TECNA®

WELDING CONTROL UNIT

INSTRUCTION MANUAL

TE700

FROM SOFTWARE RELEASE N° 1.13

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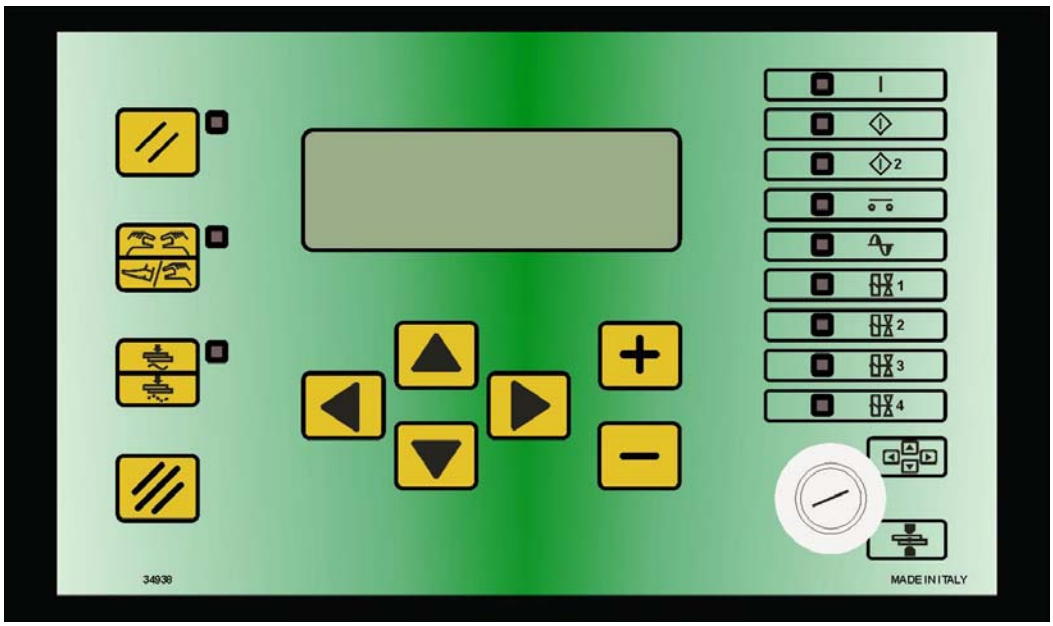
CHAPTER 1 – TE700 WELDING CONTROL UNIT DESCRIPTION

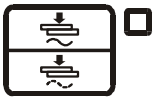
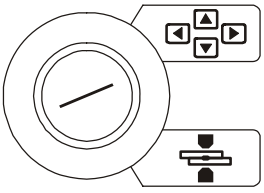
The TE700 is a microprocessor-based welding control unit for resistance welders equipped with inverter technology. The task of the welding control unit is to manage the components of the welder, specifically the IGBT power unit that adjusts the welding current.
The TE700 is a particularly versatile control unit since it can be adapted to different types of welders. In addition to the spot and projection welders, it may also be installed on seam welders and work with constant current, FIX, constant power, constant voltage, constant energy adjustment and in dynamic mode. The number of the inputs and outputs may be increased to better adapt the welding control unit to automatic machines.
The control unit can manage up to max 4 different welding transformers.
It is possible to store up to 300 different welding programs, 255 of which are recalled directly from an external device. An alphanumeric identifier may be associated with each program to simplify its identification. Each program comprises several programmable parameters that describe the work cycle. In addition to the plain 4-stage welding cycle, the control unit allows the running of welding processes with pre-welding current, post-welding current, slope and pulses.



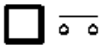
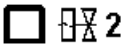
1.1 – MAIN TECHNICAL FEATURES

- Simplified programming via 6 keys and a backlit alphanumeric LCD.
- Inverter command with medium frequency IGBT, with possibility of choosing the operating frequency of the inverter between 1000 Hz and 4000 Hz.
- Storage of up to 300 welding programs; 255 may be called from external devices.
- Possibility of associating an 8-character alphanumeric identifier with each weld program.
- Possibility of managing *as* many as 4 different welding transformers or one transformer and 4 different types of electrodes.
- Overheating protection for the welding transformers.
- Up to 32 programmable parameters for each program.
- Slope up, Slope down, pulses, pre-weld, post-weld functions and adjustment of the welding times with units of 1 mS.
- Display of the RMS of the welding current, energy, power, RMS of voltage to the electrodes, of the initial and final resistance, of the machine's thermal use percentage, of the machine's use percentage and, as an option, of the initial thickness of the welded material and the indentation at the end of the weld.
- 6 WORKING MODEs: conventional, constant current, constant power, constant voltage, FIX, constant energy, DYNAMIC mode.
- Limit indicators for: Current, voltage at the electrodes, energy, power, inverter use percentage, initial and final resistance of the material to be welded; thickness and indentation limit of the material (optional).
- Double stroke function.
- Stepper function to compensate the wear and tear of the electrodes with programmable curves and possibility of intervening independently on the time and the welding current through differentiated stepper laws. Possibility of using 4 different stepper options associated with 4 different spot counters associated with each weld program.
- Single and automatic cycle. WELD and NO-WELD function.
- Control of 5 solenoid valves 24 VDC max. 5 W with self-protected output.
- Self-adjustment to the mains frequency 50/60 Hz.
- Serial communication with insulated RS232 as an option.
- Output for proportional solenoid valve.
- Key for selecting foot control or two-hand control.
- Selectable languages: Italian, English, French, German, Spanish, Hungarian, Swedish or Portuguese.
- Possibility of upgrading control unit Firmware via appropriate software.
- Electrode tip dressing for up to max of 4 different spot counters (optional).

1.2 – PANEL CONTROLS

	Left-hand direction key used for exiting from the programming menus.
	Right-hand direction key used for entering the programming menus.
	Upward direction key used for moving the cursor inside the upper parameter.
	Downward direction key used for moving the cursor inside the lower parameter.
	This key is used for increasing the value of a numeric parameter or for changing the status of a parameter.
	This key is used for decreasing the value of a numeric parameter or for changing the status of a parameter.
	 RESTART key. It enables the commands and the outputs of the control unit. **Must be activated each time the control unit is powered on.** When this key is pressed, the devices connected to the VAUX are powered and the charge of the inverter capacitors is activated. **Before pressing this key check that the devices connected to the VAUX cannot injure people or damage equipment.**
	Key for selecting the start cycle device: PEDAL or TWO-HANDS CONTROL. When the nearby LED is switched off, the start cycle command is carried out by the PEDAL whereas if the LED is switched on, the command is carried out by the two-hand push buttons (TWO-HANDS CONTROL). In order to work properly, the two push buttons must be pressed at the same time or in sequence within a maximum time of 0.5 seconds.
	WELD-NO WELD Key. In WELD position (LED switched on) the control unit runs the programmed welding cycle. In NO-WELD position (LED switched off), the control unit runs the programmed cycle without welding current circulation keeping all the time parameters unchanged.
	CLEAR Key. It is used to clear the error conditions and to set to zero the weld counter.
	PROG-RUN Key selector. In PROG position it enables the keyboard and allows the running of all the foreseen programming operations. In RUN start position it enables the spot welder commands and allows the running of the work program only.

1.3 – PANEL LEDs

	The turning on of this LED indicates that the welder control unit is powered.
	The turning on of this LED indicates that start cycle 1 command is activated.
	The turning on of this LED indicates that start cycle 2 command is activated.
	The turning on of this LED indicates that the pressure-only stopping command by means of the AUX1 and AUX2 inlets is activated.
	The turning on of this LED indicates that the control unit is generating the command signal for the inverter welding unit.
	It indicates that the solenoid valve, which carries out the main cycle, is activated.
	It indicates that the solenoid valve, which controls the back pressure, is activated.
	It indicates that the solenoid valve, which enables the forging, is activated.
	It indicates that the solenoid valve, which controls the double stroke, is activated.

1.4 – DESCRIPTION OF DISPLAYED INFORMATION

Main work screen

The main screens display some information after every run weld cycle, both for cycles carried out in weld mode, with the control unit set to WELD mode, and for cycles carried out in NO WELD mode. **The values displayed in the following description are for reference only**.

```
PRG 005-FE ZN 10-01
WELD 0010mS E 00100J
IRMS 020.26 kA
SPOT 56002 r 055.4%
```

In WORK configuration, the displayed descriptions are always in English regardless of the language selected in the **SETUP MENU**.

PRG 005-FE ZN 10-01

005 indicates the program used to carry out the last weld; the number may range from 001 to 300. It is displayed both in WELD and NO WELD mode.
FE ZN 10 is the alphanumeric identifier associated with the selected weld program. These are 8 characters that are defined at will by the operator to better identify the weld program. It is displayed both in WELD and NO WELD mode.
01 is the identifier of the number of the tool used to carry out the weld. The number ranges from 1 to 4. Displayed in WELD and NO WELD mode.

SPOT 56002

This is the counter that counts the carried out welds; the number may range from 00000 to 65000.
Each equipment is fitted with its own standalone spot counter that increases only when welds are carried out through a program in which the equivalent tool number is set.
It is updated in WELD mode only and reset through the CLEAR key.
The following screen is displayed on pressing the CLEAR key:

```
    CLEAR COUNTER
UP / DN TO SELECT:
RESET COUNTER T1?
<+> = OK <-> = CANCEL
```

Use keys ▲ and ▼ to select which of the four spot counters is to be reset or if all 4 are to be reset at the same time. The number of the spot counters that are to be used depends on the number of tools enabled inside the **FEATURES INVERTER** menu**.** Press key + to reset the selected counters or key − to cancel the counter's deletion procedure.

WELD 0010mS

It indicates the weld time with which the last weld was carried out. The value ranges from 0001 to 9999. The same value is displayed both in WELD mode and in NO WELD mode.

IRMS 020.26kA
It indicates the value of the current with which the last weld was carried out. In WELD mode the value may range from 000.00 kA to 200.00 kA. In NO WELD mode the value is 000.00 kA. It represents the average of the RMS values measured for each weld time millisecond. The displayed value always refers to the main adjustment that is to say to that of the WELD parameter. In the case of pulse welds, the displayed current value is the average of the RMS values of the current supplied during the single pulses.

E 00100J
It indicates the value of the energy supplied during the welding operation. The displayed value always refers to the energy supplied inside the weld's main block. In the case of the pulse adjustment, the displayed value always refers to the last run pulse. The value is updated if the control unit is in WELD mode, if the control unit is in NO WELD mode, 00000J is displayed.
The display of -----J indicates that the configuration of the set machine does not permit measuring the energy.

r 055.4%
It indicates the use percentage of the welding unit (transformer + inverter). The displayed number is directly proportional to the welding unit capacity of supplying current. Approaching 100% means approaching the max current the machine can supply. This value will depend on the type of welding unit, the geometry of the machine and the features of the material to be welded. Approaching 100% entails a loss of the control unit's current adjustment capacities.
The value is updated in WELD mode. 000.0% is displayed in NO WELD mode.

Use keys [+] and [−] inside this screen to view data relevant to the previously carried out 20 weld spots. The control unit only stores data relevant to spots carried out in WELD mode. The execution of a weld in WELD mode and in NO WELD mode leads to the display of data relevant to the last spot carried out in WELD mode.
Other screens containing information about the weld cycle carried out can be viewed by pressing key [▶] in the main work screen.

Sequence screen
The sequence screen may be accessed only in case the sequence function has been enabled inside the control unit.

```
PRG 005-FE ZN 10-01
ST 001-020 NXTPR 024
WELD 2048 RMS 010.00
SPOT 02345 r 000.0
```

PRG 005-FE ZN 10-01
005 Indicates the program used to carry out the last weld. The number ranges from 001 to 300. It is displayed both in WELD and NO WELD mode.
FE ZN 10 is the alphanumeric identifier associated with the selected weld program. These are 8 characters that are defined at will by the operator to better identify the weld program. It is displayed both in WELD and NO WELD mode.
01 is the identifier of the number of the transformer used to carry out the weld or the number of the tool used. The number ranges from 1 to 4. It is displayed both in WELD and NO WELD mode.

ST 001-020
001 Indicates the current spot inside the set welding sequence.
020 Indicates the total number of weld spots that make the sequence up.
The indication of the number of the spot inside the sequence increases both in WELD mode and in NO WELD mode.
Use keys [+] and [−] to increase or decrease the present position inside the sequence so that certain steps may be repeated or skipped.

NXTPR 024
It indicates the program with which the next spot will be carried out. The value is updated both in WELD mode and in NO WELD mode.

WELD 2048
It indicates the weld time with which the last weld was carried out. The value ranges from 0001 to 9999. The same value is displayed both in WELD mode and in NO WELD mode.

RMS 010.00
It indicates the value of the current with which the last weld was carried out. In WELD mode the value may range from 000.00 kA to 200.00 kA. In NO WELD mode the value is 000.00 kA. It represents the average of the RMS values measured for every welding time millisecond. The displayed value always refers to the main adjustment, that is to say to that of the WELD parameter. If welding is by pulses, the current value is always the value of the last pulse carried out.

SPOT 02345
It stands for the welded spots counter; it may be a number between 00000 and 65000. It is updated in WELD mode only and it may be cleared by means of the CLEAR key.

r 000.0%
It indicates the use percentage of the welding unit (transformer + inverter). The displayed number is directly proportional to the welding unit capacity of supplying current. Approaching 100% means approaching the max current the machine can supply. This value will depend on the type of welding unit, the geometry of the machine and the features of the material to be welded. Approaching 100% entails a loss of the control unit's current adjustment capacities.
The value is updated in WELD mode, 000.0% is displayed in NO WELD mode.

Weld analysis screen – 1
This screen may always be accessed regardless of the control unit's configuration.

```
PRG 005-FE ZN 10-01
POWER 000.0KW
VE 05.00V Th 083.0%
Rend 1285.0uOhm
```

PRG 005-FE ZN 10-01
005 Indicates the program used to carry out the last weld. The number ranges from 001 to 300. It is displayed both in WELD and NO WELD mode.

FE ZN 10 is the alphanumeric identifier associated with the selected weld program. These are 8 characters that are defined at will by the operator to better identify the weld program. It is displayed both in WELD and NO WELD mode.
01 is the identifier of the number of the transformer used to carry out the weld or the number of the tool used. The number ranges from 1 to 4. It is displayed both in WELD and NO WELD mode.

POWER 000.0KW

It indicates the average value of the power supplied during the weld's main block. The value is updated when the control unit is in WELD mode whilst 000.0KW is displayed when the unit is in NO WELD mode. The display of ---.-KW means that the present configuration of the control unit does not allow viewing the supplied power value. The displayed value always refers to the energy supplied inside the weld's main block and in the case of the pulse WORKING MODE it always refers to the last pulse.

VE 05.00V
It indicates the average value of the RMS voltage at the electrodes carried out every millisecond. The value is updated when the control unit is in WELD mode whilst 00.00V is displayed when the control unit is in NO WELD mode. The display of --.—V means that the present configuration of the control unit does not allow viewing the electrodes voltage value. The displayed value always refers to the energy supplied inside the weld's main block and in the case of the pulse WORKING MODE it always refers to the last pulse.

Use keys ⊞ and ⊟ inside this screen to view data relevant to the previously carried out 20 weld spots. The control unit only stores data relevant to spots carried out in WELD mode. The execution of a weld in WELD mode and in NO WELD mode leads to the display of data relevant to the last spot carried out in WELD mode.

Weld analysis screen – 2

This screen may be accessed when the programming of at least one of the following parameters has been activated inside the control unit: pre-weld, weld 2 or post weld.

```
PRG 005-FE ZN 10-01
PRE  0000mS 000.00KA
POST 0000mS 000.00KA
W2   0000mS 000.00KA
```

PRG 005-FE ZN 10-01
005 Indicates the program used to carry out the last weld. The number ranges from 001 to 300. It is displayed both in WELD and NO WELD mode.
FE ZN 10 is the alphanumeric identifier associated with the selected weld program. These are 8 characters that are defined at will by the operator to better identify the weld program. It is displayed both in WELD and NO WELD mode.
01 is the identifier of the number of the transformer used to carry out the weld or the number of the tool used. The number ranges from 1 to 4. It is displayed both in WELD and NO WELD mode.

PRE 0000mS 000.00KA
It indicates the duration in mS and the RMS welding current average during the pre-weld block.

The time value is displayed both in WELD mode and in NO WELD mode. The value of the current is displayed only in WELD mode whilst 000.00KA is displayed in NO WELD mode.
If PRE ----mS ---.—KA is displayed, this means that the programming of the pre-weld parameter is disabled inside the control unit.

POST 0000mS 000.00KA
It indicates the duration in mS and the RMS welding current average during the post-weld block.
The time value is displayed both in WELD mode and in NO WELD mode. The value of the current is displayed only in WELD mode whilst 000.00KA is displayed in NO WELD mode.
If POST ----mS ---.—KA is displayed, this means that the programming of the post-weld parameter is disabled inside the control unit.

W2 0000mS 000.00KA
It indicates the duration in mS and the RMS welding current average during the weld 2 block.
The time value is displayed both in WELD mode and in NO WELD mode. The value of the current is displayed only in WELD mode whilst 000.00KA is displayed in NO WELD mode.
If W2 ----mS ---.—KA is displayed, this means that the programming of the weld 2 parameter is disabled inside the control unit.

Use keys ⊞ and ⊟ inside this screen to view data relevant to the previously carried out 20 weld spots. The control unit only stores data relevant to spots carried out in WELD mode. The execution of a weld in WELD mode and in NO WELD mode leads to the display of data relevant to the last spot carried out in WELD mode.

Stepper analysis screen
This screen may be accessed only if the stepper function is activated on the control unit.

```
PRG 005-FE ZN 10-01
STEP 1-7 SPOT 02400
INC1 001.0 % OF 060%
INC2 023.1 % OF 030%
```

PRG 005-FE ZN 10-01
005 Indicates the program used to carry out the last weld. The number ranges from 001 to 300. It is displayed both in WELD and NO WELD mode.
FE ZN 10 is the alphanumeric identifier associated with the selected weld program. These are 8 characters that are defined at will by the operator to better identify the weld program. It is displayed both in WELD and NO WELD mode.
01 is the identifier of the number of the transformer used to carry out the weld or the number of the tool used. The number ranges from 1 to 4. It is displayed both in WELD and NO WELD mode.

STEP 1-7
It indicates the control unit's present STEP and the total number of STEPS activated on the stepper's parameterization. The datum increases only when the control unit is in WELD mode and does not increase when the unit is in NO WELD mode.

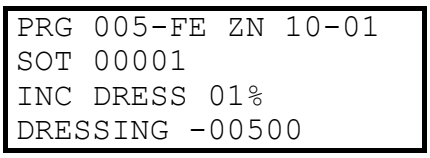
SPOT 02400
It indicates the number of the present spot. The counter increases when the control unit is in WELD mode and does not increase when the unit is in NO WELD mode.

INC1 001.0 % 0F 060%
It indicates the present percentage increase of the quantity associated with stepper law 1 and the final increment of the same quantity at the end of the present STEP.
If INC 1 000.0 % OF 000 % is displayed, this means that no quantity is present associated with stepper law 1 or that a percentage increase of 0% has been associated with this quantity. The value is not updated when the control unit is in NO WELD mode.

INC2 023.1 % OF 030 %
It indicates the present percentage increase of the quantity associated with stepper law 2 and the final increment of the same quantity at the end of the present STEP.
If INC 2 000.0% OF 000 % is displayed, this means that no quantity is present associated with stepper law 2 or that a percentage increase of 0% has been associated with this quantity. The value is not updated when the control unit is in NO WELD mode.

Use keys [+] and [−] inside this screen to view data relevant to the previously carried out 20 weld spots. The control unit only stores data relevant to spots carried out in WELD mode. The execution of a weld either in WELD mode or in NO WELD mode entails the display of the data relevant to the last spot carried out in WELD mode.

Electrodes dressing analysis screen
This screen may be accessed only if the dressing function (optional) is activated on the control unit.



PRG 005-FE ZN 10-01
005 Indicates the program used to carry out the last weld. The number ranges from 001 to 300. It is displayed both in WELD and NO WELD mode.
FE ZN 10 is the alphanumeric identifier associated with the selected weld program. These are 8 characters that are defined at will by the operator to better identify the weld program. It is displayed both in WELD and NO WELD mode.
01 is the identifier of the number of the transformer used to carry out the weld or the number of the tool used. The number ranges from 1 to 4. It is displayed both in WELD and NO WELD mode.

SPOT 00001
It indicates the number of the present spot. The counter increases when the control unit is in WELD mode and does not increase when the unit is in NO WELD mode.

INC DRESS 01%
It indicates the percentage increase of the weld parameter inside the present electrodes dressing STEP. The value does not increase when the unit is in NO WELD mode.

DRESSING – 00500
It indicates the remaining number of weld spots before the need to carry out the electrodes' dressing or changing operations. The counter does not decrease when the control unit is in NO WELD mode.

Use keys ⊞ and ⊟ inside this screen to view data relevant to the previously carried out 20 weld spots. The control unit only stores data relevant to spots carried out in WELD mode. The execution of a weld either in WELD mode or in NO WELD mode entails the display of the data relevant to the last spot carried out in WELD mode.

Quality analysis screen
This screen may be accessed only when the quality control function is enabled in the control unit by measuring the resistance of the material to be spot welded or by measuring the thickness of the material in between the electrodes.

```
PRG 005-FE ZN 10-01
IDENT. 00.000mm
THICK. 00.000mm
R START 0000.0uOhm
```

PRG 005-FE ZN 10-01
005 Indicates the program used to carry out the last weld. The number ranges from 001 to 300. It is displayed both in WELD and NO WELD mode.
FE ZN 10 is the alphanumeric identifier associated with the selected weld program. These are 8 characters that are defined at will by the operator to better identify the weld program. It is displayed both in WELD and NO WELD mode.
01 is the identifier of the number of the transformer used to carry out the weld or the number of the tool used. The number ranges from 1 to 4. It is displayed both in WELD and NO WELD mode.

IDENT. 00.000MM
It indicates the measurement of the electrode penetration into the material at the end of the welding procedure.
If this function is disabled, 00.000mm is displayed. The value is updated both in WELD mode and in NO WELD mode.

THICK. 00.000mm
It indicates the initial thickness of the material to be welded. The measurement is carried out before the current passage. If this function is not enabled, 00.000mm is displayed.
The value is updated both in WELD mode and in NO WELD mode.

R START 0000.0uOhm
It indicates the initial value of the resistance of the material to be spot welded. The value is updated only when the control unit is in WELD mode.

Use keys ⊞ and ⊟ inside this screen to view data relevant to the previously carried out 20 weld spots. The control unit only stores data relevant to spots carried out in WELD mode. The execution of a weld either in WELD mode or in NO WELD mode entails the display of the data relevant to the last spot carried out in WELD mode.

Errors log screen

The errors log screen is always accessible and contains information about the last 20 errors signalled by the control unit.

```
ERR: 162  INVERTER
SPOT: 00001 LOG: 05
 DRESSING   [165]
CAPS NEED DRESSING
```

ERR: 162
This is the code of the error displayed.

INVERTER
It indicates if the error originated from the INVERTER or the TE700 control unit.

SPOT: 00001
It indicates the value of the spot counter when the signalled error occurred.

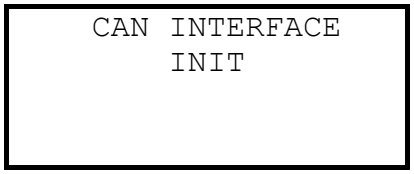
LOG: 05
It indicates the position of the error inside the LOG. The value may range from 1 to 20. The highest number refers to the last error that occurred whilst the lowest number indicates the oldest error.

DRESSING [165] / CAPS NEED DRESSING
Concise description of the displayed error. For further information consult this manual.

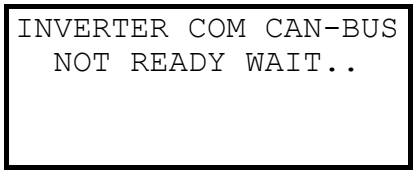
Use keys ⊞ and ⊟ inside this screen to scroll through the list of errors saved inside the control unit. Press the + key to scroll through the list of most recent errors or the – key to scroll through the list of the earliest errors.

1.5 – CONTROL UNIT SWITCH-ON

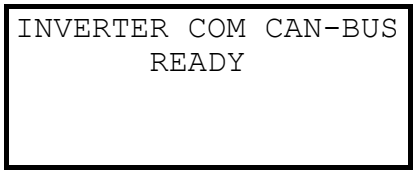
As soon as the control unit is switched on, the display notifies the operator that the communication interface is initializing.



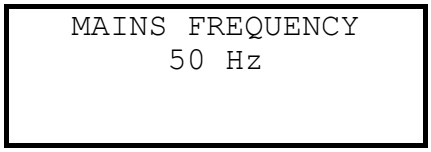
After the initialization of the communication interface, the control unit checks for the integrity of the communication channel with the inverter. The following wait message is displayed until the check is finished:



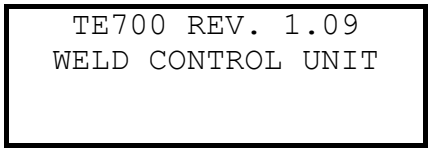
The following message is displayed once the working efficiency of the communication channel has been checked.



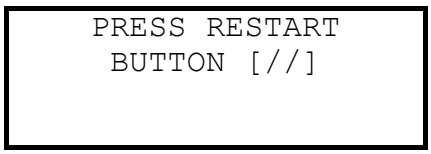
Next, the mains frequency recognized by the control unit is displayed.



Both the type of control unit and the relevant software version are displayed.



In order to complete the control unit switch-on sequence, the operator is asked to press the RESTART button or to generate the RESTART sequence through external program recalls. The displayed message is as follows.



This RESTART button enables the control unit's commands and outputs. **It must be pressed every time the control unit is powered.**

As soon as the RESTART command is issued, all the devices connected to the VAUX output are supplied and the charging procedure for the capacitors bank is started on the inverter.

Before activating the RESTART command, it is important to check that it will not cause damage to people or equipment.

The following message is displayed until the inverter is ready to weld.

```
 INVERTER CAPACITOR
CHARGING PLEASE WAIT
```

Before starting any welding operations, first program the welding data and set some general operating parameters of the welder.

For safety reasons, the microprocessor does not start the welding cycle if the cycle start signal is actuated when the welder is turned on. Simply release the control and actuate it again. Micro-cutoffs or excessive voltage drops do not alter the control unit's working efficiency but stop it. To restore working efficiency, turn off the machine and then turn it on again.

CHAPTER 2 – CONTROL UNIT PROGRAMMING

By placing the key in **PROGRAM DATA** position the following screen is displayed:

```
-TE700 VER. 1.09 --
>PROGRAM DATA
 SETUP MENU
 STEPPER MENU
```

The first row reports the control unit type and the software version. Then the display lists all the menus allowing accessing the various control unit functions.

The following list includes all the menus available in the control unit. However, it is possible that not all of these menus are displayed by the control unit being used as some of them depends either on the options actually inserted in the control unit or on the welder type the control unit is installed onto.

_ PROGRAM DATA
_ SETUP MENU
_ STEPPER MENU
_ FEATURES TE700
_ FEATURES INVERTER
_ PROGRAM COPY
_ DIAGNOSTIC TE700
_ DIAGNOSTIC INV.
_ PROG. SEQUENCE
_ THICKNESS SENSE ***(It may be activated)***
_ TIP-DRESSING ***(It may be activated)***

```
-TE700 VER. 1.09 --
 PROGRAM DATA
>SETUP MENU
 STEPPER MENU
```

Use keys ▲ and ▼ to move up and down the **>** arrow cursor displayed on the left-hand side of the menus. Use keys ▶ and ◀ to enter and exit from the menu selected by the cursor.
Use keys + and − to modify the parameter indicated by the cursor.

```
  PROGRAM DATA    T1
 PROGRAM N.      001
>PRG. NAME
 TOOLS N°          1
```

2.1 – PROGRAM DATA

```
-TE700  VER. 1.09--
>PROGRAM DATA
 SETUP MENU
 STEPPER MENU
```

The **PROGRAM DATA** menu contains all the weld cycle parameters, the times and the currents which to carry out the welds with.

```
  PROGRAM DATA    T1
>PROGRAM N.      001
 PRG. NAME
 TOOLS N°          1
```

The first choice to make is the number of the program to be used. Choose among the 300 storable programs using the ⊞ and ⊟ keys.

After having selected the program number which to work with, use key ▼ to enter an alphanumeric identifier associated with the number of the program so that it is easier to recognize it during the recall or the display.

```
  PROGRAM DATA    T1
 PROGRAM N.      001
>PRG. NAME USI1500P
 TOOLS N°          1
```

Press key ▶ to select which character is to be entered or modified. Each time key ▶ is pressed, the next character in the string is selected beginning from position 1 up to position number 8. On reaching the eighth character, when key ▶ is pressed the operator may modify the first character again.

```
  PROGRAM DATA    T1
 PROGRAM N.      001
>PRG. NAME U<SI1500P
 TOOLS N°          1
```

The affected character is indicated on the control unit display by the symbol "<" located on the right-hand side of the character itself. In order to change the character, use keys ⊞ and ⊟ and key [///]. The usable characters are the decimal numbers from 0 to 9, the space key and the capital characters of the international alphabet from A to Z.

After having changed the name of the program to work with, use key ▼ to select the weld tool number.

```
  PROGRAM DATA    T1
 PROGRAM N.      001
 PRG. NAME  USI1500P
>TOOLS N°          1
```

The values of the parameter may range from 1 up to 4 at the most. The max value is set inside the **FEATURES INVERTER** menu and is included between 1 and 4 (N.WELDING

TRAFO). If 1 was set as max value, the value of the parameter cannot be changed by the operator.

The WELD TOOL parameter permits identifying up to max 4 different types of electrodes used during the welding operations.
The electrodes may be interchanged on the same welding head and, as such, share the same welding transformer or they can be installed on different welding heads having different welding transformers connected to the same welding unit.
An independent spot counter is associated with each WELD TOOL, which increases only when the control unit welds with a program in which the corresponding WELD TOOL is selected.
This allows the control unit to manage 4 different current increments or electrodes dressing procedures, in which the current increment or electrode wear is calculated considering only the weld spots carried out by that specific electrode ignoring the weld spots carried out with other electrodes.

```
  PROGRAM DATA    T2
 PROGRAM N.      001
 PRG. NAME USI1500P
>TOOLS N°          2
```

The modification of the WELD TOOL number is indicated next to the PROGRAM DATA text by means of the symbols T1, T2, T3, T4 so that, on scrolling the weld program parameters, the operator may always see which tool identifier is associated with the weld program being used.

```
  PROGRAM DATA    T1
 PRG. NAME USI1500P
 TOOLS N°          1
>WORKING MODE     IK
```

Then the next parameters are searched for, using keys ▲ and ▼ to set the required value, one at a time, using keys + and −.

