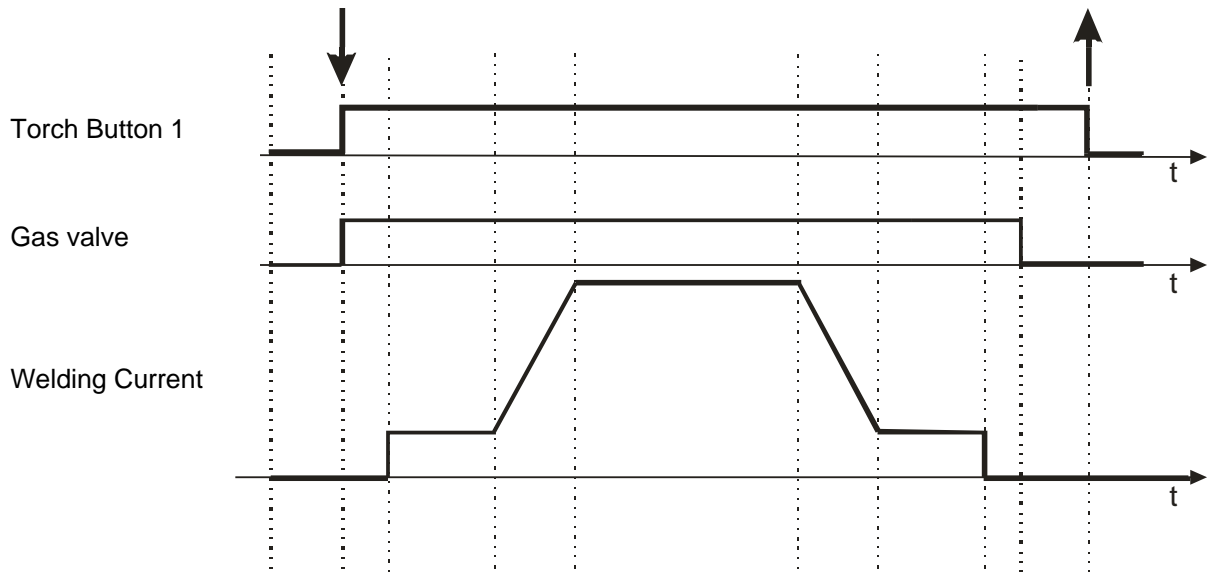


Fig. 6: 2-step spot welding procedure

□ 1. Press torch step button

The set gas pre-flow time starts to run and the gas valve opens. The arc is ignited after the gas pre-flow time has elapsed. The welding current automatically sets itself to the starting current. After the upslope time has elapsed, the welding current reaches the preset value I1. The set spot welding time starts to run. After the spot welding time has elapsed, the current reduces in accordance with the preselected downslope time to the value set for the end crater current, and switches itself off automatically after the final current time has elapsed.

□ 2. Release torch step button

The inert gas flows in accordance with the selected gas post-flow time.

3.5.2.2 TIG spot welding, 4-step

4-step spot welding

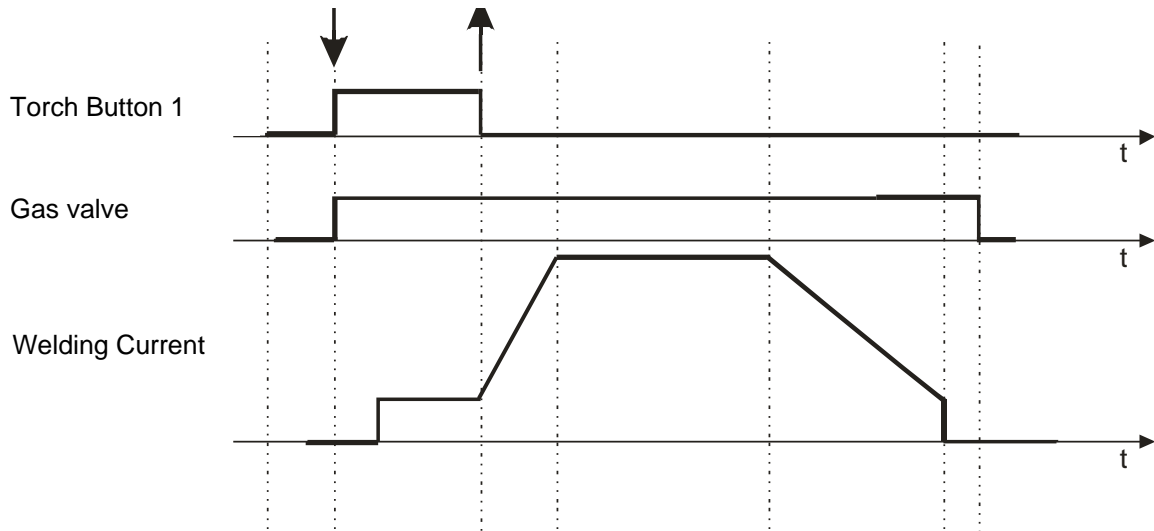


Fig. 7: 4-step spot welding procedure

□ 1. Press torch step button

The set gas pre-flow time starts to run and the gas valve opens. The arc is ignited after the gas pre-flow time has elapsed. The welding current automatically sets itself to the starting current. The starting current is retained until the torch button is pressed.



Special features:

The start and end current time cannot be adjusted for 4-step spot welding

The procedure can be aborted at any time by pressing the torch button again, the inert gas continues to flow in accordance with the selected gas post-flow time.

□ 2. Release torch step button

The welding current automatically sets itself to the pre-selected value after the upslope time has elapsed. The set spot welding time starts to run. The torch button does not have to be pressed and released again for the 3rd or 4th step, since the welding process runs automatically after the 2nd step has been triggered.



The procedure can be aborted by pressing the torch button again. The downslope time starts to run, and if the torch button is released during the current reduction time, the jump to 0A occurs and the inert gas flows in accordance with selected gas post-flow time.

After the spot welding time has elapsed, the current reduces in accordance with the preselected downslope time to the value set for the end crater current, and switches itself off automatically after the final current time has elapsed. The inert gas flows in accordance with the selected gas post-flow time.

3.5.3 WIG Interval

INVERTIG.PRO *digital* provides TIG interval welding as an additional welding method. Interval welding means defined spot welding with defined interval times. The application of extremely thin fillers is possible. Interval welding is only possible in 2-step operating mode.

Welding in interval welding mode is recommended for welding with a fixed interval time setting starting at 0.01 seconds.

In the WIG interval the interval time between the individual intervals can be set individually and therefore the cooling of the base material can be guaranteed → less distortion.

3.5.3.1 TIG interval, 2-step

2-step interval

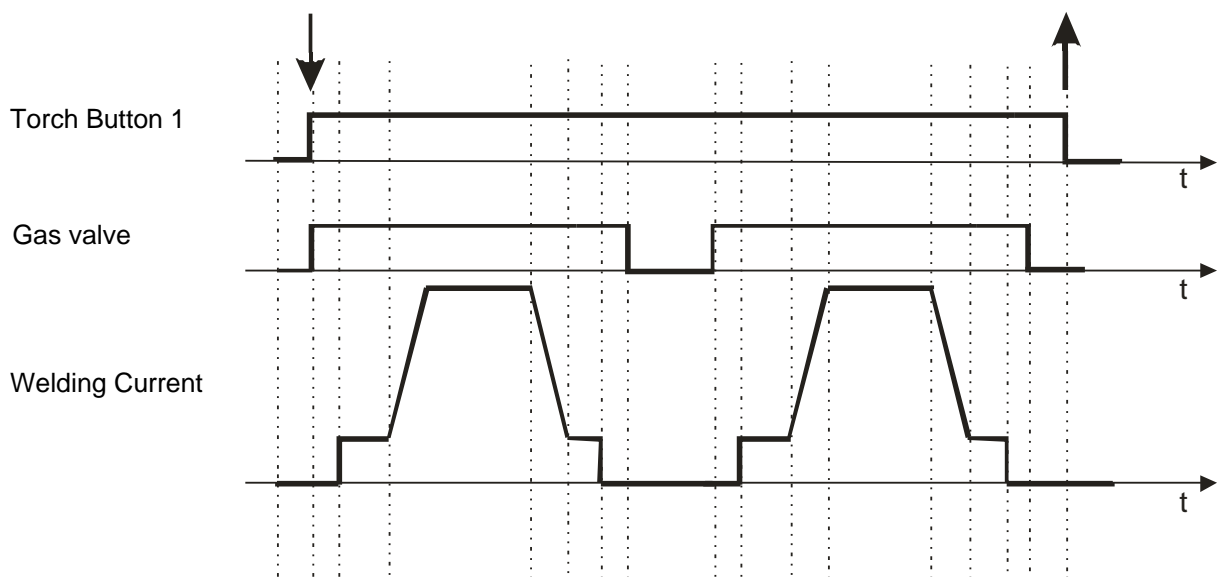


Fig. 8: 2-step interval procedure

1. Press torch step button

The set gas pre-flow time starts to run and the gas valve opens. The arc is ignited after the gas pre-flow time has elapsed. The welding current automatically sets itself to the starting current. After the upslope time has elapsed, the welding current reaches the preset value I1. The set interval time starts to run. After the interval time has elapsed, the current reduces in accordance with the preselected downslope time to the value set for the end crater current, and switches itself off automatically after the final current time has elapsed, i.e. the welding current goes to 0A. The inert gas continues to flow in accordance with the selected gas post-flow time and the interval time runs down. Once the interval time has elapsed, the welding current sets itself to the pre-selected start current again and the welding process runs again as described.

2. Release torch step button

Interval welding stops.

3.5.4 Electrode welding

The welding parameters for electrode welding are described in chapter 3.10.

The electrode is both an arc carrier and additional material at the same time. It consists of an alloyed or non-alloyed core wire and a sheathing. The sheathing has the job of protecting the melt bath from the damaging introduction of air, and stabilising the arc. It also forms a slag that protects and shapes the seam. Almost any metal can be welded using electrode welding. Electrode welding is a welding method that is popular and easy to do.

3.6 The welding parameters

The welding parameters that are assigned in the welding curve that is shown are selected using the push and rotate knob [7]. The setting facilities are always selected and adjusted using the same principle.

3.6.1 Basic setting of welding parameters.

- Rotate the push and rotate knob [7] to the required setting option (e.g. current I1). The currently selected setting facility is displayed at the bottom centre of the screen [12] and the associated value appears at the top centre of the screen. A selected parameter is marked in orange.
- Press the push and rotate knob [7] to select the setting option. The parameter that is to be modified appears in blue text.
- Rotate the push and rotate knob [7] until the required value is set.
- Press the push and rotate knob [7] to confirm the setting option.
- If no activity takes place for 20 seconds, the selected welding parameter is exited automatically.



Fig. 9: INVERTIG.PRO digital control panel

- ① Welding parameter display
- ② Push and rotate knob for selecting the welding parameters

The welding parameters are described in the following in the order shown in fig. 9.

3.6.2 Gas preflow time

The gas preflow time is set as described in Chapter 3.6.1.

The gas preflow time is the time in which the inert gas valve is opened after the torch button 1 has been pressed in order to start a welding procedure, before the arc is ignited. This causes the arc to be lit with an inert gas shielding layer, which protects the electrode and the workpiece from burning out.

If the welding procedure is restarted during the gas post-flow time, the gas preflow time is automatically set to 0 seconds by the processor controller. This speeds up re-ignition, which saves time when tacking, for example.

3.6.3 Ignition energy

The ignition energy is set as described in Chapter 3.6.1.

The ignition energy can be adjusted to a value of between 10 and 100% when igniting with high frequency or Lift Arc (infinitely variable).

Depending on the selected value for the ignition energy, the processor controller defines a preselection for the required ignition process. This preselection can now be adapted to the selected electrode (type, diameter), the gas type and the respective welding task depending on the polarity by adjusting the ignition energy.

During welding work with thin materials and small electrode diameters, less ignition energy should be selected.

In AC welding systems "power ignition" is carried out with an ignition energy setting of 90% or above, which makes ignition easier in harsh environments.

3.6.4 Start current

The ignition energy is set as described in Chapter 3.6.1.

The starting current is the initial welding current that is set after the ignition process. The setting is infinitely variable. Selecting a suitable starting current makes the following possible:

- Less stress on the electrode due to increasing current
- Search arc during 4-step welding for moving to the start of the seam
- Welding with reduced current at the beginning of the seam in the event of edges or heat accumulation.
- Fast heat introduction with values of greater than 100%. The starting current can be set in percent or as a fixed value. The setting is made in the System application.

3.6.5 Upslope time

The upslope time is set as described in Chapter 3.6.1.

The upslope time is the time during which the welding current undergoes a linear increase from the starting current to the preselected current I1. During 2-step welding the upslope time starts immediately after igniting the arc. During 4-step welding the increase time starts after releasing the torch button 1 with the start current flowing.

3.6.6 Welding current I1

The welding current I1 is set as described in Chapter 3.6.1.

The adjustable range for welding current I1 depends on the selected operating mode and the machine model.

The following values can be set using the push and rotate knob [7] depending on the selecting welding method:

	INVERTIG.PRO digital 240 DC / AC/DC	INVERTIG.PRO digital 280 DC / AC/DC	INVERTIG.PRO digital 350 DC / AC/DC	INVERTIG.PRO digital 450 DC / AC/DC
TIG	3 A ... 240 A	3 A ... 280 A	3 A ... 350 A	3 A ... 450 A

3.6.7 Welding current I2

Welding current I2 is set as described in Chapter 3.6.1.

The use of welding current I2 is only meaningful for TIG welding, and is therefore only displayed if TIG welding is taking place. Welding current I2 is used when pulsing (see chapter 3.9.1) and when two-current control is being used:

Two-current control:

General method of operation:

The use of two-current control allows the user to work with 2 different preset currents when using a 2-button torch. In other words, you can switch between the two values I1 and I2 when welding.



The changeover to I2 takes place for as long as torch button 2 is pressed. When torch button 2 is released, a changeover to I1 occurs immediately. This setting can be modified in the System application, see chapter 3.14.3 (torch function, locking I2).

Examples of changeovers:

- From high current to low current or vice-versa, e.g. due to a change of welding position
- Manual pulsing (see chapter 3.6.8)
- Starting with high current I1 to warm up the workpiece, then welding with lower current I2.
- Starting with lower current I1 at workpiece edges, then welding with higher current I2.

Changing over is possible during 2-step and 4-step operation without pulsing.

The following ranges can be set in accordance with welding current I1.

	INVERTIG.PRO digital 240 DC / AC/DC	INVERTIG.PRO digital 280 DC / AC/DC	INVERTIG.PRO digital 350 DC / AC/DC	INVERTIG.PRO digital 450 DC / AC/DC
TIG	3 A ... 240 A	3 A ... 280 A	3 A ... 350 A	3 A ... 450 A

Current I2 setting takes place either by activating the I2 setting facility, and/or extremely quickly and easily by pressing torch button 2 before the welding procedure.

3.6.8 Downslope time

The downslope time is set as described in Chapter 3.6.1.

The downslope time is the time during which the welding current is linearly reduced to the end crater current. The downslope time starts immediately after releasing torch button 1 during 2-step welding. During 4-step welding the reduction time is started by pressing torch button 1. Slowly reducing the welding current prevents end craters and the associated cracks from forming. Reduction stops immediately as soon as the torch button is released in 4-step operation.



Manual pulsing:

If torch button 1 is pressed during the downslope time with the TIG 2-step function, the welding current immediately jumps to the value used during welding. Depending on the point in time during the downslope time the torch button is pressed, the energy mid-point can be selected directly and is infinitely variable.

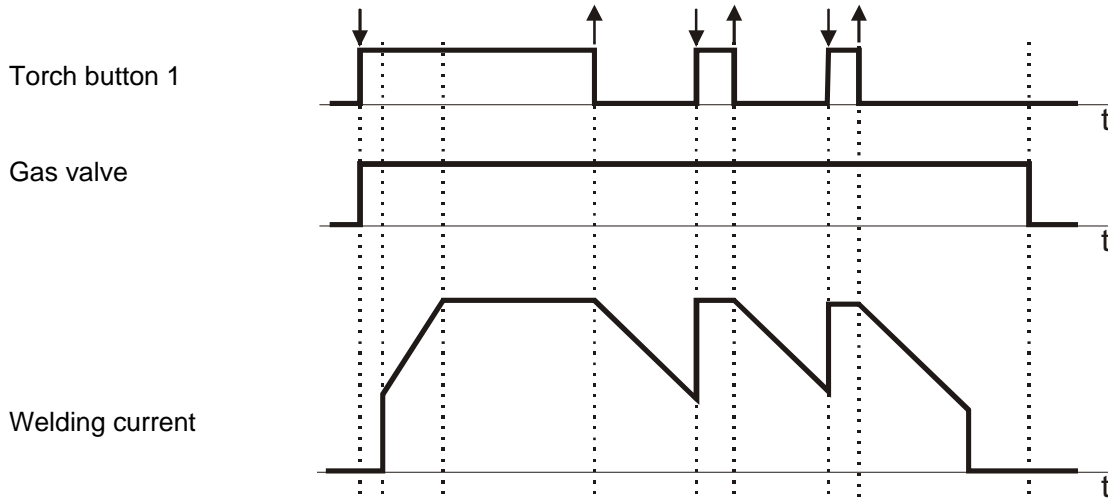


Fig. 10: Manual pulsing procedure

3.6.9 End crater current

The end crater current is set as described in Chapter 3.6.1.

The end crater current is the welding current to which the system is reduced at the end of the welding procedure. The setting can be made between 10% and 100% of the selected current I1 (infinitely variable). Example: End crater current 40% and welding current I1 100 A -> end crater current 40A). The percentage ratio can be set to a fixed value in the System application. Selecting a suitable end crater current makes the following possible:

- Prevents notches and end crater cracks at end of seam due to the melt cooling too quickly.
- Manual pulsing (see chapter 3.6.8)
- Welding with reduced current at the beginning of the seam in the event of edges or heat accumulation.

3.6.10 Gas post-flow time

The gas post-flow time is set as described in Chapter 3.6.1.

The gas post-flow time is the period of time after the arc has been extinguished before the inert gas valve is closed. The post-flow of inert gas protects the workpiece and the tungsten needle from the oxygen in the air until they have cooled. However, the preselected gas post-flow time only takes effect if welding has taken place previously. Accidentally pressing the button will not start the gas post-flow timer running. This gas management function reduces gas consumption.

3.7 Polarity multifunction button

Pressing the multifunction button [9] selects the AC current polarity (AC), the DC current positive terminal (DC +), the DC current negative terminal (DC -) and Dual Wave. The setting facilities are always selected and set using the same principle, see chapter 3.4.2.



During electrode welding, it must be ensured that the upper output connector is always the negative terminal in all INVERTIG.PRO *digital* DC welding systems

3.7.1 AC current (AC)

With AC current welding, the polarity at the output connectors switches continuously between positive and negative polarity. With TIG pulsing, TIG interval and TIG and electrode welding, the torch and the electrode holder are normally connected to the upper output connector. The use of AC current makes it possible to weld aluminium and aluminium alloys. Electrode welding with AC current has the advantage that the blowing effect is avoided.

As far as AC current polarity is concerned, the balance, frequency and the sine wave, triangle, square wave and AC-Matic curve shape can be selected on the basis of a graphical display.

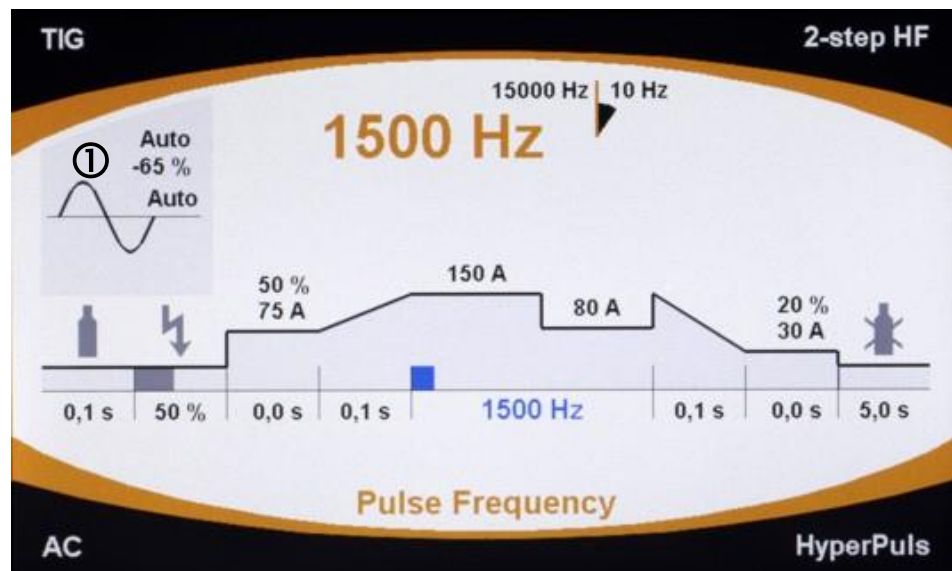


Fig. 11: INVERTIG.PRO digital / Classic application control panel
① Graphical display of sine wave curve and AC balance 65%

3.7.1.1 AC balance (%)

The balance is set as described in Chapter 3.4.2.

