TECNA®

WELDING CONTROL UNIT

INSTRUCTION MANUAL

TE550

FROM SOFTWARE RELEASE N. 4.02

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CHAPTER 1 - TE550 WELDING CONTROL UNIT DESCRIPTION

The TE550 is a microprocessor-based welding control unit for resistance welders. The task of the welding control unit is to manage the welder components, in particular the controlled diodes that carry out the welding current adjustment.

The TE550 is a particularly versatile welding control unit as it can be adjusted to different types of welders; it may be installed not only on spot and projection welders but on seam welders too. It may work with power adjustment: both in constant current and in constant energy (optional). The number of inputs and outputs may be increased so to better adjust the welding control unit to automatic machines.
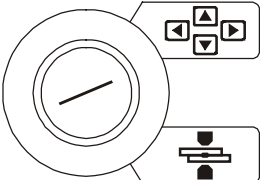
It is possible to store up to 250 different welding programs, 127 of which are recalled directly from an external device. Each program comprises several programmable parameters that describe the work cycle. In addition to the plain 4-stage welding cycle, the control unit allows the running of welding processes with pre-welding current, post-welding current, slope and pulses.
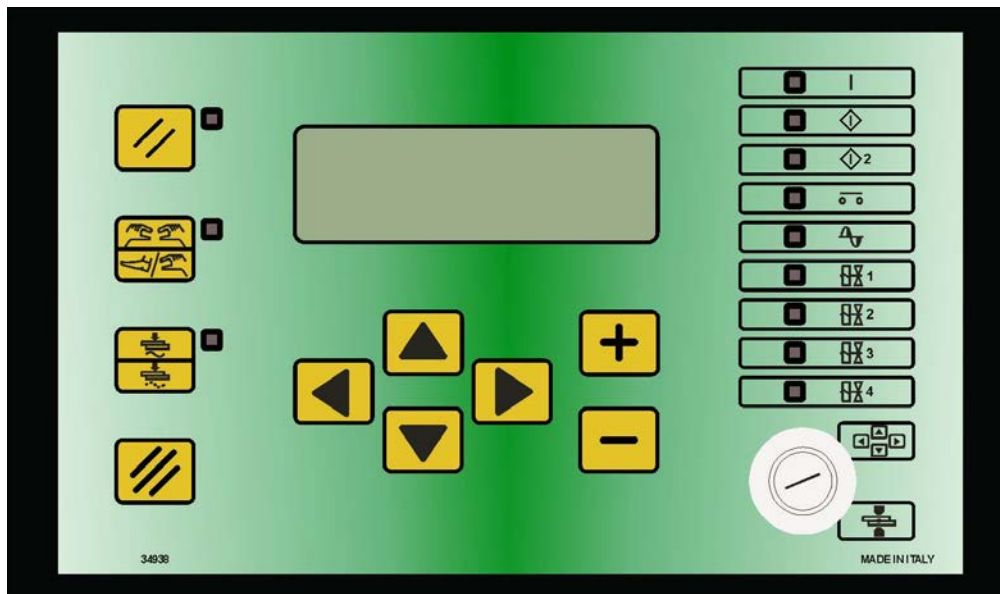
1.1 - MAIN TECHNICAL FEATURES

- Simplified programming via 6 keys and a backlit alphanumeric LCD.
- Synchronous control with controlled diodes, phase control current adjustment.
- Storage of 250 welding programs, 127 recallable from an external drive.
- *Up to* 33 programmable parameters for each program.
- Slope, pulses, pre-weld, post-weld functions and adjustment of the welding times in half-cycles.
- Display of the RMS welding current measurement in kA and relative angle of conduction.
- 3 operating modes: standard, constant current and constant energy (optional).
- Weld current, conduction angle, thickness and material indentation limits (optional), on the cylinder pressure detected by an external sensor (optional).
- Double stroke function.
- Stepper function to compensate the electrodes wear with programmable curve.
- Single and automatic cycle. WELD and NO-WELD function.
- Adjustment of first insertion delay.
- Control of 5 solenoid valves 24 VDC max. 5 W with self-protected output.
- Self-adjustment at mains frequency 50/60 Hz.
- Serial data transmission by means of optional insulated RS232 or RS485 ports.
- Output for proportional solenoid valve.
- Key for selecting foot control or two-hand control.
- Selectable languages: Italian, English, French, German, Spanish, Hungarian, Swedish, Portuguese, Dutch, Polish, Czech and Cyrillic.
- Possibility of upgrading control unit Firmware via appropriate software.
- Activation and control of the electrodes dressing (optional)