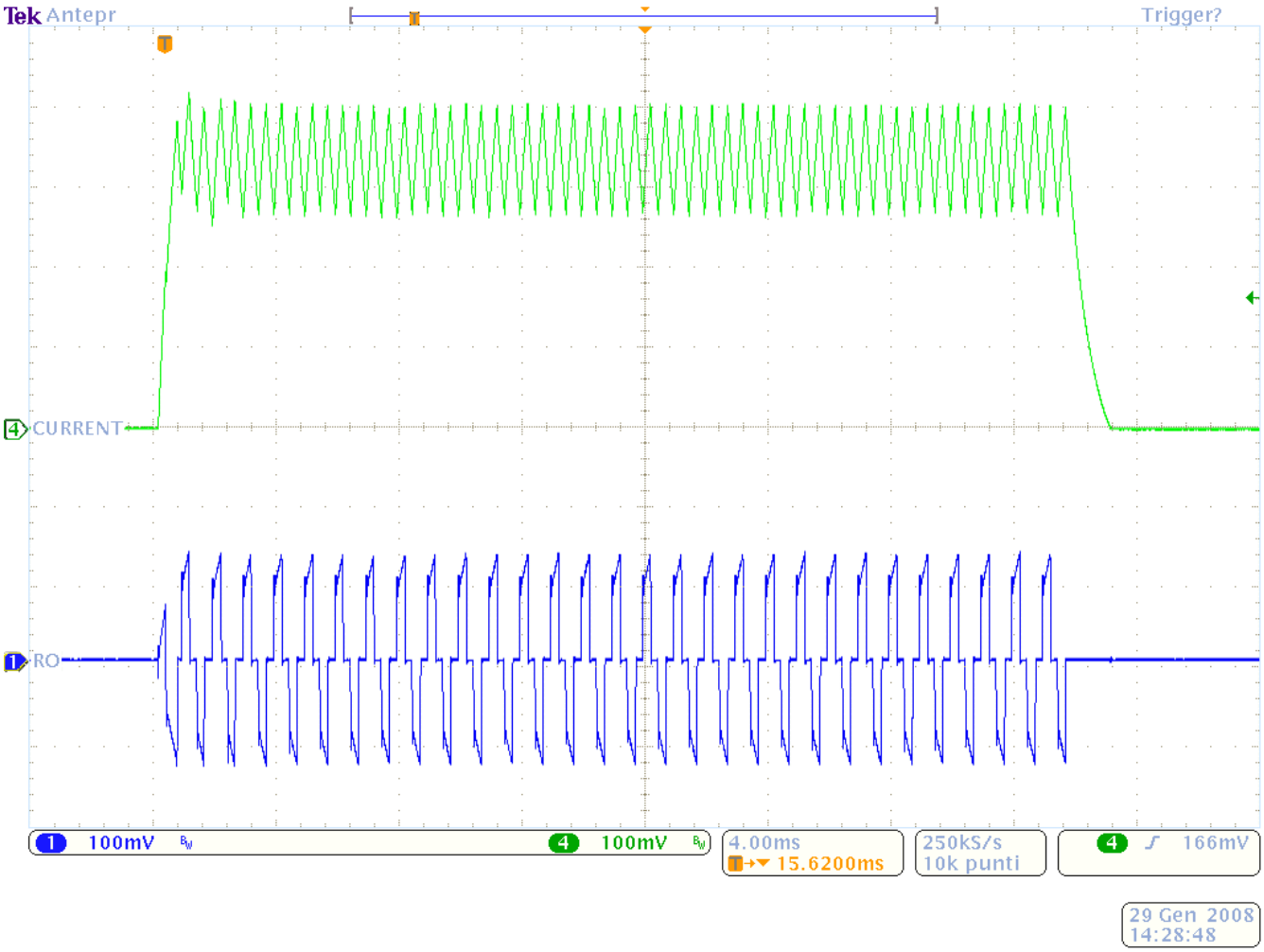
As such all the parameters will be set to the desired value for carrying out the welding process.
Please, beware that the data is saved only and exclusively if the program is exited or if the key is turned in RUN position.

Below the six WORKING MODEs are described and the six programming screens are displayed according to the parameter selected in the WORKING MODE. The screens contain all the programmable parameters.
The number of available WORKING MODEs may change depending on the configuration of the spot welder on which the control unit is installed.

2.2 - CONSTANT CURRENT OPERATING MODE (IK)

When the weld control unit works in constant current mode, the current value which to carry out the welding with may be set directly. During the welding procedure, the control unit measures the real effective value (RMS) of the welding current every mS and maintains the set current according to a mathematical correction algorithm. The max welding current value that may be set is restricted automatically to the max current than can be supplied by the welding transformer set in the **FEATURES INVERTER** menu**.**

In addition to simplifying the programming operations, this WORKING MODE also permits to keep the desired welding current even if some factors change such as: mains voltage, welding circuit dimensions and impedance, conditions of the welding tools or surface condition of the materials being processed.



The above image shows the welding current maintained by the constant adjustment mathematical algorithm. Notice that the current slicing (RO) of the inverter changes during the welding operation to keep the welding current constant.

TABLE WITH CONSTANT CURRENT OPERATING MODE PARAMETERS

PARAMETER	RANGE VALUE
PROGRAM N.	001 – 300
WORKING MODE	IK
CONTROL MODE *	NO
QUALITY – T*	OFF
QUALITY – R *	OFF
SQUEEZE 1	0.5 – 99.0 cycles
SQUEEZE	00.0 – 99.0 cycles
PRESSURE	00.5 – 10.0 bar
FORGE DELAY	00 – 99 cycles
FORG.PRESS.	00.5 – 10.0 bar
PRE-WELD	0000 – 1000 mS
PRE-CURR.	000.30 – 200.00 KA
COLD 1	0000 – 1000 mS
SLOPE UP	0000 – 1000 mS
WELD	0001 – 2000 mS
CURRENT	000.30 – 200.00 KA
COLD 2	0000 – 1000 mS
IMPULSE N.	1 – 9
WELD 2	0000 – 1000 mS
CURRENT 2	000.30 – 200.00 KA
SLOPE DOWN	0000 – 1000 mS
COLD 3	0000 – 1000 mS
POST-WELD	0000 – 1000 mS
POST-CURR.	000.30 – 200.00 KA
HOLD TIME	00.5 – 99.0 cycles
OFF TIME	00.0 – 99.0 cycles

CONTROL MODE *	CUR
LIM I MIN	000.30 – 200.00 KA
LIM I MAX	000.30 – 200.00 KA

CONTROL MODE *	RO
LIM RO MIN	005.0 – 100.0%
LIM RO MAX	005.0 – 100.0%

CONTROL MODE *	VE
LIM V MIN	00.20 – 20.00 V
LIM V MAX	00.20 – 20.00 V

CONTROL MODE *	PW
LIM P MIN	000.20 - 600.00 KW
LIM P MAX	000.20 – 600.00 KW

CONTROL MODE *	ENE
LIM E MIN	00000 – 60000 J
LIM E MAX	00000 – 60000 J

QUALITY –T *	THICK
THICK. MIN	00.00 – 60.00 mm
THICK MAX	00.00 – 60.00 mm

QUALITY –T *	IDENT
IDENT. MIN	0.000 – 6.000 mm
IDENT. MAX	0.000 – 6.000 mm

QUALITY –T *	TH+ID
THICK. MIN	00.00 – 60.00 mm
THICK MAX	00.00 – 60.00 mm
IDENT. MIN	0.000 – 6.000 mm
IDENT. MAX	0.000 – 6.000 mm

QUALITY –T *	ZERO

QUALITY –R *	PRE
RMIN PRE	0 – 60000uOhm
RMAX PRE	0 – 60000uOhm

QUALITY –R *	POST
RMIN POST	0 – 60000uOhm
RMAX POST	0 – 60000uOhm

QUALITY –R *	PRE+POST
RMIN PRE	0 – 60000uOhm
RMAX PRE	0 – 60000uOhm
RMIN POST	0 – 60000uOhm
RMAX POST	0 – 60000uOhm

QUALITY –R *	ZERO

There are some special conditions:

- On setting the OFF TIME to zero, the control unit will work in single cycle.
- On setting the PRE-WELD parameter to zero, the pre-welding process will not be carried out.
- On setting the POST-WELD parameter to zero, the post-welding process will not be carried out.
- On setting the WELD 2 parameter to zero, WELD 2 will not be carried out.
- On setting LIM I MIN and LIM I MAX to the same value, the limits are deactivated.
- On setting LIM RO MIN and LIM RO MAX to the same value, the limits are deactivated.
- On setting LIM V MIN and LIM V MAX to the same value, the limits are deactivated.
- On setting LIM P MIN and LIM P MAX to the same value, the limits are deactivated.
- On setting LIM E MIN and LIM E MAX to the same value, the limits are deactivated.
- On setting THICK. MIN and THICK. MAX to the same value, the limits are deactivated.
- On setting IDENT. MIN and IDENT. MAX to the same value, the limits are deactivated.
- On setting RMIN PRE and RMAX PRE to the same value, the limits are deactivated.
- On setting RMIN POST and RMAX POST to the same value, the limits are deactivated.

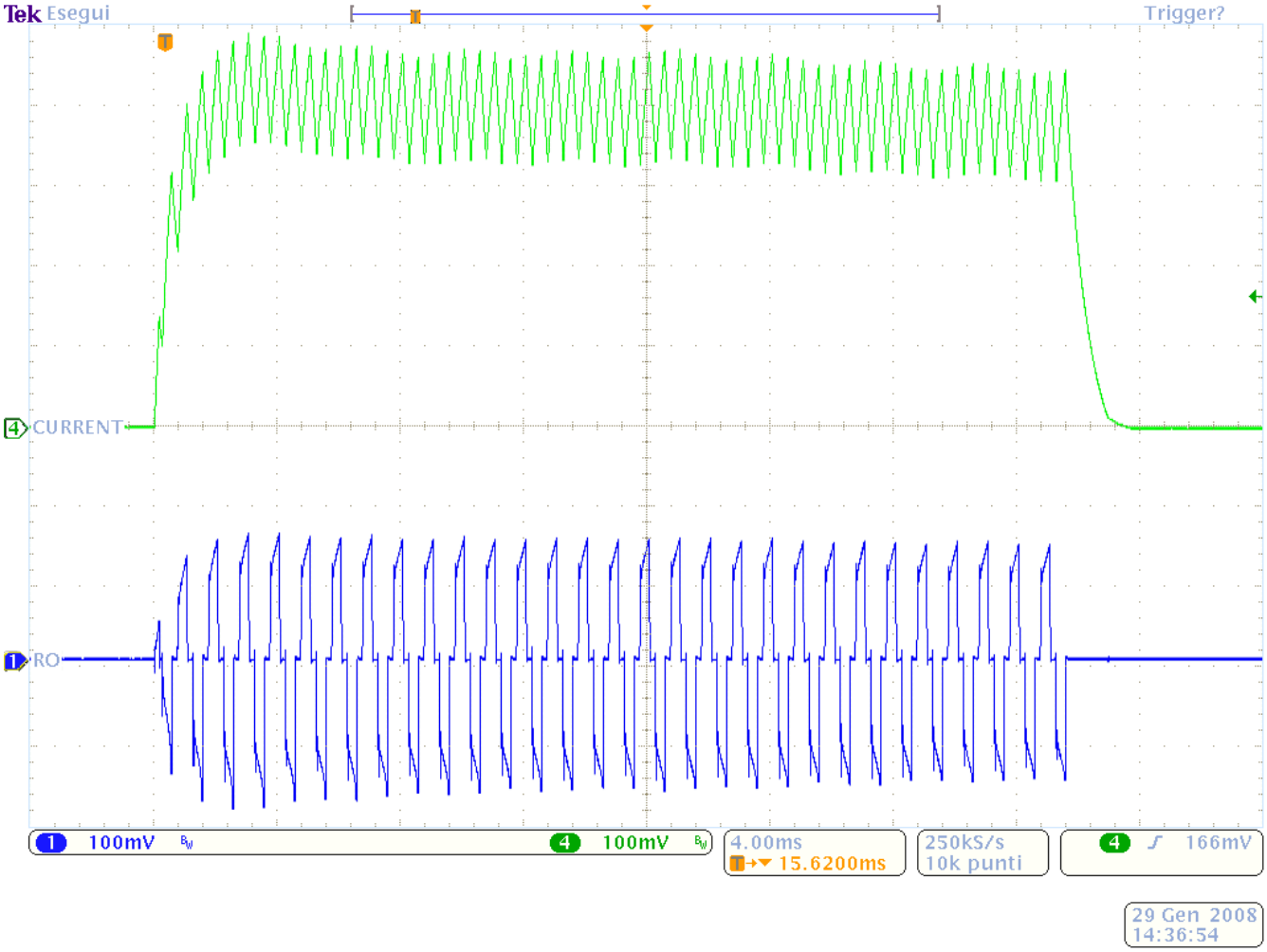
It is advisable to activate the CONTROL UNIT in RO MODE and to check the limit use conditions before proceeding with production. For instance, if use is meant to be with 2

sheets, the limit conditions are either with 1 or 3 sheets. The constant welding current is adjusted by the TE700 control unit (if the value of the r parameter for using the welding unit is less than 100.0%). The operator must then check the values of the r indicator when welding with 1 sheet and set this value as minimum limit and if welding with 3 sheets, set this value as maximum limit.
If a more accurate spot quality control is required, activate the QUALITY-T parameters to check the initial thickness of the sheets and the electrode penetration at the end of the welding cycle, and the QUALITY-R parameter to obtain a measurement of the initial and final values of the resistance.
The presence of the QUALITY-T and QUALITY-R parameters depends on the control unit's configuration and which spot welder is used.
However, it is not possible to undoubtedly assure that the piece has been effectively welded, as all the conditions and parameters involved in the welding process execution should be checked.

2.3 – FIX OPERATING MODE (FIX)

In FIX working mode the inverter welding unit does not make any adjustments to the current supplied during welding. The operator must set the power slicing percentage supplied by the inverter, which ranges from 5% to 100%. The power supplied during the welding operation increases for higher slicing values.
In this case the current actually supplied by the inverter involves various factors and is no longer constant.
The factors that might affect the current supply are: changes in the resistance of the material to be welded, wearing out of the electrodes and changes in the geometry of the secondary circuit or mains voltage fluctuations.

The FIX WORKING MODE may be advisable for short-term welding with great resistance changes or when using the welder as a metal-heating device.



The slicing of the inverter (RO) is kept constant. The slicing is understood to be the relationship between the switch-on time of the IGBT power devices and their OFF time. The current supplied to the secondary circuit is no longer constant but depends on the resistance of the secondary circuit and on the resistance of the material to be welded.

TABLE WITH FIX OPERATING MODE PARAMETERS

PARAMETER	RANGE VALUE
PROGRAM N.	001 – 300
WORKING MODE	FIX
CONTROL MODE *	NO
QUALITY – T*	OFF
QUALITY – R *	OFF
SQUEEZE 1	0.5 – 99.0 cycles
SQUEEZE	00.0 – 99.0 cycles
PRESSURE	00.5 – 10.0 bar
FORGE DELAY	00 – 99 cycles
FORG.PRESS.	00.5 – 10.0 bar
PRE-WELD	0000 – 1000 mS
PRE-RO	005.0 – 100.0 %
COLD 1	0000 – 1000 mS
SLOPE UP	0000 – 1000 mS
WELD	0001 – 2000 mS
RO	005.0 – 100.0 %
COLD 2	0000 – 1000 mS
IMPULSE N.	1 – 9
WELD 2	0000 – 1000 mS
RO 2	005.0 – 100.0 %
SLOPE DOWN	0000 – 1000 mS
COLD 3	0000 – 1000 mS
POST-WELD	0000 – 1000 mS
POST-RO	005.0 – 100.0 %
HOLD TIME	00.5 – 99.0 cycles
OFF TIME	00.0 – 99.0 cycles

CONTROL MODE *	CUR
LIM I MIN	000.30 – 200.00 KA
LIM I MAX	000.30 – 200.00 KA

CONTROL MODE *	RO
LIM RO MIN	005.0 – 100.0%
LIM RO MAX	005.0 – 100.0%

CONTROL MODE *	VE
LIM V MIN	00.20 – 20.00 V
LIM V MAX	00.20 – 20.00 V

CONTROL MODE *	PW
LIM P MIN	000.20 - 600.00 KW
LIM P MAX	000.20 – 600.00 KW

CONTROL MODE *	ENE
LIM E MIN	00000 – 60000 J
LIM E MAX	00000 – 60000 J

QUALITY –T *	THICK
THICK. MIN	00.00 – 60.00 mm
THICK MAX	00.00 – 60.00 mm

QUALITY –T *	IDENT
IDENT. MIN	0.000 – 6.000 mm
IDENT. MAX	0.000 – 6.000 mm

QUALITY –T *	TH+ID
THICK. MIN	00.00 – 60.00 mm
THICK MAX	00.00 – 60.00 mm
IDENT. MIN	0.000 – 6.000 mm
IDENT. MAX	0.000 – 6.000 mm

QUALITY –T *	ZERO

QUALITY –R *	PRE
RMIN PRE	0 – 60000uOhm
RMAX PRE	0 – 60000uOhm

QUALITY –R *	POST
RMIN POST	0 – 60000uOhm
RMAX POST	0 – 60000uOhm

QUALITY –R *	PRE+POST
RMIN PRE	0 – 60000uOhm
RMAX PRE	0 – 60000uOhm
RMIN POST	0 – 60000uOhm
RMAX POST	0 – 60000uOhm

QUALITY –R *	ZERO

There are some special conditions:

- On setting the OFF TIME to zero, the control unit will work in single cycle.
- On setting the PRE-WELD parameter to zero, the pre-welding process will not be carried out.
- On setting the POST-WELD parameter to zero, the post-welding process will not be carried out.
- On setting WELD 2 parameter to zero, WELD 2 will not be carried out.
- On setting LIM I MIN and LIM I MAX to the same value, the limits are deactivated.
- On setting LIM RO MIN and LIM RO MAX to the same value, the limits are deactivated.
- On setting LIM V MIN and LIM V MAX to the same value, the limits are deactivated.
- On setting LIM P MIN and LIM P MAX to the same value, the limits are deactivated.
- On setting LIM E MIN and LIM E MAX to the same value, the limits are deactivated.
- On setting THICK. MIN and THICK. MAX to the same value, the limits are deactivated.
- On setting IDENT. MIN and IDENT. MAX to the same value, the limits are deactivated.
- On setting RMIN PRE and RMAX PRE to the same value, the limits are deactivated.
- On setting RMIN POST and RMAX POST to the same value, the limits are deactivated

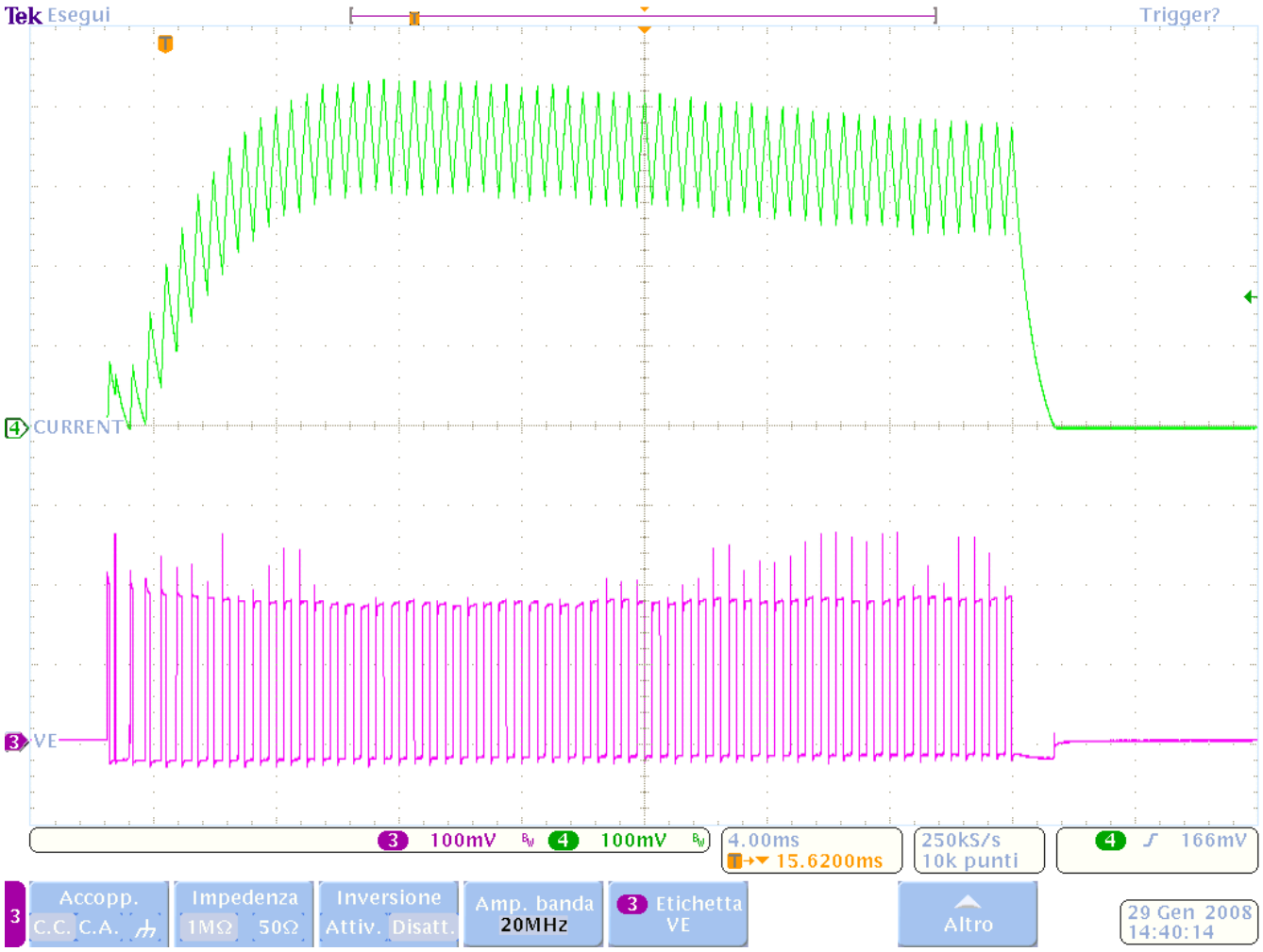
In the FIX WORKING MODE, and current slicing being the same, the current supplied by the inverter depends exclusively on the resistance of the secondary area and on the resistance of

the material to be welded. This condition applies as long as the welding current is less than the maximum current of the welding transformer. If the welding current tends to exceed the value set as welding transformer max current, the welder intervenes automatically by reducing the set current slicing value in real time to maintain current within the set limits.

2.4 - CONSTANT SECONDARY VOLTAGE OPERATING MODE (VEK)

When working with constant secondary voltage, the welder calculates the real effective value (RMS) of the voltage at the electrodes every mS and keeps the set voltage value constant according to a mathematical algorithm. The value of the current supplied by the inverter is consequently inversely proportional to the resistance of the secondary circuit and to the resistance of the material to be welded. The value of the supplied current will be independent from power line fluctuations. The secondary voltage is kept constant as long as it is lower than the CURR. MAX parameter. If the welding current tends to exceed the value set in CURR. MAX., the inverter unit will automatically decrease the value of the secondary voltage in real time to maintain the welding current within the set limits. The CURR. MAX. value may be set as high as the max value of the transformer welding current. Its task is to prevent damage to the welding tools in the case of harsh changes in the resistance of the material to be welded.

The constant secondary voltage working mode may be used for welds with tungsten electrodes or to compensate the wear of the electrodes during the welding operation.



The VE value remains constant during the welding operation, but the current value changes according to the impedance of the secondary circuit.

TABLE WITH CONSTANT SECONDARY VOLTAGE OPERATING MODE PARAMETERS

PARAMETER	RANGE VALUE
PROGRAM N.	001 – 300
WORKING MODE	VEK
CONTROL MODE *	NO
QUALITY – T*	OFF
QUALITY – R *	OFF
SQUEEZE 1	0.5 – 99.0 cycles
SQUEEZE	00.0 – 99.0 cycles
PRESSURE	00.5 – 10.0 bar
FORGE DELAY	00 – 99 cycles
FORG.PRESS.	00.5 – 10.0 bar
PRE-WELD	0000 – 1000 mS
PRE-VE	00.20 – 20.00 V
COLD 1	0000 – 1000 mS
SLOPE UP	0000 – 1000 mS
WELD	0001 – 2000 mS
VE	00.20 – 20.00 V
CURR. MAX.	001.00 – 200.00 KA
COLD 2	0000 – 1000 mS
IMPULSE N.	1 – 9
WELD 2	0000 – 1000 mS
VE 2	00.20 – 20.00 V
SLOPE DOWN	0000 – 1000 mS
COLD 3	0000 – 1000 mS
POST-WELD	0000 – 1000 mS
POST-VE	00.20 – 20.00 V
HOLD TIME	00.5 – 99.0 cycles
OFF TIME	00.0 – 99.0 cycles

CONTROL MODE *	CUR
LIM I MIN	000.30 – 200.00 KA
LIM I MAX	000.30 – 200.00 KA

CONTROL MODE *	RO
LIM RO MIN	005.0 – 100.0%
LIM RO MAX	005.0 – 100.0%

CONTROL MODE *	VE
LIM V MIN	00.20 – 20.00 V
LIM V MAX	00.20 – 20.00 V

CONTROL MODE *	PW
LIM P MIN	000.20 - 600.00 KW
LIM P MAX	000.20 – 600.00 KW

CONTROL MODE *	ENE
LIM E MIN	00000 – 60000 J
LIM E MAX	00000 – 60000 J

QUALITY –T *	THICK
THICK. MIN	00.00 – 60.00 mm
THICK MAX	00.00 – 60.00 mm

QUALITY –T *	IDENT
IDENT. MIN	0.000 – 6.000 mm
IDENT. MAX	0.000 – 6.000 mm

QUALITY –T *	TH+ID
THICK. MIN	00.00 – 60.00 mm
THICK MAX	00.00 – 60.00 mm
IDENT. MIN	0.000 – 6.000 mm
IDENT. MAX	0.000 – 6.000 mm

QUALITY –T *	ZERO

QUALITY –R *	PRE
RMIN PRE	0 – 60000uOhm
RMAX PRE	0 – 60000uOhm

QUALITY –R *	POST
RMIN POST	0 – 60000uOhm
RMAX POST	0 – 60000uOhm

QUALITY –R *	PRE+POST
RMIN PRE	0 – 60000uOhm
RMAX PRE	0 – 60000uOhm
RMIN POST	0 – 60000uOhm
RMAX POST	0 – 60000uOhm

QUALITY –R *	ZERO

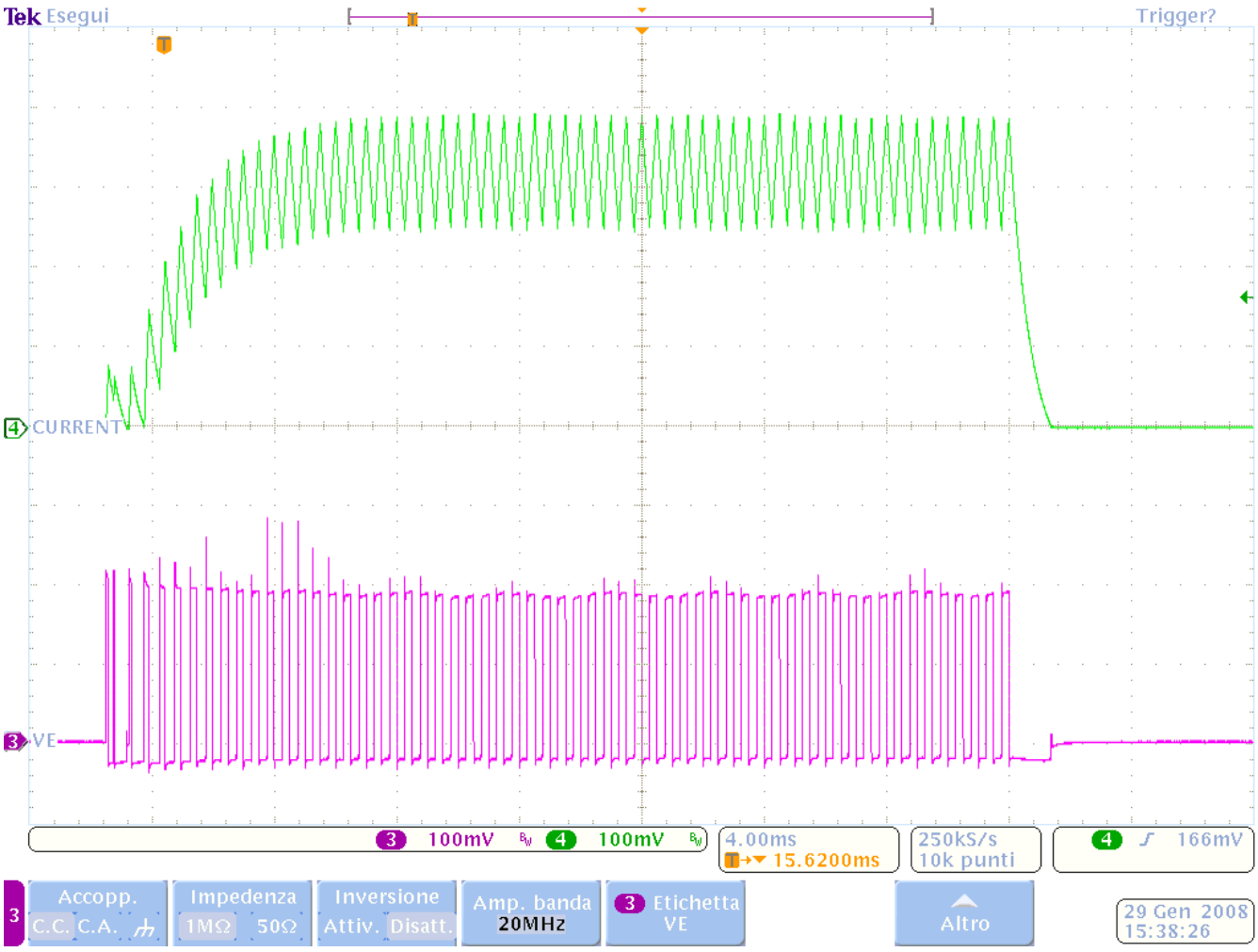
There are some special conditions:

- On setting the OFF TIME to zero, the control unit will work in single cycle.
- On setting the PRE-WELD parameter to zero, the pre-welding process will not be carried out.
- On setting the POST-WELD parameter to zero, the post-welding process will not be carried out.
- On setting WELD 2 parameter to zero, WELD 2 will not be carried out.
- On setting LIM I MIN and LIM I MAX to the same value, the limits are deactivated.
- On setting LIM RO MIN and LIM RO MAX to the same value, the limits are deactivated.
- On setting LIM V MIN and LIM V MAX to the same value, the limits are deactivated.
- On setting LIM P MIN and LIM P MAX to the same value, the limits are deactivated.
- On setting LIM E MIN and LIM E MAX to the same value, the limits are deactivated.
- On setting THICK. MIN and THICK. MAX to the same value, the limits are deactivated.
- On setting IDENT. MIN and IDENT. MAX to the same value, the limits are deactivated.
- On setting RMIN PRE and RMAX PRE to the same value, the limits are deactivated.
- On setting RMIN POST and RMAX POST to the same value, the limits are deactivated

2.5 – CONSTANT POWER OPERATING MODE (PWK)

When working in constant power mode, the inverter calculates the real effective value (RMS) of the secondary voltage and the secondary current every mS and maintains the product constant through a mathematical algorithm during mains voltage changes. Consequently if the secondary resistance decreases, the welding current will increase and vice versa when the secondary resistance increases the welding current will decrease. The adjustment in constant power works correctly until the welding current reaches the current value set in the CURR. MAX. parameter. On attaining said limit, the inverter automatically reduces the supplied power in real time to limit the value of the supplied current. The supplied welding current may never exceed the max value set for the used welding transformer. Using constant power may be seen as a constant energy welding at a known time. In fact, when working with constant power during the welding operation, a constant energy value is always supplied at a fixed time.