The balance setting can only be made in connection with AC current welding in the case of TIG. It ranges from -80% to +80% and makes it possible to influence the arc shape, penetration and cleaning when welding aluminium within an extremely broad range. The negative and positive welding current is extremely evenly distributed in the centre position (50%). With increasing negative values the proportion of the negative welding current increases (up to -80%) and the positive proportion decreases. This makes the arc narrower and generates deeper penetration with less electrode loading. With increasing positive values the proportion of positive welding current is increased (up to +80%) and the negative proportion decreases. The cleaning of the melt bath is improved by the positive proportion. The arc becomes wider and the penetration is less deep. The use of a negative value that is as high as possible with a sufficient cleaning effect is recommended (factory setting - 65%).

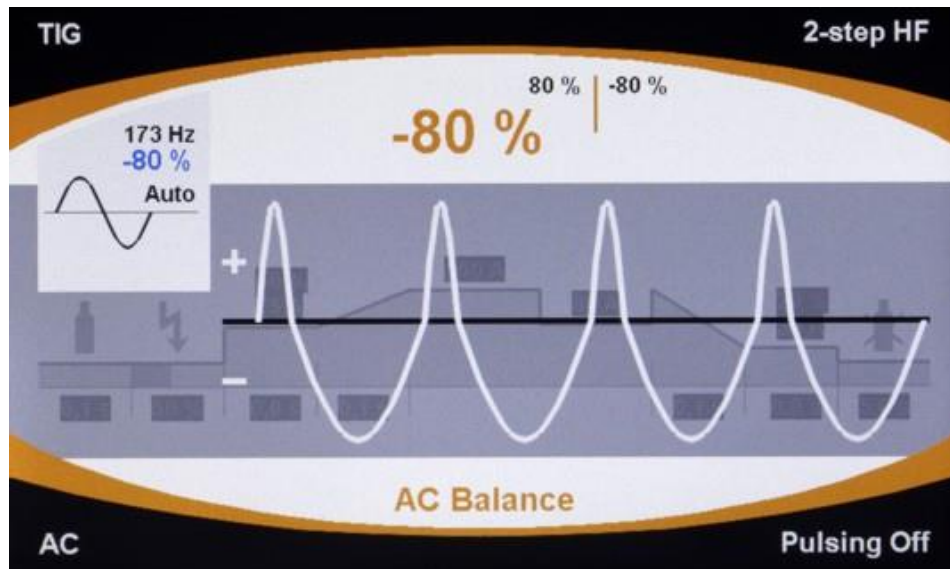


Fig. 12: INVERTIG.PRO digital / Classic application control panel
Graphical display of AC balance

3.7.1.2 AC frequency Hz

The frequency Hz is set as described in Chapter 3.4.2.

The frequency setting can only be made in connection with AC current welding in the case of TIG. The value for the frequency defines how frequently the output polarity changes. The adjusting range ranges from 30 Hz to 300 Hz. For example, at a frequency of 200 Hz the polarity change at the output connection from plus to minus and back again takes place every 5 ms (=0.005 seconds). The welding current is reduced to a value of zero whenever a polarity change takes place, is re-ignited in the opposite direction and increased to the selected welding current again. The sine wave shape that is used in this process-controlled procedure leads to a considerable reduction in the amount of noise, and has technical welding advantages in AC current welding.

REHM recommends setting to the automatic frequency system that has been patented by REHM. The automatic frequency system automatically adapts the AC frequency to the current strength. At low welding currents the AC arc is focussed. This provides reliable root formation, e.g. in fillet welds in thin sheets of metal. At higher currents the tungsten electrode load is reduced. A long service life and optimum cost-effectiveness are the result. The automatic frequency system has particular advantage when working with the *iSystem P1* remote foot controller.

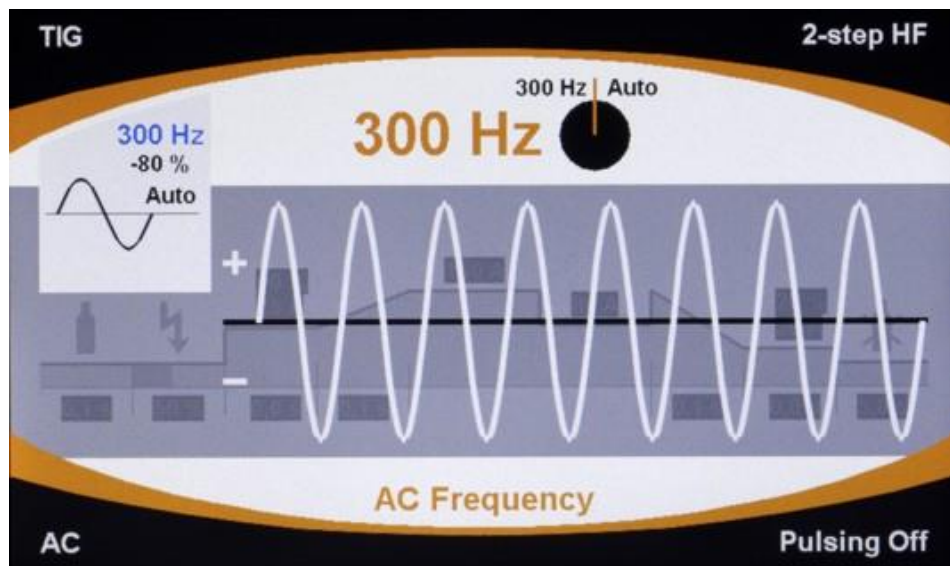
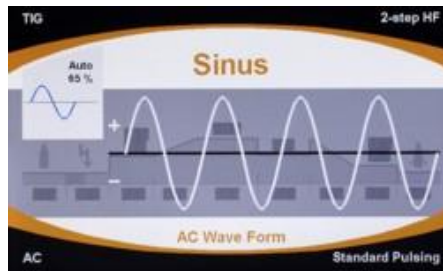


Fig. 13: INVERTIG.PRO digital / Classic application control panel
Graphical display of frequency

3.7.1.3 AC curve shape selection facility

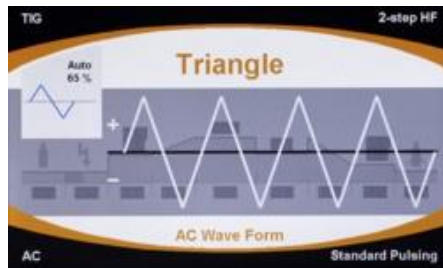
Sine wave



Noise-optimised

Fig. 14: INVERTIG.PRO digital / Classic application control panel
Graphical display of sine wave curve

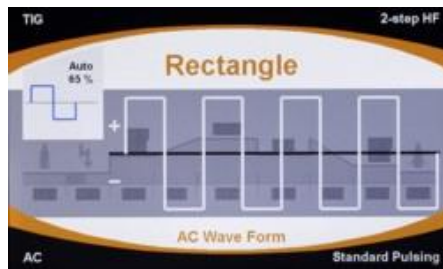
Triangle



Better penetration than sine wave shape

Fig. 15: INVERTIG.PRO digital / Classic application control panel
Graphical display of triangle curve shape

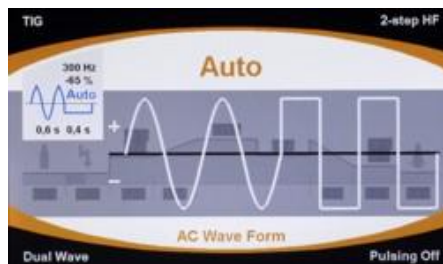
Square wave



Best penetration, low electrode loading and even better arc stability.

Fig. 16: INVERTIG.PRO digital / Classic application control panel
Graphical display of rectangle curve shape

AC-Matic



AC curve shape is automatically adapted to current strength: With low currents (< 180A) a sine wave curve shape is automatically selected, and higher currents (> 180A) the square wave curve shape is used.

Fig. 17: INVERTIG.PRO digital / Classic application control panel
Graphical display of AC-Matic

3.7.2 DC current positive terminal



During TIG welding, TIG spot welding and TIG interval welding with DC current positive terminal, the positive terminal is applied to the upper output connector for the TIG torch.

During TIG welding, TIG spot welding and TIG interval welding with DC positive terminal, the electrode is under extremely high thermal stress which can make the electrode melt, even with small currents, and can cause damage. Welding with DC current positive terminal is only possible using a REHM INVERTIG.PRO *digital* AC/DC welding system.

During electrode welding the electrode holder is also connected to the upper output connector. With the DC current positive terminal setting, the electrode is welded with positive terminal. Electrode welding with DC current positive terminal is only possible using a REHM INVERTIG.PRO *digital* AC/DC welding system. With electrode welding, the polarity for the electrode is selected depending on the type of electrode that is used (pay attention to electrode manufacturer information).

3.7.3 DC current negative terminal

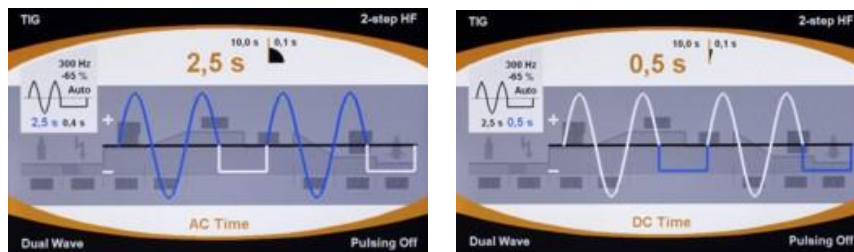
During TIG welding and TIG spot welding with DC current negative terminal, the negative terminal is applied to the upper output connector for the TIG torch. During TIG welding or TIG spot welding with DC current, welding usually takes place with this setting.

During electrode welding the electrode holder is also connected to the upper output connector. The electrode is welded with negative terminal with the DC current negative terminal setting. During electrode welding with an INVERTIG.PRO *digital* DC welding system at the positive terminal, the electrode holder must be plugged into the lower connector, since the polarity is not selectable. With electrode welding, the polarity for the electrode is selected depending on the type of electrode that is used (pay attention to electrode manufacturer information).

3.7.4 Dual Wave



The Dual Wave process from REHM is a combination of AC and DC welding. The AC and DC times can be adjusted independently of each other. The selected values for welding current I1 and I2, the frequency and the balance are taken into consideration in the same way as they are in DC-only or AC-only welding.



AC time

DC time

Fig. 18: Individual AC and DC time settings

The Dual Wave process reduces the excess AC part in the arc to the necessary minimum. The reduced heat introduction that this causes makes it easier to control the welding bath and produces less pore formation, and is used in difficult welding situations, when welding workpieces of different thickness and when processing thin plates made from aluminium and aluminium alloys.



Fig. 19: INVERTIG.PRO digital / Classic application control panel
Dual Wave time AC setting

When selecting the Dual Wave polarity, a graphical display of the selected setting appears at the top left of the screen: The AC and DC times can also be individually set between 0.1 and 10.0 seconds using the graphic.

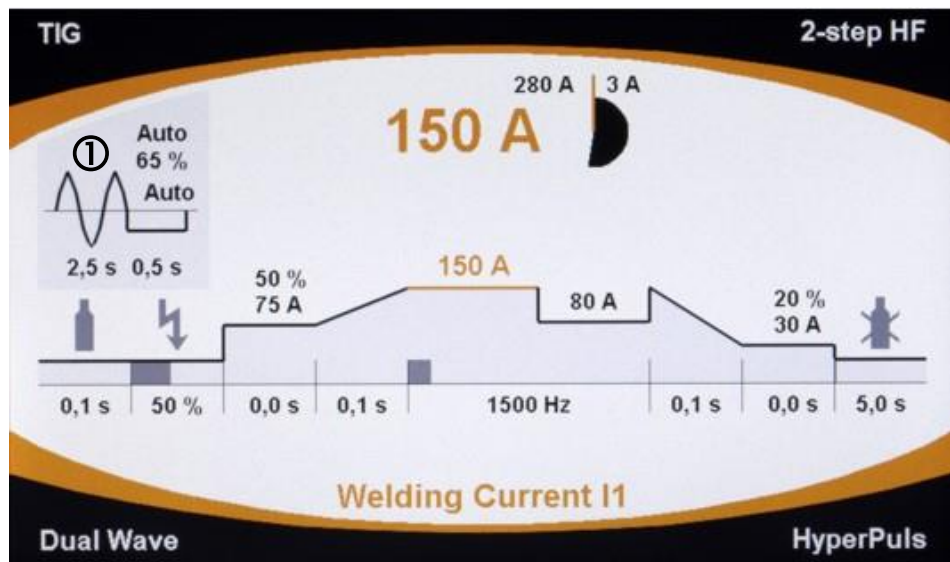


Fig. 20: INVERTIG.PRO digital / Classic application control panel
① Graphical display top left, AC frequency (auto), AC balance view (65%), AC curve shape, Dual Wave AC and DC time (2.5 s and 0.5 s)

3.8 Multifunction button 2- / 4-step and high frequency

By pressing the multifunction button [5] you can select 2-step with high frequency, 4-step with high frequency, 2-step with Lift Arc or 4-step with Lift-Arc. The setting options are always selected and set using the same principle, see chapter 3.4.2.

3.8.1 2-step function

2-step welding is recommended for fast, controlled tacking and manual spot welding.

- 1st step: Press torch button

Solenoid valve for inert gas is opened.

The arc is ignited after the set gas pre-flow time has elapsed.

The welding current sets itself automatically to the preselected value for I1 during the selected increase time starting with the selected start current.

- 2nd step: Release torch button

The current reduces with the preselected downslope time to the value set for the end crater current, and then switches itself off automatically.

The inert gas flows in accordance with the selected gas post-flow time.

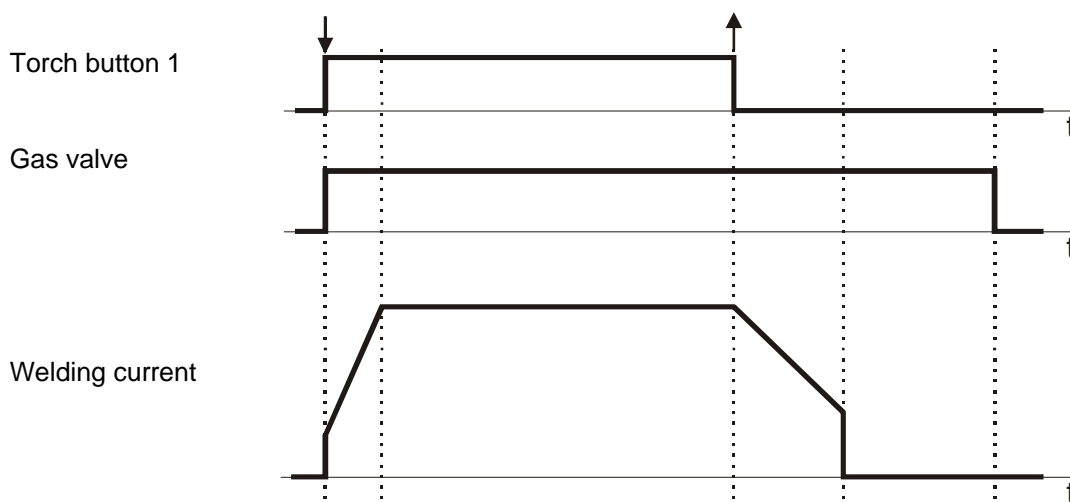


Fig. 21: Procedure for 2-step welding

Special features:

Re. 2nd step By pressing the torch button again during current reduction, the welding current can be abruptly reset to I1. This procedure is known as manual pulsing (see chapter 3.6.8). Pressing torch button 2 (BT2) extinguishes the arc.



3.8.2 4-step function

Continuous button pressing is not required with 4-step welding, which means that the torch can be guided for a longer time without fatigue.

4-step function procedure:

- 1st step: Press torch button

Solenoid valve for inert gas is opened.

The arc is ignited after the set gas pre-flow time has elapsed.

The welding current has the value set for the starting current.

- 2nd step: Release torch button

The welding current automatically sets itself to the pre-selected value for I1 during the preselected upslope time.

Functional description

- 3rd step: Press torch button

The current reduces with the preselected downslope time to the value set for the end crater current.

The welding current flows with the value set for the end crater.

- 4th step: Release torch button

The arc is extinguished.

The inert gas flows in accordance with the selected gas post-flow time.

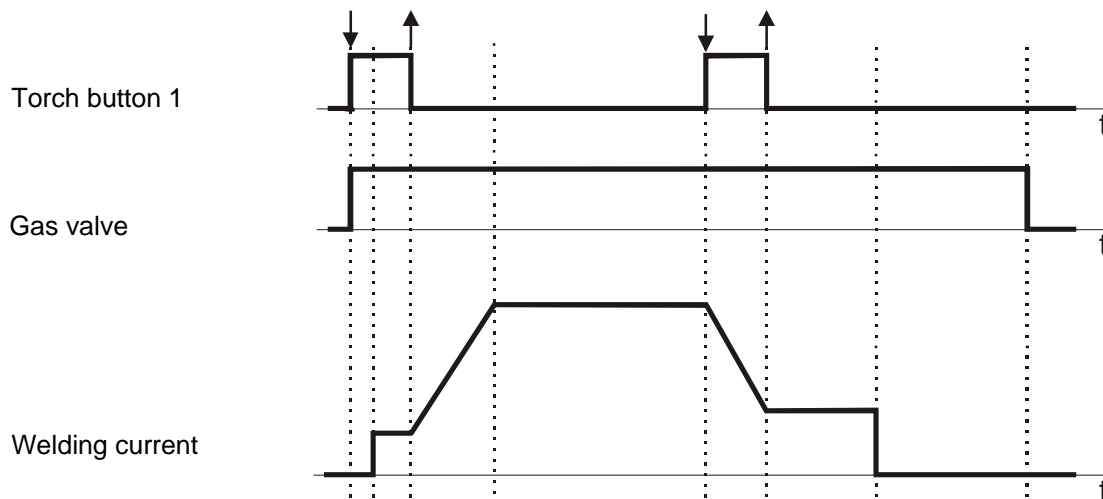


Fig. 22: Procedure for 4-step welding

Special features:

- re. 2nd step Pressing the torch button again during the upslope time causes the arc to be extinguished and the inert gas flows in accordance with the selected gas post-flow time.
- re. 3rd step The arc can be switched off during the downslope time. Releasing the torch button before reaching the end crater current causes the arc to be extinguished and the inert gas flows in accordance with the selected gas post-flow time.

3.8.3 Welding with high frequency (HF)

The REHM TIG welding systems are equipped with HF ignition devices as standard. In the "Electrode" setting, HF ignition is automatically switched off.



The HF ignition device makes contact-free ignition of the arc possible between the electrode and the workpiece by pre-ionising the air gap during DC and DC current welding, whereby tungsten inclusions and therefore welding errors are prevented. In both cases the HF ignition device is switched off again after ignition has taken place. The re-ignition of the arc that is described in chapter 3.7.1 takes place without using the HF ignition device. This reduces the radiation of electrical interference fields and even makes it possible to carry out AC current welding without HF ignition, as is already known from DC current welding (see chapter 3.8.4).

With the high frequency setting the HF ignition device is ready for operation. In order to ignite the arc, the electrode is held about 3-5 mm above the workpiece. When the torch button is pressed, the gap is ionised by a high-voltage pulse and the arc is created. The contactless ignition prevents tungsten inclusions in the weld seam. During welding, the HF ignition device is automatically switched off again after ignition has taken place.

3.8.4 Welding with Lift-Arc

When welding with DC or AC current, contact ignition (Lift-Arc) can be carried out. The high frequency is switched off when doing this. In order to ignite the arc, the electrode is applied and the torch button is pressed. When the electrode is raised, the arc ignites under program control and without wearing the sharpened electrode. This facility may be advantageous when working on sensitive electronic devices (e.g. in hospitals, when carrying out repair welding on CNC-controlled machinery), if there is a risk of interference from high-voltage pulses.

3.9 Pulsing multifunction button

The multifunction button [6] is pressed to select time pulsing, hyper pulsing® and no pulsing (pulsing off). The setting options are always selected and set using the same principle, see chapter 3.4.2.

3.9.1 I1 pulsing time t1

The I1 pulse time t1 is set as described in Chapter 3.4.2. TIG welding, TIG spot welding and TIG interval welding with pulse function can basically be divided into two areas:

1. Time pulsing with pulse times between 0.1 and 5.0 seconds
2. Hyper-pulse with pulse frequencies between 10 Hz and 15 kHz

During TIG pulse welding, automatic switching between currents I1 and I2 takes place continuously. When doing this you have free choice of which current is the bigger high current and which is the smaller low current.