1.2 - COMMANDS ON THE PANEL

◀	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 control unit's outputs. **It must be pressed every time the control unit is powered**. When this key is pressed, all the devices connected to VAUX are powered. **Before pressing the key it is important to check that it will not cause damage to people or 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**

☐ I	The turning on of this LED indicates that the welder control unit is powered.
☐ ◇	If this LED is switched on it indicates that start cycle 1 command is activated.
☐ ◇2	If this LED is switched on it 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.
☐ ⊿ᵥ	The turning on of this LED indicates that the control unit is producing the command impulses for the SCR.
☐ ⌸1	It indicates that the solenoid valve, which carries out the main cycle, is activated.
☐ ⌸2	It indicates that the solenoid valve, which controls the back pressure, is activated.
☐ ⌸3	It indicates that the solenoid valve, which enables the forging, is activated.
☐ ⌸4	It indicates that the solenoid valve, which controls the double stroke, is activated.

1.4 - DESCRIPTION OF THE DISPLAYED INFORMATION

Some pieces of information are displayed on the main frame following each weld sequence; this is done both for the cycles carried out in WELD mode and for the ones in NO-WELD mode. **The values displayed in the following description are representative only.**

```
PROG. 001 SPOT 12340
 WELD TIME  10.0 ~
CURRENT RMS 43.26 kA
CONDUCTION DEG 142°
```

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

PROG. 001
It indicates the program used for the last weld sequence; it may be a number between 001 and 250. It is displayed both in WELD and in NO WELD mode.

SPOT 12340
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.

WELD TIME 10.0 ~
It indicates the welding time used for the last weld sequence. Its value is included between 00.5 and 99.5. The same value is displayed both in WELD and in NO WELD mode.

CURRENT RMS 43.26 kA
It indicates the current value used for the last weld sequence. In WELD mode it may have a value between 00.00 kA and 90.00 kA. In NO WELD mode its value is 00.00 kA. It represents the average of the RMS values measured for each welding time half-cycle. The value shown always refers to the WELDING TIME current parameter. In case of pulse weldings, the current value would always be the average value of all the pulses.

CONDUCTION DEG 142°
It indicates the current conduction angle of the last weld. In WELD mode, it may have a value between 000° and 180°. In NO WELD mode, the displayed value is 000°. The conduction angle represents the current flowing time along the half-cycle. The displayed value represents the average of the measured values for each half-cycle of the welding time.
The showed value always refers to the main adjustment, basically to the WELDING TIME parameter one. In no instance is the conduction angle of the current measured during the slope time. In the case of pulse weldings, the angle value would refer to the last pulse.

Examples of currents with different conduction angles:

Angle of Conduction 72°

Angle of Conduction 180°
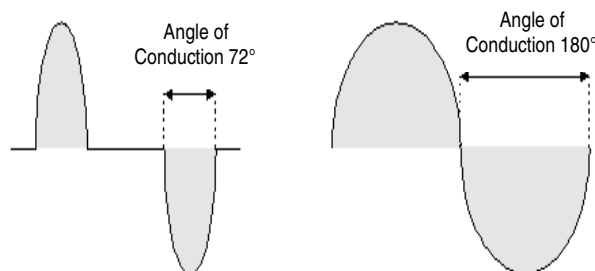
When the control unit is equipped with the supplementary expansion board item 50200, the displayed working frame is as follows:

```
PROG. 001 SPOT 12340
 WELD TIME  10.0 ~
RMS 43.26kA DEG 000°
ENERGY 01351 joule
```

Where, to the above described information, is added:

ENERGY 01351 joule
It indicates the total energy value used for the last weld sequence.

⚠ **Before switching on the TE550 control unit with the supplementary expansion board item 50220, check that the inlet ELECTRODES END LIFE CLEAR (Pin 52) is not activated.**

Otherwise, the 50200 board is not recognized by the control unit.

From the main displayed working frame

```
PROG. 001 SPOT 12340
 WELD TIME  10.0 ~
CURRENT RMS 43.26 kA
CONDUCTION DEG 142°
```

It is possible to have other information displayed: for instance, about the carried out weldings, the stepper function status and the last 20 displayed errors.

In order to enter the welding analysis function of the different carried out half-cycles, it is necessary to press the key ▶ once.

```
PRG 001  SPOT 12340
 WELD TIME 01 ~
POS+ 43.26 kA  142°
NEG- 43.26 kA  142°
```

PRG 001
It indicates the program number used for carrying the last weld sequence.