The use of the constant power working mode may be useful to compensate the wear of the electrodes or to weld materials that are subjected to significant resistance changes during the welding process such as, for instance, rod welding or highly-resistive metal welding. In these cases the current decreases during the initial welding phase in which the resistance of the material is typically higher. As such, the squirting of molten material is avoided, phenomena that reduce the quality of the weld.



You can see the inconstancy of the current and secondary voltage to maintain constant the product of the two quantities and, as such, the supplied power.

TABLE WITH CONSTANT POWER OPERATING MODE PARAMETERS

PARAMETER	RANGE VALUE
PROGRAM N.	001 – 300
WORKING MODE	PWK
CONTROL MODE *	NO
QUALITY – T*	OFF
QUALITY – R *	OFF
SQUEEZE 1	0.5 – 99.0 cycles
SQUEEZE	00.0 – 99.0 cycles
PRESSURE	00.5 – 10.0 bar
FORGE DELAY	00 – 99 cycles
FORG.PRESS.	00.5 – 10.0 bar
PRE-WELD	0000 – 1000 mS
PRE-POWER	000.20 – 600.00 KW
COLD 1	0000 – 1000 mS
SLOPE UP	0000 – 1000 mS
WELD	0001 – 2000 mS
POWER	000.20 – 600.00 KW
CURR. MAX.	001.00 – 200.00 KA
COLD 2	0000 – 1000 mS
IMPULSE N.	1 – 9
WELD 2	0000 – 1000 mS
POWER 2	000.20 – 600.00 KW
SLOPE DOWN	0000 – 1000 mS
COLD 3	0000 – 1000 mS
POST-WELD	0000 – 1000 mS
POST-POWER	000.20 – 600.00 KW
HOLD TIME	00.5 – 99.0 cycles
OFF TIME	00.0 – 99.0 cycles

CONTROL MODE *	CUR
LIM I MIN	000.30 – 200.00 KA
LIM I MAX	000.30 – 200.00 KA

CONTROL MODE *	RO
LIM RO MIN	005.0 – 100.0%
LIM RO MAX	005.0 – 100.0%

CONTROL MODE *	VE
LIM V MIN	00.20 – 20.00 V
LIM V MAX	00.20 – 20.00 V

CONTROL MODE *	PW
LIM P MIN	000.20 - 600.00 KW
LIM P MAX	000.20 – 600.00 KW

CONTROL MODE *	ENE
LIM E MIN	00000 – 60000 J
LIM E MAX	00000 – 60000 J
QUALITY –T *	THICK
THICK. MIN	00.00 – 60.00 mm

THICK MAX	00.00 – 60.00 mm

QUALITY –T *	IDENT
IDENT. MIN	0.000 – 6.000 mm
IDENT. MAX	0.000 – 6.000 mm

QUALITY –T *	TH+ID
THICK. MIN	00.00 – 60.00 mm
THICK MAX	00.00 – 60.00 mm
IDENT. MIN	0.000 – 6.000 mm
IDENT. MAX	0.000 – 6.000 mm

QUALITY –T *	ZERO

QUALITY –R *	PRE
RMIN PRE	0 – 60000uOhm
RMAX PRE	0 – 60000uOhm

QUALITY –R *	POST
RMIN POST	0 – 60000uOhm
RMAX POST	0 – 60000uOhm

QUALITY –R *	PRE+POST
RMIN PRE	0 – 60000uOhm
RMAX PRE	0 – 60000uOhm
RMIN POST	0 – 60000uOhm
RMAX POST	0 – 60000uOhm

QUALITY –R *	ZERO

There are some special conditions:

- On setting the OFF TIME to zero, the control unit will work in single cycle.
- On setting the PRE-WELD parameter to zero, the pre-welding process will not be carried out.
- On setting the POST-WELD parameter to zero, the post-welding process will not be carried out.
- On setting WELD 2 parameter to zero, WELD 2 will not be carried out.
- On setting LIM I MIN and LIM I MAX to the same value, the limits are deactivated.
- On setting LIM RO MIN and LIM RO MAX to the same value, the limits are deactivated.
- On setting LIM V MIN and LIM V MAX to the same value, the limits are deactivated.
- On setting LIM P MIN and LIM P MAX to the same value, the limits are deactivated.
- On setting LIM E MIN and LIM E MAX to the same value, the limits are deactivated.
- On setting THICK. MIN and THICK. MAX to the same value, the limits are deactivated.
- On setting IDENT. MIN and IDENT. MAX to the same value, the limits are deactivated.
- On setting RMIN PRE and RMAX PRE to the same value, the limits are deactivated.
- On setting RMIN POST and RMAX POST to the same value, the limits are deactivated

2.6 – CONSTANT ENERGY OPERATING MODE (ENE)

With a constant energy control unit, all the settings are made as for conventional control units except for the ENERGY parameter and the welding time parameter, where a set rating is not required but minimum and maximum ratings are set.
The inverter constantly adjusts the welding current to match it with the set value. During the welding operations, the inverter detects the real effective value (RMS) of the welding current, the non-inductive component of the voltage at the electrodes in volts and the welding duration in mS. The product of I x V x time gives the thermal energy produced during welding, expressed in joules (W x sec).

Since the energy subtracted by conduction and that dissipated between the external sheets and the electrodes, reduce the precision of the energy measured, it is advisable to weld with short timings and high electrode force. Therefore it is important, for good execution of the spot quality control, that the welding machine it is applied to has adequate specifications relating to power, electrode force and welding current for the execution of high A and B class spots.

To ensure correct use of the control unit in this working mode, we recommend following the procedure below step by step:

1. **adjust the welding pressure, the welding current and the diameter of the electrodes according to the traditional tables for the execution of the required welding.**
2. **disable the stepper function or the dressing function if activated.**
3. **set AUTORETAIN ON**
4. **set the control unit to work in constant current mode.**
5. **carry one spot weld out and verify that it is satisfactory.**
6. **read the total developed energy value on the control unit.**
7. **set the control unit to work in constant energy mode.**
8. **set the energy value read in the ENERGY parameter of the work program.**
9. **adjust the minimum time (T. MIN. WELD.) equal to the number of mS required to carry out the spot with the new electrodes.**
10. **adjust the maximum time (T. MAX. WELD.) equal to a number of mS that will not damage the piece to be welded.**

ENERGY TREND READINGS DURING WELDING

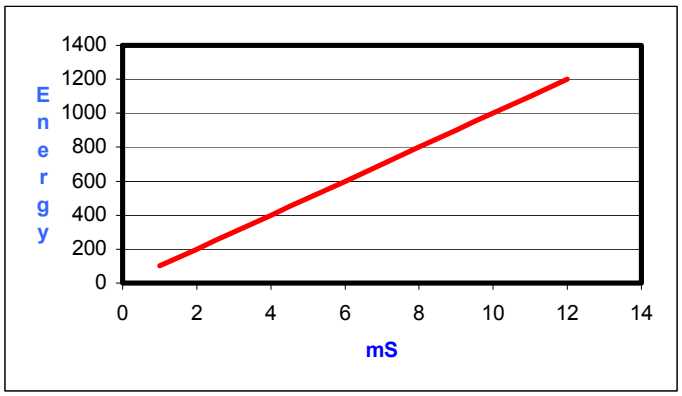


TABLE WITH CONSTANT ENERGY OPERATIONG MODE PARAMETERS

PARAMETER	RANGE VALUE
PROGRAM N.	001 – 300
WORKING MODE	ENE
CONTROL MODE *	NO
QUALITY – T*	OFF
QUALITY – R *	OFF
SQUEEZE 1	0.5 – 99.0 cycles
SQUEEZE	00.0 – 99.0 cycles
PRESSURE	00.5 – 10.0 bar
FORGE DELAY	00 – 99 cycles
FORG.PRESS.	00.5 – 10.0 bar
PRE-WELD	0000 – 1000 mS
PRE-CURR.	000.30 – 200.00 KA
COLD 1	0000 – 1000 mS
SLOPE UP	0000 – 1000 mS
CURRENT	000.30 – 200.00 KA
ENERGY	0 – 60000 J
WELD. MIN.	0001 – 999 mS
WELD. MAX.	0002 – 1000 mS
COLD 2	0000 – 1000 mS
IMPULSE N.	1 – 9
WELD 2	0000 – 1000 mS
CURRENT 2	000.30 – 200.00 KA
SLOPE DOWN	0000 – 1000 mS
COLD 3	0000 – 1000 mS
POST-WELD.	0000 – 1000 mS
POST-CURR.	000.30 – 200.00 KA
HOLD TIME	00.5 – 99.0 cycles
OFF TIME	00.0 – 99.0 cycles

CONTROL MODE *	CUR
LIM I MIN	000.30 – 200.00 KA
LIM I MAX	000.30 – 200.00 KA

CONTROL MODE *	RO
LIM RO MIN	005.0 – 100.0%
LIM RO MAX	005.0 – 100.0%

CONTROL MODE *	VE
LIM V MIN	00.20 – 20.00 V
LIM V MAX	00.20 – 20.00 V

CONTROL MODE *	PW
LIM P MIN	000.20 - 600.00 KW
LIM P MAX	000.20 – 600.00 KW

QUALITY –T *	THICK

THICK. MIN	00.00 – 60.00 mm
THICK MAX	00.00 – 60.00 MM

QUALITY –T *	IDENT
IDENT. MIN	0.000 – 6.000 mm
IDENT. MAX	0.000 – 6.000 mm

QUALITY –T *	TH+ID
THICK. MIN	00.00 – 60.00 mm
THICK MAX	00.00 – 60.00 MM
IDENT. MIN	0.000 – 6.000 mm
IDENT. MAX	0.000 – 6.000 mm

QUALITY –T *	ZERO

QUALITY –R *	PRE
RMIN PRE	0 – 60000uOhm
RMAX PRE	0 – 60000uOhm

QUALITY –R *	POST
RMIN POST	0 – 60000uOhm
RMAX POST	0 – 60000uOhm

QUALITY –R *	PRE+POST
RMIN PRE	0 – 60000uOhm
RMAX PRE	0 – 60000uOhm
RMIN POST	0 – 60000uOhm
RMAX POST	0 – 60000uOhm

QUALITY –R *	ZERO

There are some special conditions:

- On setting the OFF TIME to zero, the control unit will work in single cycle.
- On setting the PRE-WELD parameter to zero, the pre-welding process will not be carried out.
- On setting the POST-WELD parameter to zero, the post-welding process will not be carried out.
- On setting WELD 2 parameter to zero, WELD 2 will not be carried out.
- On setting LIM I MIN and LIM I MAX to the same value, the limits are deactivated.
- On setting LIM RO MIN and LIM RO MAX to the same value, the limits are deactivated.
- On setting LIM V MIN and LIM V MAX to the same value, the limits are deactivated.
- On setting LIM P MIN and LIM P MAX to the same value, the limits are deactivated.
- On setting LIM E MIN and LIM E MAX to the same value, the limits are deactivated.
- On setting THICK. MIN and THICK. MAX to the same value, the limits are deactivated.
- On setting IDENT. MIN and IDENT. MAX to the same value, the limits are deactivated.
- On setting RMIN PRE and RMAX PRE to the same value, the limits are deactivated
- On setting RMIN POST and RMAX POST to the same value, the limits are deactivated

It is advisable to activate the CONTROL UNIT in RO MODE and to check the limit use conditions before proceeding with production. For instance, if use is meant to be with 2 sheets, the limit conditions are either with 1 or 3 sheets. The constant energy is adjusted by the TE700 control unit. The operator must then check the current slicing percentage of the inverter with 1 sheet and set this value as minimum limit. The value with 3 sheets should be set as maximum limit.

However, it is not possible to undoubtedly assure that the piece has been effectively welded, as all the conditions and parameters involved in the welding process execution should be checked.

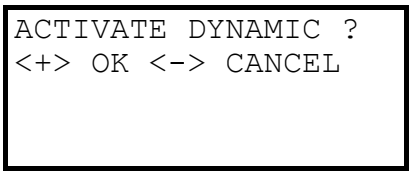
2.7 - OPERATING IN DYNAMIC MODE (DYN)

The DYNAMIC MODE is an adaptive type inverter working mode. This unit is capable of detecting faulty conditions, during the welding operation, such as the imperfect contact of the sheets to be welded, presence of impurities between the pieces to be welded, presence of shunts near the electrodes or wear of the electrodes. After having identified one or more faulty conditions, the control unit can dynamically modify the welding process to correct said conditions. The welding process is corrected by extending the welding time up to a max limit defined by the operator. In DYNAMIC MODE the control unit adjusts the welding current for the purpose of obtaining a correct weld and avoiding, at the same time, the squirting of molten material that could lead to welds of lower classes.

Proceed as follows to use the DYNAMIC MODE:

- **Set the control unit to IK WORKING MODE.**
- **Adjust the welding pressure, the welding current and the diameter of the electrodes, conforming to the standard tables, to carry out the required weld.**
- **In order to activate the DYNAMIC MODE at the end of the welding procedure, the PULSE and CURRENT 2 parameters must NOT be set to IK WORKING MODE otherwise it will not be possible to activate the DYNAMIC MODE.**
- **Check that the electrodes used are in perfect working order.**
- **Spot-weld a sample of material not subjected to anomalous conditions that is to say with paired sheets, clean and without any shunt spots in the whereabouts.**
- **If the quality of the welding is satisfactory, switch the control unit WORKING MODE to DYN. The DYN mode may be activated only if the affected weld program is the same with which the last weld was carried out and if the last weld was carried out in IK WORKING MODE.**

The control unit asks the operator whether or not to activate the DYNAMIC MODE. If the – key is pressed, the working mode goes back to IK mode whilst if the + key is pressed, the new WORKING MODE will be DYN.



After having activated the dynamic mode, the welding parameters inside the program set to dynamic mode should not be changed by the operator since they are compiled automatically by the control unit. Should the operator change any of them, this would invalidate the correcting capacity of the dynamic mode and therefore would entail a new calibration cycle to work efficiently.

However, it is not possible to undoubtedly assure that the piece has been effectively welded, as all the conditions and parameters involved in the welding process execution should be checked.

TABLE WITH DYNAMIC OPERATING MODE PARAMETERS

PARAMETER	RANGE VALUE
PROGRAM N.	001 – 300
WORKING MODE	DYN
CONTROL MODE *	NO
QUALITY – T*	OFF
QUALITY – R *	OFF
SQUEEZE 1	0.5 – 99.0 cycles
SQUEEZE	00.0 – 99.0 cycles
PRESSURE	00.5 – 10.0 bar
FORGE DELAY	00 – 99 cycles
FORG.PRESS.	00.5 – 10.0 bar
PRE-WELD	0000 – 1000 mS
PRE-POWER	000.20 – 600.00 KW
COLD 1	0000 – 1000 mS
SLOPE UP	0000 – 1000 mS
WELD	0001 – 2000 mS
CURRENT	000.30 – 200.00 KA
POWER 2	000.20 – 600.00 KW
CURR. MAX.	001.00 – 200.00 KA
SLOPE DOWN	0000 – 1000 mS
COLD 3	0000 – 1000 mS
POST-WELD	0000 – 1000 mS
POST-POWER	000.20 – 600.00 KW
HOLD TIME	00.5 – 99.0 cycles
OFF TIME	00.0 – 99.0 cycles

CONTROL MODE *	CUR
LIM I MIN	000.30 – 200.00 KA
LIM I MAX	000.30 – 200.00 KA

CONTROL MODE *	RO
LIM RO MIN	005.0 – 100.0%
LIM RO MAX	005.0 – 100.0%

CONTROL MODE *	VE
LIM V MIN	00.20 – 20.00 V
LIM V MAX	00.20 – 20.00 V

CONTROL MODE *	PW
LIM P MIN	000.20 - 600.00 KW
LIM P MAX	000.20 – 600.00 KW

CONTROL MODE *	ENE
LIM E MIN	00000 – 60000 J
LIM E MAX	00000 – 60000 J

QUALITY –T *	THICK
THICK. MIN	00.00 – 60.00 mm
THICK MAX	00.00 – 60.00 mm

QUALITY –T *	IDENT
IDENT. MIN	0.000 – 6.000 mm
IDENT. MAX	0.000 – 6.000 mm

QUALITY –T *	TH+ID
THICK. MIN	00.00 – 60.00 mm
THICK MAX	00.00 – 60.00 mm
IDENT. MIN	0.000 – 6.000 mm
IDENT. MAX	0.000 – 6.000 mm

QUALITY –T *	ZERO

QUALITY –R *	PRE
RMIN PRE	0 – 60000uOhm
RMAX PRE	0 – 60000uOhm

QUALITY –R *	POST
RMIN POST	0 – 60000uOhm
RMAX POST	0 – 60000uOhm

QUALITY –R *	PRE+POST
RMIN PRE	0 – 60000uOhm
RMAX PRE	0 – 60000uOhm
RMIN POST	0 – 60000uOhm
RMAX POST	0 – 60000uOhm

QUALITY –R *	ZERO

There are some special conditions:

- On setting the OFF TIME to zero, the control unit will work in single cycle.
- On setting the PRE-WELD parameter to zero, the pre-weld. will not be carried out.
- On setting the POST-WELD. parameter to zero, the post-welding process will not be carried out.
- On setting WELD 2 parameter to zero, WELD 2 will not be carried out.
- On setting LIM I MIN and LIM I MAX to the same value, the limits are deactivated.
- On setting LIM RO MIN and LIM RO MAX to the same value, the limits are deactivated.
- On setting LIM V MIN and LIM V MAX to the same value, the limits are deactivated.
- On setting LIM P MIN and LIM P MAX to the same value, the limits are deactivated.
- On setting LIM E MIN and LIM E MAX to the same value, the limits are deactivated.
- On setting THICK. MIN and THICK. MAX to the same value, the limits are deactivated.
- On setting IDENT. MIN and IDENT. MAX to the same value, the limits are deactivated.
- On setting RMIN PRE and RMAX PRE to the same value, the limits are deactivated.
- On setting RMIN POST and RMAX POST to the same value, the limits are deactivated.

2.8 – WORK PROGRAM PARAMETERS DESCRIPTION

All the following parameters that indicate non-weld times are expressed in periods, also called mains cycles. The mains frequency determines the duration of a period:

Mains frequency 50 Hz - 1 period = 20 ms

Mains frequency 60 Hz - 1 period = 16.6 ms

WORKING MODE

The WORKING MODE parameter defines the program's welding current type of adjustments: by current slicing percentage (**FIX**), by constant current (**IK**), by constant energy (**ENE**), by constant power (**PWK**), by constant secondary voltage (**VEK**) and by DYNAMIC MODE (**DYN**).
The foregoing modes affect the adjustments of the welding current, the secondary voltage and the current slicing percentage of the inverter. The different adjustment modes affect the welding blocks relevant to the welding, welding 2, pre welding and post welding.
The possibility of selecting a specific work mode depends on the configuration of the TE700 + INVERTER units and on the configuration of the spot welder on which they are installed.

CONTROL MODE

This parameter allows the operator to select the control mode of the required weld parameter:

- **NO** No control is carried out on the parameters of the run weld.
- **CUR** The welding current min. and max. limits may be set.
- **RO** The operator may set the minimum and maximum limits of the inverter current slicing percentage when the weld is executed.
- **VE** The operator may set the minimum and maximum limits of the average secondary voltage RMS. The comparison is carried out when the secondary voltage is present during the WELDING block. If working in pulse mode, the comparison is carried out on the last run impulse.
- **PW** The operator may set the minimum and maximum limits of the average supplied power value. The comparison is carried out with the average power value supplied during the WELDING block. If working in pulse mode, the comparison is carried out on the last run pulse.
- **ENE** The operator may set the minimum and maximum limits of the supplied energy value. The comparison is carried out with the value of the energy supplied by the inverter during the WELDING block. If working in pulse mode, the comparison is carried out on the last run pulse.

The possibility of using a specific control mode depends on the configuration of the TE700 + INVERTER units and on the configuration of the spot welder which they are installed on. Moreover, the available control modes depend on the currently selected WORKING MODE.

QUALITY-T

This parameter allows the operator to select if and which controls are to be carried out on the mechanical qualities of the welded material. The controls are carried out before the passage of the welding current in order to measure the initial thickness of the material to be welded and after the passage of the welding current to measure the electrode penetrations inside the material to be welded.

- **OFF** No control is carried out on the mechanical dimensions of the material present between the electrodes.
- **THICK** The thickness of the material to be welded is measured, before the passage of the welding current, at the end of the SQUEEZE 1 and SQUEEZE times (if present). The minimum and maximum limits may be set in the measurement carried out.

- **IDENT** At the end of the passage of the welding current and before the execution of the HOLD TIME, the electrodes penetration into the material (that took place during the welding operation), is measured. In order to identify the correct penetration values according to the type of material to be welded, consult the specific welding tables. The minimum and maximum limits may be set in the measurement carried out.
- **TH+ID** Both measurements are carried out before and after the welding and the minimum and maximum limits may be set in both.
- **ZERO** In this mode the welder switches automatically to NO WELD mode. As such, the operator may carry out a welding cycle without any material in between the electrodes. During this cycle the control unit calculates the zero coordinate used as a reference for the thickness and penetration measurements. The zero procedure is required every time the machine is turned on, when the welder's secondary geometry changes or when maintenance is performed to the electrodes.

This control mode may be activated only if the specific position sensor is properly installed on the spot welder and is activated through the **SETUP MENU**.

QUALITY-R

This parameter allows the operator to select if and which controls are to be carried out on the electrical qualities of the welded material. The activation of the parameter introduces an initial weld (into the main welding cycle), with reduced current and time as compared to that set in the WELDING block, capable of measuring the initial resistance of the material placed in between the electrodes without altering it from a mechanical point of view. Moreover, a final weld is introduced having the same time and current values as the initial one so as to measure the final resistance of the welded material.

- **OFF** The resistance of the material in between the electrodes is not measured.
- **PRE** The initial resistance of the material to be welded is measured. The operator may set the minimum and maximum limits on the measured value.
- **POST** The final resistance of the material to be welded is measured. The operator may set the minimum and maximum limits on the measured value.
- **PRE+POST** Both the initial and the final resistances are measured and the operator may set the minimum and maximum limits on both measured values.
- **ZERO** When this mode is selected on the welder, the unit carries out a welding cycle with reduced current and time as compared to that set in the WELDING block. The procedure is intended to compensate the resistance of the arms so as to read the actual resistance of the material in between the electrodes. The zero procedure must be carried out each time the machine is turned on, when the welder's secondary geometry changes or when maintenance is performed to the electrodes.

The activation of this control mode depends on the configuration mode of the control unit and is activated through the **SETUP MENU**.

SQUEEZE 1

The SQUEEZE 1 time determines the time needed by the electrode to move down.
If a simple pneumatic circuit is present, such time represents the interval of time that elapses from the beginning of the head descent to the welding process beginning. The set value must be long enough to allow the electrodes to achieve the proper clamping force, before the welding process begins.
In a pneumatic circuit with low-pressure squeeze, the SQUEEZE 1 time is combined with the SQUEEZE time where the SQUEEZE 1 time is the one determining the duration of the low force squeeze, that is to say the interval of time that elapses from the beginning of the head descent to the application of the welding pressure. The set value must be long enough to allow the electrodes to reach the work piece to be welded. During the SQUEEZE 1 time, it is possible to end the cycle by disabling the start cycle signal.

SQUEEZE

Even the SQUEEZE time is a wait time similar to that of SQUEEZE 1. It is required in the case of welders that contemplate low-force squeeze function. In this case, said time determines the interval between the application of the welding force to the electrodes (valve EV2 energizes) and the beginning of the welding. It must be long enough to allow the electrodes to reach the correct clamping force before the welding starts. An insufficient adjustment of this time triggers sparks between the electrodes and the sheet when the welding begins and could cause quality inconsistency. The SQUEEZE time is activated via parameter LOW FORCE SQUEEZE inserted in the **FEATURES TE700** menu. It is advisable to activate this parameter only in the presence of a pneumatic circuit fitted with low-force squeeze. The SQUEEZE time is summed up to the SQUEEZE time 1. The cycle may be interrupted during the SQUEEZE time by deactivating the cycle start signal.

PRESSURE

This parameter, expressed in bar, represents the welding pressure value. It is used only if the proportional valve is installed in the pneumatic system. The set value must guarantee a suitable clamping force during the welding operation. An insufficient adjustment of this value produces sparks between the electrodes and the sheet when the welding begins. This parameter is activated through the PROP. VALVE function present in the **FEATURES TE700** menu.

FORGE

The FORGE parameter expresses the delay time that elapses from the beginning of the welding process and the application of the forging force. It is used exclusively with pneumatic circuits that contemplate the forging function. Such function activates EV3 which permits to increase the electrodes force during the welding cycle.
If the value is set to zero, the FORGE function is disabled, valve EV3 is activated either simultaneously with SQUEEZE time 1 or with the SQUEEZE, if the relevant function was activated. This parameter is activated through the specific function in the **FEATURES TE700** menu.

PRES-FORG.

This parameter, expressed in bar, represents the forge pressure value. It is used only if the proportional valve is installed in the pneumatic system. The set value must guarantee a suitable clamping force during the forging. An insufficient adjustment of this value produces sparks between the electrodes and the sheet during the welding operation. This parameter is activated after the activation of the FORGE and PROP. VALVE parameters in the **TE700 FEATURES** menu.

PRE-WELD.

The pre-weld. time parameter (PRE-WELD) describes the duration of a current passage that can be carried out before the weld itself. This parameter is expressed by four digits since it can be adjusted with a 1-mS precision. If the parameter is set to 0, the pre-weld. will not be carried out.
This parameter may be activated through the relevant function in the **SETUP MENU**.

PRE-CURR.

The value expressed in this parameter indicates the current which the PRE-WELD is carried out with. This parameter is activated through the specific function in the **SETUP MENU.** This parameter is displayed only in IK or ENE WORKING MODE.

PRE-RO

The value expressed in this parameter indicates the current slicing percentage which the PRE-WELD is carried out with. This parameter is activated through the specific function in the **SETUP MENU.** This parameter is displayed only in FIX WORKING MODE.

PRE-VE

The value expressed in this parameter indicates the value of the secondary voltage which the PRE-WELD is carried out with. This parameter is activated through the specific function in the **SETUP MENU.** This parameter is displayed only in VEK WORKING MODE.

PRE-POWER

The value expressed in this parameter indicates the value of the secondary power which the PRE-WELD is carried out with. This parameter is activated through the specific function in the **SETUP MENU.** This parameter is displayed only in PWK or DYN WORKING MODE.

COLD 1

The COLD 1 parameter indicates the time that elapses from the pre-weld. to the weld.
If the pre-weld. is deactivated (that is, when PRE-WELD time = 0), this cold time is not carried out. This parameter may be activated through the relevant function in the **SETUP MENU**.

SLOPE UP

The current slope up parameter (SLOPE UP) describes the time within which the programmed value of the weld adjustment parameter is attained. The initial value of this parameter is equivalent to the minimum value that the adjustment parameter may have if COLD T. 1 differs from 0. If COLD T. 1 equals 0 and PRE-WELD is other than 0, then the initial value will no longer be the minimum value of the adjustment parameter but the adjustment quantity value used in the PRE-WELD..
Whilst the final value is equivalent to the current value programmed in the WELD parameter, the inclination of the SLOPE UP is calculated automatically by the microprocessor according to programmed values. The SLOPE UP time is summed up to the welding time.

WELD

The WELD time parameter represents the duration of the passage of the welding current. It will be carried out according to the work mode selected for the control unit.
When the impulse work mode is activated, this parameter indicates the duration of every single pulse. This parameter is expressed by four digits since it can be adjusted with a 1 mS precision.

WELD. MIN.

The minimum weld. time parameter (WELD. MIN.) is expressed in mS and represents the minimum welding duration. This is carried out with a current value equal to the one indicated in the CURRENT parameter. The welding operation stops if on the elapsing of said time the measured energy value is higher than or equal to the corresponding programmed value.
This parameter is displayed only on selecting the ENE WORKING MODE.

WELD. MAX.

The maximum weld. time parameter (WELD. MAX.) is expressed in mS and represents the maximum welding duration. This is carried out with a power value equal to the one indicated in the POWER parameter. In any case, the welding operation stops if on the elapsing of said time the measured energy value is lower than the corresponding programmed value.
This parameter is displayed only on selecting the ENE WORKING MODE.

CURR. MAX

The parameter indicates the maximum current that can circulate on the secondary circuit when the unit's adjustment mode is not by constant current. The task of this parameter is to protect the integrity of the tool used against excessive increases in the welding current.
The set value must be greater than the value of the welding current that usually circulates in the machine's secondary circuit with a typical welding performed with a certain spot welder in its work cycle.
This parameter is displayed only on selecting the VEK, PWK or DYN WORKING MODE.

CURRENT

The value expressed in this parameter indicates the current which the WELD is carried out with. This parameter is displayed only in the IK or ENE WORKING MODE.

RO

The value expressed in this parameter indicates the current slicing percentage which the WELD is carried out with. This parameter is displayed only in the FIX WORKING MODE.

VE

The value expressed in this parameter indicates the value of the secondary voltage which the WELD is carried out with. This parameter is displayed only in the VEK WORKING MODE.