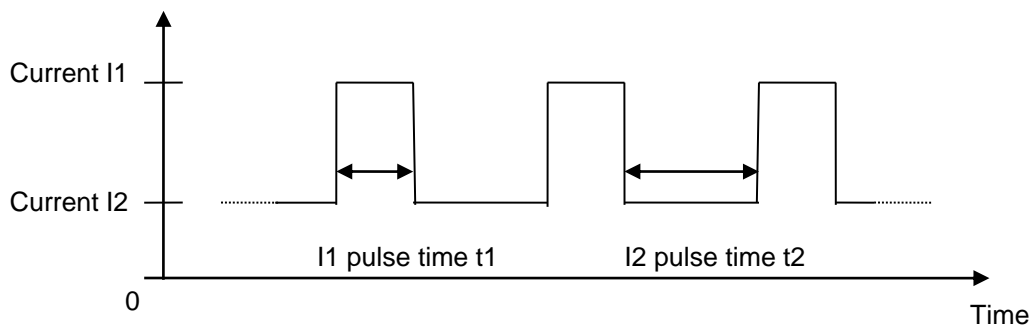


Fig. 23: Welding current when pulsing



Pulsing can be switched off and on again during welding by pressing torch button 2. If torch button 2 is pressed with a pulsing welding current, pulsing is switched off and welding continues with welding current I2. Welding can continue with welding current I2 until a new filler is taken, for example, and welding is continued with a pulsing welding current by pressing torch button 2 again.

Time pulsing: Pulsing with pulse times of 0.1 to 5.0 seconds

The settings for I1 pulsing time t1 and I2 pulsing time t2 determine the length of time for which currents I1 and I2 should be active until switching over to the other current. Both pulse times can be set independently of each other

The times and the welding current levels should be coordinated in such a way that the base material is melted during the high current phase and solidifies again during the low current phase. Because of TIG pulse welding, the weld pool is easier to control in difficult situations (particularly in dilemmas and with large gaps to bridge) and when welding thin sheets of metal than with a constant welding current.

Hyperpulse: with pulse frequencies of 10 Hz to 15 kHz

The course of the welding current corresponds to conventional pulsing. However, the periods of time for which currents I1 and I2 respectively are active are always the same. Since these time periods are extremely short, it is meaningful and normal to refer to them as pulse frequencies.

The following relationships apply for converting the pulse frequency into the respective pulse times t1 and t2:

$$\begin{aligned} \text{Total pulse time} &= I1 \text{ pulse time } t1 + I2 \text{ pulse time } t2 = 1 / \text{pulse frequency} \\ I1 \text{ pulse time } t1 &= I2 \text{ pulse time } t2 = 0.5 * \text{total pulse time} \end{aligned}$$

Example:

Pulse frequency = 50 Hz

$$\text{Total pulse time} = I1 \text{ pulse time } t1 + I2 \text{ pulse time } t2 = 1 / 50 \text{ Hz} = 20 \text{ ms} = 0.02 \text{ s}$$

$$I1 \text{ pulse time } t1 = 0.5 * \text{total pulse time} = 0.01 \text{ s}$$

$$I2 \text{ pulse time } t2 = 0.5 * \text{total pulse time} = 0.01 \text{ s}$$

This means that the current has the value of current I1 for 0.01 s (=10 ms) during welding, then the value of current I2 for 0.01 s (=10 ms), then the value of current I2 again for 0.01 s (=10 ms) etc.

Pulsing with such short times results in a narrower and more concentrated arc and deeper penetration.

3.9.2 I2 pulse time t2

The settings are made in accordance with I1 pulse time t1 (see chapter 3.9.1).

3.10 Electrode welding parameters

The electrode welding procedure is selected using the multifunction button [8]. The setting of electrode welding parameter welding current I1, Arc Force, Hot Start and Hot Start Time is carried out as described in Chapter 3.4.2.



When making the settings for electrode welding, please ensure that no TIG torch is connected. Failure to do this will result in error number "E021" being displayed on the screen (see Chapter 7.3).

3.10.1 Welding current I1 during electrode welding

Welding current I1 can be set using the push and rotate knob [7] (infinitely variable).

The Dual Wave procedure enables better control of the welding bath and, particularly in difficult welding positions, when welding work pieces of differing thicknesses, and is used for processing thin sheet like aluminium and aluminium alloys.

	INVERTIG.PRO digital 240 DC / AC/DC	INVERTIG.PRO digital 280 DC / AC/DC	INVERTIG.PRO digital 350 DC / AC/DC	INVERTIG.PRO digital 450 DC / AC/DC
Electrode	3 A ... 240 A	3 A ... 280 A	3 A ... 350 A	3 A ... 450 A

3.10.2 Arc Force

In order to have a stable arc during electrode welding, it is important to make the drip-shaped material transitions easier by adding extremely short current pulses to the selected welding current I1. The magnitude of these current pulses is determined by the Arc Force that is selected. The Arc Force can be set to a value between 0% and 300% (infinitely variable) using the push and rotate knob [7] with the Rutil and Basic electrode type selected, and between 100% and 300% of the selected current I1 with cellulose electrode type selected (but a maximum of I_{max}, e.g.: Arc Force 50% and welding current I1=100A -> ArcForce 150A)

3.10.3 Hot Start

For better ignition of the electrode during electrode welding, a higher current than the selected welding current I1 is briefly used at the start of welding. The magnitude thereof is determined by the Hotstart setting. The setting can be made between 0% and 200% of the selected current I1 (infinitely variable) using the push and rotate knob [7] (but max. I_{max}, e.g.: Hotstart 30% and welding current I1=100A -> Hotstart 130A). The Hotstart time can be set to between 0.1 and 10 sec. (infinitely variable).

3.10.4 Anti-Stick Function

If a permanent short circuit occurs during electrode welding, the anti-stick function is activated after about 0.3 sec., which limits the current to approx. 20 A. This prevents the electrode from wearing out and the permanent short circuit can be easily remedied by stripping.

3.11 Quick setting P1 and P2 (Quick Choice buttons)

Pushbuttons P1 [10] and P2 [11] allow the user to load and save two programs quickly.

In order to load program 1 or program 2, briefly press the multifunction button P1 or P2.

To save the machine settings that have been made, press and hold down pushbutton P1 [10] or P2 [11] for approx. 2 seconds in the Classic application. When the program has been saved, P1 or P2 appears at the top right of the screen.



Program P1 or P2 can also be called up using Up/Down torch (see Chapter 3.14).

3.12 Programs application (Progr.)

The Programs application (Progr.) allows up to 1000 programs to be loaded, saved and managed in up to 100 folders. The programs can be saved and

Functional description

loaded under a freely selectable name (e.g. name of an employee, customer and/or material) in a freely selectable folder. The values for all setting options provided by the machine are saved and loaded for each program.

This means that device settings that have been determined for repeated welding tasks can be set again on the welding device within seconds. This saves time and provides consistent quality.

Also, the individual basic settings of the welding device such as start and end crater current, ignition energy etc. can be saved and quickly retrieved again for each person if the equipment is being used by several persons.



As a special feature, the INVERTIG.PRO *digital* welding system provides quick loading and saving of 2 programs, P1 [10] and P2 [11], see chapter 3.11. In the Progr. application [2] P1 and P2 can be selected, but the saved settings cannot be modified or deleted.

The green border colour indicates that you are in the Programs application.



Fig. 24: INVERTIG.PRO *digital* / Programs application (Progr.) control panel

3.12.1 Managing folders

Creating a new folder

- If you press the Progr. application button [2] you will be taken to the Programs application (Progr.)
- Rotate the push and rotate knob [7] to "New Folder"

Pushing the push and rotate knob [7] allocates a default name for this folder.

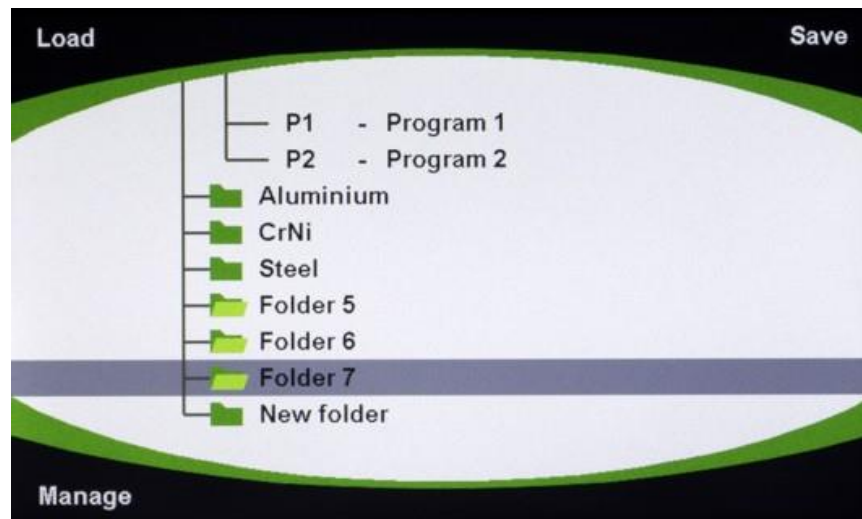


Fig. 25: INVERTIG.PRO digital / Programs application (Progr.) control panel
New folder

Managing existing folders

- If you press the Progr. application button [2] you will be taken to the Programs application (Progr.)
- Rotate the push and rotate knob [7] to the required folder
- Press the multifunction button [9] to edit the folder. The following options are available: Name, Rename, Delete, Move.

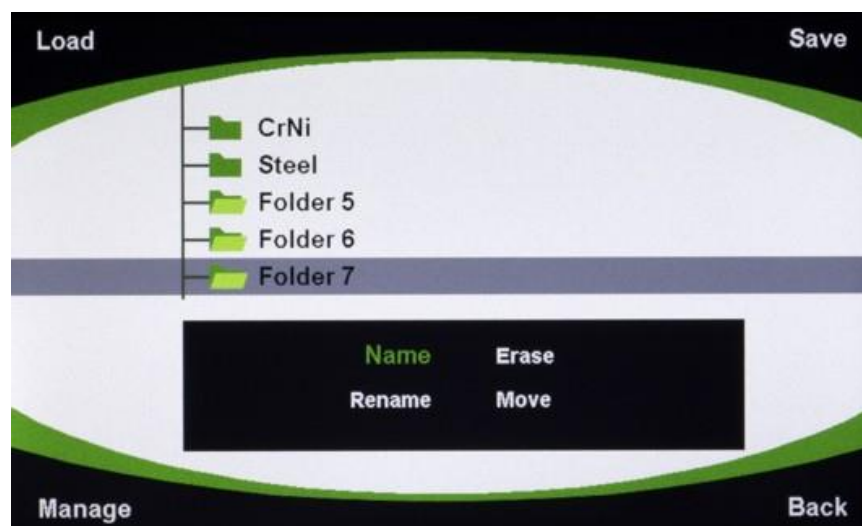


Fig. 26: INVERTIG.PRO digital / Programs application (Progr.) control panel
Managing existing folders

3.12.2 Main management settings

- Pressing the "Progr." application button [2] takes you to the Programs application (Progr.)
- Pressing the multifunction button [9] takes you to the Management menu.
- Rotate the push and rotate knob [7] to the required action (e.g. Name, Rename, Delete, Move, Copy).
- Press the push and rotate knob [7] to select the action.
- If no activity takes place for 20 seconds, the selected menu is exited automatically.

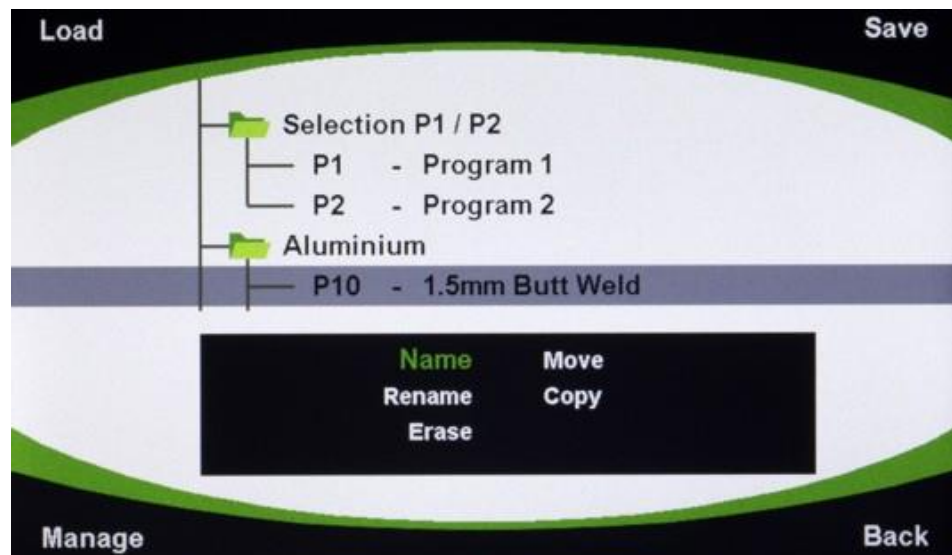


Fig. 27: INVERTIG.PRO digital / Programs application (Progr.) control panel Management selection: Name, Rename, Delete, Move, Copy.

3.12.2.1 Management: Name / Text Entry

The setting options are always selected and set using the same principle, see chapter 3.12.2.

- The letters, numbers and symbols are arranged on the screen in the same way as they are on the control panel (see fig. 28). The letters, numbers and symbols are selected by pressing the application and multifunction buttons on the control panel.
- The required letter, number or symbol is selected by pressing the respective application or multifunction button several times.
- Upper and lower case can be selected by pressing the push and rotate knob [7].
- Characters that have been selected by mistake can be deleted again by pressing the application button [3].
- Once the required name has been entered, saving takes place by pressing the application button [2]. The name has been saved.
- The "Name" menu can be exited again without saving by pressing the application key [4].



Fig. 28: INVERTIG.PRO digital / Programs application (Progr.) control panel Text entry

3.12.2.2 Management: Rename

- See Management: Name procedure in Chapter 3.12.2.1

3.12.2.3 Management: Move

The setting options are always selected and set using the same principle, see chapter 3.12.2.

- Rotate the push and rotate knob [7] to the folder to be moved in order to move the selected folder or program to the required location. "Move" appears in green text at the left-hand edge of the screen next to the folder or program to be moved.
- Press the push and rotate knob [7] to confirm.
- Rotate the push and rotate knob to the new position for the folder.
- Press the push and rotate knob [7] to confirm.

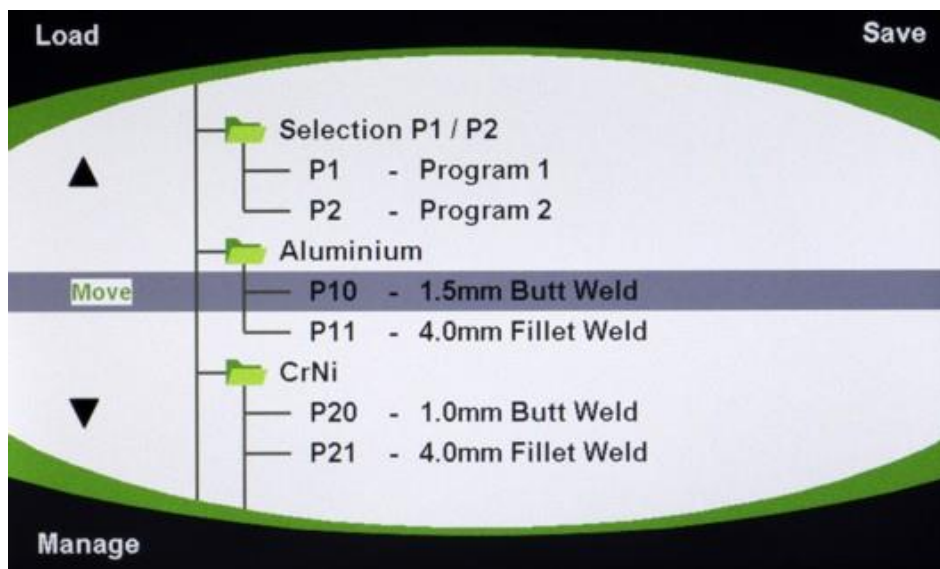


Fig. 29: INVERTIG.PRO digital / Programs application (Progr.) control panel "Move" appears in green text next to the folder/program.

3.12.2.4 Management: copy

Select program to be copied using the push and rotate knob [7]. The selected program can be displayed by pressing the push and rotate knob [7]. Display mode is exited by pressing the push and rotate knob again.

The setting options are always selected and set using the same principle, see chapter 3.12.2.

- Rotate the push and rotate knob [7] to select the position to which the program is to be copied. "Copy" appears in green text at the left-hand edge of the screen next to the program to be copied.
- Press the push and rotate knob [7] to confirm. The copied program is saved under the next free program number.

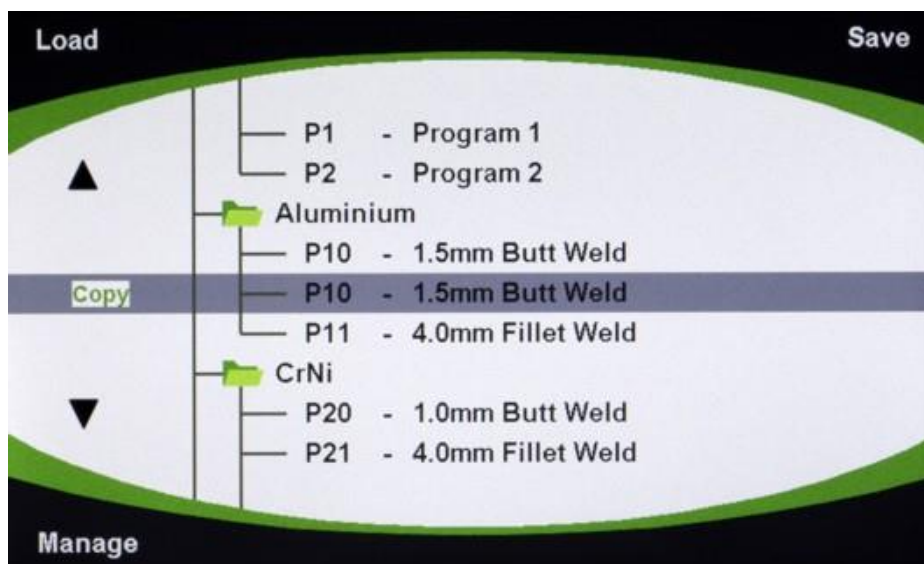


Fig.30: INVERTIG.PRO digital / Programs application (Progr.) control panel "Copy" appears in green text next to the folder/program.

3.12.2.5 Management: Delete

- Select folder or program to be deleted using the push and rotate knob [7].
- Pressing the multifunction button [9] takes you to the Management menu.
- Rotate the push and rotate knob [7] to the required action, Delete.
- Press the push and rotate knob [7] to select the action.
- Rotate the push and rotate knob [7] to Delete "Yes" or "No".
- Press the push and rotate knob [7] to confirm the selection.

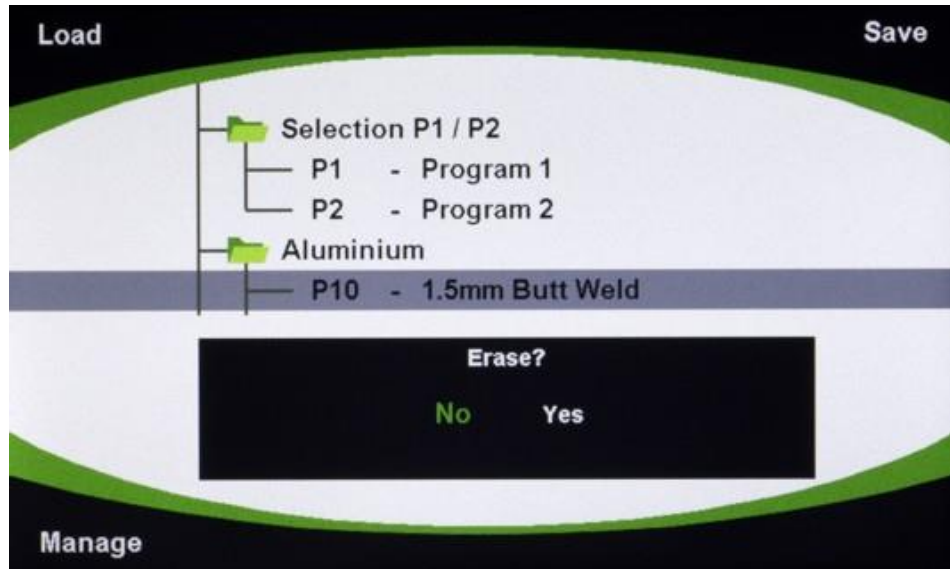


Fig. 31: INVERTIG.PRO digital / Programs application (Progr.) control panel Delete view? Yes/No

3.12.3 Loading programs

- Rotate the push and rotate knob to select the required program.
- The parameters of the program can be displayed on the Classic display by pressing the push and rotate knob. No values can be modified in this view. Pressing the push and rotate knob again takes you back to the overview.
- Press the Load multifunction button [8]. The program is loaded.
- The loaded program has a grey background. The program number appears in green text on the left-hand edge of the display, next to the loaded programs.