SPOT 12340
It indicates the welded spot number being analysed. It always stands for the last weld sequence.

WELD TIME 01 ~
It indicates the cycle of the whole welding time relevant to the welding being analyzed.

POS+ 43.26 kA 142°
It indicates the current value, expressed in kA, relevant to the welding cycle positive half-period and the relevant conduction angle, expressed in degrees, of the cycle taken into consideration.

POS- 43.26 kA 142°
It indicates the current value, expressed in kA, relevant to the welding cycle negative half-period and the relevant conduction angle, expressed in degrees, of the cycle taken into consideration.

By means of the keys ⊞ and ⊟, it is possible to check the other cycles of the analysed welding.


```
PRG 001  SPOT 12340
 WELD TIME 02 ~
POS+ 43.26 kA  142°
NEG- 43.26 kA  142°
```

```
PRG 001  SPOT 12340
  WELD TIME 10 ~
POS+ 43.26 kA  142°
NEG- 43.26 kA  142°
```

By further pressing the key ▶, it is possible to check the **stepper function** status.

```
SPOT MAX 12340
SPOTS 00000
INCREMENT 00% OF 00%
STEP NUM. 00 OF 00
```

SPOT MAX 12340
It indicates the maximum spots number programmed in the stepper function.

SPOTS 00000
It indicates the number of the already welded spots.

INCREMENT 00% OF 00%
It indicates both the carried out stepper value and the value to be reached, both expressed in percentage.

STEP NUM. 00 OF 00
It indicates the carried out segment spot and the spot to be reached.

By pressing the key ▶ again, it is possible to carry a further welding analysis out in ENERGY working mode.
This frame may be displayed by means of the supplementary expansion board item 50200 only.

```
 PRG 001   SPOT 12340
CYC 01 ENERGY 00000J
 V+ 00.00  E+ 00000J
 V- 00.00  E+ 00000J
```

PRG 001
It indicates the program number used for the last weld sequence.

SPOT 12340
It indicates the welded spot number being analysed. It always stands for the last carried out welding.

CYC
It indicates the cycle of the whole welding time relevant to the welding being analysed.

ENERGY
It indicates the total energy value of the welding being analysed.

V+ 00.00 E+00000J
It indicates the voltage value, expressed in volts, of the welding cycle positive half-period and the relevant energy value, expressed in joule, of the cycle taken into consideration.

V- 00.00 E+00000J
It indicates the voltage value, expressed in volts, of the welding cycle negative half-period and the relevant energy value, expressed in joule, of the cycle taken into consideration.

By means of the keys ⊞ and ⊟, it is possible to check the other cycles of the analysed welding.

<table>
<tr><td>

➕

</td><td>

```
PRG 001  SPOT 12340
CYC 02 ENERGY 00000J
V+ 00.00  E+ 00000J
V- 00.00  E+ 00000J
```

</td><td>

➖

</td><td>

```
PRG 001  SPOT 12340
CYC 10 ENERGY 00000J
V+ 00.00  E+ 00000J
V- 00.00  E+ 00000J
```

</td></tr>
</table>

By pressing the key ▶ again, it is possible to check the measurements performed by the control unit when the **position sensor** is present and powered.

```
PRG 005    SPOT 01234

THICKNESS 02.486 mm
IDENTATION 0.000 mm
```

PRG 005
Indicates the programme used to carry out the last weld cycle, ranging from 001 to 250. It is displayed in WELD and NO WELD mode.

SPOT 01234
Indicates the number of the spot in which the measurement was performed. It is displayed in WELD and NO WELD mode.

THICKNESS 02.486 mm
Indicates the initial thickness of the material to be welded that the TE550 control unit measures before current flows. This value is updated in WELD and NO WELD.

IDENTATION 0.000 mm
Indicates the measurement of the electrode indentation into the welded material at the end of the weld cycle. The value is updated only when in WELD and when the IDENTATION measurement is enabled in the welding program being used.

By pressing the key ▶ again, it is possible to check the measurement carried out by the control unit when the **pressure sensor** is present and activated.

```
PRG 005    SPOT 01234
PRESSURE     02.3 bar
PRESS. MIN  01.5 bar
PRESS. MAX  02.5 bar
```

PRG 005
Indicates the program used to carry the last welding cycle out; it may be a number included within 001 and 250. It is displayed both in WELD and in NO WELD mode.