POWER

The value expressed in this parameter indicates the value of the secondary power which the WELD is carried out with. This parameter is displayed only in the PWK or DYN WORKING MODE

ENERGY

This parameter indicates the energy value, expressed in joules, which must be developed during welding. This rating must be reached in a number of cycles between the minimum time and the maximum time.
This parameter is only displayed when ENE (Constant Energy WORKING MODE) is selected.

IMPULSE N.

The number of impulses parameter (IMPULSE N.) indicates the number of impulses which the weld is carried out with. The duration time of every single impulse is the one set in the weld. time parameter (WELD). This parameter is not visible if it is selected as DYN WORKING MODE.

COLD 2

The COLD 2 parameter is used in the pulse working mode; it indicates the time that elapses from a welding impulse to the next one.
When the number of the impulses is programmed to zero, cold 2 time is carried out only if a WELD 2 is programmed afterwards, otherwise it is not carried out. This parameter is not visible if it is selected as DYN WORKING MODE.

WELD 2

The WELD 2 time parameter represents the duration of the passage of the welding current. This is carried out conforming to the working mode selected for the control unit. This parameter is expressed by four digits since it can be adjusted with a 1 mS precision. This parameter is not visible if it is selected as DYN WORKING MODE. This parameter is activated through the specific function in the **SETUP MENU.**

CURRENT 2

The value expressed in this parameter indicates the current which the WELD is carried out with. This parameter is displayed only in the IK or ENE WORKING MODE. This parameter is activated through the specific function in the **SETUP MENU.**

RO 2

The value expressed in this parameter indicates the current slicing percentage which the WELD is carried out with. This parameter is displayed only in the FIX WORKING MODE. This parameter is activated through the specific function in the **SETUP MENU.**

VE 2

The value expressed in this parameter indicates the value of the secondary voltage which the WELD is carried out with. This parameter is displayed only in the VEK WORKING MODE. This parameter is activated through the specific function in the **SETUP MENU.**

POWER 2

The value expressed in this parameter indicates the value of the secondary power which the WELD is carried out with. This parameter is displayed only with WORKING MODE in PWK. This parameter is activated through the specific function in the **SETUP MENU.**

SLOPE DOWN

The current slope down parameter (SLOPE DOWN) is a weld. time that is added at the end of the welding procedure during which the welding current decreases from the value set in the adjustment parameter of the WELD or WELD 2 (if present) down to the minimum value foreseen by the adjustment parameter if the COLD 3 TIME is other than zero whilst if the COLD 3 TIME is zero and POST-WELD is other than zero, the minimum value will be the value set for the adjustment parameter in POST WELD.
The downward inclination is calculated automatically by the microprocessor according to the programmed values. The SLOPE DOWN time is always summed up to the welding time.
This parameter may be activated through the relevant function in the **SETUP MENU**.

COLD 3

The COLD 3 parameter indicates the time that elapses between the WELD time and the POST-WELD time. This parameter is activated through the specific function in the **SETUP MENU**.

POST-WELD

The post-weld. time parameter (POST-WELD) describes the duration of a current passage that may be carried out after the weld. time. This parameter is expressed by four digits since it can be adjusted with a 1-mS precision. If the parameter is set to 0, the post-weld. will not be carried out. The post-weld. will be carried out in the adjustment mode set in the working mode with value equal to that set in the control parameter. This parameter is activated through the specific function in the **SETUP MENU**.

POST-CURR.

The value expressed in this parameter indicates the current which the POST WELD is carried out with. This parameter is displayed only in the IK or ENE WORKING MODE. This parameter is activated through the specific function in the **SETUP MENU.**

POST-RO

The value expressed in this parameter indicates the current slicing percentage which the POST-WELD is carried out with. This parameter is displayed only in the FIX WORKING MODE. This parameter is activated through the specific function in the **SETUP MENU.**

POST-VE

The value expressed in this parameter indicates the value of the secondary voltage which the POST-WELD is carried out with. This parameter is displayed only in the VEK WORKING MODE. This parameter is activated through the specific function in the **SETUP MENU.**

POST-POWER

The value expressed in this parameter indicates the value of the secondary power which the POST-WELD is carried out with. This parameter is displayed only with WORKING MODE in PWK and DYN. This parameter is activated through the specific function in the **SETUP MENU**

HOLD TIME

The HOLD TIME parameter indicates the time that elapses from the end of the welding process to the opening of the electrodes. It allows a quicker cooling of the welding spot and prevents the spot from being stimulated before being properly cooled.

OFF TIME

The OFF TIME parameter indicates a welder wait time, namely the one that elapses from one welder cycle to the next one when the welder is working in automatic cycle.
When this value is set to 0, the welder always works in single cycle; if it is set to another value, the welder will work in the automatic cycle.
When the welder works in single cycle, the control unit carries out a single welding cycle each time it receives a start cycle signal. When the welder works in automatic cycle, the welder goes on executing welding cycles until the start cycle signal is released.

LIM I MIN

This parameter fixes a minimum current limit value. For each weld, the control unit monitors that the welding current supplied by the welder is higher than the value set at this parameter; if it is lower, an error message will be displayed (see the relevant paragraph).
Activate this parameter by setting the CONTROL MODE to CUR., otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

LIM I MAX

This parameter fixes a maximum current limit value. For each weld, the control unit monitors that the welding current supplied by the welder is lower than the value set at this parameter; if it is higher, an error message will be displayed (see the relevant paragraph).
Activate this parameter by setting the CONTROL MODE to CUR., otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

LIM RO MIN

This parameter defines a minimum current slicing limit value. Each time a weld is carried out the control unit checks that the average current slicing held during the welding operation is greater than the value set in this parameter. Otherwise an error condition occurs (see the specific paragraph).

Activate this parameter by setting the CONTROL MODE to RO, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

LIM RO MAX

This parameter defines a maximum current slicing limit value. Each time a weld is carried out the control unit checks that the average current slicing held during the welding operation is less than the value set in this parameter. Otherwise an error condition occurs (see the specific paragraph).

Activate this parameter by setting the CONTROL MODE to RO, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

LIM V MIN

This parameter defines a minimum secondary voltage limit value. Each time a weld is carried out the control unit checks that the secondary voltage during the welding operation is greater than the value set in this parameter. Otherwise an error condition occurs (see the specific paragraph).

Activate this parameter by setting the CONTROL MODE to VE, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

LIM V MAX

This parameter defines a maximum secondary voltage limit value. Each time a weld is carried out the control unit checks that the secondary voltage during the welding operation is less than the value set in this parameter. Otherwise an error condition occurs (see the specific paragraph).

Activate this parameter by setting the CONTROL MODE to VE, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

LIM P MIN

This parameter defines a minimum power limit value. Each time a weld is carried out the control unit checks that the power supplied by the welder is greater than the value set in this parameter. Otherwise an error condition occurs (see the specific paragraph).

Activate this parameter by setting the CONTROL MODE to PW, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

LIM P MAX

This parameter defines a maximum power limit value. Each time a weld is carried out the control unit checks that the power supplied by the welder is less than the value set in this parameter. Otherwise an error condition occurs (see the specific paragraph).

Activate this parameter by setting the CONTROL MODE to PW, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

LIM E MIN

This parameter defines a minimum energy limit value. Each time a weld is carried out the control unit checks that the energy supplied by the welder is greater than the value set in this parameter. Otherwise an error condition occurs (see the specific paragraph).
Activate this parameter by setting the CONTROL MODE to ENE, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

LIM E MAX

This parameter defines a maximum energy limit value. Each time a weld is carried out the control unit checks that the energy supplied by the welder is less than the value set in this parameter. Otherwise an error condition occurs (see the specific paragraph).
Activate this parameter by setting the CONTROL MODE to ENE, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

THICK MIN

This parameter defines a lower limit as concerns the minimum thickness of the material in between the electrodes. Before the welding begins, the measurement of the thickness of the material in between the electrodes must be greater than the set minimum limit. Otherwise an error condition occurs (see the specific paragraph).
Activate this parameter by setting QUALITY-T. to THICK or TH+ID, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus.

THICK MAX

This parameter defines an upper limit as concerns the maximum thickness of the material in between the electrodes. Before the welding begins, the measurement of the thickness of the material in between the electrodes must be less than the set maximum limit. Otherwise an error condition occurs (see the specific paragraph).
Activate this parameter by setting QUALITY-T. to THICK or TH+ID, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

IDENT MIN

This parameter defines a lower limit as concerns the minimum electrodes penetration at the end of the welding procedure. At the end of the welding operation the measurement of the penetration value must be greater than the set limit. Otherwise an error condition occurs (see the specific paragraph).
Activate this parameter by setting QUALITY-T. to IDENT or TH+ID, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

IDENT MAX

This parameter defines an upper limit as concerns the maximum electrodes penetration at the end of the welding procedure. At the end of the welding operation the measurement of the penetration value must be less than the set limit. Otherwise an error condition occurs (see the specific paragraph).
Activate this parameter by setting QUALITY-T. to IDENT or TH+ID, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

R MIN PRE

This parameter defines a lower limit as concerns the value of the material's initial resistance. Before starting the welding, the initial resistance value must be greater than the minimum set value. Otherwise an error condition occurs (see the specific paragraph).
Activate this parameter by setting QUALITY-R. to PRE or PRE+POST, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

R MAX PRE

This parameter defines an upper limit as concerns the value of the material's initial resistance. Before starting the welding, the initial resistance value must be less than the maximum set value. Otherwise an error condition occurs (see the specific paragraph).
Activate this parameter by setting QUALITY-R. to PRE or PRE+POST, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

R MIN POST

This parameter defines a lower limit as concerns the value of the material's final resistance. At the end of the welding, the value of the material's final resistance must be greater than the minimum set limit. Otherwise an error condition occurs (see the specific paragraph).
Activate this parameter by setting QUALITY-R. to POST or PRE+POST, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

R MAX POST

This parameter defines the maximum limit as concerns the value of the material's final resistance. At the end of the welding, the value of the material's final resistance must be greater than the maximum set limit. Otherwise an error condition occurs (see specific paragraph).
Activate this parameter by setting QUALITY-T. to THICK or TH+ID, otherwise the parameter is not displayed during the programming phase. The display of this parameter depends on the configuration of the machine set in the **FEATURES INVERTER** and **FEATURES TE700** menus**.**

2.9 - SETUP MENU

```
-TE700  VER. 1.13--
 PROGRAM DATA
>SETUP MENU
 STEPPER MENU
```

In this menu, the operator may find those parameters that allow simplifying the programming and better adjusting the control unit to the operator's requirements.

```
  SETUP MENU
>START 1 PRG     010
 CYCLE START 2   006
 PRINTER SPOTS  NONE
```

SETUP MENU PARAMETERS TABLE

PARAMETER	PARAMETER DESCRIPTION	VALUE
START 1 PRG	Start cycle 1 program	000 – 300
START 2 PRG	Start cycle 2 program	001 – 300
PRINTER SPOTS	Welding spots print	ALL – NONE – BAD
STOP BAD SPOT T1	Number of spots to stop out of limit for tool 1	0 – 15
STOP BAD SPOT T2	Number of spots to stop out of limit for tool 2	0 – 15
STOP BAD SPOT T3	Number of spots to stop out of limit for tool 3	0 – 15
STOP BAD SPOT T4	Number of spots to stop out of limit for tool 4	0 – 15
LANGUAGE	Language for describing parameters	ITA – ENG – SPA – DEU - FRA - UNG – POR - SWE
PRE-WELD	It activates the parameters relevant to the PRE-WELD.	ON - OFF
POST-WELD	It activates the parameters relevant to the POST-WELD.	ON - OFF
WELD 2	Activates the WELD 2 parameters	ON – OFF
PROG. SEQUENCE	Activates the sequence of programs	ON - OFF
DYNAMIC TIME	Max welding time adjustment in DYNAMIC mode	2X – 9X
DYNAMIC COMP	Dynamic correction algorithm intervention adjustment	30 % - 200 %
WELD QUALITY	Activation of the quality control limits in the weld program during the welding operation.	OFF – R ONLY – T ONLY – R+T

START 1 PRG

This parameter indicates the program number to be run when the cycle is activated from the start cycle 1 command.
The value of the program also includes 0 which, if set, allows the control unit to work with the program selected in the programming frame.

START 2 PRG

This parameter indicates the program number to be run when the cycle is activated from the start cycle 2 command.

PRINTER SPOTS

With this parameter, if the serial port is setup for print (see **FEATURES TE700**), the operator can choose which welding spots to be printed. It is possible to disable the print, print all spots or only the spots whose current value remains out of the set limits values.

STOP BAD SPOT T1

The STOP BAD SPOT T1 parameter allows the operator to program the control unit so that it stops when welds are carried out with weld programs associated with tool number 1 with values of the controlled parameter beyond the set limits.
The programmed value indicates the number of consecutive "out of limits" welds that cause the machine to stop. The limits error occurs when a welding is carried out with values that are greater than or less than the set limits. Adjust the value with keys ⊞ and ⊟ from 0 to 15. When the value is set to zero the function is disabled therefore the condition in which the preset limits are exceeded does not stop the welder.
For further information, please, check the relevant paragraph.

STOP BAD SPOT T2

The STOP BAD SPOT T2 parameter allows the operator to program the control unit so that it stops when welds are carried out with weld programs associated with tool number 2 with values of the controlled parameter beyond the set limits.
The programmed value indicates the number of consecutive "out of limits" welds that cause the machine to stop. The limits error occurs when a welding is carried out with values that are greater than or less than the set limits. Adjust the value with keys ⊞ and ⊟ from 0 to 15. When the value is set to zero the function is disabled therefore the condition in which the preset limits are exceeded does not stop the welder.
For further information, please, check the relevant paragraph.

STOP BAD SPOT T3

The STOP BAD SPOT T3 parameter allows the operator to program the control unit so that it stops when welds are carried out with weld programs associated with tool number 3 with values of the controlled parameter beyond the set limits.
The programmed value indicates the number of consecutive "out of limits" welds that cause the machine to stop. The limits error occurs when a welding is carried out with values that are greater than or less than the set limits. Adjust the value with keys ⊞ and ⊟ from 0 to 15. When the value is set to zero the function is disabled therefore the condition in which the preset limits are exceeded does not stop the welder.
For further information, please, check the relevant paragraph.

STOP BAD SPOT T4

The STOP BAD SPOT T4 parameter allows the operator to program the control unit so that it stops when welds are carried out with weld programs associated with tool number 4 with values of the controlled parameter beyond the set limits.
The programmed value indicates the number of consecutive "out of limits" welds that cause the machine to stop. The limits error occurs when a welding is carried out with values that are greater than or less than the set limits. Adjust the value with keys ⊞ and ⊟ from 0 to 15. When the value is set to zero the function is disabled therefore the condition in which the preset limits are exceeded does not stop the welder.
For further information, please, check the relevant paragraph.

LANGUAGE

With this parameter the operator programs the language in which the control unit should display both the parameters to be set and the error messages.
One may select the following languages: ITALIAN – ENGLISH – SPANISH – GERMAN – FRENCH – HUNGARIAN – PORTUGUESE – SWEDISH.

PRE-WELD
When set to ON it activates the pre-weld parameters in all the programs.

POST-WELD
When set to ON it activates the parameters relevant to the post welding, the cold 3 time and the slope down in all the programs.

WELD 2
When set to ON it activates the welding 2 parameters in all the programs. If the WORKING MODE of a program is set to DYNAMIC, the WELD 2 parameters in that program will not be activated.

DYNAMIC TIME
This parameter allows the operator to set the time window inside which the DYN WORKING MODE can intervene to correct any welding defects. The intervention time may be adjusted from twice the time required to carry out the sample weld up to 9 times the time used to carry out the sample weld. If the DYNAMIC control unit is not capable of correcting the error within the max foreseen time, the control unit stops and signals the error (see the specific chapter).

DYNAMIC COMP
This parameter allows the operator to set, with DYN WORKING MODE active, how effective the action of the weld correction algorithm should be. When using the machine under routine conditions this parameter should be set to 30%. Increase the value of the parameter if the corrective action is not satisfactory.

WELD QUALITY
This parameter allows the operator to activate additional weld quality controls inside the weld program. The operator may choose to activate either the measurement of the initial and/or final resistance quality or only the measurement of the initial thickness and/or penetration, or activate both the measurement of the material's electrical resistance and the measurement of its mechanical characteristics.
The activation of items T ONLY and R+T is subordinated to the correct installation of the linear position transducer on the machine.
The activation of items R ONLY and R+T is subordinated to the presence of the cables that measure the electrodes' voltage on the spot welder otherwise said items may not be selected.

2.10 - STEPPER MENU

```
 -TE700 VER. 1.09--
>PROGRAM DATA
 SETUP MENU
 STEPPER MENU
```

This menu contains parameters associated with the current stepper operations.

```
  STEPPER MENU    T1
>TOOLS N°          1
 STEPPER WELD    OFF
 STEPPER TIME    OFF
```

The unit can manage up to max 4 different stepper modules, one for each welding tool managed by the control unit. This allows the operator to personalize a stepper curve, for each type of tool used, which takes into consideration only the spots carried out by the specific tool selected and the different wear speeds of the individual tools. For each tool the operator can choose, in a self-contained and mutually exclusive manner, whether to activate the stepper function or the electrodes dressing function. If the electrodes dressing function has already been activated for the selected tool, when the operator attempts to activate the stepper function the following screen will be displayed to warn the operator about the conflicting condition.

```
SW OFF DRESSING ?
<+> OK <-> CANCEL
```

Press key – to deactivate the stepper function and activate the electrodes dressing function for the selected tool. Press key + to deactivate the electrodes dressing function for the selected tool (without losing the parameterization entered for the electrodes dressing) and activate the stepper function on the same tool. Two different stepper laws, having segments of the same duration as far as number of steps but different stepper percentages for each segment, may be defined for each stepper module. The use of two different stepper laws inside the same stepper module permits to correct parameter changes that occur at different speeds during the welding operation.

For example, the operator may correct the wear of the electrode by increasing the welding current and, at the same time, also correct the reduction of the dimensions of the electrode within the QUALITY-T control on the initial thickness of the material to be welded. Or, with one law it is possible to intervene on the increase of the welding current proportionally with the consumption of the electrode and increase the weld. time with a second law. As such, the total welding current increase can be restricted in case the tool or the spot welder is not capable of withstanding the current increase that would be necessary without intervening on the weld. time.

STEPPER MENU PARAMETERS TABLE

PARAMETER	PARAMETER DESCRIPTION	RANGE VALUE
TOOLS N°	Number of the tool which the parameterization refers to	1 – 4
STEPPER WELD	Stepper of the main adjustment parameter	OFF – ON L1 – ON L2
STEPPER TIME	Weld time increase	OFF – ON L1 – ON L2
STEPPER THICK.	Decrease of the electrodes size	OFF – ON L1 – ON L2
N.TOTAL STEPS	Total number of steps	1 – 7
SPOTS 1	Spots step 1	0 – 10000
INCREMENT 1-L1	INCREMENT percentage law 1	0 – 50 %
INCREMENT 1-L2	INCREMENT percentage law 2	0 – 50 %
SPOTS 2	Spots step 2	0 – 5000
INCREMENT 2-L1	INCREMENT percentage law 1	0 – 50 %
INCREMENT 2-L2	INCREMENT percentage law 2	0 – 50 %
SPOTS 3	Spots step 3	0 – 5000
INCREMENT 3-L1	INCREMENT percentage law 1	0 – 50 %
INCREMENT 3-L2	INCREMENT percentage law 2	0 – 50 %
SPOTS 4	Spots step 4	0 – 5000
INCREMENT 4-L1	INCREMENT percentage law 1	0 – 50 %
INCREMENT 4-L2	INCREMENT percentage law 2	0 – 50 %
SPOTS 5	Spots step 5	0 – 5000
INCREMENT 5-L1	INCREMENT percentage law 1	0 – 50 %
INCREMENT 5-L2	INCREMENT percentage law 2	0 – 50 %
SPOTS 6	Spots step 6	0 – 5000
INCREMENT 6-L1	INCREMENT percentage law 1	0 – 50 %
INCREMENT 6-L2	INCREMENT percentage law 2	0 – 50 %
SPOTS 7	Spots step 7	0 – 5000
INCREMENT 7-L1	INCREMENT percentage law 1	0 – 50 %
INCREMENT 7-L2	INCREMENT percentage law 2	0 – 50 %

TOOLS N°

This parameter allows the operator to choose on which INCREMENT module a corresponding INCREMENT module will be available for each tool made available in the **INVERTER FEATURES** menu. On changing the value of the parameter, all the next parameters will be updated with the newly selected INCREMENT module.

STEPPER WELD

This parameter allows the operator to activate or deactivate the stepper of the welding adjustment parameter. The stepper will act on the adjustment parameter selected in the working mode of the called weld program. For example in the case of IK, the stepper will affect the welding current, in the case of PWK the stepper will affect the power supplied during the welding operation. The stepper of the main adjustment parameter may be left deactivated or arbitrarily associated with one of the two available stepper laws.

STEPPER TIME

This parameter allows the operator to activate or deactivate the stepper of the parameter time referred to the duration of each hot phase of the welding process, pre-weld time, slope-up time, weld time, weld. 2 time, slope-down time and post-weld time. The cold weld times and

the movement times are not increased. The time increase may be left deactivated or arbitrarily associated with one of the two available stepper laws.

STEPPER THICK.

This parameter may be modified only if the sensors that check for the position of the electrodes have been correctly installed in the spot welder. If affirmative, the parameter may be changed and consequently it will be possible to define a law that corrects the thickness reduction of the electrodes caused by wear and tear. The correction permits to maintain the exact measurement of the initial thickness of the sheets to be welded. Otherwise if the electrodes are very worn out and the operator does not wish to resort to a stepper law, the zero procedure may be carried out more often than the rate at which the change in size of the electrodes is corrected.

The parameter may be left deactivated or arbitrarily associated with one of the two available stepper laws.

N.TOTAL STEPS

This parameter indicates by how many segments the current stepper curve is to be made up of. In order to deactivate the stepper module function, STEPPER WELD. and STEPPER TIME and STEPPER THICK must all be OFF.

SPOTS 1

This parameter indicates the number of spots which the associated segment is composed of. When STEPPER 1-L1 = 0 and SPOTS 1 ≠ 0, the value set in parameter SPOTS 1 equals the max number of weld spots.

INCREMENT 1-L1

This increment indicates the percentage increase relevant to the first segment of stepper law 1.

INCREMENT 1-L2

This increment indicates the percentage increase relevant to the first segment of stepper law 2.

SPOTS 2

This parameter indicates the number of spots which the associated segment is composed of.

INCREMENT 2-L1

This increment indicates the percentage increase relevant to the second segment of stepper law 1.

INCREMENT 2-L2

This increment indicates the percentage increase relevant to the second segment of stepper law 2.

SPOTS 3

This parameter indicates the number of spots which the associated segment is composed of.

INCREMENT 3-L1

This increment indicates the percentage increase relevant to the third segment of stepper law 1.

INCREMENT 3-L2
This increment indicates the percentage increase relevant to the third segment of stepper law 2.

SPOTS 4
This parameter indicates the number of spots which the associated segment is composed of.

INCREMENT 4-L1
This increment indicates the percentage increase relevant to the fourth segment of stepper law 1.

INCREMENT 4-L2
This increment indicates the percentage increase relevant to the fourth segment of stepper law 2.

SPOTS 5
This parameter indicates the number of spots which the associated segment is composed of.

INCREMENT 5-L1
This increment indicates the percentage increase relevant to the fifth segment of stepper law 1.

INCREMENT 5-L2
This increment indicates the percentage increase relevant to the fifth segment of stepper law 2.

SPOTS 6
This parameter indicates the number of spots which the associated segment is composed of.

INCREMENT 6-L1
This increment indicates the percentage increase relevant to the sixth segment of stepper law 1.

INCREMENT 6-L2
This increment indicates the percentage increase relevant to the sixth segment of stepper law 2.

SPOTS 7
This parameter indicates the number of spots which the associated segment is composed of.

INCREMENT 7-L1
This increment indicates the percentage increase relevant to the seventh segment of stepper law 1.

INCREMENT 7-L2
This increment indicates the percentage increase relevant to the seventh segment of stepper law 2.

2.11 - ADJUSTMENT STEPPER FUNCTION

The adjustment stepper function permits correcting the wear of the electrodes that affects the quality of the welds. When the diameter of the electrodes increases, so does the contact section between electrode and piece to be welded and consequently the welding current density decreases (Amperes/mm^2). If the same adjustment is maintained for the entire electrodes' life, the quality of the last spots carried out is poorer as compared to the first ones. In order to correct this event, the adjustment stepper function was introduced, also called "stepper". The operating principle is to gradually increase the adjustment as the diameter of the electrodes increases so that constant current density is maintained.

In order to describe the trend of the adjustment during the electrodes' lifespan, a stepper curve is programmed. This curve is made up of one or more segments for each of which the operator programs the number of welds and the relevant increment of the adjustment parameter in percentage.

Once programmed, the increment of the adjustment parameter is applied to all the weld programs that use the same tool number of the programmed stepper module.

Limits, if used, increase by the same percentage, as well as the pre-weld., post-weld. and welding 2 adjustments and the energy value to be attained.

During the welding process, it is possible to correct the stepper curve trend by changing the parameters determining its trend.

In order to begin a new stepper curve, reset the spot counter relevant to the stepper module to be cleared, that is to say the one relevant to the tool in which the electrodes' starting diameter was restored.

SIMPLIFIED USE OF THE STEPPER FUNCTION (LINEAR STEPPER)

The present example is carried out considering the control unit set to IK WORKING MODE. Only tool 1 will be used and the only active stepper will be the one relevant to the parameter adjustment associated with stepper law number 1.
The stepper function can be used in a simplified manner by programming a simple percent increment for a specific number of welding spots that are to be carried out with the same electrodes.
The operator must know the service life of the electrodes in order to adjust these parameters. To do this run some welding tests with new electrodes before they are replaced. Under these two conditions the currents, required for carrying out the welding spots of the required quality, are assessed. The change in percent is calculated and then it is set in the control unit.

The parameters that allow the carrying out of the stepper function are entered in the **STEPPER MENU**. The instructions for programming these parameters are outlined in the relevant paragraph.

In the "simplified" stepper function use, always set N.TOTAL STEPS parameter to 1 (since there is only one segment to be programmed). Enter the number of welds to be carried out in parameter SPOTS 1. In practice, the foreseen service life of the electrodes. Enter the required percentage increase in parameter INCREMENT 1-L1.

Example:

The welding tests proved that: the electrode life corresponds to 2000 welding spots; that with new electrodes the required current is 15 kA; that after 2000 spots the electrodes diameter increment requires a 19 kA current.

The percent variation is calculated as follows:

$$Change\ \% = \frac{endcurrent - initialcurrent}{initialcurrent} \times 100 = \frac{19-15}{15} \times 100 = 26\%$$

Consequently the following parameters are set in the "**STEPPER MENU**":

PARAMETER	PARAMETER DESCRIPTION	VALUE
TOOLS N°	Identifier of the tool which the stepper module works on	1
STEPPER WELD	Parameter adjustment increase, current in the example	ON L1
STEPPER TIME	Weld time increase	OFF
STEPPER THICK.	Electrodes thickness decrease	OFF
TOTAL STEPS	Total number of stepper steps	1
SPOTS 1	Number of spots of first segment	2000
INCREMENT 1-L1	Percentage increase of the first segment relevant to law L1	26 %
INCREMENT 1-L2	Percentage increase of the first segment relevant to law L2	00 %

The welding program must be set in order to carry out the first welding spot, which is with an adjustment enabling to obtain the necessary current with the starting electrodes diameter: 15 kA.

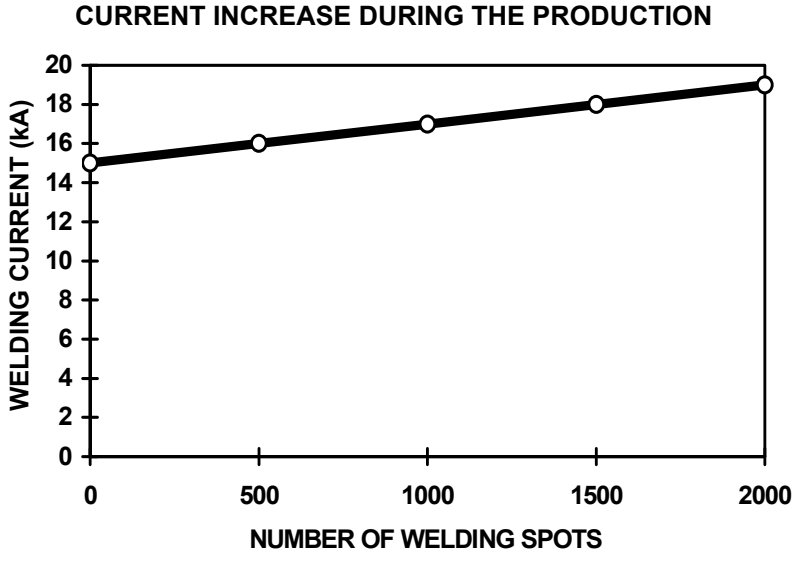
Now the welding process can begin. Current will vary conforming to the set increment rule. The graph below shows its pattern.

INITIAL CURRENT = 15 kA

FINAL CURRENT = 19 kA

INCREMENT PERCENT = 26 %

WELDING SPOTS NUMBERS = 2000



On having completed the 2000 welding spots, the control unit stops the production cycle and displays the following message:

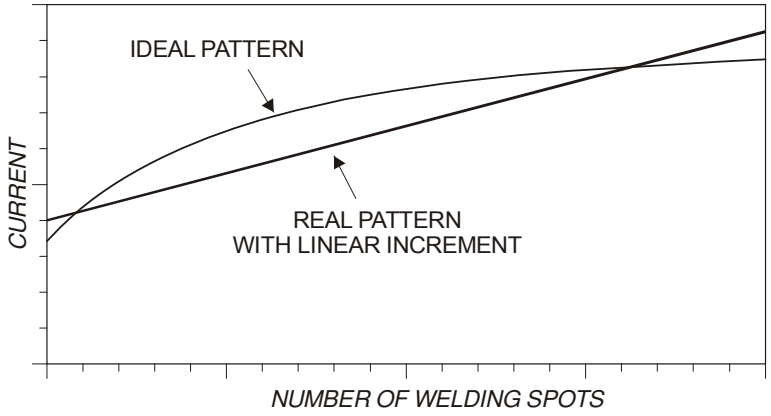
```
STEPPER        [164]
END
WARNING ON TOOLS T1
PUSH [///] TO RESET
```

Now the operator replaces the electrodes (or restores their original diameter) and clears the spots counter relevant to the tool whose electrodes were replaced to clear the stepper calculations.