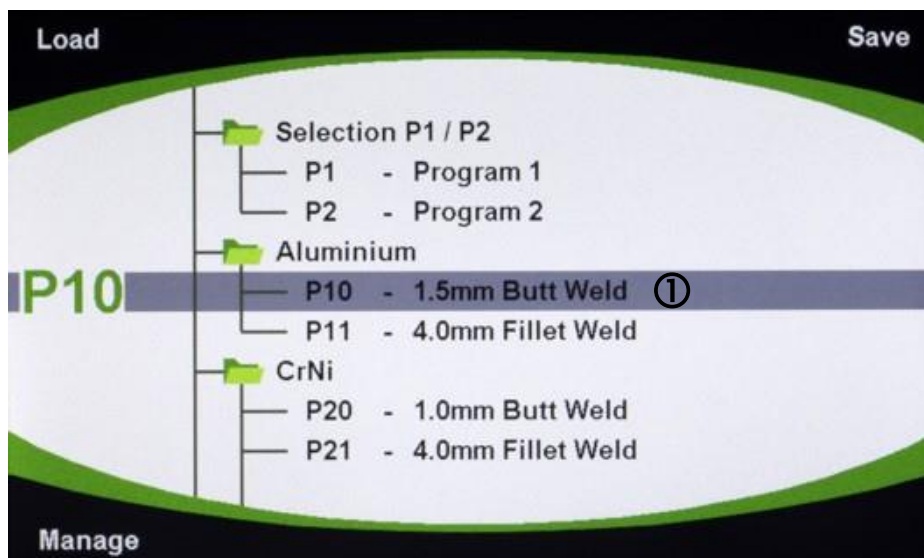


Fig. 32: INVERTIG.PRO digital / Programs application (Progr.) control panel
 ① The loaded program has a grey background

- Press the Classic application button [1]. The loaded program is displayed. The program number appears in green text at the top right of the screen [12].

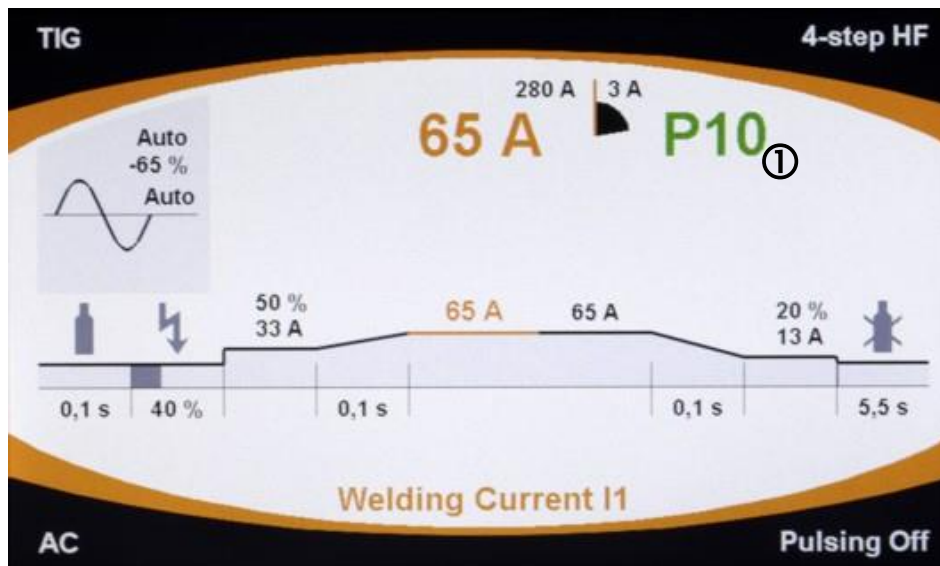


Fig. 33: INVERTIG.PRO digital / Classic application control panel
 ① The loaded program number appears in green text at the top right.

3.12.4 Saving programs

- Make the required machine settings (welding parameters) in the Classic application [1].
- Press the Progr. application button 2.
- Select the required folder using the push and rotate knob [2].
- Pressing the push and rotate knob [7] will cause the contents of the folder to be displayed.

- Use the push and rotate knob [7] to select the required program in which the new program will be saved. It is possible to overwrite an existing program or create a new one.
- Press Save multifunction button [5]. The program has been saved.
- A new program is stored under the next free program number.
- If an existing program is being overwritten, you must reply with "Yes" or "No" to the question "Overwrite?" after pressing the multifunction button [5].

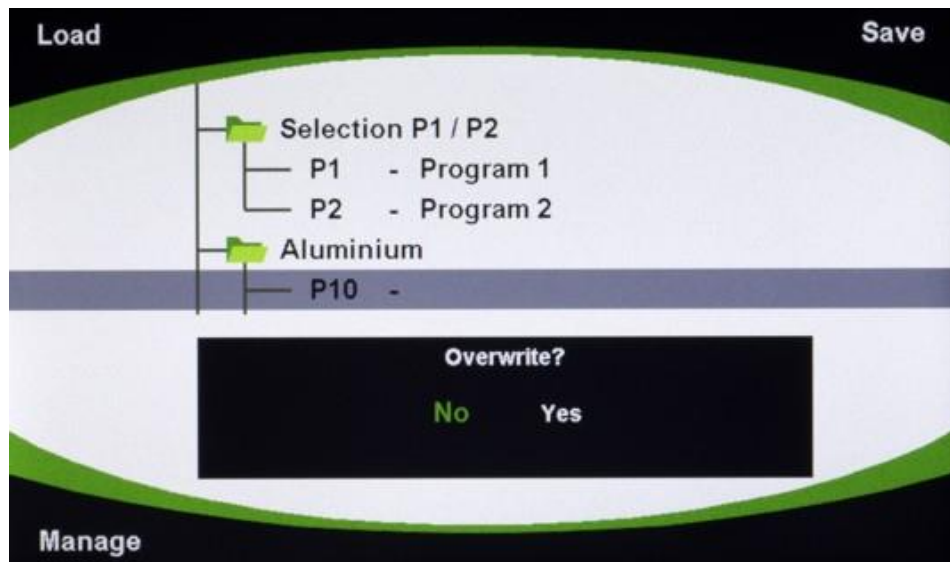


Fig. 34: INVERTIG.PRO digital / Programs application (Progr.) control panel
Overwrite? Yes/No

3.13 Assist Application

Pressing the Assist application button [3] takes you to the Assist application. The Assist application [3] allows you to enter a welding task in order to obtain suggestions for the optimum parameters for the welding task. The following values / data can be entered.

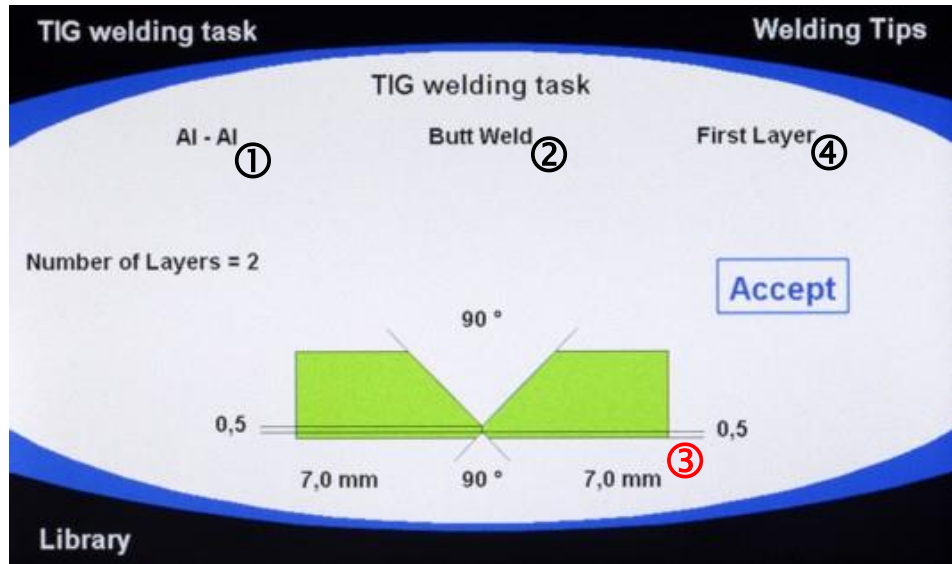


Fig. 35: INVERTIG.PRO digital / Assist Application control panel
Data / value entry selection option

- ① Select materials
- ② Select weld type (butt weld / fillet weld)
- ③ Select material thickness for both components to be joined
- ④ Layer selection, first or other layers

The material thickness of the materials to be joined can be set using a graphic.

The blue border colour indicates that you are in the Assist application.

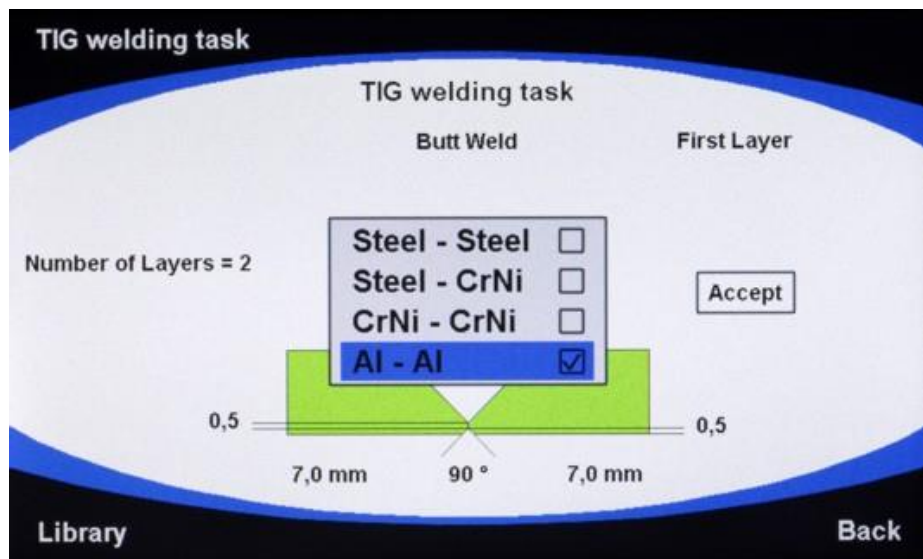


Fig. 36: INVERTIG.PRO digital / Assist application control panel
Material selection

3.13.1 Setting the welding task

- Rotate the push and rotate knob [7] to the specified points
- You are taken to the selection by pressing the push and rotate knob [7].
- Rotate the push and rotate knob [7] to the required setting.
- Press the push and rotate knob [7] to confirm the setting.
- Press the push and rotate knob [7] again to leave the point.

The material thickness can be set on the displayed graphic using the push and rotate knob [7]. Note: If the material thicknesses differ considerably, the Assist application does not calculate a suggestion. "D1-D2 too great!" appears on the TFT display.

- After entering all of the required data, select the "Accept" field using the push and rotate knob [7]. The welding parameters are then accepted.
- Press the push and rotate knob [7] to accept the data.
- The colour of the "Accept" text will be red whilst the data is being loaded.

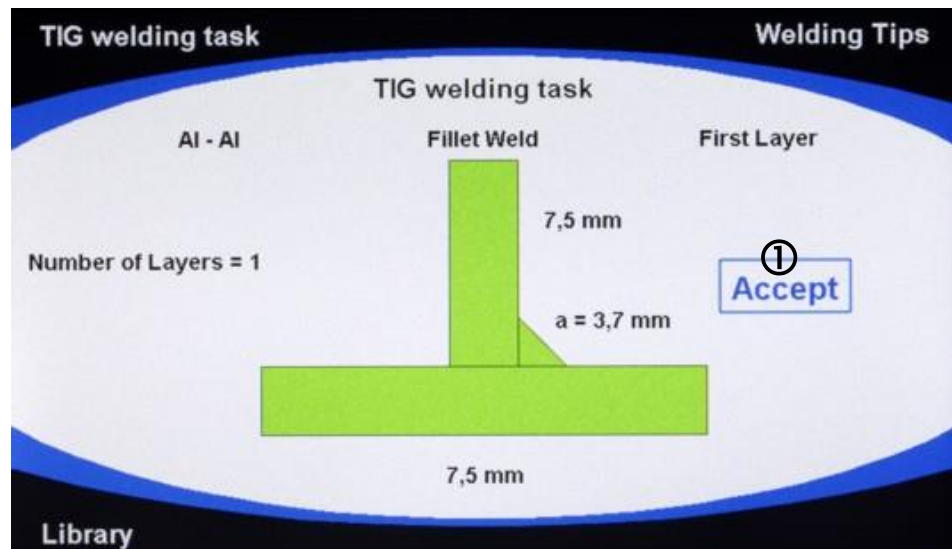


Fig. 37: INVERTIG.PRO digital / Assist application control panel

① Accept loading procedure

- When loading is complete, "Accepted" is displayed black. Note: The device is now ready for welding. There is no need to switch to the Classic application.

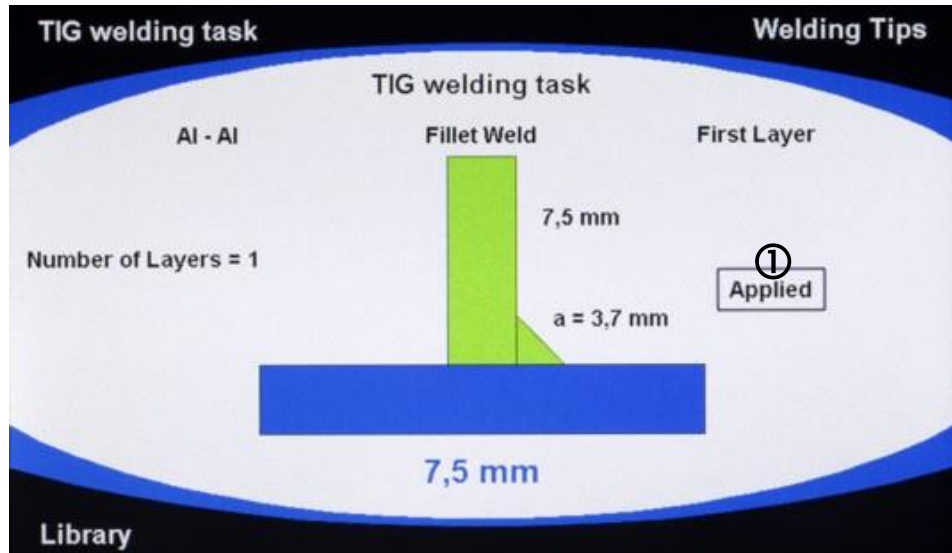


Fig. 38: INVERTIG.PRO digital / Assist application control panel

① Welding task accepted

- ❑ If you press the Classic application button [1], the optimum parameters for the welding task will be displayed on the Classic screen. "Assist" appears in blue text at the top right of the screen [12].



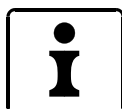
Fig. 39: INVERTIG.PRO digital / Classic application control panel

① Display optimum welding parameters for welding task

3.13.2 Welding tip

The welding tip is called up by pressing the multifunction button [5]. As well as the parameters, additional practical information for the welding task is suggested in the welding tip such as the gas nozzle size, the preheating temperature, the electrode type etc.

The information in the welding tip cannot be modified or overwritten.



The welding tip cannot be called up until the entered Assist values for the welding task have been determined.

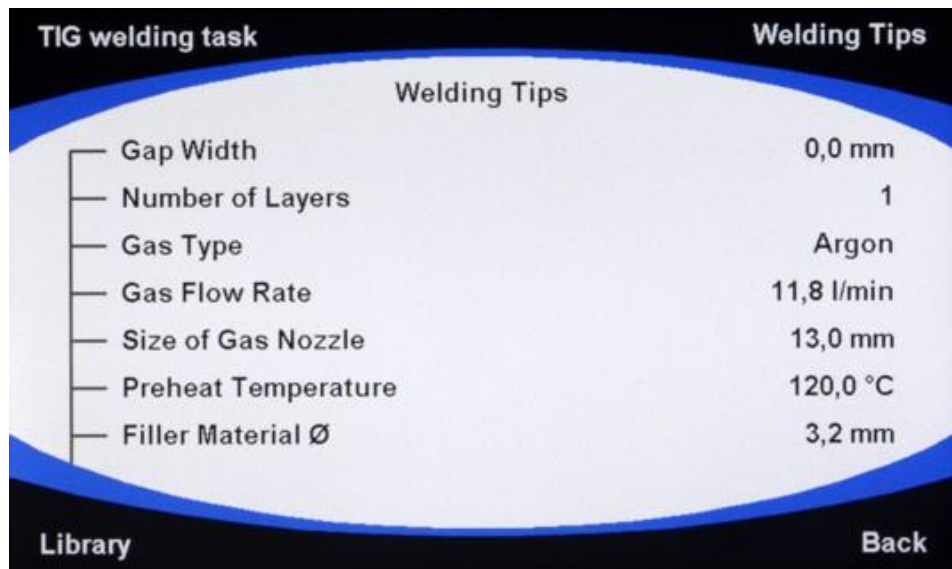


Fig. 40: INVERTIG.PRO digital / Assist application welding tip

3.13.3 Library

The library is called up by pressing the multifunction button [9]. The library is a comprehensive technical database to do with welding, and provides information about gas, fillers, electrodes, types of seam and welding position.

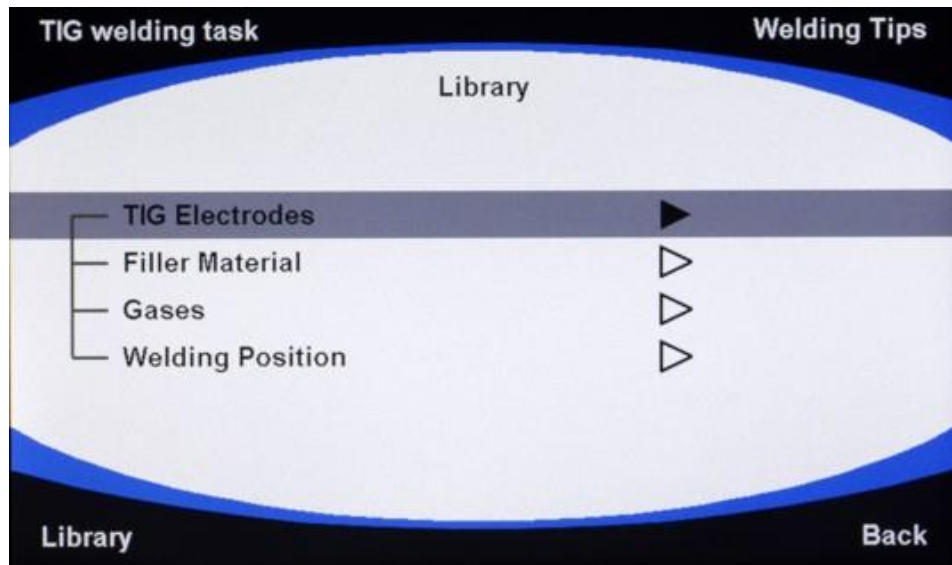


Fig. 41: INVERTIG.PRO digital / Assist application control panel Library view



Fig. 42: INVERTIG.PRO digital / Assist application control panel Library view WIG electrodes and welding position

3.14 System application button

Pressing the application button [4] takes you to the System application. System is the application with which functions and procedures can be defined in an extremely convenient and clear way.

The yellow border colour indicates that you are in the System application.

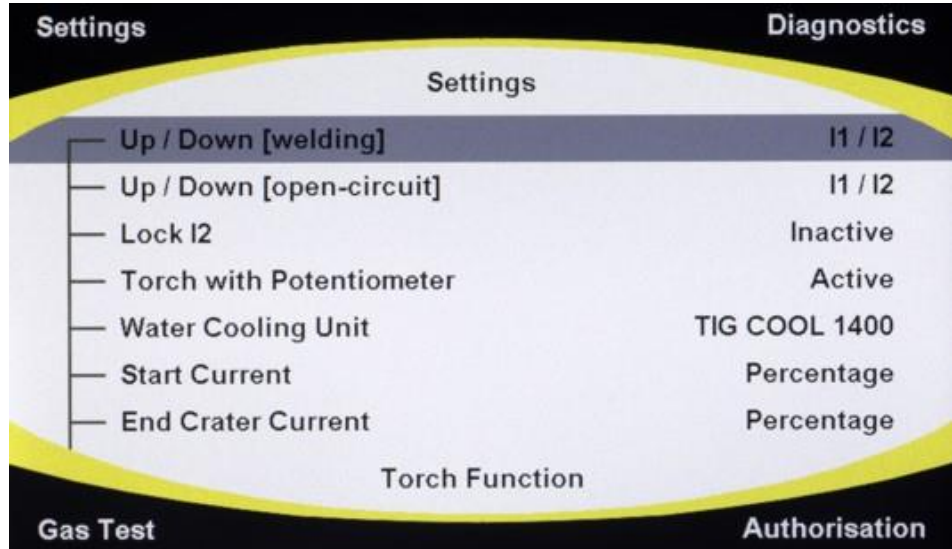


Fig. 43: INVERTIG.PRO digital / Assist application control panel Settings view

3.14.1 System overview

Pull-down menus provide clarity and allow you to make quick changes.