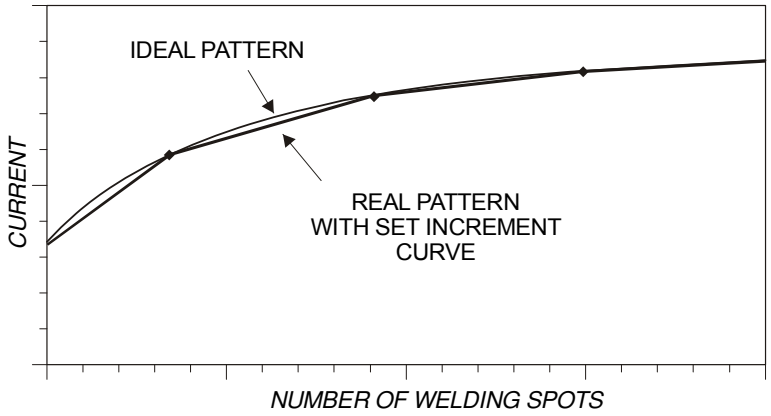
The TE700 resets the initial work parameters and begins a new stepper phase.

COMPLETE USE OF THE STEPPER FUNCTION (NON-LINEAR INCREMENT CURVE)

It is possible to use the non-linear increment curve function by knowing the real electrodes consumption only.
In the aforesaid work method, a linear welding current increment is used during the whole life span of the electrodes. In actual fact the increase of the contact section of the electrode on the sheet is not linear but has a pattern that is similar to the one shown in the graph below.



As such the use of the linear increment is an approximation which nonetheless permits to achieve good results in most applications. However when the operator wishes to achieve utmost constancy during work conditions, a non-linear increment curve can be set that is described by defining a certain number of segments.
This type of adjustment requires an adequate knowledge on how electrodes wear and on the parameters required during their life. Consequently many welding spot tests are necessary for assessing the work conditions in different moments of the electrodes' life.



The increment curve is set by assessing a certain number of linear segments. The number of welding spots and the desired increment are assessed for each segment.

The N.TOTAL STEPS parameter determines the number of segments to be entered in the stepper curve. Enter the number of welds that make up the segment in parameters SPOTS 1,2… and enter the relevant percentage increase to be carried out in parameter INCREMENT 1-L1,2-L1….
The programming procedure is outlined in the **STEPPER MENU** paragraph.

Example:

Welding tests have determined that the electrode life corresponds to 4000 welding spots, and that the following currents values are necessary at different moments of the electrodes life

WELDING SPOTS EXECUTED	NECESSARY CURRENT
0 (initial electrode diameter)	15 kA
700	17.8 kA
1800	19.5 kA
3000	20.2 kA
4000 (final electrode diameter)	20.7 kA

Therefore calculate the duration (in number of welding spots) and the percent increment of each segment.
Please, notice that the percent increment must always be calculated referring to the beginning of the considered segment.

$$\text{Duration of segment } 1 = 700 - 0 = 700 \text{ spots}$$
$$\text{Duration of segment } 2 = 1800 - 700 = 1100 \text{ spots}$$
$$\text{Duration of segment } 3 = 3000 - 1800 = 1200 \text{ spots}$$
$$\text{Duration of segment } 4 = 4000 - 3000 = 1000 \text{ spots}$$

$$Change\ \%\ segment\ 1 = \frac{endcurrent - initialcurrent}{initialcurrent} \times 100 = \frac{17.8 - 15}{15} \times 100 = 19\%$$

$$Change\ \%\ segment\ 2 = \frac{endcurrent - initialcurrent}{initialcurrent} \times 100 = \frac{19.5 - 17.8}{17.8} \times 100 = 10\%$$

$$Change\ \%\ segment\ 3 = \frac{endcurrent - initialcurrent}{initialcurrent} \times 100 = \frac{20.2 - 19.5}{19.5} \times 100 = 4\%$$

$$Change\ \%\ segment\ 4 = \frac{endcurrent - initialcurrent}{initialcurrent} \times 100 = \frac{20.8 - 20.2}{20.2} \times 100 = 3\%$$

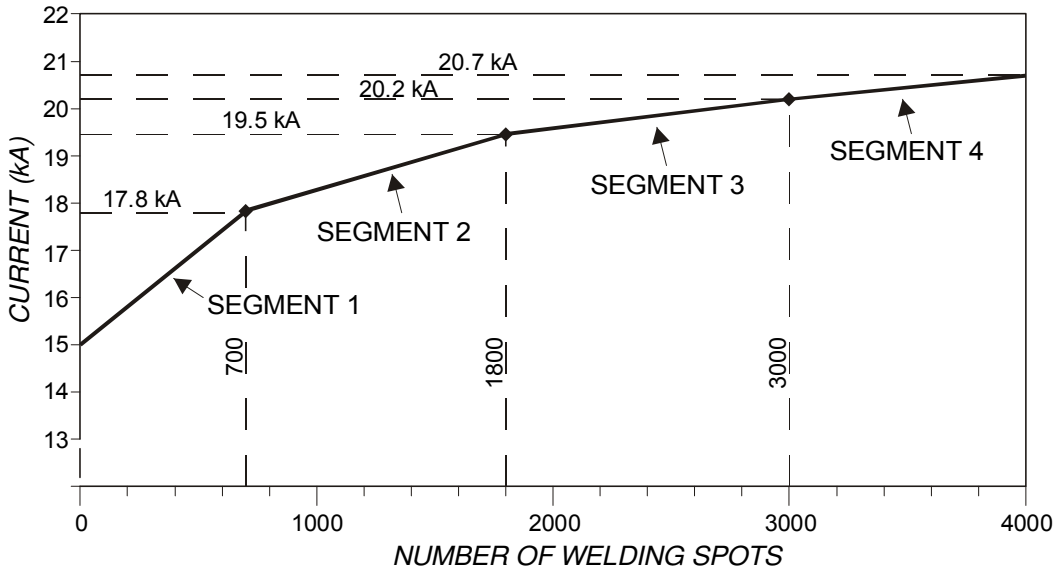
The following parameters are consequently set in the **STEPPER MENU**:

PARAMETER	PARAMETER DESCRIPTION	VALUE
TOOLS N°	Identifier of the tool on which the stepper module works	1
STEPPER WELD	Parameter adjustment increase, current in the example	ON L1
STEPPER TIME	Weld time increase	OFF
STEPPER THICK.	Electrodes thickness decrease	OFF
N.TOTAL STEPS	Total number of stepper steps	4
SPOTS 1	Number of spots of first segment	700
INCREMENT 1-L1	Percentage increase of the first segment relevant to law L1	19 %

PARAMETER	PARAMETER DESCRIPTION	VALUE
INCREMENT 1-L2	Percentage increase of the first segment relevant to law L2	00 %
SPOTS 2	Number of spots of second segment	1100
INCREMENT 2-L1	Percentage increase of the second segment relevant to law L1	10 %
INCREMENT 2-L2	Percentage increase of the second segment relevant to law L2	00 %
SPOTS 3	Number of spots of third segment	1200
INCREMENT 3-L1	Percentage increase of the third segment relevant to law L1	4 %
INCREMENT 3-L2	Percentage increase of the third segment relevant to law L2	00 %
SPOTS 4	Number of spots of fourth segment	1000
INCREMENT 4-L1	Percentage increase of the fourth segment relevant to law L1	3 %
INCREMENT 4-L2	Percentage increase of the fourth segment relevant to law L2	00 %

The welding program must be set in order to carry out the first welding spot, which is with an adjustment enabling to obtain the necessary current with the starting electrodes diameter: 15 kA.

Now the welding process can begin. Current will change according to the programmed increment rule. The graph below shows its pattern.



On having completed the 4000 welding spots, the control unit stops the production cycle and displays the following message:

```
STEPPER    [164]
 END
 WARNING ON TOOLS T1
 PUSH [///] TO RESET
```

Now the operator replaces the electrodes (or restores their original diameter) and clears the spots counter relevant to the tool the electrodes of which were replaced to clear the stepper calculations.

The TE700 resets the initial work parameters and begins a new stepper phase.

2.12 - FEATURES TE700

```
-TE700 VER. 1.13--
 SETUP MENU
 STEPPER MENU
>FEATURES TE700
```

The TE700 installation menu contains the parameters that describe the complexity and the typology of the welder on which the control unit works. Access to said menu is protected by an access code due the importance of these parameters.

```
ENTER ACCESS CODE
  FEATURES MENU
    - - - - -
```

If the operator is not authorized to enter this menu and does not know the access code, the following message is displayed:

```
    WRONG CODE
    TRY AGAIN !
```

The parameters can be edited only after having typed in the access code.

```
  FEATURES TE700
>SERIAL COM.     OFF
 NET ADDRESS      01
 OUT LOCK/END    END
```

Keep in mind that only skilled personnel are permitted to edit the following parameters to prevent damage to people or equipment.

PARAMETER	PARAMETER DESCRIPTION	RANGE VALUE
SERIAL COM.	Serial communication	232 – 485 – OFF
NET ADDRESS	Network address	01 – 31
OUT LOCK/END	Output function	END – LOCK
LOW FORCE SQ.	Low force squeeze	ON - OFF
FORGE	Forging	ON – OFF
PROP. VALVE	Proportional valve	ON - OFF
PRESSURE RATIO	Proportional ratio	0.1 – 2.0
AUTORETAIN	Start Autoretain	ON – OFF
START 1-2 NC	Operation of NC inputs	OFF – RIC 7-8 – ON
BIC 1-2 NC	Operation of NC inputs	OFF – RIC 5-6 – ON
SEAM WELD MODE	Spots / seams	ON – OFF
CASCADE MODE	Electric cascade function	ON – OFF
WELD – NO WELD	Operation of weld - no weld external input	INT – EXT – BOTH
DSP UPG PRESS	Command to update inverter SW	<+>

THICK SENSOR	Enabling of the parameters relevant to the thick sensor (position sensor)	ON – OFF
STEPPER TIME	Enabling of the stepper functionality on the welding time	ON – OFF

SERIAL COM.

The operator may choose whether to activate the serial data transmission port and how it is to be used, connect a printer (232) or connect the control unit to a data supervision network (485), or not to use this option (OFF).

NET ADDRESS

This parameter indicates the identifying address of the control unit when connected in the network, activating the aforesaid option.

OUT LOCK/END

This parameter is used to indicate the time for activation of the corresponding output, interlock (LOCK) or end of cycle (END).

LOW FORCE SQ.

This parameter is used for enabling the low-pressure squeeze function for pneumatic circuit welders that are equipped with this function. Its enabling adds the SQUEEZE parameter to the welding program.

FORGE

This parameter is used for enabling the forging for pneumatic circuit welders that are equipped with this function. Its enabling adds the FORGE DELAY parameter to the work program.

PROP. VALVE

This parameter is used for enabling the use of a proportional valve for pneumatic circuit welders that are equipped with this function. Its enabling adds the PRESSURE parameter to the work program.
If the FORGE parameter is enabled too, then the FORG.PRESS. parameter is added to the work program.

PRESSURE RATIO

This parameter can be used to select the optimum bar/Volt ratio for the type of proportional solenoid valve that is to be employed. It works only if the PROP. VALVE parameter is enabled.
Further pieces of information are described in the paragraph **INTERFACE FOR PROPORTIONAL VALVE**.

AUTORETAIN

This parameter allows disabling the AUTORETAIN cycle start signal.
On setting the parameter on the OFF value, the working cycle is stopped the moment the cycle start signal is disabled and does not complete the welding time. This occurs even if the welding current is in its flowing phase.
The welding time is always completed whenever the value is set to ON.
This function is specifically to be used when the machine works with mechanical devices instead of pneumatic ones.

If the control unit is in seam weld mode with autoretain deactivated, its activation implies the automatic deactivation of the seam weld mode and automatic commutation of the unit to SPOT mode.

START 1-2 NC

When this parameter is set to ON it enables the normally closed inputs of the cycle start signals. This allows the starting of the welding cycle only in the presence of the double exchange contact, normally open that closes and normally closed that opens.
When set to OFF, the control unit ignores the status of the two signals and the starting of the welding only depends on the status of the NO inputs.
If set to RIC 7-8, the two NO inputs become program recalls from a functional point of view so as to extend the number of recallable programs directly through the inputs.

BIC 1-2 NC

When this parameter is set to ON it enables the normally closed inputs of the cycle start signals. This allows the starting of the welding cycle only in the presence of the double exchange contact, normally open that closes and normally closed that opens.
When set to OFF, the control unit ignores the status of the two signals and the starting of the welding only depends on the status of the NO inputs.
If set to RIC 5-6, the two NO inputs become program recalls so as to extend the number of recallable programs directly through the inputs.

SEAM WELD MODE

This parameter is used to enable the function that adapts the control unit to seam welder specifications. The activation of the seam weld mode automatically deactivates the autoretain. Further information is supplied in the **SEAM WELD MODE** paragraph.

CASCADE MODE

This parameter allows reversing the output signal of the end cycle (END), that is to say from normally open contact to normally closed contact, to allow putting more control units in cascade.
Check the proper paragraph for further information.

WELD – NO WELD

When the optional board code 50200 is installed, this parameter allows the operator to select the priority of the weld-no-weld control.
When the parameter is set to INT, the running of the external WELD-NO WELD line is deactivated whilst the button on the TE700 control unit remains enabled.
When the parameter is set to EXT, the running of the external WELD-NO WELD line on board code 50200 is active whilst the button on the front panel of the TE700 control unit is disabled.
When the parameter is set to BOTH, both WELD-NO WELD controls are enabled: the one on the TE700 front panel and the external control line on the board code 50200. The two controls are in series therefore to switch the unit to NO WELD mode, simply set only one of the two controls to NO WELD mode whilst in order to switch the unit to WELD mode both controls must be switched to WELD mode.

DSP UPG PRESS

If key <+> is pressed when this parameter is selected, the operator can remotely activate the software upgrade procedure inside the inverter unit. The spot welder must not be off during the upgrade procedure. Any other operation during the upgrade procedure is prohibited and welds may not be carried out. In order to resume the running of the spot welder after the upgrade procedure, it must be turned off and then back on again once the procedure is finished.

THICK SENSOR

This parameter enables the THICKNESS SENSE menu for parameterizing eventual position sensors connected to the control unit. Also, by means of a stepper law, it enables the possibility of compensating the electrode's wear according to the initial quote.

STEPPER TIME

This parameter allows enabling the welding time stepper law inside the stepper menu. This law is enabled either independently or associated with a current stepper value.

2.13 - FEATURES INVERTER

```
-TE700 VER. 1.13--
 STEPPER MENU
 FEATURES TE700
>FEATURES INVERTER
```

The inverter installation menu contains the parameters that describe the complexity and the typology of the welder on which the control unit works. Access to said menu is protected by an access code due the importance of these parameters.

```
ENTER ACCESS CODE
  FEATURES MENU
    - - - - -
```

If the operator is not authorized to enter this menu and does not know the access code, the following message is displayed:

```
    WRONG CODE
   TRY AGAIN !
```

The parameters can be edited only after having typed in the access code.

```
  FEATURES INVERTER
>INVERTER SIZE 0250A
 TA TURNS        500
 FREQUENCY    1000Hz
```

Keep in mind that only skilled personnel are permitted to edit the following parameters to prevent damage to people or equipment.

PARAMETER	PARAMETER DESCRIPTION	RANGE VALUE
INVERTER SIZE	Max current supplied by the inverter	50 A – 4000 A
TA TURNS	Number of sensor turns primary current	500 – 2000
FREQUENCY	Inverter operating frequency	1000–2000–3000–4000 Hz
CURRENT LOOP	Current adjustment loop	ROG – TA
EXT.REF.INPUT	Analogue input for current profile	OFF – ON
VE INPUT	Electrodes voltage gauge	OFF – ON
TH TR. PRIM.	Transformer primary thermal current	0 – 60000 A
TH TR TIME	Transformer thermal time constant	0.0 – 6000.0 S
TH TR DIODE	Type of diodes installed in the welding transformer	OFF – 2*56DN – 4*56DN – 8*56DN – 2*65DN – 4*65DN – 8*65DN
ROGOWSKY TEST	Check for Rogowsky coil integrity	OFF – ON
N° WELDING TRAFO	Number of welding transformers or tools used.	1 – 4
TURNS TR.1	Transformer 1 turns ratio	1 – 200

I MAX TR.1	Max supplied current	2.00 – 200.00 KA
TURNS TR.2	Transformer 2 turns ratio	1 – 200
I MAX TR.2	Max supplied current	2.00 – 200.00 KA
TURNS TR.3	Transformer 3 turns ratio	1 – 200
I MAX TR.3	Max supplied current	2.00 – 200.00 KA
TURNS TR.4	Transformer 4 turns ratio	1 – 200
I MAX TR.4	Max supplied current	2.00 – 200.00 KA

It is important to keep in mind that after having modified the following parameters the memory of the TE700 control unit must always be reset.

INVERTER SIZE

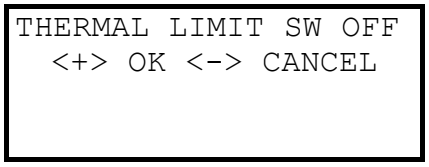
Indicates the max current that the inverter can supply at output. If a wrong value is set, this could damage the inverter and/or the welding transformer.

TA TURNS

Indicates the turns ratio of the current transducer installed inside the inverter. If a wrong value is set, this could lead to a wrong adjustment of the welding current.

FREQUENCY

This parameter sets the frequency at which the power semiconductors are switched. This control unit can work at 1000 Hz, 2000 Hz, 3000 Hz and 4000 Hz. The selected operating frequency must be adapted to the welding transformer used otherwise it might be damaged. If an operating frequency higher than 1000 Hz is selected, it will not be possible to activate the thermal limit switches relevant to the welding transformer and/or the diodes. If the thermal limit switches relevant to the welding transformer and/or the diodes were previously activated, when a work frequency higher than 1000Hz is selected, the following message is displayed:



If key <-> is pressed, the previously set thermal limit switches will remain energized and the operating frequency of the inverter remains at 1000 Hz. If key <+> is pressed, the thermal limit switches relevant to diodes and welding transformer will be disabled automatically and the operator will be able to use an inverter operating frequency higher than 1000 HZ.

CURRENT LOOP

This parameter allows the operator to choose which current transducer should be used in the adjustment loop. If set to ROG, the Rogowsky coil installed on the secondary circuit of the machine is used to adjust the current. If set to TA, a current sensor inside the inverter and installed on the primary of the welding transformer is used for the adjustment.
The best performance of the current adjustment loop is achieved by selecting ROG and installing the Rogowsky coil on the secondary circuit of the spot welder.

The adjustment, made through TA, is to be used when a Rogowsky coil cannot be installed on the secondary circuit of the spot welder or if set to seam weld mode.
If the seam weld mode is selected when Rogowsky has been selected as current sensor, a continuous weld cannot be carried out but the minimum COLD 2 TIME will be 8 mS. If TA has been selected as current sensor, the COLD 2 TIME may be set to 0mS and a continuous weld may be carried out without any interruptions.

EXT.REF.INPUT

This parameter allows the operator to enable an analogue input in the inverter unit with dynamics 0 – 10V by means of which a current profile may be supplied to the welder to be followed through a variable voltage applied at the appropriate input.

VE INPUT

This parameter allows the gauging of the voltage at the electrodes but, before doing so, be sure that the wires that carry out the measurement are properly installed.

TH TR. PRIM

This parameter allows the setting of the primary thermal current of the welding transformer. If the value is equal to zero or the value of the TH TR. TIME parameter equals zero, the limit switch at the thermal current of the welding transformer is deactivated. This function may be activated only when the inverter unit has been set with an operating frequency of 1000 Hz. If the operating frequency is greater than 1000 Hz the following message is displayed:

```
FAIL INIT THERMAL
       LIM
CHECK PARAM. CONFIG.
```

This parameter may be modified only after having set an operating frequency of 1000 Hz. The function cannot be activated if an operating frequency greater than 1000Hz is set.

TH TR. TIME

This parameter allows the setting of the thermal time constant of the welding transformer. If the value is equal to zero or the value of the TH TR. PRIM parameter equals zero, the limit switch at the thermal current of the welding transformer is deactivated. This function may be activated only when the inverter unit has been set to an operating frequency of 1000 Hz. If the operating frequency is greater than 1000 Hz the following message is displayed:

```
FAIL INIT THERMAL
       LIM
CHECK PARAM. CONFIG.
```

The parameter may be modified only after having set an operating frequency of 1000 Hz.

TH TR. DIODE

This parameter allows the setting of the type of rectifiers installed on the secondary circuit of the welding transformer. This function may be activated only if the operating frequency of the inverter equals 1000 Hz. If operating frequencies are greater, the parameter cannot be modified and the following message is displayed:

```
FAIL INIT THERMAL
LIM
CHECK PARAM. CONFIG.
```

ROGOWSKY TEST

It enables the check for the integrity both of the Rogowsky coil and the cable that connects it to the inverter unit. If the function is activated, the inverter periodically checks that the circuit of the current sensor is neither open nor short circuited. If a fault occurs, welding is inhibited and the condition is signalled on the TE700 display. The activation of the Rogowsky test function leads to a decrease in the max number of spots that the inverter may carry out in one minute.

N° WELDING TRAFO

This parameter sets the number of welding transformers used with the inverter or alternatively the number of the different welding tools used. If the operator intends using different tools for the welding operations but only one welding transformer, set the required number of tools and set the same turns and max current value, in the following parameters, for all the welding transformers. If the operator intends using different welding transformers, each transformer should be characterized by its turns ratio and by the max secondary current that can be supplied. If the operator uses different welding transformers the Rogowsky integrity test must not be enabled. If the operator uses more than one transformer or welding tool, the thermal limit switches cannot be activated at the primary thermal current and at the diodes thermal switch.

If the operator wishes to use different tools for alternating welds on a single welding transformer, he/she must set the parameter equal to the number of welding tools used and in any case the max number is four. Moreover, the operator must set the turns ratio of the welding transformers to an identical value for all the transformers and equivalent to the turns ratio of the transformer installed on the spot welder. Even the max supplied current values from each transformer must all be set to the same value of the max current that is supplied by the transformer installed on the spot welder.

TURNS TR.1

It sets the number of turns of welding transformer 1.

IMAX TR.1

It sets the max current that may be supplied by welding transformer 1.

TURNS TR.2

It sets the number of turns of welding transformer 2.

IMAX TR.2

It sets the max current that may be supplied by welding transformer 2.

TURNS TR.3
It sets the number of turns of welding transformer 3.

IMAX TR.3
It sets the max current that may be supplied by welding transformer 3.

TURNS TR.4
It sets the number of turns of welding transformer 4.

IMAX TR.4
It sets the max current that may be supplied by welding transformer 4.

2.14 - PROGRAMS COPY

```
-TE700 VER. 1.13--
 FEATURES TE700
 FEATURES INVERTER
>PROGRAM COPY
```

This menu is used for copying the values of the parameters of a program to other programs without having to set one parameter at a time (to make programming quicker).

```
  PROGRAM COPY
>SOURCE PROGRAM. 003
 COPY FROM PRG.  006
 TO PROGRAM      010
```

After having selected the source program and the programs which it is to be saved in, simply press the ¼ key and a request will appear asking either to continue and copy or cancel the operation.

```
  COPY PROGRAM?

 <+> OK <-> CANCEL
```

In order to copy, simply press key <+> and the following screen is displayed. The bar shows the copying progress state.

```
 PROGRAM COPY WAIT…
 ▌▌▌▌▌▌▌▌
```

When the copying procedure is finished, the main programming screen is displayed.

```
-TE700 VER. 1.09--
 FEATURES TE700
 FEATURES INVERTER
>PROGRAM COPY
```

PROGRAM COPY MENU PARAMETERS TABLE

PARAMETER	PARAMETER DESCRIPTION	RANGE VALUE
SOURCE PROGRAM	Source program	001 – 300
COPY FROM PRG	Start copy/target program	001 – 300
TO PROGRAM	Copy end program	001 – 300

SOURCE PROGRAM
This program indicates the number of the program to be copied to other programs. The value of this parameter may range from 001 to 250.

COPY FROM PRG
This program indicates the first program which the source program is copied into. The value of this parameter may range from 001 to 250.

TO PROGRAM
This program indicates the last program which to copy the source program into. The value of this parameter may range from 001 to 250.

2.15 – CHECK INPUT – DIAGNOSTIC TE700

```
-TE700 VER. 1.13--
 FEATURES INVERTER
 PROGRAM COPY
>DIAGNOSTIC TE700
```

This menu displays the status of the inputs of the TE700 weld control unit. It is used to check the working efficiency of the external devices, connected to the TE700 control unit, required for using the welder.

```
  DIAGNOSTIC TE700
>START 1 PRG     OFF
 START1 NC-RIC7  OFF
 AUX             OFF
```

The following inputs are mentioned in the list which may be scrolled by means of the ▲ and ▼ keys.

PARAMETER	PARAMETER DESCRIPTION	VALUE
START 1 PRG	It indicates the status of the cycle start signal	ON – OFF
START1 NC-RIC7	It indicates the status of cycle start NC signal or RIC7	ON – OFF
AUX	It indicates the status of the auxiliary signal	ON – OFF
AUX 3	It indicates the status of the auxiliary 3 signal	ON – OFF
DOUBLE STROKE	It indicates the status of the double stroke signal	ON – OFF
START 2 PRG	It indicates the status of the cycle 2 start signal	ON – OFF
START2 NC-RIC8	It indicates the status of cycle start NC signal or RIC8	ON – OFF
TERM/FLUX	It indicates the status of the thermostat signal	ON – OFF
PRG.RECALL 1	It indicates the status of the recall 1 signal	ON – OFF
PRG.RECALL 2	It indicates the status of the recall 2 signal	ON – OFF
PRG.RECALL 3	It indicates the status of the recall 3 signal	ON – OFF
PRG.RECALL 4	It indicates the status of the recall 4 signal	ON – OFF
INVERTER READY	It indicates the status of the READY signal from the inverter unit	ON – OFF
SAFETY START 1	It indicates the status of the signal of safety start 1	ON – OFF
BIC1 NC-RIC5	It indicates the status of the NC signal of two-hand control button 1 or RIC5	ON – OFF
SAFETY START 2	It indicates the status of the signal of safety start 2	ON – OFF
BIC2 NC-RIC6	It indicates the status of the NC signal of two-hand control button 2 or RIC6	ON – OFF

(When Code 50200 option is present)

RESET DRESS	It indicates the status of the accomplished electrodes dressing signal	ON – OFF
WELD / NO WELD	It indicates the status of the external weld / no weld signal	ON – OFF
RESET ERROR	It indicates the status of the errors clear signal	ON – OFF
RESET ELECTRODE	It indicates the status of the accomplished electrodes change signal	ON – OFF

The input status is represented as enabled (closed input with COM1) by means of the wording ON, while it is represented as disabled by means of the wording OFF.

2.16 – CHECK INPUT – DIAGNOSTIC INVERTER

```
-TE700 VER. 1.09--
 PROGRAM COPY
 DIAGNOSTIC TE700
>DIAGNOSTIC INV.
```

This menu displays the status of the inputs and outputs of the inverter unit connected to the TE700. It is used to check the working efficiency of the inverter unit.

```
  DIAGNOSTIC INV.
>VERSION INV.   2.02
 RIC 1           OFF
 RIC 2           OFF
```

The following inputs are mentioned in the list which may be scrolled by means of the ▲ and ▼ keys.

PARAMETER	PARAMETER DESCRIPTION	VALUE
VERSION INV.	It indicates the software version installed in the inverter.	X.XX
RIC 1	It indicates the status of the signal relative to RIC 1 inside the inverter.	ON – OFF
RIC 2	It indicates the status of the signal relative to RIC 2 inside the inverter.	ON – OFF
RIC 3	It indicates the status of the signal relative to RIC 3 inside the inverter.	ON – OFF
RIC 4	It indicates the status of the signal relative to RIC 4 inside the inverter.	ON – OFF
TERM	It indicates the status of the signal relative to thermostat wired on the inverter.	ON – OFF
DRIVER	It indicates a power semiconductor driver fault.	NO ERR – ERR
EMERGENCY	It indicates the status of the signal relevant to the emergency chain on the inverter.	ON – OFF
WELD NO WELD	It indicates the status of the weld-no weld signal inside the inverter.	ON – OFF
TRIGGER	It indicates the status of the welding start signal inside the inverter.	ON – OFF
RIC 5 / WELD 2	It indicates the status of signal RIC 5 or SEAM WELD. 2 inside the inverter.	ON – OFF
OUT EV WATER	It indicates the status of the inverter output that controls the EV for the cooling circuit water.	ON – OFF
OUT READY	It indicates the status of inverter output for the READY signal transmitted to the TE700 control unit.	ON – OFF
OUT LOCK	It indicates the status of the LOCK output of the inverter.	ON – OFF
OUT WRONG	It indicates the status of the WRONG output of the inverter.	ON – OFF
VER. DRIVER	It indicates the software version installed inside the board that checks for the capacitors' charged condition.	XX.X
CAPACITOR VOLT	It indicates the voltage present on the bank of capacitors inside the inverter. **Warning: this measurement is indicative and should not be used as a reference when operating in the inverter unit.**	000V
BOARD TEMP.	It indicates the room temperature on the inverter unit.	XX.X°C
SINK TEMP.	It indicates the temperature of the dissipater on which the power semiconductors are installed.	XX.X°C
THERMAL LEVEL	It indicates the use percentage of the inverter in case the thermal limit switches tripped relative to the primary of the weld transformer and/or the diodes of the secondary rectifier.	XXX%
SCR DRV STATUS	Alphanumeric code that indicates the operating status of the board that checks for the capacitors' charged condition.	XX
INV. SERIAL	Inverter unit serial number.	XXXXX

2.17 - PROG. SEQUENCE

```
-TE700  VER. 1.13--
 DIAGNOSTIC TE700
 DIAGNOSTIC INV.
>PROG. SEQUENCE
```

This menu includes the parameters required for activating the programs sequences operations. In this working mode the weld control unit commands the welder to perform a series of spots, deciding automatically the work program for each spot and the spots order without having to make an external selection of the program.

```
  PROG. SEQUENCE
>STEP 1 PRG.     003
 STEP 1 WELDS     07
 STEP 2 PRG.     012
```

PROGRAM SEQUENCES MENU PARAMETERS TABLE

PARAMETER	PARAMETER DESCRIPTION	RANGE VALUE
STEP 1 PRG.	Program to be carried out in the step 1	000 – 250
STEP 1 WELDS	Number of spots to be carried out with step 1	01 – 25
STEP 2 PRG.	Program to be carried out in the step 2	001 – 250
STEP 2 WELDS	Number of spots to be carried out with step 2	00 – 25
STEP 3 PRG.	Program to be carried out in the step 3	001 – 250
STEP 3 WELDS	Number of spots to be carried out with step 3	00 – 25
STEP 4 PRG.	Program to be carried out in the step 4	001 – 250
STEP 4 WELDS	Number of spots to be carried out with step 4	00 – 25
STEP 5 PRG.	Program to be carried out in the step 5	001 – 250
STEP 5 WELDS	Number of spots to be carried out with step 5	00 – 25

STEP 1 PRG.
This parameter indicates the number of the program that the welder must carry out, and is coupled with the STEP 1 WELDS parameter.
When this parameter is set to zero, the programs sequence is disabled.

STEP 1 WELDS
The value of this parameter indicates the number of welds to be carried out with the program matched to the same step.

STEP 2 PRG.
This parameter indicates the program number that the welder has to carry out and is always coupled with the STEP 2 WELDS parameter.

STEP 2 WELDS
The value of this parameter indicates the number of welds to be carried out with the program matched to the same step.

STEP 3 PRG.
This parameter indicates the program number that the welder has to carry out and is always coupled with the STEP 3 WELDS parameter.

STEP 3 WELDS
The value of this parameter indicates the number of welds to be carried out with the program matched to the same step.

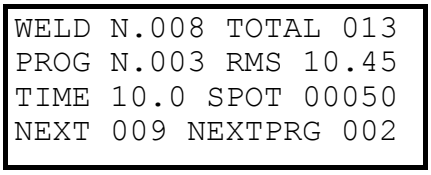
STEP 4 PRG.
This parameter indicates the program number that the welder has to carry out and is always coupled with the STEP 4 WELDS parameter.

STEP 4 WELDS
The value of this parameter indicates the number of welds to be carried out with the program matched to the same step.

STEP 5 PRG.
This parameter indicates the program number that the welder has to carry out and is always coupled with the STEP 5 WELDS parameter.

STEP 5 WELDS
The value of this parameter indicates the number of welds to be carried out with the program matched to the same step.

The weld spots may be carried out after having activated this mode and having set the parameters of the **PROGRAM SEQUENCES** menu as outlined above. Switch the key to WORK position on the display to view the data of the sequences as shown in the figure below.



WELD N.008 TOTAL 013
It indicates the progressive number of the last carried out welding spot and the welding spots total number the sequence is composed of.

PROG. N.003 RMS 10.45
It indicates the program number and the RMS current value of the last welding spot.

TIME 10.0 SPOT 00050
It indicates the welding time of the last carried out program and the spots counter value.

NEXT 009 NEXTPRG 002
It indicates the progressive number of the next spot and the program to be carried out.

SEQUENCE EXAMPLE

Let's take for example the sequence operation after having set the following values in the parameters.

PARAMETER	VALUE
STEP 1 PRG.	03
STEP 1 WELDS	04
STEP 2 PRG.	07
STEP 2 WELDS	02
STEP 3 PRG.	11
STEP 3 WELDS	06
STEP 4 PRG.	04
STEP 4 WELDS	01

At each cycle start signal, a welding spot is carried out with the welding program relevant to the actual step.
In this specific case, as shown by the below scheme, the following welding spots are carried out in sequence:

- 4 welds with program 03
- 2 welds with program 07
- 6 welds with program 11
- 1 weld with program 04

WELD	1	2	3	4	5	6	7	8	9	10	11	12	13
STEPS	1	1	1	1	2	2	3	3	3	3	3	3	4
PROG.	03	03	03	03	07	07	11	11	11	11	11	11	04

This working mode typology is usually applied to a manual welder, where the operator carries the welding spots out always in the same order but with different working parameters. This working mode prevents the operator from manually changing the program and, therefore, from diverting his attention away from the piece to be welded, from changing the foot-pedal or other cycle start device.
However the operator must pay utmost attention during the process not to perform fewer spots than those programmed, overlapping spots or not in the same order.

However, should any error occur in the sequence work mode, it is possible to repeat either the last or another welding spot or to go ahead avoiding certain spots. By always turning the key in RUN position, by means of the ⊞ key it is possible to increase the welding spots counter to the following spot or to the desired one, while, by means of the ⊟ key it is possible to go back of one or more positions along the spots to be carried out.

Display data		Display data after key
PRG 007- -01 ST 002-010 NXTPR 008 WELD 0200 RMS 002.99 SPOT 02300 r 034.4		PRG 008- -01 ST 003-010 NXTPR 009 WELD 0200 RMS 002.99 SPOT 02300 r 034.4
PRG 008- -01 ST 003-010 NXTPR 009 WELD 0200 RMS 002.99 SPOT 02300 r 034.4		PRG 008- -01 ST 002-010 NXTPR 008 WELD 0200 RMS 002.99 SPOT 02300 r 034.4

2.18 – THICKNESS SENSE

The THICKNESS SENSE menu contains the parameters for configuring the linear position sensors. A max number of 4 different linear position sensors may be connected to the TE700 control unit, one for each welding tool or one for each welding transformer. Access to said menu is protected by an access code due to the importance of these parameters.

```
ENTER ACCESS CODE
  FEATURES MENU
  -  -  -  -  -
```

If the operator is not authorized to enter this menu and does not know the access code, the following message is displayed:

```
WRONG CODE
TRY AGAIN !
```

The parameters can be edited only after having typed in the access code.

```
  THICKNESS SENSE
>LINEAR SENSOR   OFF
 LINEAR SENSOR N°  1
 SENSOR1 S/N_P1:0000
```

If the position sensors are activated, they initialize every time the control unit is turned on. If an initialization error occurs it is signalled on the control unit and the sensors are disabled automatically. The operator must then solve the failed initialization problem, enter the THICKNESS SENSE menu and re-enable the position sensors manually.
If multiple position sensors connected to different welding transformers are used, it is essential that when the TE700 control unit is turned on, all the sensors should be connected to the communication bus so as to be initialized correctly.

PARAMETER	PARAMETER DESCRIPTION	RANGE VALUE
LINEAR SENSOR	Activation – deactivation of linear sensors	ON – OFF
LINEAR SENSOR N°	Number of installed linear sensors	1 – 4
SENSOR1 S/N_P1:	Part 1 sensor 1 serial n.	XXXX
SENSOR1 S/N_P2:	Part 2 sensor 1 serial n.	XXXX
SENSOR1 ID CAN:	ID CAN for sensor 1	100 – 119
DELAY ID. S1	Delay for indentation measurement	0 – 1000 mS
SENSOR2 S/N_P1:	Part 1 sensor 2 serial n.	XXXX
SENSOR2 S/N_P2:	Part 2 sensor 2 serial n.	XXXX
SENSOR2 ID CAN:	ID CAN for sensor 2	100 – 119
DELAY ID. S2	Delay for indentation measurement	0 – 1000 mS
SENSOR3 S/N_P1:	Part 1 sensor 3 serial n.	XXXX
SENSOR3 S/N_P2:	Part 2 sensor 3 serial n.	XXXX
SENSOR3 ID CAN:	ID CAN for sensor 3	100 – 119
DELAY ID. S3	Delay for indentation measurement	0 – 1000 mS
SENSOR4 S/N_P1:	Part 1 sensor 4 serial n.	XXXX

PARAMETER	PARAMETER DESCRIPTION	RANGE VALUE
SENSOR4 S/N_P2:	Part 2 sensor 4 serial n.	XXXX
SENSOR4 ID CAN:	ID CAN for sensor 4	100 – 119
DELAY ID. S4	Delay for indentation measurement	0 – 1000 mS

LINEAR SENSOR
It activates or deactivates the use of the linear position sensors. If a sensor initialization error occurs, it automatically commutates to OFF and the error condition is signalled on the TE700 display. Sensor identification parameters are not deleted. The enabling of the position sensors makes available the measurements relevant to the initial thickness of the sheets to be welded and to the electrode penetration at the end of the welding procedure and relevant limits.

LINEAR SENSOR N°
It indicates the number of sensors installed on the machine. If multiple sensors are installed, the choice of which one to use to carry out the measurement depends on the number of the welding tool selected for the currently called weld program. For example, if 3 different welding tools are enabled with 3 associated position sensors and the operator carries out a weld with a program in which tool number 2 was selected, linear sensor number 2 will be used to measure the coordinates.

SENSOR1 S/N_P1:
This parameter contains the first part of the serial number of linear sensor 1. The serial number can be read on the sensor body.

SENSOR1 S/N_P2:
This parameter contains the second part of the serial number of linear sensor 1. The serial number can be read on the sensor body.

SENSOR1 ID CAN:
This parameter allows the setting of the sensor identifier in the CAN network. In order to work efficiently, the sensors present inside the CAN network must have univocal identifiers.

DELAY ID. S1
This parameter specifies the delay, in mS, that the system must wait after having finished the welding current passage in order to measure the coordinate with which to obtain the electrode penetration value during the welding operation.

SENSOR2 S/N_P1:
This parameter contains the first part of the serial number of linear sensor 2. The serial number can be read on the sensor body.

SENSOR2 S/N_P2:
This parameter contains the second part of the serial number of linear sensor 2. The serial number can be read on the sensor body.

SENSOR2 ID CAN:
This parameter allows the setting of the sensor identifier in the CAN network. In order to work efficiently, the sensors present inside the CAN network must have univocal identifiers.

DELAY ID. S2
This parameter specifies the delay, in mS, that the system must wait after having finished the welding current passage in order to measure the coordinate with which to obtain the electrode penetration value during the welding operation.

SENSOR3 S/N_P1:
This parameter contains the first part of the serial number of linear sensor 3. The serial number can be read on the sensor body.

SENSOR3 S/N_P2:
This parameter contains the second part of the serial number of linear sensor 3. The serial number can be read on the sensor body.

SENSOR3 ID CAN:
This parameter allows the setting of the sensor identifier in the CAN network. In order to work efficiently, the sensors present inside the CAN network must have univocal identifiers.

DELAY ID. S3
This parameter specifies the delay, in mS, that the system must wait after having finished the welding current passage in order to measure the coordinate with which to obtain the electrode penetration value during the welding operation.

SENSOR4 S/N_P1:
This parameter contains the first part of the serial number of linear sensor 4. The serial number can be read on the sensor body.

SENSOR4 S/N_P2:
This parameter contains the second part of the serial number of linear sensor 4. The serial number can be read on the sensor body.

SENSOR4 ID CAN:
This parameter allows the setting of the sensor identifier in the CAN network. In order to work efficiently, the sensors present inside the CAN network must have univocal identifiers.

DELAY ID. S4
This parameter specifies the delay, in mS, that the system must wait after having finished the welding current passage in order to measure the coordinate with which to obtain the electrode penetration value during the welding operation.

SETTING THE DELAY PARAMETER ID. SX
During the welding stage which the current passes in, the machine's mechanical structure might vibrate further to the current's electro-dynamic action. The vibration induced by the passage of the current does not stop immediately at the end of the current passage but might require a certain amount of time to stop. Said time depends on the elasticity of the spot welder structure. The execution of a coordinate measurement during this transient might be

altered by the vibrations induced in the structure. As such, a minimum delay must be set, which depends on each structure, to carry out the coordinate measurements in a static type situation.
Proceed as follows to determine the minimum wait time before executing the measurement:

1) **Configure the linear position sensor for use.**
2) **Set the DELAY ID. parameter to zero.**
3) **Set the WELD QUALITY parameter in the SET UP menu equivalent to T-ONLY (THICKNESS).**
4) **Set, in the PROGRAM DATA menu, the QUALITY-T parameter to ZERO in the program used for welding. Carry out a spot in short circuit to zero the coordinate (electrodes without material in between).**
5) **Set, in the PROGRAM DATA menu, the QUALITY-T parameter to IDENT in the program used for welding.**
6) **Carry out a spot in short circuit, observe the penetration measurement supplied on the TE700 control unit display at the end of the welding procedure. If the value remains equal to zero even after several weld spots this means that the set delay is correct.**
7) **If the displayed penetration value does not remain constant on carrying out several welds, return to the THICKNESS SENSE menu and increase the DELAY ID. parameter relevant to the position sensor used.**
8) **Repeat a few weld spots as specified in point 6.**

2.19 – TIP-DRESSINGS

The tip-dressing function is the combination, in just one function, of the current linear stepper function coupled with the restoring of the electrodes original diameter.
The current stepper function allows compensating the electrodes wear which affects the welding quality. When the electrodes diameter increases also the contact section between the electrode and the piece to be welded increases. Consequently, the welding current density (Ampere/mm^2) decreases. In order to compensate this phenomenon, the current adjustment is gradually increased according to the electrodes diameter increase so to keep a constant current density.
The restoring of the electrodes original diameter is an operation which is usually carried out by means of a tool (dresser) allowing restoring the electrodes diameter, which worn out and increased during the production, to its initial working value.
If the same current adjustment is kept all along the electrodes life or if the electrodes diameter is never restored to its optimal value, the last carried out welding spots will have a lower quality than the first ones.
As a rule the electrodes dressing function is used in the presence of an automation that provides an interface between the weld control unit and the dresser.

After it has been set, the current increment is applied to all the welding programs used.

4 different electrode dressing parameterizations are available and each parameterization is associated with one of the four different welding tools available. In this way it is possible to manage the use and dressing of 4 different types of electrodes separately, taking into consideration, for the current increase, only the spots carried out by every single electrode.

This menu allows programming the tip-dressing number to be carried out during the electrodes life.

```
  TIP-DRESSING     T1
>TOOLS N°           1
 DRESSING         OFF
 DRESSING NUMBER   01
```

This function is displayed only if the (optional) expansion board, code 50200, is installed on the control unit.

Before turning on the TE700 control unit with the supplementary expansion board, code 50200, check that the CLEAR ELECTRODES LIFE (Pin 52) input is not active.
Otherwise, the 50200 board is not recognized by the control unit.

The activation of this function inhibits the programming of the **STEPPER** menu**.** If the stepper function is active, a message is displayed requesting the operator to confirm the deactivation of the stepper function for the tool whose electrodes dressing activation is required. The deactivation of the stepper function does not entail the loss of the parameterization set for the stepper function.

The parameters to be programmed for using the tip-dressing function are the following ones:

PARAMETER	PARAMETER DESCRIPTION	VALUE
TOOLS N°	Selection of the tool in which to parameterize the dressing function	1 – 4
DRESSING	Activation of the dressing function	ON – OFF
DRESSING NUMBER	Number of tip-dressing to be carried out	00 - 20
SPOT DRESSING	Number of welding spots per tip-dressing	001 - 999
DRESSING STEPS	Stepper percentage per tip-dressing	01 - 50%
DRESSING ALARM	Notice welding spots number	00 – 40
ELECTROD. ALARM	Pre-alarm electrodes	01 – 40
DRESSING OFFSET	Tip-dressing current compensation	00 – 30%

Each time a value relevant to the tip-dressing is modified, the spots counter is cleared and the tip-dressing is recalculated from the beginning.

TOOLS N°
This parameter permits selecting on which tool number the electrodes dressing function is to be parameterized.

DRESSING
This parameter allows the operator to activate or deactivate the dressing function on the tool specified in the TOOLS N° parameter. Should the stepper function be active in the selected TOOL, a warning is displayed requesting the operator to deactivate the stepper function.

DRESSING NUMBER
This parameter indicates the number of tip-dressing to be carried out on the electrodes before these ones become useless.
If this parameter is set to zero, the tip-dressing is not carried out.

SPOT DRESSING
It indicates the number of welding spots per each tip-dressing. The product of this parameter multiplied by the tip-dressing number (see previous paragraph) indicates the maximum welding spots number the control unit carries out.

DRESSING STEPS
This parameter indicates the current stepper percentage to be achieved at the end of each tip-dressing.

DRESSING ALARM
This parameter indicates the number of warning spots during which the DRESSING ALARM output is enabled, requesting maintenance for the welding electrodes.
If, at the end of the pre-alarm welding spots, the control unit has not received the accomplished tip-dressing signal, it stops and displays the following message:

```
 DRESSING      [165]
 CAPS NEED DRESSING
WARNING ON TOOLS  T1
PUSH [///]  TO RESET
```

In order to restore control unit working efficiency, first of all clear the screen through the DELETE ERRORS input and then activate the electrodes-dressed signal. If more than one weld tool was activated the operator can choose which tool to use to dress the electrodes as follows: if only the external dressing input is activated, to the control unit this means that the electrode is being dressed on the tool used during the last weld carried out. If the dressing is to be carried out on a tool other than the one used during the last weld carried out, the operator uses the RIC1, RIC2 and RIC3 inputs to decide which of the four tools to use to carry out the dressing as outlined in the following table:

RIC1	RIC2	RIC3	FUNCTION
OFF	OFF	OFF	Dressing of the tool used during the last program used.
ON	OFF	OFF	Dressing of the electrodes of tool 1
OFF	ON	OFF	Dressing of the electrodes of tool 2
ON	ON	OFF	Dressing of the electrodes of tool 3
OFF	OFF	ON	Dressing of the electrodes of tool 4

The required recalls configuration must be set before the activation of the dressing signal and must be kept steady for the whole duration of the dressing signal activation.

ELECTROD ALARM

This parameter indicates the number of pre-warning spots during which the ELECTRODES ALARM output is enabled, requesting the replacement of the welding electrodes.
If, at the end of the pre-alarm welding spots, the control unit has not received the signal that indicates that the electrodes were replaced, it stops and displays the following message:

```
 DRESSING      [166]
 END CAPS LIFE
WARNING ON TOOLS  TI
PUSH [///]   O RESET
```

In order to restore control unit working efficiency, first of all clear the screen through the DELETE ERRORS input and then activate the electrodes-replaced signal. If more than one weld tool was activated the operator can choose which tool to use to change the electrodes as follows: if only the external electrodes-replacement input is activated, to the control unit this means that the electrode is being replaced on the tool used during the last weld carried out. If the electrode is to be replaced on a tool other than the one used during the last weld carried out, the operator uses the RIC1, RIC2 and RIC3 inputs to decide which of the four tools to use to replace the electrode as outlined in the following table:

RIC1	RIC2	RIC3	FUNCTION
OFF	OFF	OFF	Dressing of the tool used during the last program used.
ON	OFF	OFF	Dressing of the electrodes of tool 1
OFF	ON	OFF	Dressing of the electrodes of tool 2
ON	ON	OFF	Dressing of the electrodes of tool 3
OFF	OFF	ON	Dressing of the electrodes of tool 4

The required recalls configuration must be set before the activation of the electrodes-change signal and must be kept steady for the whole duration of the electrodes-change signal activation.

DRESSING OFFSET

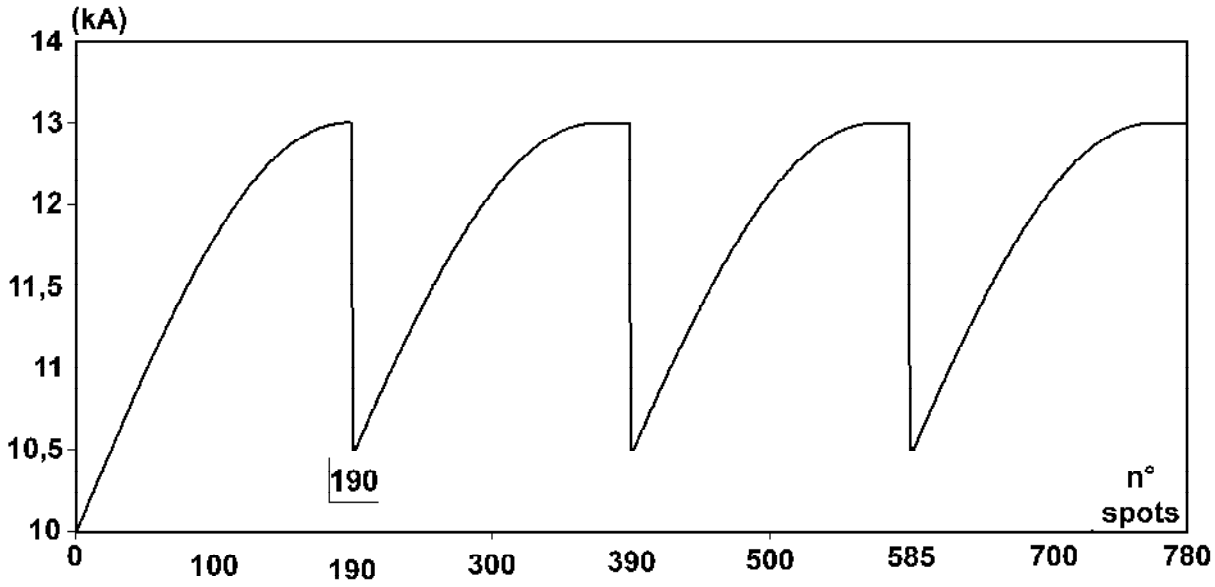
Use this parameter to increase, in percentage, the starting value of the dressings welding current after the first one.

EXAMPLE:

The parameters outlined in the table below were set (with a set work program such as, for example, "WORKING MODE" IK) with an initial current value set to 10KA.

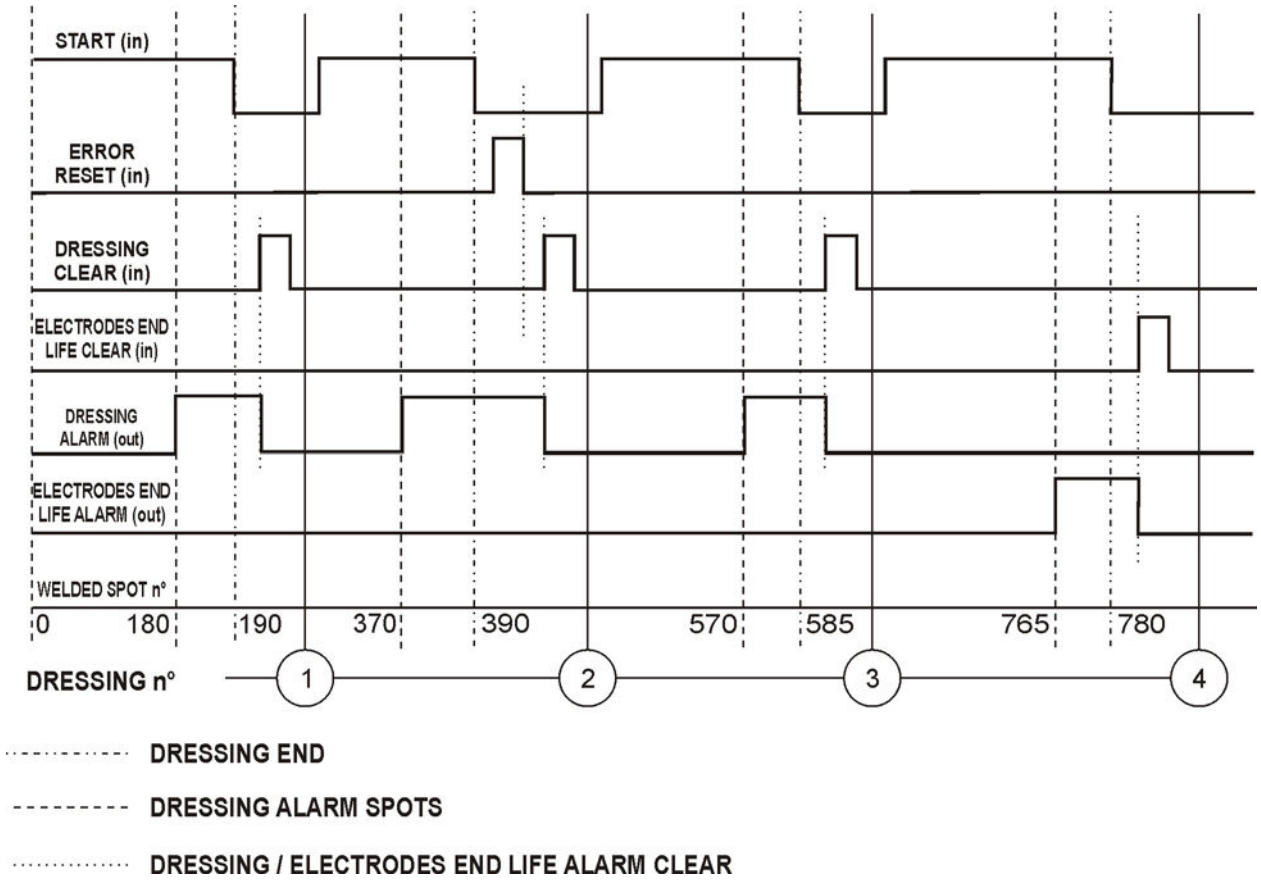
PARAMETER	VALUE
DRESSING NUMBER	3
SPOT DRESSING	200
DRESSING STEPS	30%
DRESSING ALARM	20
ELECTRODES ALARM	20
DRESSING OFFSET	5 %

The chart below shows the pattern of how the current increased during the electrodes dressing run mode.



You may notice that the initial current of the first dressing begins at 10KA whilst a percentage is added to the starting current value of the next dressing (parameter DRESSING OFFSET).

The graph below shows the time and modality of the signals used for this WORKING MODE (with reference to the values outlined in the foregoing table).



From the moment the control unit activates the DRESSING ALARM output it may be reset at any time by activating the DRESSING RESET input as shown in the foregoing graph for dressings 1, 3 and 4.

In the example above, the very last spot of the dressing was reached during DRESSING no. 2 without resetting the DRESSING ALARM. In this case the control unit stops and displays the relevant warning message (ERROR 116). In this case the operator must first delete the screen from the control unit either through the ERROR RESET input or the CLEAR key, and then reset the DRESSING ALARM output.

The same is applicable to clear the ELECTRODES END LIFE ALARM output.

When the ELECTRODES END LIFE CLEAR input signal is activated, the control unit resets the spots counter.

CHAPTER 3 – SEAM WELD OPERATING MODE

```
  FEATURES TE700
 START 1-2NC      OFF
 BIC 1-2 NC       OFF
>SEAM WELD MODE    ON
```

If the seam weld mode is active on setting the mode, the AUTORETAIN function will be automatically deactivated at the START inputs. If the operator does not accept the deactivation of the AUTORETAIN function it will not be possible to activate the seam weld mode.
This function allows the operator to adapt the control unit to the requirements of a seam welder. Consequently, welding current is supplied either continuously or via parameter COLD 2 in pulse mode.
On keeping the cycle-start command active, the control unit keeps repeating the time set in the WELD parameter to prevent the control unit from completing a long weld. time on cutting off the cycle-start command. We suggest using short weld times.
The welding current is measured indifferently through pulse cycle, WELD and COLD T. 2 time combination, or through continuous cycle, WELD time only.
In the seam weld mode, the EV3 output is used as a roller-start command instead of being used for the forging.
On enabling the programming of the WELD 2 parameter, the operator may set not only the CURRENT parameter but also the CURRENT 2 parameter. During the welding operation it is possible to commutate between one set current value and the other using the WELD 2 input present on the INVERTER unit. If the COLD T. 2 parameter is other than zero, each time the two foregoing current values commutate, the COLD T. 2 is carried out. the COLD T. 2 parameter is equal to zero, the passage between two set current values will take place instantly.
If Rogowsky was set in the **FEATURES INVERTER** menu as current sensor for the adjustment loop, the continuous weld cannot be carried out but only a pulsed weld with a COLD T. 2 greater than or equal to 8mS.
If TA was set as current sensor for the adjustment loop, it will be possible to carry out even a continuous weld with COLD T. 2 equal to zero.
According to the type of current adjustment loop, the available weld modes differ as outlined in the tables below.
During the welding in the SEAM WELD mode, the value of the welding current and the conduction percentage of the power semiconductors are displayed in real time on the control unit. Said information is updated every 0.5 seconds both during the hot times and the cold times.