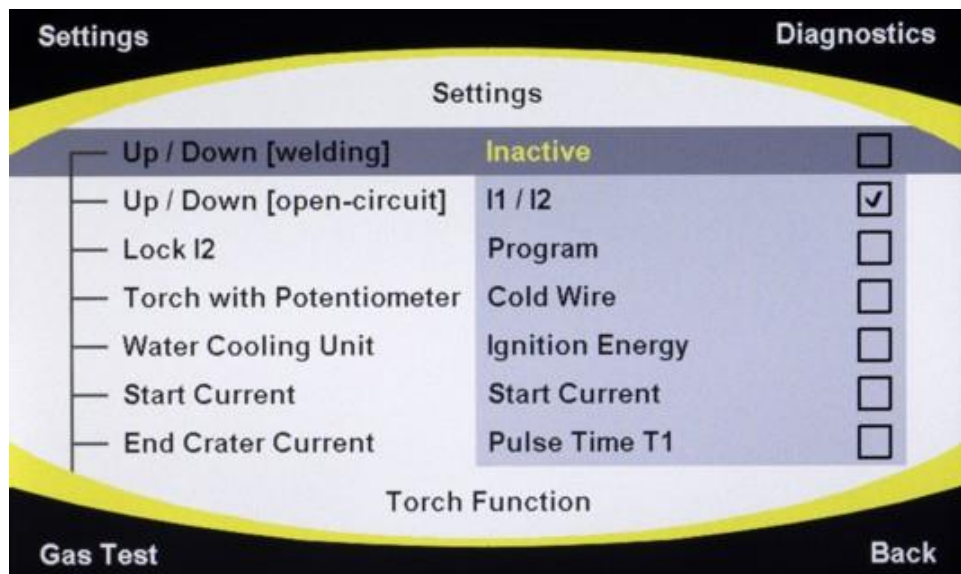


Fig. 44: Overview of System application and pull-down menu

3.14.2 Basic selection of machine settings

- Rotate the push and rotate knob [7] to the required setting.
- Press the push and rotate knob [7] to display the selection of the setting to be modified.
- Rotate the push and rotate knob [7] to the required point.
- Press the push and rotate knob [7] to confirm the selection.

The settings in the System application are described in the following.

3.14.3 Explanation of system settings

- **Torch Up/Down welding function**

This setting is provided for the use of an Up/Down torch. The following settings can therefore be made for the Up/Down torch for welding operation.

Inactive

→ Up-/Down torch is inactive, i.e. Up-Down function not present

I1/I2

→ Welding current I1 or I2 can be modified for the Up/Down torch. The I1/I2 relationship is maintained when pulsing.

Program

→ With the Up/Down torch, all programs can be called up within a program sequence.

Other setting options:

Cold wire, only when using the REHM APUS series cold wire device (start and end of wire feed is carried out using the Up button; cold wire retraction is carried out using the Down button), ignition energy, start current, pulse time t1, Pulse time t2, pulse frequency, end crater current, AC balance, AC frequency, current I1, Current I2, gas pre-flow time, start current time, upslope time, downslope time, end crater current time, gas post-flow time, AC time, DC time, pulse type, AC curve type, spot welding time, interval time

- **Torch idling Up/Down function**

The Up/Down function of the torch can be set in the following ways during standby operation, i.e. not during welding operation.

Inactive. I1/I2, cold wire (start and end of wire positioning in 2nd step), ignition energy, start current, pulse time t1, Pulse time t2, pulse frequency, end crater current, AC balance, AC frequency, current I1, Current I2, gas pre-flow time, start current time, upslope time, downslope time, end crater current time, gas post-flow time, ignition, operating mode, polarity, AC time, DC time, pulse type, AC curve type, spot welding type, welding procedure, interval time

- **Torch I2 locking function**

Inactive

→ I2 locking is inactive, i.e. I2 is only active for as long as torch button 2 is pressed.

Active

→ I2 locking is active, i.e. the changeover from I1 to I2 during welding takes place in such a way that pressing torch button 2 provides a constant changeover to the other current. Pressing torch button 2 again switches back to I1.

Functional description

- **Torch poti-torch function**

This setting is intended for the use of a torch with a potentiometer.

Inactive

 - Torch potentiometer is inactive, i.e. the potentiometer at the torch is not evaluated

Active

 - Torch potentiometer is active, i.e. the value set at the potentiometer is evaluated
- **Water cooling device**

TIG COOL 1400

 - Welding with a water-cooled torch is possible without a water cooling device being detected by the welding system, e.g.: TIG -COOL CART 1400, or other water cooling device without a communication interface.

TIG COOL 2000

 - Welding with water-cooled torch is only allowed if the welding system detects the use of a functioning water cooling device, e.g. TIG-COOL CART 2000. Otherwise an error message occurs, which prevents damage to the welding torch if no water cooling device is present.
- **Classic application start current**

Percentage or absolute

 - Start current is set percentage-wise to I1 or can be set to an absolute value
- **Classic application end crater current**

Percentage or absolute

 - End crater current is set percentage-wise to I1 or can be set to an absolute value
- **Classic E-manual polarity function**

Manual or auto (automatic changeover of torch connector polarity – depending on the selected electrode type): Note: The Auto function can only be selected for INVERTIG.PRO *digital* AC/DC welding systems.
- **Mode sequence program function**

Selection of "limiting" or "rolling" program sequence in the programs application (Progr.). All programs within a folder belong to a program sequence. The programs within this sequence can be loaded via the torch Up/Down buttons. The type of loading can be "rolling" or "limiting".

Limiting

 - The loading of the programs within a program sequence ends with the first or last program, i.e. no fast access is possible from the first to the last program, because scrolling through is required at the end of the program.

Rolling

 - The program in last position can be loaded immediately from the program that is stored on first position (rotating).

- Welding device language

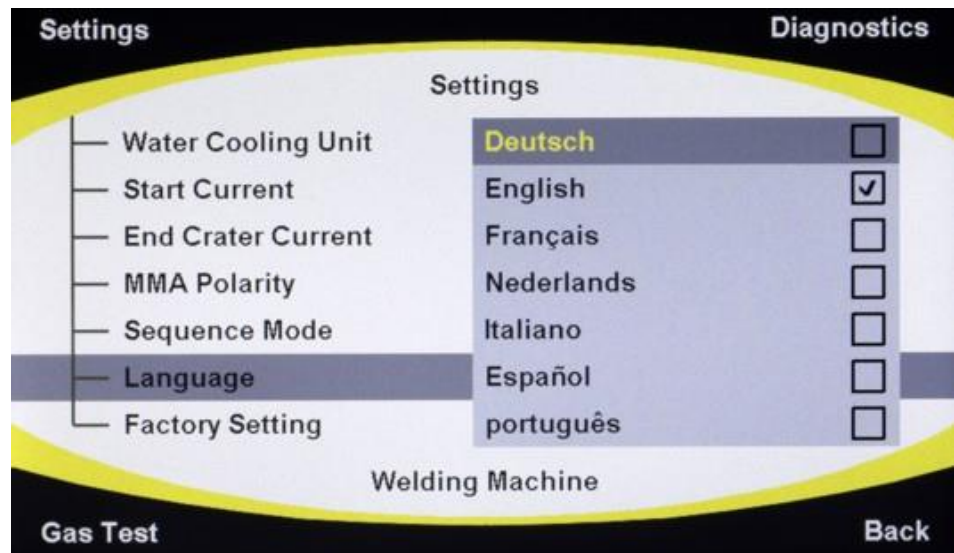


Fig. 45: Overview of System application with language selection pull-down menu

- Welding device factory settings

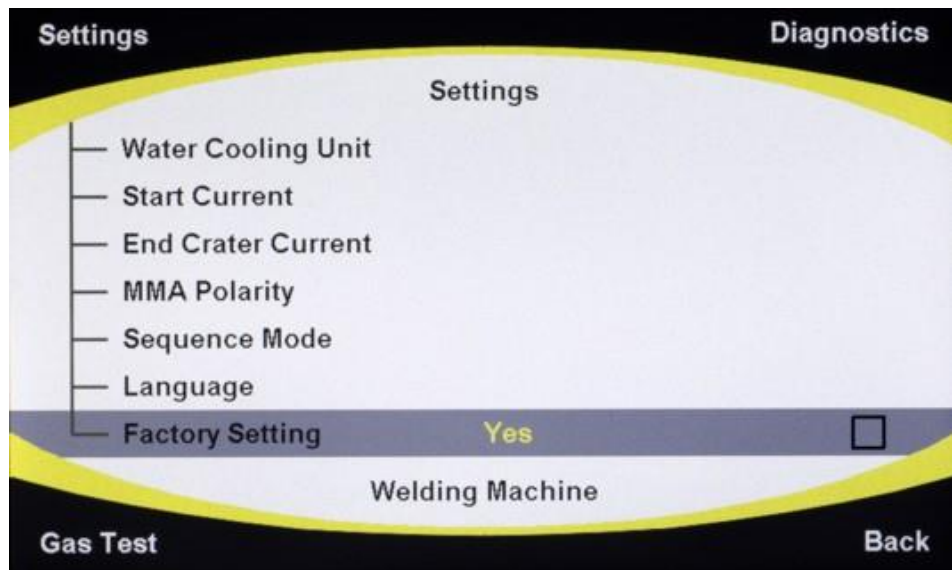


Fig. 46: Overview of System application / factory settings

The factory settings are set by pressing the push and rotate knob twice. The programs and the settings in the System application are retained.

Welding parameters	Factory setting
Gas preflow time	0.1 s
Ignition current	50%
Start current	50%
Upslope time	0.1 s
Current I1	100 A
Current I2	80 A
Pulse time t1	0.3 s
Pulse time t2	0.3 s
Downslope time	0.1 s
End crater current	20%
Gas post-flow time	5.0 s
AC frequency*	Automatic
AC balance*	- 65%
Ignition	HF on
Operating mode	2 step
Polarity*	DC Minus
EL current I1	150 A
Hot-Start current	70%
Arc Force current	70%
Pulse type	Pulses off
Pulse frequency	500 Hz

* not used in DC systems

Fig. 47: Factory settings overview

3.14.4 Gas test

The gas test is carried out by pressing the multifunction button once [9] for the factory set time of 20 seconds. The gas test can be prematurely terminated by pressing the multifunction button [6].

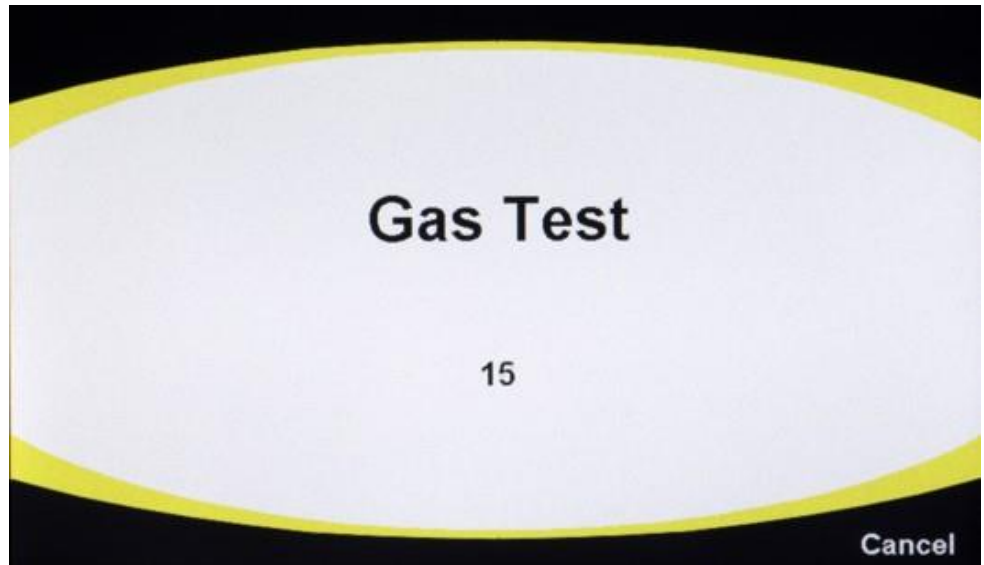


Fig. 48: INVERTIG.PRO digital / System application control panel
Gas test view

3.14.5 Access authorisation

An increasing number of companies stipulate fixed parameters for certain tasks in order to safeguard quality

However, users have different preferences and capabilities. For example, in terms of welding speed and the associated welding currents. The access authorisation for the INVERTIG.PRO *digital* takes this into account and makes individual adaptation possible.

The INVERTIG.PRO *digital* gives the user the possibility of providing preset welding data records with access authorisation and a parameter tolerance range of 0% to 30%.

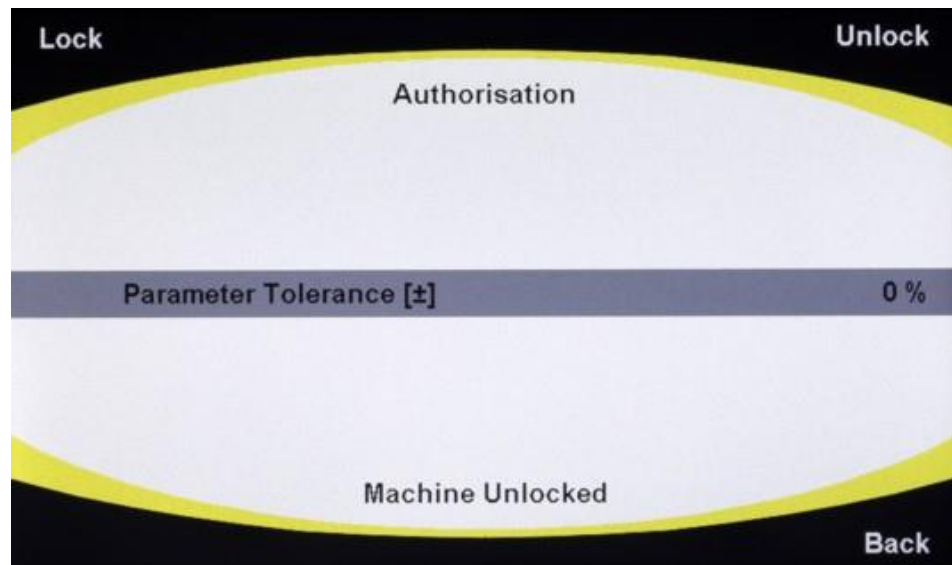


Fig. 49: INVERTIG.PRO digital / System application control panel
Access authorisation / tolerance range entry view

The block can be set with a password (exactly 4 characters required) by pressing the multifunction button [8]. The password is entered as described in Chapter 3.12.2.1. The defined password is accepted by pressing "Enter" (Program application button [2]). Unlocking takes place by pressing the multifunction button [8] and entering and confirming the password.

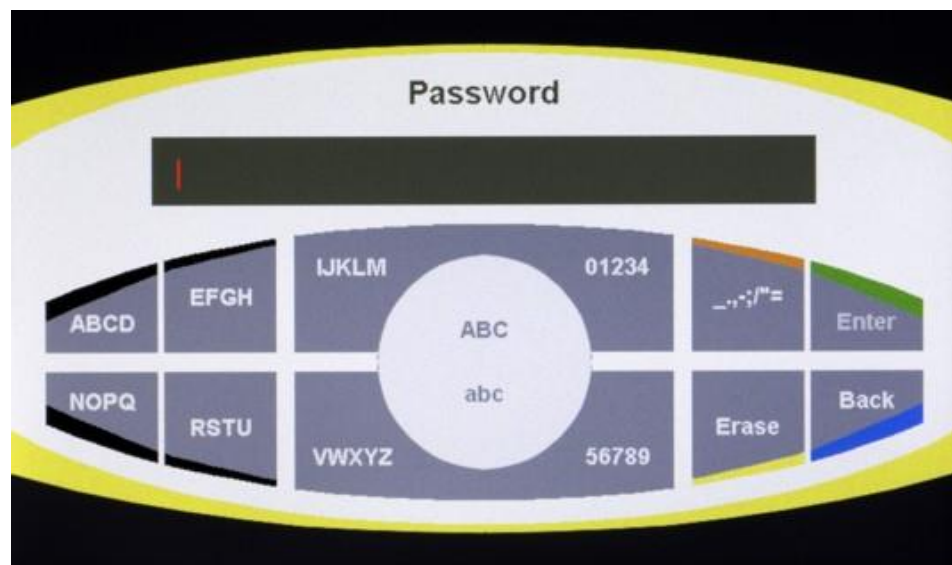


Fig. 50: INVERTIG.PRO digital / System application control panel
Password entry

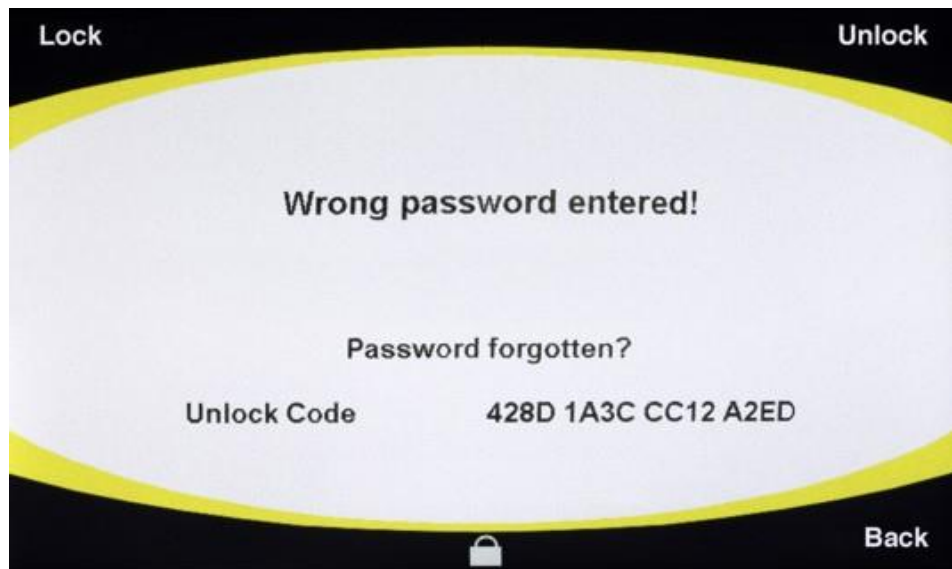


Fig. 51: INVERTIG.PRO digital / System application control panel
Wrong password entered



If an incorrect password is entered, an unlocking code appears on the TFT display. This consists of a combination of numbers and letters. To unlock your INVERTIG.PRO *digital* please notify your REHM customer service of this unlocking code. The entry of the password can be repeated by pressing the multifunction button [6] "Back".

3.14.6 Diagnosis

A comprehensive range of diagnosis provides up to date information about the software and the hardware.

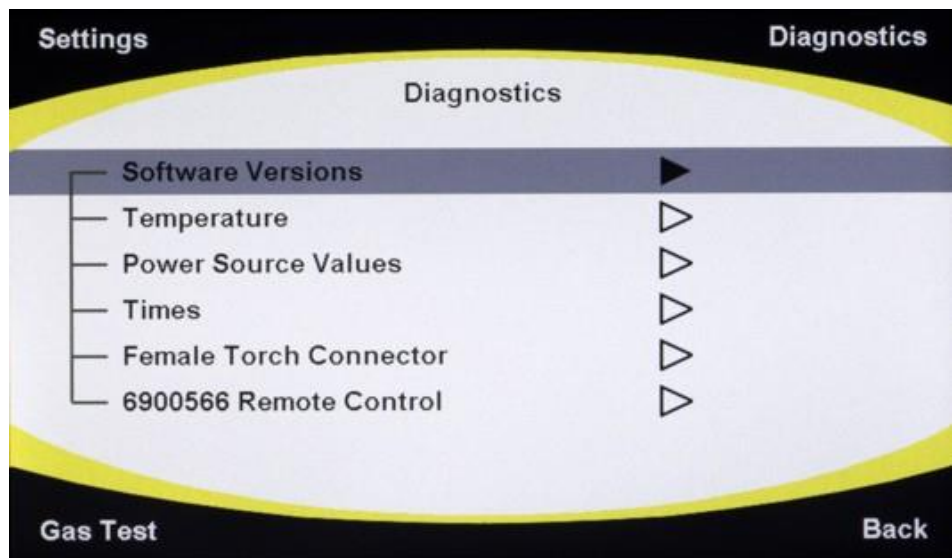


Fig. 52: INVERTIG.PRO digital / System application control panel
Diagnosis range view

4. Accessories

The following additional units can be supplied as accessories. Remote control units are always active as soon as they are connected! Only one additional unit may be connected at any given time.

4.1 Overview

REHM parts number	Description
Earth cable	
7810102	35 qmm / 4 m
7810109	50 qmm / 4 m
7810104	70 qmm / 4 m
7810106	95 qmm / 4 m
Pressure reducer	
7830100	Pressure reducer with content and working manometer
Welding torch (in premium set)	
Gas-cooled	
7631700	R-TIG 12-200 / 8 m / Up/Down Highflex <i>iSystem</i>
Water-cooled	
7631702	R-TIG 12-260W / 8 m / Up/Down Highflex <i>iSystem</i>
7631704	R-TIG 12-450W / 8 m / Up/Down Highflex <i>iSystem</i>
7631706	R-TIG 12-450W SC / 8 m / Up/Down Highflex <i>iSystem</i>
Alternative torches	
Gas-cooled	
7631735	R-TIG 12-200 / 4 m / Up/Down Highflex <i>iSystem</i>
7631701	R-TIG 12-200 / 12m / Up/Down Highflex <i>iSystem</i>
Water-cooled	
7631736	R-TIG 12-260W / 4m / Up/Down Highflex <i>iSystem</i>
7631703	R-TIG 12-260W / 12m / Up/Down Highflex <i>iSystem</i>
7631737	R-TIG 12-450W / 4m / Up/Down Highflex <i>iSystem</i>
7631705	R-TIG 12-450W / 12 m / Up/Down Highflex <i>iSystem</i>
7631738	R-TIG 12-450W SC / 4m / Up/Down Highflex <i>iSystem</i>
7631707	R-TIG 12-450W SC / 12m / Up/Down Highflex <i>iSystem</i>
Remote control units	
7531023	Hand remote control P2 12-pin (analog)
7531021	Foot remote control P1 <i>iSystem</i>
Adapter cable for series torch 7-pin to 12-pin	
3600518	Adapter cable 7 to 12 pin torch air/water without potentiometer
3600519	Adapter cable 7 to 12 pin torch air-cooled with potentiometer cable
3600536	Adapter cable 12 to 7 pin torch air/water without potentiometer
Premium-Sets (R-TIG torch <i>iSystem</i> 8 m, pressure reducer, earth cable 4 m)	
1485200	R-TIG 200/35
148 5205	R-TIG 200/50
1485210	R-TIG 260W/35
1485215	R-TIG 260W/50
1485220	R-TIG 450W/70
1485225	R-TIG 450W SC/95
Consumable parts sets	
7700425	R-TIG 12-260W
7700426	R-TIG 12-200
7700427	R-TIG 12-450W
7700428	R-TIG 12-450WSC

REHM parts number	Description
Torch consumable parts	
R-TIG 12-260W	
7733235	Electrode holder, size 1.6 mm; CU = 5
7733236	Electrode holder, size 2.4mm; CU = 5
7733237	Electrode holder, size 3.2mm; CU = 5
7730187	Gas diffuser, size 1.6 mm; CU = 5
7730188	Gas diffuser, size 2.4mm; CU = 5
7730189	Gas diffuser, size 3.2mm; CU = 5
7730002	Isolator; CU= 10
7699999	Gas nozzle, size 6.5 mm; CU =10
7700000	Gas nozzle, size 8mm; CU =10
7700001	Gas nozzle, size 10mm; CU =10
7700002	Gas nozzle, size 11.5mm; CU =10
7729995	Torch cap short; CU =1
7729996	Torch cap medium; CU =1
7729997	Torch cap long; CU =1
R-TIG 12-200, 12-450W, 12-450W SC	
7733238	Electrode holder, size 1.6 mm; CU = 5
7733239	Electrode holder, size 2.4mm; CU = 5
7733240	Electrode holder, size 3.2mm; CU = 5
7733241	Electrode holder, size 4.0mm; CU = 5
7733242	Electrode holder, size 4.8mm; CU = 5
7730190	Gas diffuser, size 1.6 mm; CU = 5
7730191	Gas diffuser, size 2.4mm; CU = 5
7730192	Gas diffuser, size 3,2mm; CU = 5
7730193	Gas diffuser, size 4,0mm; CU = 5
7730194	Gas diffuser, size 4,8mm; CU = 5
7720406	Isolator; CU = 10
7700003	Gas nozzle 37mm, size 7,5mm; CU = 10
7700004	Gas nozzle 37mm, size 10mm; CU = 10
7700005	Gas nozzle 37mm, size 13mm; CU = 10
7700006	Gas nozzle 37mm reinforced, size 13mm; CU = 10
7700007	Gas nozzle 37mm, size 15mm; CU = 10
7700008	Gas nozzle 37mm reinforced, size 15mm; CU = 10
7729998	Torch cap, short; CU = 1
7729999	Torch cap, long; CU = 1
Accessory options	
7532000	TIG – COOL CART 2000 <i>iSystem</i>
7532005	TIG – COOL CART 1400
7532010	TIG – COOL 2000 <i>iSystem</i>
7532015	TIG – COOL 1400
Automation interfaces	
1381286	Interface INVERTIG.PRO <i>digital</i> Standard

4.2 Foot remote control P1 *iSystem*

With the foot remote control P1 *iSystem* (see Chapter 4.1 – Overview) the welding current can permanently be adapted during welding according to the application task, using the foot pedal. The current set at the machine is the one used when the pedal is pressed to the maximum. Based on tolerances of the foot remote control in its initial range, the display value in the lower area can differ from the welding current.

The foot remote control is connected to the 7-pin remote operation socket on the rear of the INVERTIG.PRO *digital*.

4.3 REHM TIG torch

The TIG torches (see Chapter 4.1 – Overview) are designed to work with the electronic components of the INVERTIG.PRO *digital*. They offer a wide range of options for setting the current source remotely (see Chapters 3.14.1, 3.14.2 and 3.14.3). The use of other TIG torches with remote control can lead to functional disruptions or cause defects to the INVERTIG.PRO *digital*.

CAUTION: When using TIG torches with remote control of any type not specifically recommended by REHM, the guarantee claim is voided.



4.4 REHM water-cooling units TIG - COOL CART and TIG - COOL

The REHM water cooling units TIG - COOL CART and TIG – COOL (see Chapter 4.1 – Overview) is designed, in terms of performance data and layout, for the INVERTIG.PRO *digital* and allows you to use water-cooled TIG torches. The water-cooling unit and the INVERTIG.PRO *digital* form a mobile unit, see the operating instructions for the water-cooling unit (item number 730 1880).

4.5 Handheld remote control P2 12-pin (analog)

The handheld remote control P2 12-pin (analog) (see Chapter 4.1 – Overview) can be used to reduce the welding current set at the machine by between 0 % and 100 %. This remote is suitable for MMA welding. This option cannot be used for TIG welding as the torch button connector cannot be connected and thus it is not possible to ignite the arc. Please note that the analogue input must be activated in the system application in order to use the manual remote control.

4.6 Automation INVERTIG.PRO *digital*

4.6.1 Interface INVERTIG.PRO *digital* standard

The connection for the automation is made using the standard 7-pin remote control socket on the rear of the INVERTIG.PRO *digital*.

The following signals are available:

- Start / Stop (to start the welding procedure)
- Current I_1 (to remotely control the welding current)
- Current flows (to identify whether welding current is flowing)

For more information, please contact your REHM retailer.

5. Putting into operation

5.1 Safety notes

Read the operating instructions, in particular, → **Chapter 2, Safety notes**, carefully before starting work on this current power source.



Warning!

REHM welding units may only be operated and maintained by persons who have been educated and trained to operate and maintain welding units.

When welding, always wear protective clothing and ensure that other people in the vicinity of the machine are not endangered by the UV radiation of the arc.

5.2 Working under increased electrical danger (IEC 974, EN 60974-1, TRBS 2131 and BGR 500 chapter 2.26)

The REHM TIG welding units meet the requirements for working under increased electrical danger in accordance with IEC 974, EN 60974-1, TRBS 2131 and BGR 500 chapter 2.26 (S).

For alternating current welding, a safety feature has been built in to the electronic control. This ensures that when welding using alternating current, the arc is only ever ignited with direct current and only when the welding current starts to flow does the machine switch to alternating current. If the arc is suddenly broken during welding, the machine automatically deactivates the HF and the welding current. The machine then returns to the basic state.

You should ensure that when working under increased electrical risk, the power source is not set up in this area. Observe the regulations EN 60974-1, TRBS 2131 and BGR 500 chapter 2.26.

5.3 Setting up the welding unit

Set the REHM welding unit in such a way that the welder has sufficient space in front of the unit to control the setting elements and to operate it.

Secure the unit in such a way that it cannot roll away or fall.

Pay attention to the relevant accident regulations when transporting the unit. Only use the transportation options and fixtures provided for by REHM when transporting the unit.



Danger! Electrical voltage!

Do not use the welding unit outside in the rain!

5.4 Connecting the welding unit

Connect the REHM welding current source in accordance with the valid VDE regulations to the power supply network and ensure that you meet all the regulations stipulated by the appropriate professional associations.

When connecting the unit, pay attention to the specifications regarding the supply voltage and network fuses. Safety mechanisms and fuses must always be set out for the specified current. The required specifications can be found on the power label of your unit.

Always switch the unit off when it is not in use.

Screw the cylinder pressure regulator onto the cylinder and check the seal of the connection. Always close the bottle valve after completely work. Observe the regulations of the appropriate professional associations.

5.5 Cooling the welding unit

Set the REHM welding unit up in such a way that the air inlets and outlets are not affected. The duty cycle of the power components indicated can be reached only with adequate ventilation (see "Technical data"). Ensure that no sanding dust, dust or any other metal items or foreign objects are able to enter the unit.

5.6 Guidelines for working with welding power sources

Welding tasks may only be carried out by specialists or trained personnel familiar with the technology and procedures. When welding, wear protective clothing and ensure that other people in the vicinity of the machine are not endangered. After completing welding, leave the unit switched on for a few minutes so that the fan runs a little longer and removes some of the residual heat from the unit.

5.7 Connecting welding cables or torches

The REHM TIG welding units are fitted with quick-fit socket systems for connecting earth cables and TIG torches or electrode cables. The connection is made by inserting and turning to the right. The inert gas hose is connected a via quick connector to welding unit. The torch button socket is fitted into the socket that is built in.

Important!



In order to prevent unnecessary losses of energy during welding ensure that all of the connections of the welding cables are tightened and well insulated.

5.8 Connecting external components

External components are connected via the standard 7-pin remote control socket on the back of the INVERTIG.PRO *digital*. These include the Rehm accessories that are described in chapter 4 (remote foot controller P1, water cooling devices TIG-COOL 2000 and TIG-COOL CART 2000, automation interface). The electrical connection is made via a serial CAN connection.



Important!

When using this 7-pin remote control socket, please ensure that you comply with the directives pertaining to the use of serial bus systems. Particularly the electromagnetic compatibility (EMC) specifications. Always use the accessories provided by REHM.

Please note that the length of the INVERTIG.PRO iSystem cable between the first and last subscribers must not exceed 20m because of the design of the serial connection.

In order to ensure that the external connection is always reliably initialised, first switch on the power switch of the INVERTIG.PRO *digital* and then the switches of the external devices.

6. Operation

6.1 Safety notes

Read the operating instructions, in particular, → **Chapter 2, Safety notes**, carefully before starting work on this current power source.

Warning!



REHM welding units may only be operated and maintained by persons who have been educated and trained to operate and maintain welding units.

Working with and maintaining electrical welding units always carries slight dangers. People who are not familiar with units and installations of this type may hurt themselves or others. For these reasons, the operators must be warned of the following potential dangers and the safety mechanisms that are to be used to prevent possible damages. Independently of this, the user of a welding unit must also inform themselves of the safety regulations of that company prior to starting work.

6.2 Electrical risks



Connection and maintenance work on welding units and accessories may only be carried out in accordance with the valid VDE regulations and the regulations of the appropriate professional associations.

- Never touch metal parts under current with bare skin or wet clothing.
- Always wear gloves and welding masks with the appropriate protection filters when welding.
- Ensure that all parts that you must touch during your work, for example, clothing, work area, torch, electrode holder and welding unit, are always dry. Never work in a wet environment.
- Ensure good insulation by wearing dry gloves and rubber-soled shoes and standing on an insulating surface, in particular when you are standing on a metal surface or in areas with increased electrical danger.
- Do not use worn or damaged welding cables. Ensure that the welding cables are not overloaded. Only use equipment that is in good condition.
- When taking a longer break from work switch the welding unit off.
- Do not wind the welding cable about the housing parts and do not leave it coiled up.
- Never leave a switched on welding unit unattended.

6.3 Personal safety tips

The rays of the electrical arc and the hot metal can both lead to serious burns on unprotected skin and eyes.

- Only use welding masks with permitted protective filters, leather gloves and a mask to protect your eyes and body from sparks and from the rays of the arc (see TRBS 2131 and BGR 500 chapter 2.26). Also wear the same kind of protective even if you are only supervising welding work.

- Inform people standing by of the dangers of the arc rays and the hot metal sparks and protect them using a shield that is not flammable.
- Pressurised gas bottles also present a potential danger. Strictly observe the safety regulations of the relevant professional authorities and the suppliers. Ensure that inert gas bottles are not able to fall. Never transport inert gas bottles without their protective caps.

6.4 Fire prevention

Hot slag and sparks can cause fires if they come into contact with flammable materials, liquids or gases. Remove all flammable materials from the welding area and ensure a fire extinguisher is on stand-by.

6.5 Ventilation

Work places must be set up, whilst taking account of procedures, materials and conditions of use, in such a way that the air the user breathes is free from unhealthy materials (see TRBS 2131 and BGR 500 chapter 2.26).

Ensure that the welding area is well ventilated either by natural means or by technical ventilation systems.

Do not weld painted or solvent treated work pieces as these may give off poisonous gases.

6.6 Checks before starting

The prerequisites that

- the unit is set up correctly in accordance with → **Chapter 5, Putting into operation**
- all connections (inert gas, torch connection) have been made in accordance with → **Chapter 5, Putting into operation**
- the appropriate maintenance has been carried out in accordance with the maintenance interval → **Chapter 8, Maintenance**
- the safety mechanisms and the components of the unit (in particular the torch connector hoses) are checked by the operator and are functional.
- the operator and other persons involved have put on the appropriate protective clothing, and the working area has been shielded so that no bystanders are at risk.

6.7 Connecting the earth cable



Warning!

→ **Chapter 6.2 Electrical risks. Make sure that the welding current is not able to flow through chains of lifting machinery, crane lines or other current carrying parts.**

→ **Chapter 6.2 Electrical risks. Make sure that the earth cable is connected to the work piece as close as possible to the welding area. Earth connections affixed to points further apart reduce the effectiveness and increase the risk of electrical shocks and stray current.**

6.8 Practical notes

The practical user tips below represent just an overview of the wide range of applications of REHM TIG welding units. For questions regarding specific welding tasks, materials, inert gases or welding equipment, see the professional literature or manufacturer recommendations.

Weldable materials

When TIG welding you differentiate between materials, those that are welded under direct current, and those welded under alternating current. Direct current materials are non-alloyed, alloyed, highly alloyed steels, as well as copper, nickel, titanium and their alloys. Alternating current is generally used for aluminium and the associated alloys.

Tungsten electrodes

Various tungsten electrodes are offered and used for TIG welding. The differences lie in the proportion and type of doping elements in tungsten electrodes. The compositions are set out in DIN EN ISO 6848 (formerly EN 26848) and are generally made up of thorium oxide, cerioxide, zircon oxide or lanthan oxide. The advantages of tungsten electrodes containing oxides are:

- better ignition characteristics
- more stable arc
- greater current resilience
- longer stand time

REHM supplies their torches with tungsten electrode WC 20 (grey) as standard.

The most frequently used electrode diameters and their resilience can be found in the relevant technical literature. Remember that the values specified there are calculated with machines that do not have the balance range of the REHM TIG units. The guideline is that the current is too high for a given electrode if it drips or has a broom-like structure. You can choose between lower current or, when using alternating current, using a larger minus proportion in the balance setting.

When welding with direct current, the electrode is pointed.

The REHM TIG welding units can also use pointed electrodes for alternating currents welding with the balance settings in the minus region. This has the advantage that the arc is even more concentrated and effective. This also usually increases the welding speed.

Remember when grinding the electrode, the grind direction should be along the length of the electrode. To avoid risks, only use grinding units and extraction systems suitable for the purpose.

Inert gases

Argon is usually used as inert gas for TIG welding. For some applications, helium, argon/helium mixes, or argon/hydrogen mixes may also be used. With the increase in helium, the arc ignition is more difficult and the application of heat higher. The amount of inert gas required will depend on the electrode diameter, gas nozzle size, welding current level and the movement of air at the place of work. With a work piece thickness of 4 mm using argon as inert gas, the first guideline is, for example, aluminium requires approximately 8 litres a minutes and steel and chrome-nickel-steel 6 litres a minute. When using helium, the required amount is considerably higher.

TIG torches

The standard lengths of the TIG torches are 4 m and 8 m. But longer torches may also be connected to these machines. Depending on the task and current level, the appropriate tungsten electrode, split pin and gas nozzle must be selected. When using torches with two buttons, the two current regulators can be used during welding to switch the current between two preset values.

Operation

Welding with and without additional materials

Additional welding materials are added in stock form when welding manually. The correct material for the basic material must be selected. But excellent results can also be achieved if you just allow the welding bath of two pieces to come together, for example, on corner seams.

Direct current welding

When direct current welding, the minus pole is usually at the electrode. The minus pole is the colder pole, this means that the current resilience and the stand time of the tungsten electrode is considerably greater than when plus pole welding.

Alternating current welding

When alternating current welding, the resilience of the electrode is heavily influenced by the balance setting. The balance setting distributes the plus and minus proportions of the welding current between the electrode and the work piece. During the positive half wave, the aluminium oxide skin is destroyed and a higher temperature occurs at the electrode. During the negative half wave, the electrode cools down and the aluminium is heated. Since tearing the aluminium oxide skin only need a short plus impulse, REHM TIG units can use a high minus proportion.

This has many benefits:

1. the temperature load of the electrode is reduced
2. the electrode can be loaded with a higher current
3. the current range of the electrode increases
4. a pointed electrode can be used for welding
5. the arc is slimmer
6. the penetration is deeper
7. the heat influence zone of the weld is smaller
8. the welding speed increases
9. the application of heat to the work piece reduces

Practical values of the balance setting for alternating current welding are:

- with butt welds 60% to 70% minus proportion
 - with hollow seam welds 70% to 80% minus proportion
- see "Tungsten electrodes".

**Ignition
with and without
high-frequency
(HF)**

For contact-less ignition of the arc, the high-frequency ignition units are built as standard in the REHM INVERTIG.PRO *digital* units. The high-frequency ionises the gap between the tungsten electrode and the work piece in such a way that the arc can jump across. A higher oxide proportion in the tungsten electrode or a closer gap to the work piece have a positive effect on the ignition behaviour.

When direct and alternating current welding, the arc is able to be ignited by the built-in program controller even without high-frequency. This is how it works:

The HF setting is set to "Off", the tungsten electrode is touched to the work piece, then the torch button pressed and the electrode lifted from the work piece by tipping the torch over the gas nozzle. Ignition of the arc without high-frequency is of benefit when, for example, welding in hospitals or repairing electronically controlled machines when a disruptions may be caused to controls as a result of by high-frequency ignition units.

**Welding stick
electrodes**

REHM TIG units are, thanks to their fast and precise regulation dynamics, ideal current sources for electrode welding. The current level and polarity to be set is specified by the electrode manufacturers. When welding basic electrodes, plus pole welding is to be used.

More information can be found in the technical literature from

DVS-Verlag GmbH
Aachener Str. 172
40223 Düsseldorf
www.dvs-verlag.de

7. Faults

7.1 Safety notes



Warning!

In the event of a fault occurring which may endanger persons, machinery or the surrounding area, deactivate the unit immediately and ensure that it cannot be reactivated.

Only restart the unit when the cause of the fault has been eliminated and no further risk is posed to people, machinery and/or surrounding area, Faults should only be eliminated by qualified personnel and all safety notes should be observed.

The unit must be released for use by qualified personnel before being restarted.