TABLE WITH SEAM WELD OPERATING MODE PARAMETERS – SECONDARY ADJUSTMENT

```
  PROGRAM DATA     T1
>TOOLS N°           1
 WORKING MODE      IK
 CONTROL MODE      NO
```

PARAMETER	**RANGE VALUE**
PROGRAM N.	001 – 300
WORKING MODE	IK
CONTROL MODE *	NO
SQUEEZE 1	0.5 – 99.0 cycles
SQUEEZE	00.0 – 99.0 cycles
PRESSURE	00.5 – 10.0 bar
MOTOR DELAY	05 - 99 cycles
PRE-WELD	0000 – 1000 mS
PRE CURR.	000.30 – 200.00 KA
COLD 1	0000 – 1000 mS
SLOPE UP	0000 – 1000 mS
WELD	0001 – 2000 mS
CURRENT	000.30 – 200.00 KA
COLD 2	0000 – 1000 mS
CURRENT 2	000.30 – 200.00 KA
HOLD TIME	00.5 – 99.0 cycles

CONTROL MODE *	CUR
LIM I MIN	000.30 – 200.00 KA
LIM I MAX	000.30 – 200.00 KA

CONTROL MODE *	RO
LIM RO MIN	005.0 – 100.0%
LIM RO MAX	005.0 – 100.0%

CONTROL MODE *	VE
LIM V MIN	00.20 – 20.00 V
LIM V MAX	00.20 – 20.00 V

CONTROL MODE *	PW
LIM P MIN	000.20 - 600.00 KW
LIM P MAX	000.20 – 600.00 KW

TABLE WITH SEAM WELD OPERATING MODE PARAMETERS – SECONDARY ADJUSTMENT

```
  PROGRAM DATA     T1
>TOOLS N°           1
 WORKING MODE     FIX
 CONTROL MODE      NO
```

PARAMETER	RANGE VALUE
PROGRAM N.	001 – 300
WORKING MODE	FIX
CONTROL MODE *	NO
SQUEEZE 1	0.5 – 99.0 cycles
SQUEEZE	00.0 – 99.0 cycles
PRESSURE	00.5 – 10.0 bar
MOTOR DELAY	05 - 99 cycles
PRE-WELD	0000 – 1000 mS
PRE-RO	005.0 – 100.0 %
COLD 1	0000 – 1000 mS
SLOPE UP	0000 – 1000 mS
WELD	0001 – 2000 mS
RO	005.0 – 100.0 %
COLD 2	0000 – 1000 mS
RO 2	005.0 – 100.0 %
HOLD TIME	00.5 – 99.0 cycles

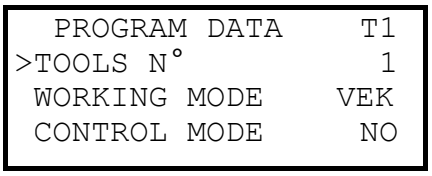
CONTROL MODE *	CUR
LIM I MIN	000.30 – 200.00 KA
LIM I MAX	000.30 – 200.00 KA

CONTROL MODE *	RO
LIM RO MIN	005.0 – 100.0%
LIM RO MAX	005.0 – 100.0%

CONTROL MODE *	VE
LIM V MIN	00.20 – 20.00 V
LIM V MAX	00.20 – 20.00 V

CONTROL MODE *	PW
LIM P MIN	000.20 - 600.00 KW
LIM P MAX	000.20 – 600.00 KW

TABLE WITH SEAM WELD OPERATING MODE PARAMETERS – SECONDARY ADJUSTMENT



PARAMETER	**RANGE VALUE**
PROGRAM N.	001 – 300
WORKING MODE	VEK
CONTROL MODE *	NO
SQUEEZE 1	0.5 – 99.0 cycles
SQUEEZE	00.0 – 99.0 cycles
PRESSURE	00.5 – 10.0 bar
MOTOR DELAY	05 - 99 cycles
PRE-WELD	0000 – 1000 mS
PRE-VE	00.20 – 20.00 V
COLD 1	0000 – 1000 mS
SLOPE UP	0000 – 1000 mS
WELD.	0001 – 2000 mS
VE	00.20 – 20.00 V
CURR. MAX.	001.00 – 200.00 KA
COLD 2	0000 – 1000 mS
VE 2	00.20 – 20.00 V
HOLD TIME	00.5 – 99.0 cycles

CONTROL MODE *	CUR
LIM I MIN	000.30 – 200.00 KA
LIM I MAX	000.30 – 200.00 KA

CONTROL MODE *	RO
LIM RO MIN	005.0 – 100.0%
LIM RO MAX	005.0 – 100.0%

CONTROL MODE *	VE
LIM V MIN	00.20 – 20.00 V
LIM V MAX	00.20 – 20.00 V

CONTROL MODE *	PW
LIM P MIN	000.20 - 600.00 KW
LIM P MAX	000.20 – 600.00 KW

TABLE WITH SEAM WELD OPERATING MODE PARAMETERS – SECONDARY ADJUSTMENT

```
  PROGRAM DATA     T1
>TOOLS N°           1
 WORKING MODE     PWK
 CONTROL MODE      NO
```

PARAMETER	RANGE VALUE
PROGRAM N.	001 – 300
WORKING MODE	PWK
CONTROL MODE *	NO
SQUEEZE 1	0.5 – 99.0 cycles
SQUEEZE	00.0 – 99.0 cycles
PRESSURE	00.5 – 10.0 bar
MOTOR DELAY	05 - 99 cycles
PRE-WELD	0000 – 1000 mS
PRE-POWER	000.20 - 600.00 KW
COLD 1	0000 – 1000 mS
SLOPE UP	0000 – 1000 mS
WELD	0001 – 2000 mS
POWER	000.20 - 600.00 KW
CURR. MAX.	001.00 – 200.00 KA
COLD 2	0000 – 1000 mS
POWER 2	000.20 - 600.00 KW
HOLD TIME	00.5 – 99.0 cycles

CONTROL MODE *	CUR
LIM I MIN	000.30 – 200.00 KA
LIM I MAX	000.30 – 200.00 KA

CONTROL MODE *	RO
LIM RO MIN	005.0 – 100.0%
LIM RO MAX	005.0 – 100.0%

CONTROL MODE *	VE
LIM V MIN	00.20 – 20.00 V
LIM V MAX	00.20 – 20.00 V

CONTROL MODE *	PW
LIM P MIN	000.20 - 600.00 KW
LIM P MAX	000.20 – 600.00 KW

TABLE WITH SEAM WELD OPERATING MODE PARAMETERS – PRIMARY ADJUSTMENT

```
  PROGRAM DATA     T1
>TOOLS N°           1
 WORKING MODE      IK
 CONTROL MODE      NO
```

PARAMETER	**RANGE VALUE**
PROGRAM N.	001 – 300
WORKING MODE	IK
CONTROL MODE *	NO
SQUEEZE 1	0.5 – 99.0 cycles
SQUEEZE	00.0 – 99.0 cycles
PRESSURE	00.5 – 10.0 bar
MOTOR DELAY	05 - 99 cycles
PRE-WELD	0000 – 1000 mS
PRE-CURR.	000.30 – 200.00 KA
COLD 1	0000 – 1000 mS
SLOPE UP	0000 – 1000 mS
WELD	0001 – 2000 mS
CURRENT	000.30 – 200.00 KA
COLD 2	0000 – 1000 mS
CURRENT 2	000.30 – 200.00 KA
HOLD TIME	00.5 – 99.0 cycles

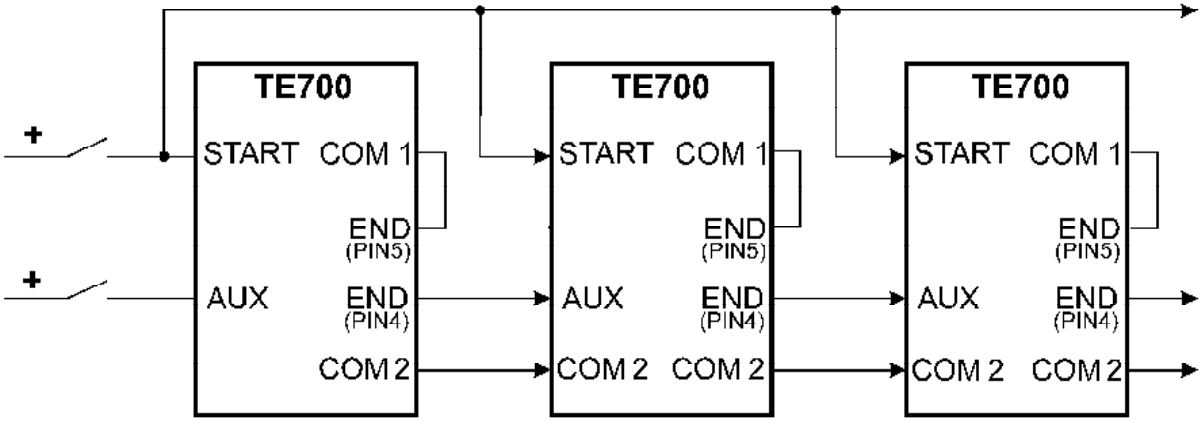
CHAPTER 4 – CASCADE OPERATING MODE

```
  FEATURES TE700
 BIC 1-2 NC       OFF
 SEAM WELD MODE   OFF
>CASCADE MODE      ON
```

This function allows the cycle-end signal to be normally closed instead of normally open. As such, multiple TE700 control units may work in electrical cascade mode.

When two or more control units are connected to one another, the signals used to synchronize control units and carry out electrical cascade welds are as follows:
- START CYCLE input
- AUX input
- CYCLE END output

All the TE700 control units receive the cycle start signal simultaneously. Connect the CYCLE END signal to the AUX input of the next control unit. It is advisable to program parameter CASCADE MODE, of the last control unit, to OFF in order to use the CYCLE END signal with the normally open contact

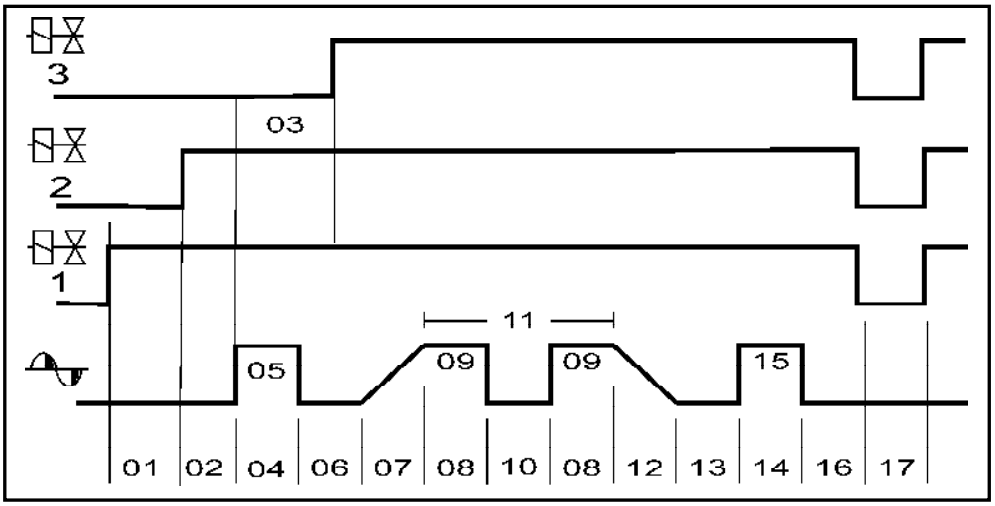


The cascade WORKING MODE excludes the possibility of using the control unit in SEAM WELD MODE.

CHAPTER 5 – DESCRIPTION OF THE WORK CYCLE

The work cycle carried out by the TE700 is described by adjusting the programming parameters. These parameters describe operating times and current adjustments that make up the work cycle when run in sequence.

The following chart shows the sequence in which the programmed functions are carried out.



The numbers below refer to the following types of parameters:

01	SQUEEZE 1 (EV1)	**10**	COLD 2
02	SQUEEZE (EV2) *	**11**	IMPULSE N.
03	FORGE DELAY (EV3) *	**12**	SLOPE DOWN *
04	PRE-WELD *	**13**	COLD 3 *
05	PRE-POWER *	**14**	POST-WELD. *
06	COLD 1 *	**15**	POST-POWER *
07	SLOPE UP	**16**	HOLD TIME
08	WELD	**17**	OFF TIME
09	POWER / CURRENT		

Parameters marked by symbol * may either be enabled or disabled depending on which welder is used and the job it must perform.

For safety reasons, the microprocessor does not start the weld cycle if the cycle start signal is activated on turning-on the welder. Therefore simply release the control and then activate it again. Micro-cutoffs or excessive voltage drops do not alter the WORKING MODE but just stop the control unit. Just turn off the machine and then turn it on again to restore operations.

CHAPTER 6 - STOP BAD SPOTS

The machine may be stopped when a consecutive series of welds fall out of the regulated limits. The number of consecutive welds that cause the control unit to stop is adjusted through parameter STOP BAD SPOTS in the **SETUP MENU** (for the programming directions, see the relevant paragraph).

```
  SETUP MENU
>STOP BAD SPOT T1 01
 STOP BAD SPOT T2 00
 STOP BAD SPOT T3 00
```

This value may range from 0 to 15. On programming the value to 0, the function is disabled. As such, on exceeding the preset limits, this does not stop the welder. There are four STOP SPOTS parameters, one for each available welding tool, so as to be able to differentiate the max number of admissible out of limits spots for each tool used.

It must be pointed out that in order to count the out of limits welds, they must be consecutive, one after the other. This is applicable to each tool used.

In addition to activating the function in the **SETUP MENU**, the operator must enable the CONTROL MODE parameter relevant to the current limits in the **PROGRAM DATA** menu.

```
 PROGRAM DATA      T1
 TOOLS N°           1
 WORKING MODE      IK
>CONTROL MODE     CUR
```

These parameters allow the operator to keep the consistency of the welding current under control to help achieve constant quality results.
The control unit enables to select two different control modes:

Welding current limits

This mode is activated by setting parameter CONTROL MODE to CUR.
Two new parameters will be displayed:
LIM I MIN lower current limit
LIM I MAX upper current limit
These two parameters enable to set the welding current limit-values.

```
  PROGRAM DATA     T1
 TOOLS N°           1
 WORKING MODE      IK
>CONTROL MODE     CUR
```

```
  PROGRAM DATA     T1
>PAUSE              00
 LIM I MIN    010.0kA
 LIM I MAX    015.0kA
```

When the programmed condition occurs, the control unit stops and an error message is displayed. The displayed message refers to the error condition of the last run weld. In current control mode (CONTROL MODE = CUR), if the current value of the last weld is lower or higher than the values set in the foregoing parameters, one of the following messages is displayed:

```
STOP BAD SPOT MAX T1
 WELD CURRENT [201]
 LIMIT LOW
```

```
STOP BAD SPOT MAX T1
 WELD CURRENT [202]
 LIMIT HIGH
```

```
 PUSH [///] TO RESET
```

```
 PUSH [///] TO RESET
```

Inverter use percentage limits

Activate this mode by setting the CONTROL MODE parameter to RO.
Two new parameters will be displayed:
LIM RO MIN lower limit of the power semiconductors conduction percentage.
LIM RO MAX upper limit of the power semiconductors conduction percentage.
that permit setting limit values on the conduction percentage of the power semiconductors.

```
  PROGRAM DATA    T1
 TOOLS N°          1
 WORKING MODE     IK
>CONTROL MODE     RO
```

```
  PROGRAM DATA    T1
>PAUSE            00
 LIM RO MIN   006.0%
 LIM RO MAX   020.0%
```

In conduction percentage control mode (CONTROL MODE = RO), if the value of the conduction percentage of the last weld is higher or lower than the values set in the foregoing parameters, one of the following messages is displayed:

```
STOP BAD SPOT MAX T1
RO              [203]
LIMIT LOW
 PUSH [///]  TO RESET
```

```
STOP BAD SPOT MAX T1
RO              [204]
LIMIT HIGH
PUSH [///]  TO RESET
```

Limits on secondary voltage

Activate this mode by setting the CONTROL MODE parameter to VE.
Two new parameters will be displayed:
LIM V MIN lower limit on the secondary voltage
LIM V MAX upper limit on the secondary voltage
that permit setting limit values on the secondary voltage during the welding operation

```
  PROGRAM DATA    T1
 TOOLS N°          1
 WORKING MODE     IK
>CONTROL MODE     VE
```

```
  PROGRAM DATA    T1
>PAUSE            00
 LIM V MIN    00.50V
 LIM V MAX    01.20V
```

In secondary voltage control mode (CONTROL MODE = VE), if the value of the secondary voltage is higher or lower than the values set in the foregoing parameters, one of the following messages is displayed:

```
STOP BAD SPOT MAX T1
SECONDARY VE   [205]
LIMIT LOW
 PUSH [///]  TO RESET
```

```
STOP BAD SPOT MAX T1
SECONDARY VE   [206]
LIMIT HIGH
PUSH [///]  TO RESET
```

Power limits

Activate this mode by setting the CONTROL MODE parameter to PW.
Two new parameters will be displayed:
LIM P MIN lower limit on the power supplied during the welding operation
LIM P MAX upper limit on the power supplied during the welding operation
that permit setting limit values on the power supplied during the welding operation.

```
  PROGRAM DATA    T1
 TOOLS N°          1
 WORKING MODE     IK
>CONTROL MODE     PW
```

```
  PROGRAM DATA    T1
>PAUSE            00
 LIM P MIN  010.00KW
 LIM P MAX  020.25KW
```

In power control mode (CONTROL MODE = PW), if the value of the power is higher or lower than the values set in the foregoing parameters, one of the following messages is displayed:

```
STOP BAD SPOT MAX T1
POWER          [207]
LIMIT LOW
 PUSH [///]  TO RESET
```

```
STOP BAD SPOT MAX T1
POWER          [208]
LIMIT HIGH
PUSH [///]  TO RESET
```

Energy limits

Activate this mode by setting the CONTROL MODE parameter to ENE.
Two new parameters will be displayed:
LIM E MIN lower limit of the energy supplied during the welding operation
LIM E MAX upper limit of the energy supplied during the welding operation
that permit setting limit values on the energy supplied during the welding operation.

```
  PROGRAM DATA    T1
 TOOLS N°          1
 WORKING MODE     IK
>CONTROL MODE    ENE
```

```
  PROGRAM DATA   T1
>PAUSE           00
 LIM E MIN   01000J
 LIM E MAX   02000J
```

In control mode of the energy (CONTROL MODE = ENE), if the value of the energy is higher or lower than the values set in the foregoing parameters, one of the following messages is displayed:

```
STOP BAD SPOT MAX T1
ENERGY         [209]
LIMIT LOW
 PUSH [///]  TO RESET
```

```
STOP BAD SPOT MAX T1
ENERGY         [210]
LIMIT HIGH
PUSH [///]  TO RESET
```

Limits on electrode penetration

Activate this mode by setting the QUALITY-T parameter to IDENT or TH+ID.
Two new parameters will be displayed:
IDENT. MIN lower limit of the electrode penetration at the end of the welding.
IDENT. MAX upper limit of the electrode penetration at the end of the welding.
that permit setting electrode penetration limit values at the end of the welding procedure.

```
  PROGRAM DATA    T1
 WORKING MODE     IK
 CONTROL MODE     NO
>QUALITY-T     IDENT
```

```
  PROGRAM DATA    T1
>PAUSE           00
 IDENT. MIN  1.000mm
 IDENT. MAX  1.500mm
```

In electrode penetration control mode (QUALITY-T = IDENT or TH+ID), if the value of the penetration is higher or lower than the values set in the foregoing parameters, one of the following messages is displayed:

```
STOP BAD SPOT MAX T1
DISPLACEMENT   [211]
LIMIT LOW
 PUSH [///]  TO RESET
```

```
STOP BAD SPOT MAX T1
DISPLACEMENT   [212]
LIMIT HIGH
PUSH [///]  TO RESET
```

Limits on final resistance of material

Activate this mode by setting the QUALITY-R parameter to POST or PRE+POST.
Two new parameters will be displayed:
RMIN POST lower limit of the resistance at the end of the welding procedure.
RMAX POST upper limit of the resistance at the end of the welding procedure.
that permit setting resistance limit values at the end of the welding procedure.

```
  PROGRAM DATA    T1
 WORKING MODE     IK
 CONTROL MODE     NO
>QUALITY-R      POST
```

```
  PROGRAM DATA    T1
>PAUSE           00
 RMIN POST 00100uOhm
 RMAX POST 00200uOhm
```

In final resistance control mode (QUALITY-R = POST or PRE+POST), if the value of the resistance is higher or lower than the values set in the foregoing parameters, one of the following messages is displayed:

```
STOP BAD SPOT MAX T1
RESISTANCE     [213]
LIMIT LOW
 PUSH [///]  TO RESET
```

```
STOP BAD SPOT MAX T1
RESISTANCE     [214]
LIMIT HIGH
PUSH [///]  TO RESET
```

The operator may set the following limits simultaneously: a limit on the electrical parameters of the weld (current, voltage, RO, power, energy), the limits on the final resistance of the welded material (if the spot welder has the electrodes voltage gauge) and the limits on the electrode penetration at the end of the welding procedure (if the spot welder has the linear sensor for measuring penetration). All the foregoing settable limits are linked to the STOP SPOTS parameter. If the parameter equals zero even in the presence of out of limits welds, the spot welder keeps working but if the parameter is other than zero, the spot welder stops on reaching the set number of the out of limits welds and indicates the out of limits condition on the display. If multiple limit conditions occur, they all contribute cumulatively to the attainment of the number of out of limits spots provided that the out of limits spots occur in sequence; in this case that which is displayed on reaching the max number of out of limits spots refers to the last quantity that did not fall within the set limits.

The following limits may be activated simultaneously with the aforementioned limits. Specifically, the limit on the initial resistance of the material to be welded can be activated only if the spot welder has the electrodes voltage gauge and the limit on the initial thickness of the material to be welded can be activated only if the linear position sensor is installed on the

spot welder. On the other hand, as concerns the aforementioned limits the operator may define, through the STOP SPOTS parameter, if the spot welder should keep working or stop when the out of limits condition occurs. In this case the control unit stops and signals the out of limits condition when the event occurs the first time because a faulty condition is detected either in the material that is in between the electrodes, or because the thickness is different from specifications or because the electrical resistance is too high, etc. Carrying out the weld in these cases could damage the piece or trigger a rejection. This is why the weld is not carried out and the fault condition is signalled at once.

Limits on initial resistance of material

Activate this mode by setting the QUALITY-R parameter to PRE or PRE+POST.
Two new parameters will be displayed:
RMIN PRE lower limit of the resistance at the beginning of the welding.
RMAX PRE upper limit of the resistance at the beginning of the welding.
that permit setting limit values of the resistance at the beginning of the welding.

```
  PROGRAM DATA     T1
 WORKING MODE      IK
 CONTROL MODE      NO
>QUALITY-R        PRE
```

```
  PROGRAM DATA     T1
>PAUSE             00
 RMIN PRE   00100uOhm
 RMAX PRE   00200uOhm
```

In initial resistance control mode (QUALITY-R = PRE or PRE+POST), if the value of the resistance is higher or lower than the values set in the foregoing parameters, one of the following messages is displayed:

```
MATERIAL RES   [179]
UNDER MIN VALUE
WARNING ON TOOLS  T1
 PUSH [///]  TO RESET
```

```
MATERIAL RES   [180]
OVER MAX VALUE
WARNING ON TOOLS  T1
PUSH [///]  TO RESET
```

Limits on initial thickness of material

Activate this mode by setting the QUALITY-T parameter to THICK or TH+ID.
Two new parameters will be displayed:
THICK MIN lower limit of the initial thickness of the material.
THICK MAX upper limit of the initial thickness of the material.
that permit setting limit values of the thickness of the material at the beginning of the welding.

```
  PROGRAM DATA     T1
 WORKING MODE      IK
 CONTROL MODE      NO
>QUALITY-T      THICK
```

```
  PROGRAM DATA     T1
>PAUSE             00
 THICK MIN    02.00mm
 THICK MAX    02.25mm
```

In initial thickness control mode (QUALITY-T = THICK or TH+ID), if the value of the initial thickness is higher or lower than the values set in the foregoing parameters, one of the following messages is displayed:

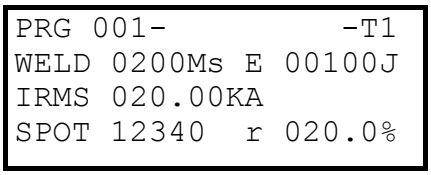
```
THICKNESS      [175]
UNDER LOW LIMIT
WARNING ON TOOLS  T1
 PUSH [///]  TO RESET
```

```
THICKNESS     [176]
OVER HIGH LIMIT
WARNING ON TOOLS T1
PUSH [///] TO RESET
```

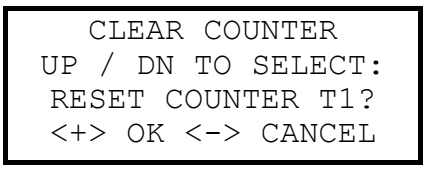
CHAPTER 7 – WELDS COUNTER FUNCTION

The control unit is fitted with the same number of weld counters as the number of selected transformers or welding tools. As such, the operator can count the spots carried out with each welding head or with each different tool so as to manage the consumption of the electrodes and the current increases according to the spots carried out in actual fact by each electrode. During the process, the display shows the counter of the spots carried out by the transformer or tool associated with the last weld program used. The counters increase at each weld cycle carried out by the tool associated with the counter. The weld cycles carried out in NO WELD mode are not counted.

The welds counter may be cleared when the control unit is in work configuration.



Reset by pressing the CLEAR key on the TE700 control unit front panel. In this case the following message is displayed:



If only one welding transformer or tool was selected, then only the T1 counter can be reset. Press key <+> to reset the counter or key <-> to leave the counter value as it is.
If a number higher than one was selected for the welding transformers or tools, use keys ▲ and ▼ in the foregoing screen either to choose which counter to reset or reset all the counters of the spots associated with the tools used. If more than one tool was used, press the CLEAR key to view the request for resetting the counter associated with the last tool used. Press key <+> to reset the selected counter or all the counters. Press key <-> to leave the counters value as it is and return to the work screen.

The spots counters may also be reset through the external control line only if optional board code 50200 is installed. In this case the activation of the signal to change the electrodes resets the spots counter. If only one spots counter is available it will reset automatically but if multiple counters were activated, which counter is to be reset is selected with recall lines RIC1, RIC2 and RIC3 according to the following table.

RIC 1	RIC 2	RIC 3	FUNCTION
OFF	OFF	OFF	The counter associated with the last weld program used is reset.
ON	OFF	OFF	Counter number 1 is reset
OFF	ON	OFF	Counter number 2 is reset
ON	ON	OFF	Counter number 3 is reset
OFF	OFF	ON	Counter number 4 is reset
ON	OFF	ON	All 4 counters are reset.

Recalls must be activated before the signal to change the electrodes energizes and must be kept steady until the signal to change the electrodes de-energizes.

The max number of welds to be carried out is adjusted by adhering to the same procedure described for the stepper function. Since there is one stepper module for each spots counter, the operator may define for each available tool or welding head after how many spots the control unit must prevent the selected tool from carrying out any more welds.
For example, if the operator wants the control unit to carry out 2840 welds with tool 1 and then stop, he/she must set the following parameters in the **STEPPER MENU**:

```
  STEPPER MENU     T1
>TOOLS N°           1
 STEPPER WELD   ON L1
 STEPPER TIME     OFF
```

PARAMETER	PARAMETER DESCRIPTION	VALUE
TOOLS N°	Number of the tool in which a limit is to be set	1
STEPPER WELD	Stepper function activation with increase of 0	ON L1
STEPPER TIME		OFF
STEPPER THICK.		OFF
N.TOTAL STEPS		1
SPOTS 1	Number of spots after which the unit must stop	02840
INCREMENT 1-L1		00%
INCREMENT 1-L2		00%

Further information about the parameters is supplied in the **STEPPER** function paragraph.
When the counter reaches the set welds number, the control unit displays the following message:

```
 STOP             [167]
 N SPOT MAX
 WARNING ON TOOLS  T1
 PUSH [///]  TO RESET
```

and will not permit carrying out any other welds until the counter is cleared.

If the STEPPER WELD parameter is set to OFF, the stop function is disabled.

CHAPTER 8 – DESCRIPTION OF INTERFACE OUTPUTS

8.1 – WELD ERROR (WRONG)

The WRONG signal identifies a wrong weld which is out of the limits set conforming to the table shown below.

The output, which is an opto-electronic contact, closes at the beginning of the hold time and remains closed until the end of the hold time (if the cycle start signal had already been deactivated), as long as the start button is held down or, if present, until the end of the pause time.

When an error message appears on the control unit, the wrong remains high until the error is cleared from the display through the CLEAR key or through the ERROR RESET input (when the additional board 50200 is present).

WRONG SIGNAL ACTIVATION TABLE

WORKING MODE -► / CONTROL MODE ▼	IK / FIX / RO / VEK / PWK / DYN	ENE
NO	/	• Min time • Max time
CUR	• Minimum current limit • Maximum current limit	• Min time • Max time • Minimum current limit • Maximum current limit
RO	• Minimum conduction limit • Maximum conduction limit	• Min time • Max time • Minimum conduction limit • Maximum conduction limit
VE	• Minimum secondary voltage limit • Maximum secondary voltage limit	• Min time • Max time • Minimum secondary voltage limit • Maximum secondary voltage limit
PW	• Minimum power limit • Maximum power limit	• Min time • Max time • Minimum power limit • Maximum power limit
ENE	• Minimum supplied energy limit • Maximum supplied energy limit	/
QUALITY-T ▼		
THICK	• Minimum material initial thickness limit • Maximum material initial thickness limit	• Min time • Max time • Minimum material initial thickness limit • Maximum material initial thickness limit
IDENT	• Minimum final indentation limit • Maximum final indentation limit	• Min time • Max time • Minimum final indentation limit

		• Maximum final indentation limit
QUALITY-R ▼		
PRE	• Minimum resistance initial value limit • Maximum resistance initial value limit	• Min time • Max time • Minimum resistance initial value limit • Maximum resistance initial value limit
POST	• Minimum resistance final value limit • Maximum resistance final value limit	• Min time • Max time • Minimum resistance final value limit • Maximum resistance final value limit

8.2 - END CYCLE

The END CYCLE signal indicates the end of the weld cycle. The output, which is an opto-electronic contact, closes at the end of the hold time and may last according to the following possibilities:

1. active until the cycle-start signal is present
2. active for 40 ms, if the cycle-start signal has already been deactivated
3. active for the entire OFF TIME if programmed to other than zero
4. active until any message or signal is deleted from the display

8.3 - LOCK

The LOCK signal indicates current activation during the weld cycle. The output, which is an opto-electronic contact, closes at the beginning of the weld. time. It may also be the pre-weld. or the rise of current, the duration of which entails all weld. times and all the active current rising and dropping times.

CHAPTER 9 – SELECTING THE WORK PROGRAM THROUGH EXTERNAL RECALLS

The following table shows which inputs should be activated in order to call the work program directly. The selection is made through five inputs that are duly activated in the combinations outlined below.

PROG. N.	RIC1	RIC2	RIC3	RIC4	RIC5	RIC6	RIC7	RIC8
1	•							
2		•						
3	•	•						
4			•					
5	•		•					
6		•	•					
7	•	•	•					
8				•				
9	•			•				
10		•		•				
11	•	•		•				
12			•	•				
13	•		•	•				
14		•	•	•				
15	•	•	•	•				
16					•			
17	•				•			
18		•			•			
19	•	•			•			
20			•		•			
21	•		•		•			
22		•	•		•			
23	•	•	•		•			
24				•	•			
25	•			•	•			
26		•		•	•			
27	•	•		•	•			
28			•	•	•			
29	•		•	•	•			
30		•	•	•	•			
31	•	•	•	•	•			
32						•		
33	•					•		
34		•				•		
35	•	•				•		
36			•			•		
37	•		•			•		
38		•	•			•		
39	•	•	•			•		
40				•		•		
41	•			•		•		
42		•		•		•		
43	•	•		•		•		
44			•	•		•		
45	•		•	•		•		
46		•	•	•		•		
47	•	•	•	•		•		
48					•	•		
49	•				•	•		
50		•			•	•		
51	•	•			•	•		
52			•		•	•		
53	•		•		•	•		
54		•	•		•	•		
55	•	•	•		•	•		
56				•	•	•		
57	•			•	•	•		
58		•		•	•	•		
59	•	•		•	•	•		
60			•	•	•	•		
61	•		•	•	•	•		
62		•	•	•	•	•		

63	•	•	•	•	•	•		
64							•	
65	•						•	
66		•					•	
67	•	•					•	
68			•				•	
69	•		•				•	
70		•	•				•	
71	•	•	•				•	
72				•			•	
73	•			•			•	
74		•		•			•	
75	•	•		•			•	
76			•	•			•	
77	•		•	•			•	
78		•	•	•			•	
79	•	•	•	•			•	
80					•		•	
81	•				•		•	
82		•			•		•	
83	•	•			•		•	
84			•		•		•	
85	•		•		•		•	
86		•	•		•		•	
87	•	•	•		•		•	
88				•	•		•	
89	•			•	•		•	
90		•		•	•		•	
91	•	•		•	•		•	
92			•	•	•		•	
93	•		•	•	•		•	
94		•	•	•	•		•	
95	•	•	•	•	•		•	
86						•	•	
97	•					•	•	
98		•				•	•	
99	•	•				•	•	
100			•			•	•	
101	•		•			•	•	
102		•	•			•	•	
103	•	•	•			•	•	
104				•		•	•	
105	•			•		•	•	
106		•		•		•	•	
107	•	•		•		•	•	
108			•	•		•	•	
109	•		•	•		•	•	
110		•	•	•		•	•	
111	•	•	•	•		•	•	
112					•	•	•	
113	•				•	•	•	
114		•			•	•	•	
115	•	•			•	•	•	
116			•		•	•	•	
117	•		•		•	•	•	
118		•	•		•	•	•	
119	•	•	•		•	•	•	
120				•	•	•	•	
121	•			•	•	•	•	
122		•		•	•	•	•	
123	•	•		•	•	•	•	
124			•	•	•	•	•	
125	•		•	•	•	•	•	
126		•	•	•	•	•	•	
127	•	•	•	•	•	•	•	
128								•
129	•							•
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131	•	•						•
132			•					•
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171	•	•		•		•		•
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174		•	•	•		•		•
175	•	•	•	•		•		•
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183	•	•	•		•	•		•
184				•	•	•		•
185	•			•	•	•		•
186		•		•	•	•		•
187	•	•		•	•	•		•
188			•	•	•	•		•
189	•		•	•	•	•		•
190		•	•	•	•	•		•
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235	•	•		•		•	•	•
236			•	•		•	•	•
237	•		•	•		•	•	•
238		•	•	•		•	•	•
239	•	•	•	•		•	•	•
240					•	•	•	•
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242		•			•	•	•	•
243	•	•			•	•	•	•
244			•		•	•	•	•
245	•		•		•	•	•	•
246		•	•		•	•	•	•
247	•	•	•		•	•	•	•
248				•	•	•	•	•
249	•			•	•	•	•	•
250		•		•	•	•	•	•
251	•	•		•	•	•	•	•
252			•	•	•	•	•	•
253	•		•	•	•	•	•	•
254		•	•	•	•	•	•	•
255	•	•	•	•	•	•	•	•

• = input active

The operator may choose among 255 programs, when using inputs RIC5, RIC6, RIC7 and RIC8, but just 15 if using inputs RIC1, RIC2, RIC3 and RIC4 only.
Inputs RIC5, RIC6, RIC7 and RIC8 may be activated via the **FEATURES TE700** menu as recalls (see the specific paragraph).