7.2 Table of faults

REHM control panel not working

No display on screen

Cause:

No mains power supply (possibly mains fuse)
Fault in power cable or plug

Remedy:

Check mains voltages
Check.

Current rise time and current down slope time are at "0.0" and cannot be changed

Cause:

Foot remote control is attached

Solution:

Times are controlled by remote.
Remove remote control.

Current rise time and current down slope time are not being met

Cause:

Start current set to 100 %
End crater current set to 100%

Solution:

Lower start current value
Lower end crater current value

4-step cannot be set

Cause:

Foot remote control is attached

Solution:

Remove remote control.

Balance and frequency cannot be selected

Cause:

Polarity is not " ~ "

Solution:

Can only be set in alternating current area

Unit has different parameters on start than on switch offCause:

Values are only saved after
Welding procedure saved.

Solution:

Carry out welding

Inert gas is not flowingCause:

Bottle is empty or the gas hose has been bent.
Pressure reducer is defective.
Gas valve in the machine is defective.
Flat connect on the gas valve is loose.
Welding process "Electrode"

Solution:

Check
Check
Contact service
Check
Gas valve remains closed

Fans cannot be heard to be turningCause:

The fan level is adjusted to suit requirements, at low temperatures the fan will turn at lower revolutions or switches off.
Fan is defective.

Solution:

Check to see whether the fan switches to higher revolutions when put under more load.
Contact service

No high voltage impulseCause:

HF ignition is set to off
No inert gas available
Earth cable connected badly
Electrode is dirty
No suitable electrode
Gas pre-flow time too long
High frequency surge at torch
Connectors for torch and earth cable swapped

Solution:

Switch on HF ignition
Check
Check
Sharpen
Change electrode
Shorten gas pre-flow time, or wait
Change torch
Connect the correct way round

Welding current does not reach the specified value or arc does not burnCause:

Earth cable connected badly.
Foot remote control attached and not pressed.
Hand remote control attached
No inert gas or incorrect gas

Solution:

Check
Check
Set current on remote
Check

Faults

Arc flickers and jumps

Cause:

Electrode and work piece do not reach working temperature
Electrode is badly pointed
No suitable electrode

Solution:

Use thinner electrode

Sharpen electrode.
Change electrode

Arc is a strange colour

Cause:

No/too little/incorrect inert gas
Electrode is dirty

Solution:

Check
Sharpen

Electrode burns off

Cause:

No inert gas
Current load too high
Proportion of Plus too high when welding with alternating current
Connectors for torch and earth cable swapped
MMA welding is set

Solution:

Check
Use thicker electrode
Use the Balance to increase the proportion of Minus
Connect the correct way round
Set TIG welding

Unit is not pulsing

Cause:

Pulse is not activated
Values for I1 and I2 are the same

Solution:

Set T1 and/or T2 pulse times
Change values

Arc breaks away on ignition

Cause:

Ignition energy has been set too low

Electrode is used or dirty

Solution:

Set the ignition energy or use a thinner electrode
Sharpen electrode again

7.3 Error messages

Error number	Error	Cause	Solution
1	Phase failure	<ul style="list-style-type: none"> At least one phase of main supply voltage has failed 	<ul style="list-style-type: none"> Check main fuse, cables and connectors
2	Over voltage	<ul style="list-style-type: none"> Main supply has supplied over voltage > 480 V 	<ul style="list-style-type: none"> Check mains voltage
3	Under voltage	<ul style="list-style-type: none"> Main supply has supplied under voltage < 320 V 	<ul style="list-style-type: none"> Check mains voltage
20	Water-cooling	<ul style="list-style-type: none"> Welding with water-cooled torch without water cooling unit 	<ul style="list-style-type: none"> Connect water-cooling unit Replace torch (gas-cooled)
21	TIG torch in electrode operation	<ul style="list-style-type: none"> Electrode operation active with a TIG torch connected 	<ul style="list-style-type: none"> Remove TIG torch Switch to TIG operation
30	Through flow coolant	<ul style="list-style-type: none"> Through flow monitor identifies too low a throughput of coolant Monitor blocked by dirt 	<ul style="list-style-type: none"> Switch off power source immediately Check whether the CAN connection cable is plugged in Check the level of the coolant Check the connections of the water-cooled torch Lift the interruptions in the coolant circulation Bleed the coolant circulation system Check pump
31	Water-cooling	<ul style="list-style-type: none"> Water-cooling unit is not available (cable breach in AUTO mode) 	<ul style="list-style-type: none"> Check whether the CAN connection cable is plugged in Connect water-cooling unit
32	Over heated coolant	<ul style="list-style-type: none"> Temperature of coolant > 65°C 	<ul style="list-style-type: none"> Allow the water-cooling unit to cool down Refill coolant
> 51	Contact service	Analysis of causes can only be carried out by a service technician	

8. Maintenance work

8.1 Safety notes



Warning!

Repair and maintenance work may only be carried out by personnel who have been trained by REHM. Contact your REHM representative. When replacing parts, only use original REHM parts.

If maintenance or repair work is carried out on this unit by personnel who have not been trained by REHM and thus are not authorised to carry out the work, this will void your guarantee and warranty claims over REHM.

Before starting to clean the welding unit, it must be switched off and taken from the power network!

Before starting maintenance work on the welding unit, it must be switched off and taken from the power network and secured against accidental reactivation.

Supply lines must be capped and switched without pressure.

The warning notes given in → Chapter 2 "Safety" must be taken into account.

The welding unit and its components are to be maintained in accordance with the specifications made in the operating and maintenance instructions.

Insufficient or incorrect maintenance or repairs can lead to disruptions in operation. Regular maintenance of the unit is thus essential. No structural changes or additions may be made to the unit.

8.2 Maintenance table

The maintenance intervals given are a recommendation made by REHM whilst assuming normal circumstances (e.g. single-shift operation, in a clean and dry environment). The exact intervals will be specified by your safety officer.

Task	Interval
Cleaning the inside of the unit	according to utilisation conditions
Functional testing of safety mechanisms by operating personnel	Daily
Observational check of the unit, with special attention to the torch hoses	Daily

Task	Interval
Check the functions of the error current protection switch	Daily (with flying objects) Otherwise, monthly
Connection lines and torch hoses checked by professionals, check should be logged in the relevant log book Check may need to be carried out more often in order to meet local regulations.	Every six months
Entire welding unit checked by professionals, check should be logged in the relevant log book Check may need to be carried out more often in order to meet local regulations.	Once a year

8.3 Cleaning the inside of the unit

If the REHM welding unit is used in a dusty environment, then the inside of the unit must be cleaned regularly by vacuuming or blasting.

The frequency of the cleaning process depends on the conditions under which it is used. Use clean, dry air to clean the unit or a vacuum cleaner.

If maintenance or repair work is carried out on this unit by personnel who have not been trained by REHM and thus are not authorised to carry out the work, this will void your guarantee and warranty claims over REHM.

8.4 Correct disposal

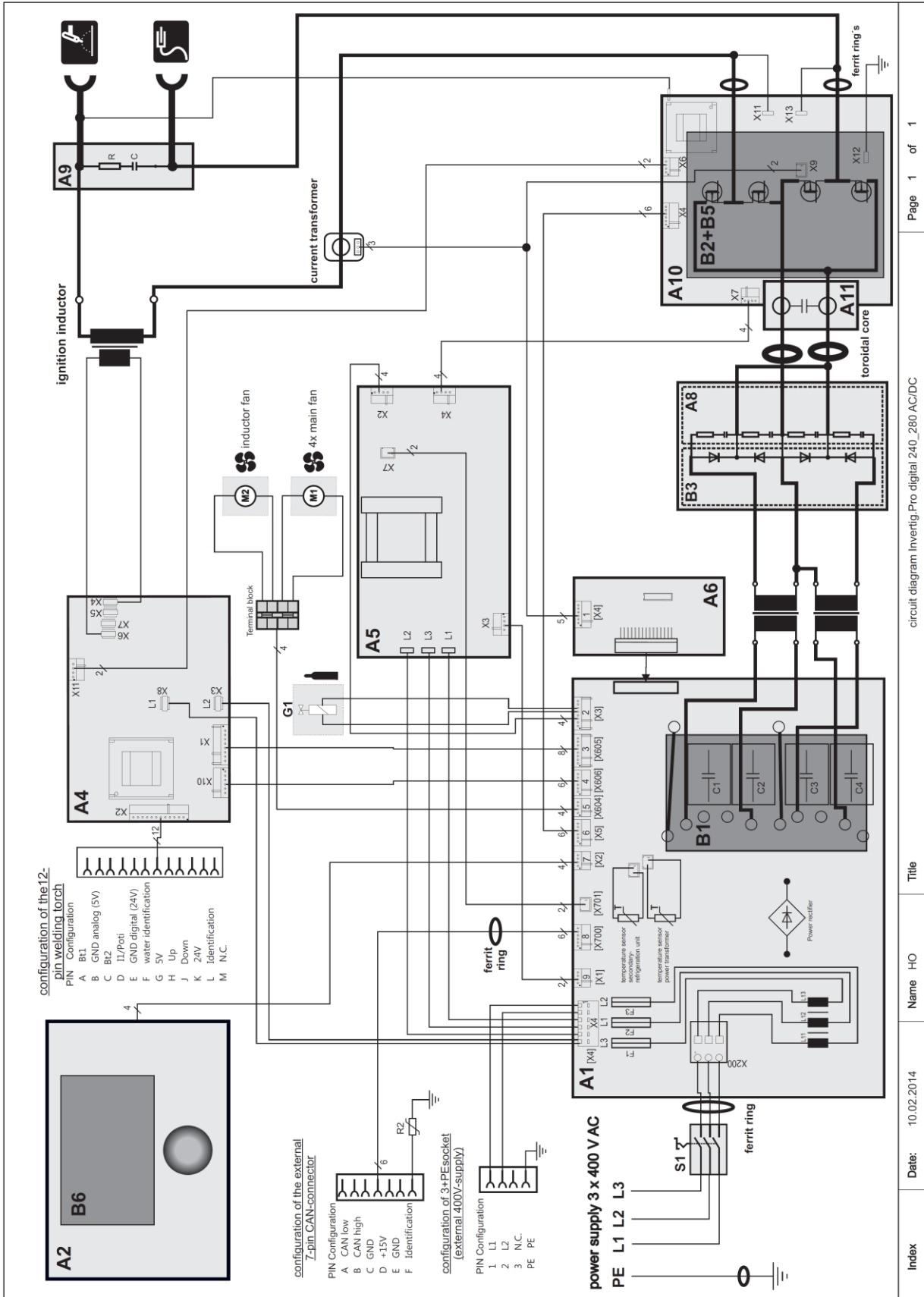


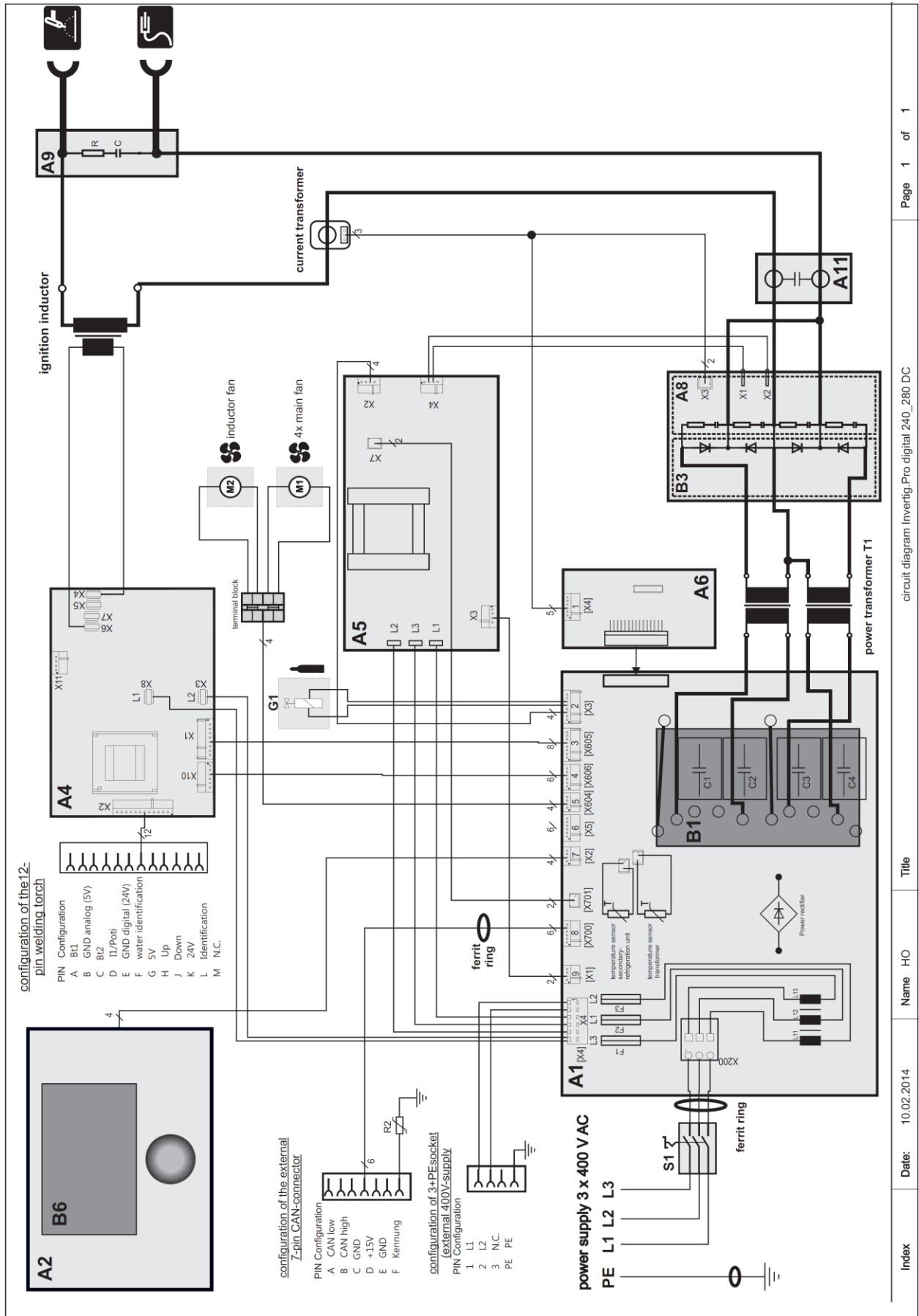
Only applies to countries in the EU.

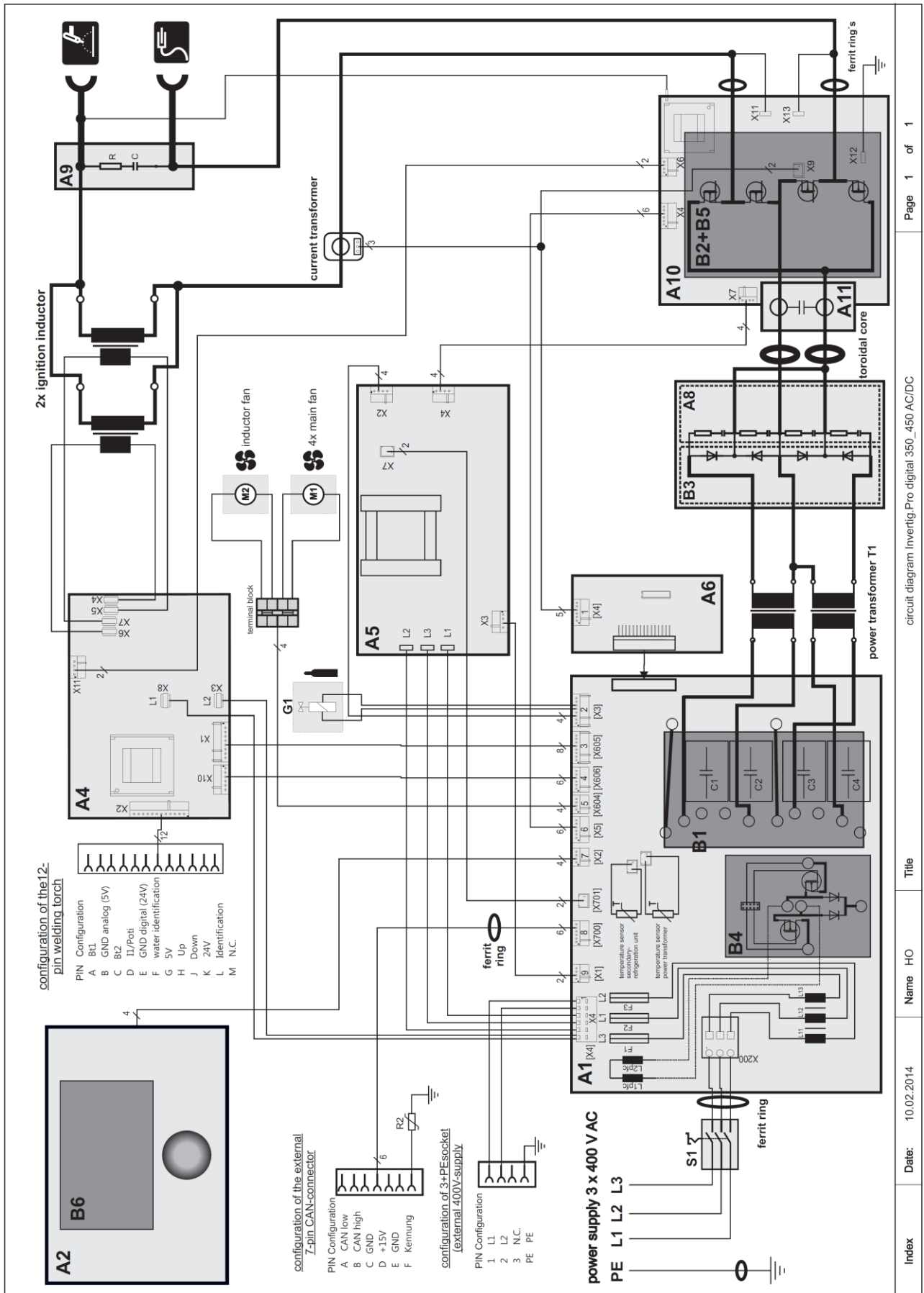
Do not put electrical tools in the household rubbish.

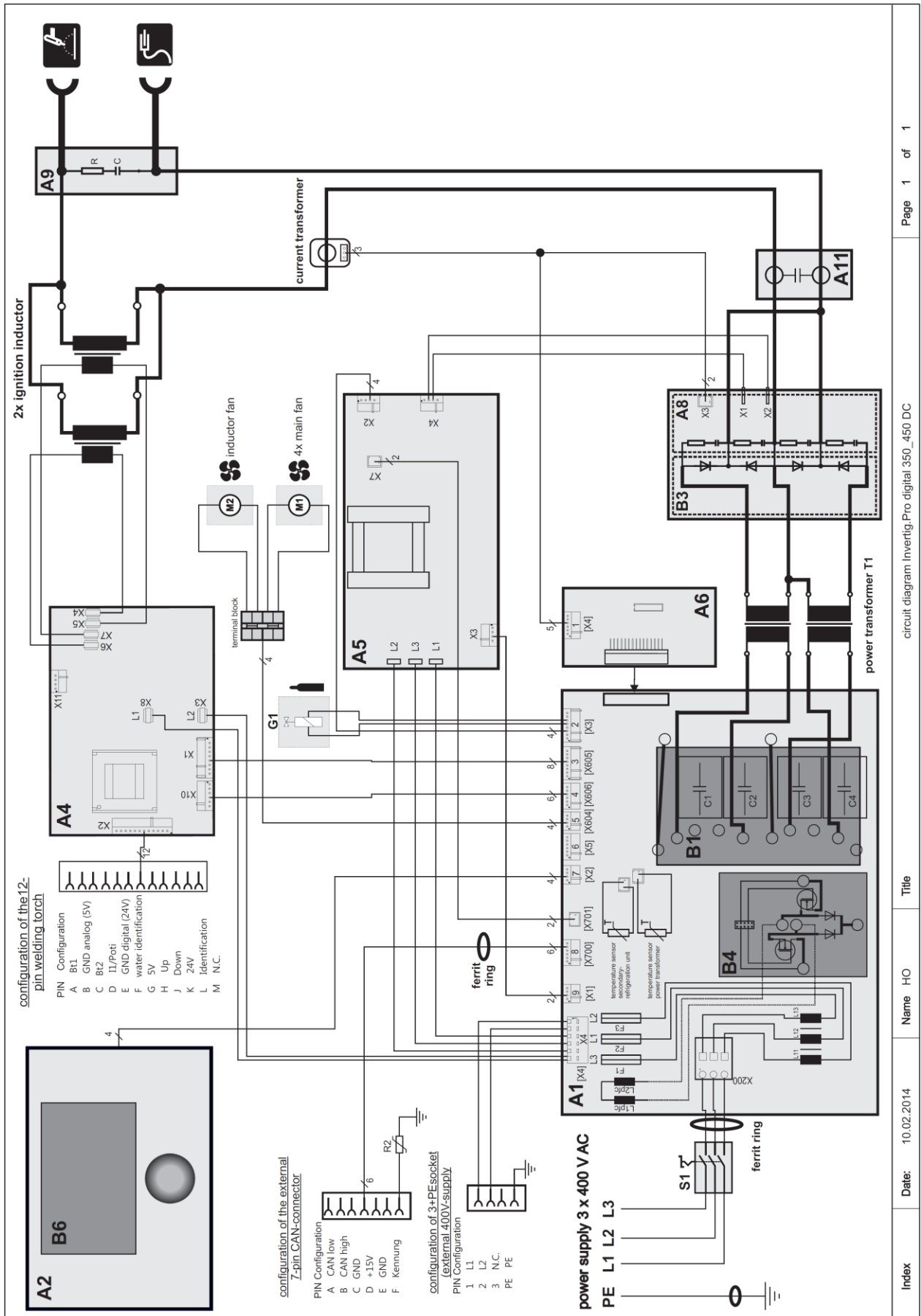
The European directive 2002/96/EG regarding the disposal of electronic and electrical goods and the implementation of such in national law means that used electrical tools must be collected separately and sent for environmentally-friendly recycling.

9. Circuit diagrams









10. Components of the INVERTIG.PRO digital units

10.1 List of components with REHM part numbers

No.	Description	240 DC	240 AC/DC	280 DC	280 AC/DC	350 DC	350 AC/DC	450 DC	450 AC/DC
1.	Cover	2101901	2101901	2101901	2101901	2101901	2101901	2101901	2101901
2.	Floor	2101900	2101900	2101900	2101900	2101900	2101900	2101900	2101900
3.	Side panel right	2101902	2101902	2101902	2101902	2101902	2101902	2101902	2101902
4.	Side panel left	2101903	2101903	2101903	2101903	2101903	2101903	2101903	2101903
5.	Handle	2600207	2600207	2600207	2600207	2600207	2600207	2600207	2600207
6.	Bar right	2600201	2600201	2600201	2600201	2600201	2600201	2600201	2600201
7.	Bar left	2600202	2600202	2600202	2600202	2600202	2600202	2600202	2600202
8.	Washer for incremental sensor	2600215	2600215	2600215	2600215	2600215	2600215	2600215	2600215
9.	Front	2600200	2600200	2600200	2600200	2600200	2600200	2600200	2600200
10.	Air outlet	2600203	2600203	2600203	2600203	2600203	2600203	2600203	2600203
11.	Feed shaft for feet	2600210	2600210	2600210	2600210	2600210	2600210	2600210	2600210
12.	Rubber feet	3300005	3300005	3300005	3300005	3300005	3300005	3300005	3300005
13.	Screw	2900352	2900352	2900352	2900352	2900352	2900352	2900352	2900352
14.	Main board (A1)	6900570	6900570	6900570	6900570	6900574	6900574	6900574	6900574
15.	Control board (A6)	6900583	6900583	6900575	6900575	6900583	6900583	6900575	6900575
16.	IMS-PFC (B4)	-	-	-	-	6900578	6900578	6900578	6900578
17.	IMS primary (B1)	6900576	6900576	6900576	6900576	6900577	6900577	6900577	6900577
18.	Rectifier	5300082	5300082	5300082	5300082	5300082	5300082	5300082	5300082
19.	Power supply (A5)	6900603	6900603	6900603	6900603	6900603	6900603	6900603	6900603
20.	Ignition device board (A4)	6900606	6900606	6900606	6900606	6900606	6900606	6900606	6900606
21.	Controller (A2)	6900561	6900561	6900561	6900561	6900561	6900561	6900561	6900561
22.	IMS rectifier (B3)	6900585	6900585	6900585	6900585	6900586	6900586	6900586	6900586
23.	Anti-interference board (A8)	6900580	6900580	6900580	6900580	6900580	6900580	6900580	6900580
24.	IMS board AC switch (B2)	-	6900595	-	6900595	-	6900597	-	6900597
25.	AC board controller (A10)	-	6900590	-	6900590	-	6900590	-	6900590
25.1	Ignition booster plate (A11)	6900593	6900593	6900593	6900593	6900593	6900593	6900593	6900593
26.	Anti-interference board (A9)	6900602	6900602	6900602	6900602	6900602	6900602	6900602	6900602
27.	Performance transfer (T1)	4700375	4700375	4700375	4700375	4700376	4700376	4700376	4700376
28.	Ignition choke	4700379	4700379	4700379	4700379	4700379	4700379	4700379	4700379
29.	Current sensor	5300080	5300080	5300080	5300080	5300080	5300080	5300080	5300080
30.	Ferrite ring	4500045	4500045	4500045	4500045	4500045	4500045	4500045	4500045
31.	Ring core	4500044	4500044	4500044	4500044	4500044	4500044	4500044	4500044
32.	Fan for HF choke	4100054	4100054	4100054	4100054	4100054	4100054	4100054	4100054
33.	Fan	4100051	4100051	4100051	4100051	4100051	4100051	4100055	4100055
34.	Plastic rivet	3000036	3000036	3000036	3000036	3000036	3000036	3000036	3000036
35.	Power cable	3600137	3600137	3600137	3600137	3600139	3600139	3600139	3600139
36.	Cable connector	3700085	3700085	3700085	3700085	3700085	3700085	3700085	3700085
37.	Main switch (S1)	4200004	4200004	4200004	4200004	4200004	4200004	4200004	4200004
38.	Switch handle	4200156	4200156	4200156	4200156	4200156	4200156	4200156	4200156
39.	Installation socket	4300342	4300342	4300342	4300342	4300342	4300342	4300342	4300342
40.	Cable set	3600485	3600485	3600485	3600485	3600485	3600485	3600485	3600485
41.	One-handed coupling	3100186	3100186	3100186	3100186	3100186	3100186	3100186	3100186
42.	Magnetic valve (G1)	4200075	4200075	4200075	4200075	4200075	4200075	4200075	4200075
43.	Cable set for unit socket	3600487	3600487	3600487	3600487	3600487	3600487	3600487	3600487
44.	Connecting cable from the PCB to CAN INVERTIG PRO	3600488	3600488	3600488	3600488	3600488	3600488	3600488	3600488

No.	Description	240 DC	240 AC/DC	280 DC	280 AC/DC	350 DC	350 AC/DC	450 DC	450 AC/DC
45.	Gas hose	2200100	2200100	2200100	2200100	2200100	2200100	2200100	2200100
46.	Fuse inset	6600042	6600042	6600042	6600042	6600042	6600042	6600042	6600042
47.	Incremental sensor	4200175	4200175	4200175	4200175	4200175	4200175	4200175	4200175
48.	Rotating button	2600214	2600214	2600214	2600214	2600214	2600214	2600214	2600214
49.	Washer for rotating button	2600215	2600215	2600215	2600215	2600215	2600215	2600215	2600215
50.	Graphic sheet	7301602	7301607	7301604	7301608	7301605	7301609	7301606	7301610
51.	Resistor	5000258	5000258	5000258	5000258	5000258	5000258	5000258	5000258
52.	Anti-interference board AC switch		6900592		6900592		6900592		6900592
53.	Graphical display (B6)	6900599	6900599	6900599	6900599	6900599	6900599	6900599	6900599
54.	Textile seal for display	3300140	3300140	3300140	3300140	3300140	3300140	3300140	3300140
55.	Pertinax holder display	3400227	3400227	3400227	3400227	3400227	3400227	3400227	3400227
56.	Replacement frame spring	3000180	3000180	3000180	3000180	3000180	3000180	3000180	3000180
57.	Screen, incremental encoder	2900367	2900367	2900367	2900367	2900367	2900367	2900367	2900367
58.	Incremental encoder nut	2900368	2900368	2900368	2900368	2900368	2900368	2900368	2900368

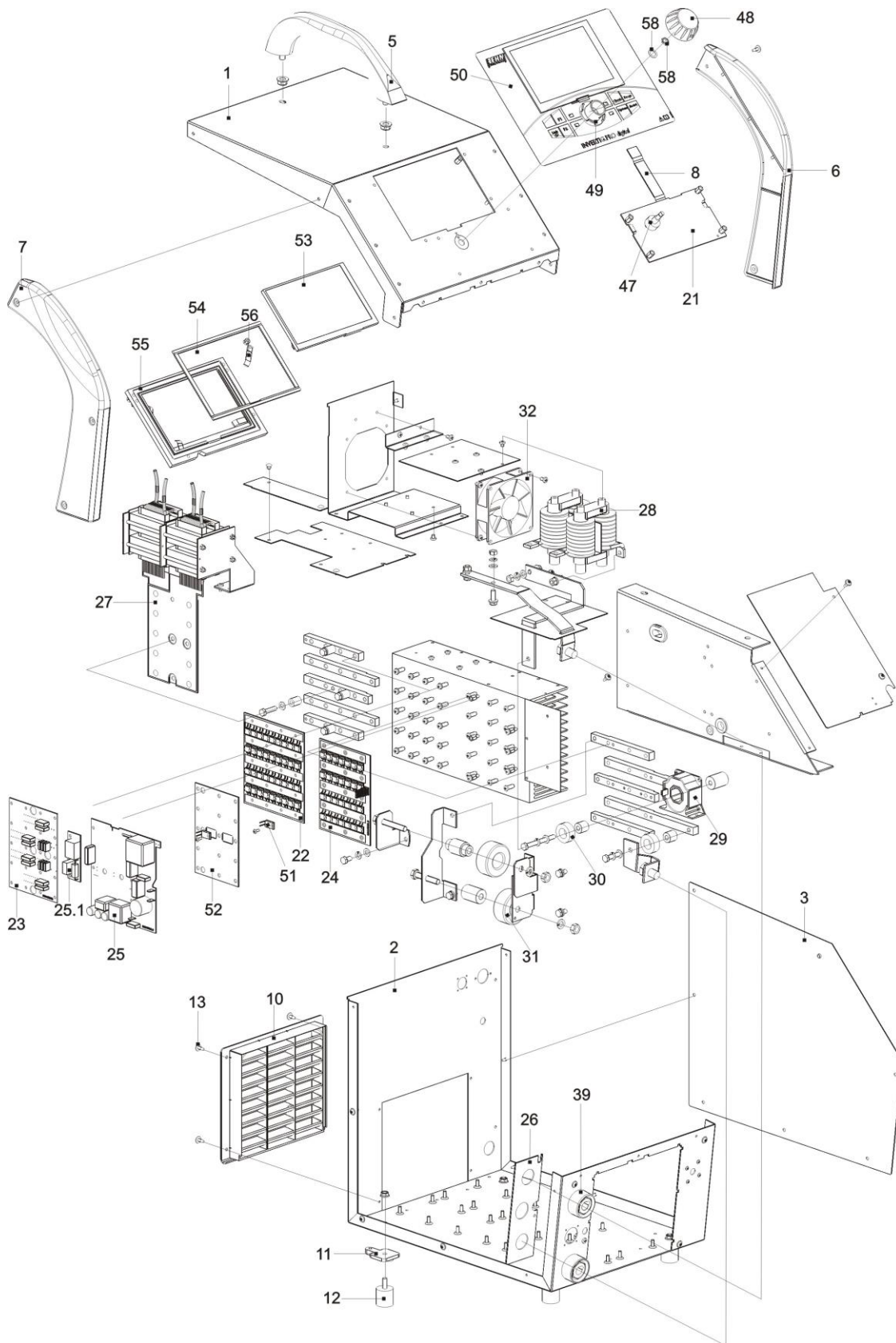


Figure 53: Exploded view of an INVERTIG.PRO digital 240 DC – 450 AC/DC (left)

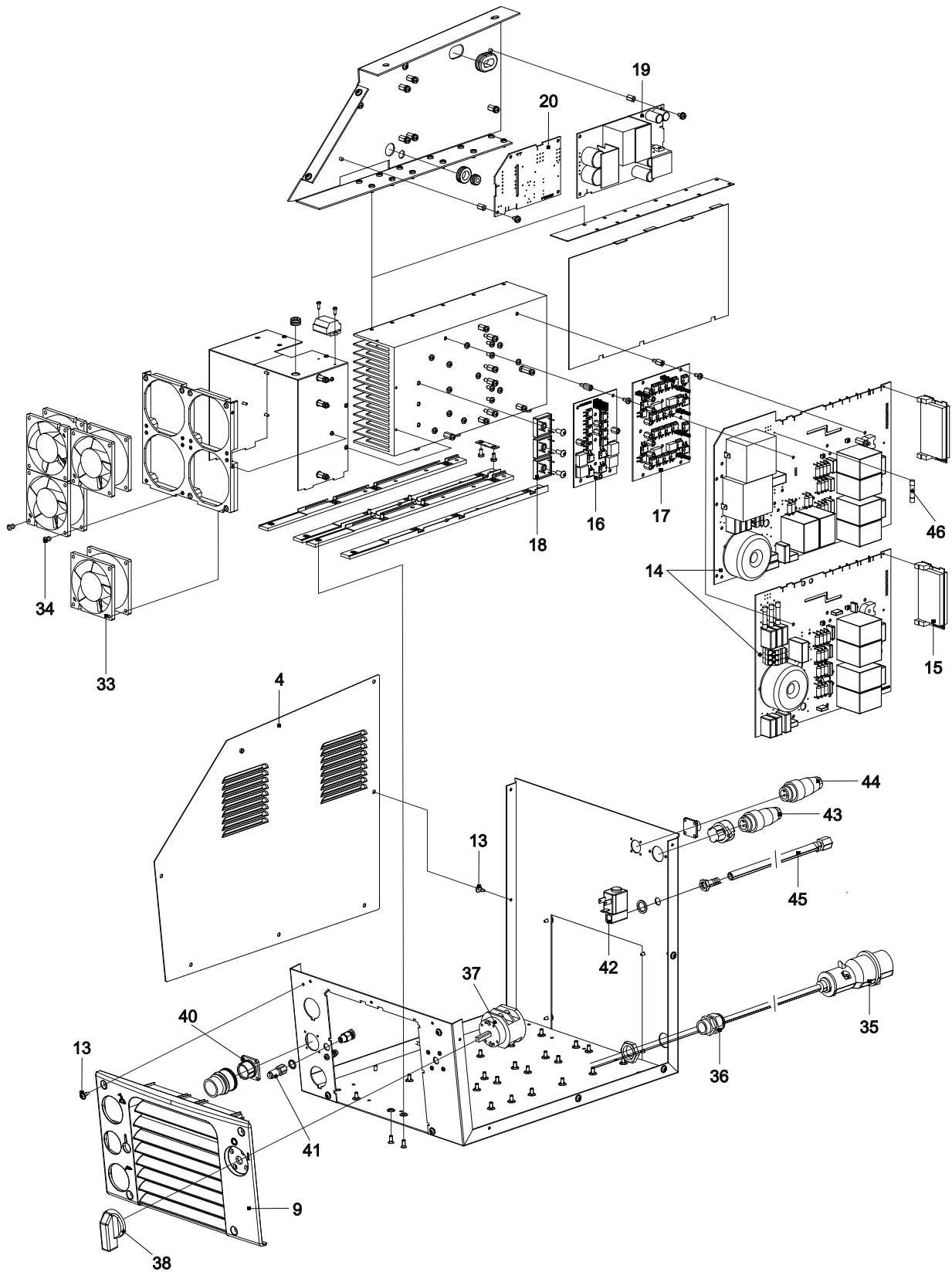


Figure 54: Exploded view of an INVERTIG.PRO digital 240 DC – 450 AC/DC (right)

11. Technical data

Type			240 AC/DC 240 DC	280 AC/DC 280 DC	350 AC/DC 350 DC	450 AC/DC 450 DC
Setting range	TIG	[A]	3 – 240	3 – 280	3 – 350	3 – 450
	MMA	[A]	3 – 240	3 – 280	3 – 350	3 – 360
Duty cycle at I _{max} . (10 min.) at 40°C	TIG	[%]	100	100	100	100
	MMA	[%]	100	60	100	100
Welding current at 100 % Duty cycle	TIG	[A]	240	280	350	450
	MMA	[A]	240	260	350	360
Maximum power consumption		[kVA]	9,3	11,9	16,3	16,5
Open circuit voltage		[V]	91	91	91	91
Effective current I _{Eff}		[A]	13,5	13,4	22,5	24,0
Maximum effective current I _{I_{max}}		[A]	13,5	17,3	22,5	24,0
Mains voltage			3x400V 50Hz	3x400V 50Hz	3x400V 50Hz	3x400V 50Hz
Supply voltage tolerance			-15% / +10%	-15% / +10%	-15% / +10%	-15% / +10%
Fuse		[A]	16	16	32	32
Short-circuit performance, main supply S _{SC}		[MVA]	3,3	4,2	5,7	5,8
Performance factor λ		[%]	0,96	0,96	0,96	0,96
Protection class			IP 23	IP 23	IP 23	IP 23
Apex voltage HF U _p		[kV]	12	12	12	12
Insulation class			B	B	B	B
Torch cooling type			Gas / Water	Gas / Water	Gas / Water	Gas / Water
Dimensions L/W/H		[mm]	520 x 360 x 460	520 x 360 x 460	520 x 360 x 460	520 x 360 x 460
Weight	AC/DC	[kg]	27	27	31.5	31.5
	DC	[kg]	25	25	30.5	30.5

We reserve the right to make technical changes to reflect further development.

- a) Performance factor λ = describes the relationship of effective power to apparent power
- b) Protection class = Extent of protection offered by housing against penetration of solid foreign matter and water (IP23 = protection against solid foreign matter > 12.5 mm Ø and against splash water)
- c) Insulation class = Class of the insulation materials used and their highest permitted constant temperature (B = highest permitted constant temperature 130°)
- d) Short-circuit performance, main supply S_{SC} = minimum permitted short-circuit performance of the main supply system in accordance with IEC 61000-3-12

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EC Declaration of Conformity

We hereby confirm that the following products

TIG inert gas welding units
INVERTIG.PRO *digital* 240 DC, 240 AC/DC
INVERTIG.POR *digital* 280 DC, 280 AC/DC
INVERTIG.PRO *digital* 350 DC, 350 AC/DC
INVERTIG.PRO *digital* 450 DC, 450 AC/DC

meet all the major protection requirements laid down in the Council Directive **2004/108/EEC** on the approximation of the laws of the member states relating to electromagnetic compatibility and in the Directive **2006/95/EEC** relating to electrical equipment designed for use within certain voltage limits

The above products conform to the regulations in this Directive and meet the safety requirements for equipment used for arc welding in accordance with the following product standards.

EN 60 974-1: 2006-07

Arc welding equipment – Part 1: Welding power sources

EN 60 974-3: 2004-04

Arc welding equipment – Part 3: Arc ignition and stabilisation equipment

EN 60974-10: 2004-01

Arc welding equipment – Part 10: Electromagnetic compatibility (EMC) requirements

In accordance with the EU: Directive **2006/42/EG** Article 1, Section. 2, the above products come exclusively under the scope of Directive **2006/95/EWG** relating to electrical equipment designed for use within certain voltage limits.

This declaration is made on behalf of the manufacturer:

REHM GmbH u. Co KG Schweißtechnik
Ottostr. 2
73066 Uhingen, Germany

Uhingen, 25.06.2015

Declaration made by

R. Stumpp

Managing Director

REHM – Setting the pace in welding and cutting

The REHM range

- **REHM MIG/MAG inert gas welding units**
 - SYNERGIC.PRO² gas- and water-cooled to 450 A
 - SYNERGIC.PRO² water-cooled 500 A to 600 A
 - MEGA.ARC stepless regulation to 450 A
 - RP REHM Professional to 560 A
 - PANTHER 202 PULS pulse welding unit with 200 A
 - MEGA.PULS *FOCUS* pulse welding units to 500 A
- **REHM TIG inert gas welding units**
 - TIGER, portable 100 KHz inverter
 - INVERTIG.PRO TIG welding unit
 - INVERTIG.PRO *digital* TIG welding unit
- **REHM MMA inverter technology**
 - TIGER and BOOSTER.PRO 100 KHz electrode inverter
- **REHM plasma cutting units**
- **Welding accessories and additional materials**
- **Welding smoke extraction fans**
- **Welding rotary tables and positioners**
- **Technical welding consultation**
- **Torch repair**
- **Machine Service**

REHM WELDING TECHNOLOGY – German Engineering and Production at its best

Development, construction and production – all under one roof – in our factory in Uhingen. Thanks to this central organisation and our forward-thinking policies, new discoveries can be rapidly incorporated into our production. The wishes and requirements of our customers form the basis for our innovative product development. A multitude of patents and awards represent the precision and quality of our products. Customer proximity and competence are the principles which take highest priority in our consultation, training and service.

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