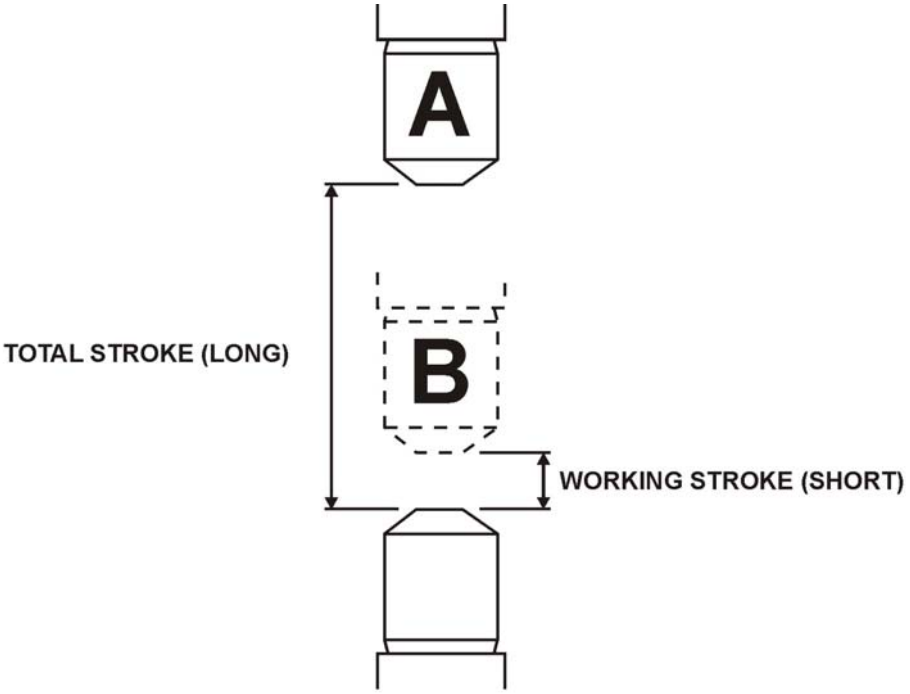
To properly recall the welding programs, either activate the direct recall inputs before the start cycle signal or simultaneously.

CHAPTER 10 – DOUBLE STROKE FUNCTION

In addition to the 3 solenoid valves that are part of the work cycle, the control unit manages a fourth solenoid valve aside from the work cycle to command the double stroke, which is also called the approach stroke.

The input (D.STROKE) enables the output of solenoid valve EV4, to control the DOUBLE STROKE, and keeps it enabled separately from the work cycle; the output remains enabled even when the WORK - PROGRAM key is switched to PROGRAM position.

On turning on the machine, with input (D STROKE) active, the output is disabled. In this case, during the first welding the control unit activates solenoid valve EV4 (that switches the electrode from position "A" to position "B") before the work cycle begins. Then the programmed welding cycle is carried out, on the elapsing of a fixed time of 0.6 seconds. When the cycle is over, solenoid valve EV4 does not deactivate and the electrode remains in position "B" as shown in the figure below.



A - MOVABLE ELECTRODE POSITION WHEN THE DOUBLE STROKE IS DISABLED (LONG
B - MOVABLE ELECTRODE POSITION WHEN THE DOUBLE STROKE IS ACTIVATED (SHO

Later on, by keeping the input activated (D.STROKE), the work cycles will be carried out starting from position B.

In order to disable the EV4 double stroke output, simply deactivate the input (D.STROKE); the output will be disabled at the end of the cycle only if the input is deactivated during the weld cycle.

If the input is enabled during the weld cycle, the output will be enabled only on issuing the next cycle-start command.

CHAPTER 11 – OPTIONS

11.1 - RS-232 SERIAL INTERFACE

The RS-232 serial expansion board, code 50214, permits the operator to connect the TE700 to a printer or a personal computer which must be fitted with a RS232 serial interface board, to document production data. The board interfaces with the control unit through a 6-pin connector and with the printer (or computer) through a standard female 9-pin connector. The 9-pin connector is wired as follows:

PIN 2	TRANSMISSION (TD)
PIN 3	RECEPTION (RD)
PIN 4	DTR (ALWAYS ON)
PIN 5	MASS (SIGNAL GROUND)
PIN 6	DSR (ALWAYS ON)
PIN 7	RTS
PIN 8	CTS

For the connection with a 9-pin port of a PC, simply use a standard modem cable, that is to say do not cross wires 2 and 3.
On connecting the control unit to a serial printer with a 25-pin connector, keep in mind that the serial ports of the printers have the following pin configuration:

PIN1	GROUND (FRAME GROUND)
PIN2	TRANSMISSION (TD)
PIN3	RECEPTION (RD)
PIN 4	TRANSMISSION REQUEST (RTS)
PIN 5	READY TO SEND (CTS)
PIN 6	DATA READY (DSR)
PIN 7	MASS (SIGNAL GROUND)
PIN 20	TERMINAL READY (DTR)

The control unit does not perform any type of handshaking at the serial port. The printer's serial port must be configured with the following values:

SPEED	9600 BAUD
WORD LENGTH	7 BIT
PARITY	EVEN
STOP BIT	1

The control unit runs the transmission at the beginning of the OFF TIME. It is important to point out that the time required to print data is approximately 20 ms and this time will be added to the set OFF TIME.

A specific parameter, in the special functions menu, allows the operator to choose whether or not to activate the print. The following data is printed for each weld:

- Welding program number.
- Tool or welding head which the weld spot was carried out with.
- Duration of the welding in mS.
- Welding current in KA.
- Conduction percentage of the RO power semiconductors.
- Energy supplied during the welding operation (only if the electrodes voltage gauge is installed on the machine).

- Progressive spot number
- Out-of-limit spot signal

The control unit prints the heading and the value of the parameters of the selected program, when turned on and each time the key selector is switched from PROGRAM to RUN position.

Data print example during the weld in WORKING MODE = IK:

```
WELD CONTROL UNIT TE700 REV.1.09
PROG TOOL WELD CURRENT RO  ENERGY SPOTS LIMIT
 001  1 0200 002.99 034.6 00741 00004 -------
 001  1 0200 002.99 034.7 00741 00005 -------
 001  1 0200 002.99 034.9 00747 00006 -------
 001  1 0200 002.99 034.9 00749 00007 -------
 001  1 0200 002.99 035.0 00756 00008 -------
 001  1 0200 002.99 035.0 00761 00009 -------
```

Data print example during the weld in CONTROL MODE = CUR:

```
WELD CONTROL UNIT TE700 REV.1.13
PROG TOOL WELD CURRENT RO  ENERGY SPOTS LIMIT
 001  1 0200 002.99 034.6 00741 00004 CUR OK
 001  1 0200 002.99 034.7 00741 00005 CUR MIN(Current lower than MIN limit)
 001  1 0200 002.99 034.9 00747 00006 CUR MAX(Current higher than MAX limit)
 001  1 0200 002.99 034.9 00749 00007 CUR OK
 001  1 0200 002.99 035.0 00756 00008 CUR OK
 001  1 0200 002.99 035.0 00761 00009 CUR OK
```

Print example of the work program parameters values:

WELD CONTROL UNIT TE700 REV.1.13
PROGRAM N. 001
PRG. NAME
N0 WELD TOOL 1
WORKING MODE IK
CONTROL MODE CUR
SQUEEZE1 01.0~
PRE-WELD 0000mS
PRE CURR 000.30kA
COLD T. 1 0000mS
CURR. SLOPE UP 0000mS
WELD 0200mS
CURRENT 003.00kA
COLD T. 2 0400mS
IMPULSE N. 2
WELD 2 0000mS
CURRENT 2 000.30kA
HOLD 01.0~
PAUSE 00.0~
LIM I MIN 000.31kA
LIM I MAX 004.42kA

11.2 - INTERFACE FOR PROPORTIONAL VALVE

This interface board, code 50220, permits the control unit to control a proportional valve and set the welding pressure in bars as one of the program's parameters. This interface requires external power supply. The 12-pole terminal board permits the connection of the proportional valve, the control unit and the interface power supply.

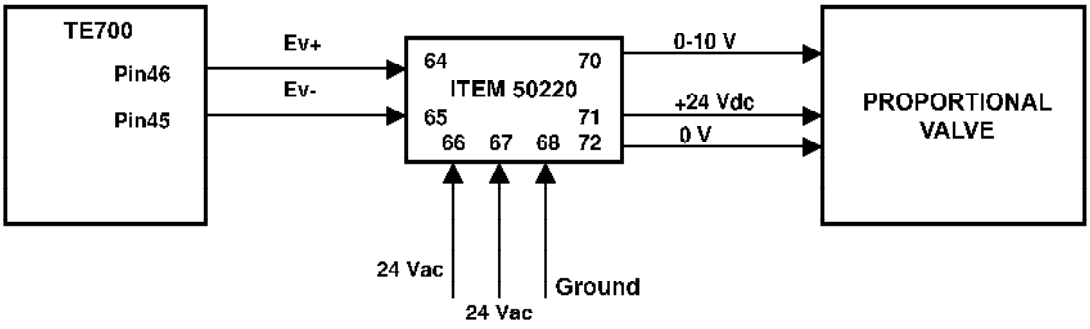
TERMINAL BOARD CONNECTIONS	
64	EV+ from the control unit (PIN 46)
65	EV- from the control unit (PIN 45)
66	24Vac
67	24Vac
68	Ground
69	OUT-I
70	0-10Vdc to the proportional EV
71	+24Vdc to the proportional EV
72	Ground to the proportional EV
73	ALARM-IN
74	ALARM1 (PIN 33- AUX3)
75	ALARM2 (PIN 34- COM1)

Program the voltage control range of the proportional valve directly via the weld control unit. The **FEATURES TE700**menu contains the PRESSURE RATIO parameter with which to select the most suitable **bar/Volt** ratio for the type of solenoid valve that is to be used.

Example:

Pressure Parameter bar	PRESSURE RATIO Parameter (bar/Volt)	Output Volt
5.0	1.0	5
5.0	2.0	10
5.0	0.5	2.5

CONNECTIONS DIAGRAM:



N.B.

_ The board is fitted with a red LED, indicated by acronym D10 (adjacent to the relay), which indicates when +24VDC is present (Pin 71) and leads to the proportional valve. If the LED is off when power is ON, the operator must check for the correct 24VAC (Pin 66 and Pin 67) and ground (Pin 68) connections.

_ The board is also fitted with a small trimmer, for adjusting the full scale of the output in voltage (Pin 70). This adjustment is carried out when tested and therefore MUST NEVER be moved away from its natural position so as not to alter the signal in the output.

CHAPTER 12 - DESCRIPTION OF SIGNALS ON TERMINAL BOARD

PIN	NAME	DESCRIPTION
1 *3*	**VAC**	This is the power supply of the control unit, which must be 24VAC. The power supply transformer must be of at least 50VA and must power the control unit only, to prevent any sources of interference.
2	**GND**	Ground connection. **Pay attention not to invert the wire with VAC (1-3) as this could damage the control unit's fuses.**
4 *5*	**LOCK- / END-** **LOCK+ / END+**	This output is a polarized opto-electronic switch, Max 30VDC/10mA, and is used to warn the operator when a cycle ends if END CYCLE is selected; when in LOCK state, the control unit supplies a signal at output from the beginning of the weld up to the hold.
6 *7*	**WRONG -** **WRONG +**	This output is a polarized opto-electronic switch, Max 30VDC/10mA, and closes if the set current limits are not met. The contact remains closed for the HOLD and OFF time.
8	**COM2**	Common for outputs with 0V reference. Connected to GND conforming to regulation EN60204.
9	**COM2**	Common for outputs with 0V reference. Connected to GND conforming to regulation EN60204.
10	**TRIGGER**	Output for the command of the inverter unit.
11	**COM1**	Common for inputs with 24VDC reference.
12	**READY_IN**	Signal arriving from the inverter unit to highlight it is in perfect working order.
13 *14* *15* *16*	**RIC4** **RIC3** **RIC2** **RIC1**	These inputs are used for directly calling welding programs from the outside. In order to call the programs correctly, these inputs must be enabled before the cycle-start signal. Inputs are active when closed towards the common COM1.
17	**COM1**	Common for inputs with 24VDC reference.
18	**AUX2**	This input allows an external device to stop the weld cycle during the squeeze stage. It may be used as interlocking input or to connect safety devices such as, for instance, flow meters or pressure switches. The contact connected to it must be the normally open type and activates closed on COM1.
19	**START2 NO**	To be connected to the micro-switches of the cycle-start pedal. START2 determines the beginning of the work cycle of the second program selected during the programming phase. This input is active closed on the common COM1.
20	**START2 NC / RIC8**	This input may be left unused or may be used either as a NC input for the START 2 signal or as RIC8.
21	**COM1**	Common for inputs with 24VDC reference.
22	**AUX**	This input allows an external device to stop the welding cycle during the squeeze phase. It may be used as an interlock input or to connect safety devices such as flow meters or pressure switches. The contact connected to it must be the NO type and is activated closed on the COM1.
23	**START NO**	To be connected to the micro-switches of the cycle-start pedal. START determines the beginning of the work cycle. This input is active closed on the common COM1.
24	**START NC / RIC 7**	This input may be left unused or may be used either as a NC input for the START 1 signal or as RIC7.
25	**BIC1 NO**	This input may be connected to the cycle start manual buttons. The welding cycle starts when BIC1 NO and BIC2 NO close at the same time or in sequence within a max time of 0.5 seconds. This value was chosen in conformity with international safety standards.

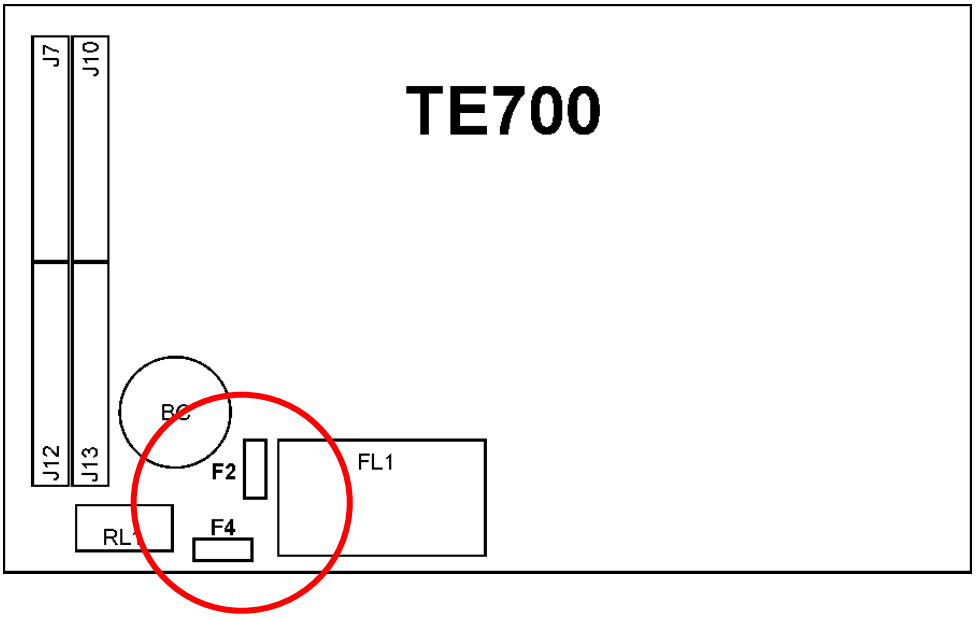
26	**BIC1 NC / RIC 5**	This input may be left unused or may be used either as a NC input for the button BIC1 or as recall RIC5.
27	**D STROKE**	This input is used to manually control the double stroke in welders fitted with this function.
28	**BIC2 NC / RIC 6**	This input may be left unused or may be used either as a NC input for the button BIC2 or as recall RIC6.
29	**COM1**	Common for inputs with 24VDC reference.
30 *31*	**TERM** **FLUX/TERM**	This input is used to connect a thermostat (pin 30). If a flow meter is also present, it must be connected in series with the thermostat, that is to say the thermostat with pin 30-31 and the flow meter with pin 31-32.
32	**COM1**	Common for inputs with 24VDC reference.
33	**AUX3**	This input allows an external device to stop the welding cycle during the squeeze phase. It may be used as an interlock input or to connect safety devices such as flow meters or pressure switches. The contact connected to it must be the NO type and is activated closed on the COM1.
34	**COM1**	Common for inputs with 24VDC reference.
35	**BIC2 NO**	Input for manual cycle-start buttons. The weld cycle begins when BIC1 NO and BIC2 NO close simultaneously, or in sequence within a max time of 0.5 seconds.
36	**COM1**	Common for inputs with 24VDC reference.
37	**VAUX**	This is a 24VDC output and indicates that the control unit is powered-on and ready to receive a cycle-start command. This output may be used to connect a valve intended for the welder's supplementary services. Command suitable for coil control at 24VDC. Max. 5W.
38	**EV1**	Connect to the solenoid valve that actuates the main cycle. Command suitable for coil control at 24VDC. Max 5W.
39	**COM2**	Common for outputs with 0V reference. Connected to GND conforming to regulation EN60204.
40	**EV2**	Connect to solenoid valve 2 (BACK PRESSURE). Command suitable for coil control at 24VDC. Max 5W.
41	**COM2**	Common for outputs with 0V reference. Connected to GND conforming to regulation EN60204.
42	**EV3**	Connect to solenoid valve 3 (FORGE). Command suitable for coil control at 24VDC. Max 5W.
43	**COM2**	Common for outputs with 0V reference. Connected to GND conforming to regulation EN60204.
44	**EV4**	Connect to solenoid valve 4 (DOUBLE STROKE). Command suitable for coil control at 24VDC. Max 5W.
45 *46*	**EV PROP-** **EV PROP+**	This is an output for the connection with the board that controls the proportional valve.
47 *48*	**EMERGENCY** **EMERGENCY**	Emergency input. An emergency button may be connected to these inputs, the contacts of which must open if a fault occurs. The emergency procedure and consequently the opening of these inputs cut-off voltage to all outputs.
49 *50*	**ROG** **AGND**	This analogue input is not used.
51	**SHIELD**	Shield for transducer cable.

52	**RESET ELECTRODES LIFE (Counter)**	This input resets the ELECTRODES LIFE FINISHED ALARM output.
53	**RESET DRESSING**	This input resets the DRESSING ALARM output.
54	**WELD /NO WELD**	Input for enabling/disabling the weld. The command works in series with the button on the control unit's keypad. If using only the weld/no weld via the keypad, this input must be connected to the COM1 present on board TE700.
55	**ERROR RESET**	This input should be used to delete the displayed error messages.
56	**GND**	Ground
57	**COM2**	**To be connected with COM2 present on board TE700**. Connected to GND conforming to regulation EN60204.
58 *59*	**VE** **VE**	This analogue input is not used.
60 *61*	**DRESSING ALARM**	This output warns that the dressing pre-alarm weld spots number has been attained.
62 *63*	**ELECTRODES LIFE FINISHED ALARM**	This output warns that the electrodes end life pre-alarm weld spots number has been attained.

Before turning on the TE700 control unit with the supplementary expansion board, code 50200, check that input RESET ELECTRODES LIFE (Pin 52) is NOT active.
Otherwise, the 50200 board is not recognized by the control unit.

NOTES:
Components **"F2"** and **"F4"**, located on the control unit connector's side, are delay fuses, which cannot be reset and that withstand a max current of 3.5 A each. If the ON warning light does not turn on, check the state of the foregoing components.
The fuses used are "LITTELFUSE" 47303.5 Tecna item, Code 21954.

Component **"BC"** stands for the two-position PROGRAM - RUN key lock installed on the control unit's front panel, traced as code "RS" 321054 or as a Tecna item, Code 21955.



CHAPTER 13 - LIST OF TE700 MESSAGES

13.1 - SYSTEM ERRORS – TE700

MESSAGE	*N°*	CAUSE	REMEDY
ERROR RELE1 OPEN ERROR RELE1 OPEN	***1***	An error occurred in the electronic component that activates the outputs. The state of relay 1 is off, therefore faulty. This is why the outputs cannot be enabled.	Contact service center.
ERROR RELE1 CLOSED ERROR RELE1 CLOSED	***2***	An error occurred in the electronic component that activates the outputs. The state of relay 1 is on, therefore faulty. This is why the outputs cannot be enabled.	Contact service center.
ERROR RELE2 OPEN ERROR RELE2 OPEN	***3***	An error occurred in the electronic component that activates the outputs. The state of relay 2 is off, therefore faulty. This is why the outputs cannot be enabled.	Contact service center.
ERROR RELE2 CLOSED ERROR RELE2 CLOSED	***4***	An error occurred in the electronic component that activates the outputs. The state of relay 2 is on, therefore faulty. This is why the outputs cannot be enabled.	Contact service center.
BOTH INTERNAL RELAYS FAULTY	***5***	Errors occurred in both electronic components that activate the outputs. This is why the outputs cannot be enabled.	Contact service center.
CRC INSIDE MEMORY CRC INSIDE MEMORY	***6***	An integrity error occurred in the data stored in the control unit's Eeprom. This ensued from the checksum calculation on the data in this memory.	Contact service center.
FAULT/MISSING MAINS SYNCHRONISM	***7***	A synchronism error has occurred due to the temporary lack of the reference signal of the power supply line or due to line interferences.	Clear the error and check the working efficiency of the devices that cut-off the power line and check for any interference.
SUPPLY FREQUENCY OUT OF LIMITS 50-60	***8***	The control unit did not succeed in measuring a steady mains frequency between 50 and 60 Hz.	Try to turn on the control unit again and check that power supply is 24 VAC with a frequency of 50 or 60 Hz.
OUTPUT VALVES IN SHORT CIRCUIT	***9***	One of the outputs of the solenoid valves is short circuited.	Check the electrical connections of the control unit. Check the solenoid valve coils.

13.2 - SYSTEM ERRORS – INVERTER

MESSAGE	N°	CAUSE	REMEDY
INV NOT READY WAIT RECOVERY	***150***	The inverter unit is not ready to weld after, for instance, an emergency signal drop.	Wait until the capacitor-charging procedure is finished. The error is cleared automatically.
INV NOT READY THERMOSTAT MISSING	***151***	Tripping of the inverter unit thermostat.	Check, in the INVERTER DIAGNOSTIC menu, the temperature of the dissipater of the power semiconductors and the status of the capacitor charge control board. Contact service center.
INV NOT READY CRC EEPROM FAIL	***152***	An integrity error occurred to the data stored in the inverter EEPROM. This ensued from the calculation of the checksum on the data present in this memory.	Contact service center.
INV NOT READY REMOVE START	***153***	Trigger signal always present at the inverter input.	Contact service center.
INV NOT READY FAIL IGBT DRIVER	***154***	Possible fault at the driver of the power semiconductors or at the power semiconductors.	Contact service center.
INV NOT READY TERMOSTAT MISSING	***155***	The control unit warns that it is running the procedure for charging the capacitors bank	Check the three-phase
INV NOT READY MISS END WELD	***156***	The welding finished signal was not acknowledged.	Contact service center.
INV NOT READY PRIMARY CURR MIS	***157***	The inverter was not capable of measuring the passage of the primary current.	Contact service center.
INV NOT READY SEC. CURR MISS	***158***	The inverter was not capable of detecting the current passage on the secondary circuit.	Check that the secondary circuit is closed and not open due to insulation. Also check the integrity of the Rogowsky sensor and its wiring to the inverter unit.
INV NOT READY SECONDARY V MISS	***159***	The inverter was not capable of detecting the presence of the voltage electrodes.	Check the integrity of the connections relevant to the voltage to the electrodes.
INV NOT READY DIODE THERMAL HIGH	***160***	The thermal overload, which protects the diodes of the secondary rectifier, tripped.	Wait until routine conditions are restored without turning off the spot welder. Decrease the number of cycles per minute that the machine must carry out.
INV NOT READY TRANSFO THERMAL HIGH	***161***	The thermal overload, which protects the primary of the welding transformer, tripped.	Wait until routine conditions are restored without turning off the spot welder. Decrease the number of cycles per minute that the machine must carry out.

MESSAGE	N°	CAUSE	REMEDY
WELD ENERGY BEFORE T WELD MIN	***162***	The welding energy set in the control unit was attained before the minimum set time.	Reset the error as specified and check the program to modify certain parameters such as ENERGY, POWER and WELD
WELD ENERGY NOT REACHED	***163***	The welding energy set in the control unit was NOT attained within the max set time.	Reset the error as specified and check the program to modify certain parameters such as ENERGY, POWER and WELD
STEPPER END	***164***	End of the stepper function.	Reset the error as specified, perform maintenance to the electrodes and reset the spots counter.
DRESSING CAPS NEED DRESSING	***165***	End of a step with electrodes dressing activated.	Reset the error as specified and dress the electrodes.
DRESSING END CAPS LIFE	***166***	End of electrodes life with electrodes dressing activated.	Reset the error as specified and change the electrodes.
STOP N SPOT MAX	***167***	The max set number of spots was attained.	Reset the error as specified and reset the spots counter.
FAIL ROG COIL SHORTED OR OPEN	***168***	With the Rogowsky test activated, a problem was detected at the secondary current sensor or its wiring.	Contact service center.
COM FAIL SPOT DATA LOST	***169***	Malfunction of the CAN communication between TE700 control unit and inverter.	Contact service center.
FAIL POS SENS POS SENSE DISABLED	***170***	Position sensors initialization error.	Check that the position sensors are properly wired. Contact service center.
POS SENSOR REQUIRED	***171***	The operator is using a weld program that entails the presence of the position sensors but they are not present.	Check the weld program used. If the QUALITY-T function is set, deactivate it.
POS SENSOR ZERO QUOTE MISSING	***172***	The QUALITY-T function was activated in a weld program but the coordinate zero procedure was not carried out.	Set the QUALITY-T parameter to zero and carry out a welding without any material in between the electrodes to define the ZERO coordinate. Restore the original value of the QUALITY-T parameter.

MESSAGE	N°	CAUSE	REMEDY
POS SENSOR FAIL COMMUNICATION	***173***	Communication error with the position sensor.	Check that the position sensors are properly wired. Contact service center.
POSITION FAIL STRUCTURE MODIFIED	***174***	Position sensor error on measuring the coordinate, the electrode is very worn out or the geometry of the spot welder structure changed.	Check for the absence of anomalous movements in the structure of the spot welder. Delete the error and repeat the zero procedure for the coordinate.
THICKNESS UNDER LOW LIMIT	***175***	The initial thickness of the sheets between the electrodes is less than that set in the limit.	Reset the error and check the material present between the electrodes.
THICKNESS OVER HIGH LIMIT	***176***	The initial thickness of the sheets between the electrodes is more than that set in the limit.	Reset the error and check the material present between the electrodes.
DYNAMIC MODE FAIL COMPENSATION	***177***	The DYNAMIC WORKING MODE was not capable of completing the weld within the max time set by the user.	Reset the error and check the welding that was just carried out. Repeat the learning procedure if needed.
MISSING R COMPENSATION	***178***	The QUALITY-R parameter was activated without correcting the resistance of the arms on turning the machine on.	Reset the error, set the QUALITY-R parameter to zero and carry out the correction spot and reset the original value of the QUALITY-R parameter.
MATERIAL RES UNDER MIN VALUE	***179***	The initial resistance of the material is less than the minimum set value.	Reset the error and check the material present between the electrodes.
MATERIAL RES OVER MAX VALUE	***180***	The initial resistance of the material is more than the maximum set value.	Reset the error and check the material present between the electrodes.

13.3 – WORK ERRORS

MESSAGE	*N°*	CAUSE	REMEDY
NO EMERGENCY RELAY ERROR RESTART	***101***	The emergency signal required to run the control unit was omitted or a relay error occurred when the restart relay was activated.	Carefully check the electrical connections of the emergency signal.
THERMOSTAT OR FLOW METER ERROR	***102***	Either the protective thermostat or the flow meter inside the welder tripped.	Check that enough water circulates inside the welder and/or check the working efficiency of the thermostat.
WELD CURRENT LIMIT LOW	***201***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.
WELD CURRENT LIMIT HIGH	***202***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.
RO LIMIT LOW	***203***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.
RO LIMIT HIGH	***204***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.
SECONDARY VE LIMIT LOW	***205***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.
SECONDARY VE LIMIT HIGH	***206***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.
POWER LIMIT LOW	***207***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.
POWER LIMIT HIGH	***208***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.
ENERGY LIMIT LOW	***209***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.
ENERGY LIMIT HIGH	***210***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.

MESSAGE	*N°*	CAUSE	REMEDY
DISPLACEMENT LIMIT LOW	***211***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.
DISPLACEMENT LIMIT HIGH	***212***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.
RESISTANCE LIMIT LOW	***213***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.
RESISTANCE LIMIT HIGH	***214***	The control unit counts some faulty spots, the last of which has been carried out with a current value lower than the min. set limit.	Reset the error as specified.

CHAPTER 14 – TECHNICAL SPECIFICATIONS

POWER SUPPLY: 24VAC +/- 10%

FREQUENCY: 50/60Hz +/- 1%

CONSUMPTION: 0.3A WITHOUT LOAD / 2A WITH COMPLETE LOADS

MAX ALTITUDE: 1000m

RELATIVE HUMIDITY: from 40% to 80%

WORK TEMPERATURE: 0°C to 50°C / 32°F to 122°F

WEIGHT: 530g / 1.1685 lb

PROTECTION RATING: IP40

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