SPOT 01234
Indicates the spot number according to which the measurement has been carried out. It is displayed both in WELD and in NO WELD mode.

PRESSURE 02.3 bar
Indicates the value of the pressure measurement realized by the external sensor just after the squeeze phase. This value is updated in WELD and NO WELD.

PRESS. MIN 01.5 bar
Indicates the value of the minimum pressure limit set when programming. This value is updated in WELD and NO WELD.

PRESS. MAX 02.5 bar
Indicates the value of the maximum pressure limit set when programming. This value is updated in WELD and NO WELD.

By pressing the key ▶ again, it is possible to check **the displayed errors list**.

```
ERRLOG 01 SPOT 00000
       ERR 0101
NO EMERGENCY ERROR
OR RELAY RESTART ERR
```

ERRLOG 01
It indicates which error it is being displayed in chronological order. The last chronologically displayed error is expressed through number 01: the other errors are then stored through an increasing number. A maximum of 20 errors can be stored; by exceeding this quantity, the oldest errors are cancelled to be replaced with the most recent ones.

SPOT 00011
It indicates which welding spot the error is experienced at. The number is relevant to the counted welded spots, therefore it may happen that the spots number of several consequent errors is not shown in increasing numerical order as, in the meantime, the counter might have been cleared.

ERR 0101
It indicates the error recognition number.

NO EMERGENCY ERROR OR RELAY RESTART ERR
It indicates the message displayed together with the error recognition number. The displayed message is simplified: for further information, the complete errors list together with the relevant error explanations and their possible solutions are listed in the manual's relevant paragraph.

By means of the keys ⊞ and ⊟, it is possible to check the other errors previously displayed on the control unit.

```
┌─────┐   ERRLOG 02 SPOT 00175        ┌─────┐   ERRLOG 20 SPOT 00138
│  +  │          ERR 0106             │  −  │          ERR 0102
└─────┘        STOP LIMIT             └─────┘       THERMOSTAT OR
               LOW CURRENT                         FLOWSWITCH ERROR
```

By means of the key ◀, it is possible to go back to the previous frames.

By means of the key ▶, one may go back to the main welding frame.

1.5 - CONTROL UNIT SWITCH-ON

As soon as the welding control unit is turned on, the display shows the measured mains frequency and the software version of the program.
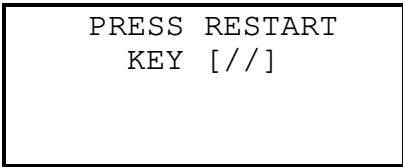
```
SUPPLY FREQUENCY
     50 Hz
```

```
TECNA TE550 4.02
WELD CONTROL UNIT
```

After a few seconds, the TE550 displays the following frame and is set to a waiting condition until the RESTART key is pressed

```
PRESS RESTART
  KEY [//]
```

The RESTART command may be activated by pressing the proper key placed on the control unit (also a non-manual activation is available).

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

When the RESTART command is activated, all the devices connected to the VAUX outlet are powered.

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

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 activate the welding cycle if the cycle start signal is already activated at the moment when the welder is switched on; it is sufficient to remove the command and activate it again. Micro-interruptions or excessive voltage drops, instead of affecting the operating mode, do stop the control unit. In order to restore its operating mode, it is sufficient to switch off and switch on the welder again.**

CHAPTER 2 - **CONTROL UNIT PROGRAMMING**

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

```
-TE550  VER. 4.02--
>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 MENU**
_ **PROGRAM COPY**
_ **CHECK INPUT**
_ **PROG. SEQUENCE** *(It may be activated)*
_ **TIP-DRESSING** *(It may be activated)*
_ **THICKNESS SENSOR** *(It may be activated)*

```
-TE550  VER. 4.02--
 PROGRAM DATA
>SETUP MENU
 STEPPER MENU
```

The arrow ">" on the left-hand side of the display indicates the cursor's position which vertically shifted by means of the keys ▲ and▼.
The keys ▶ and ◀ enable entering and quitting the menu selected by the cursor.
By means of the keys ⊞ and ⊟ it is possible to modify the parameter indicated by the cursor.

```
   PROGRAM DATA
 CONTROL MODE    CUR
>SQUEEZE 1      25.0
 SLOPE UP         00
```

2.1 - PROGRAM DATA

```
-TE550  VER. 4.02--
>PROGRAM DATA
 SETUP MENU
 STEPPER MENU
```

The **PROGRAM DATA** menu contains all the parameters associated with the welding cycle, the times and the currents by means of which to carry out the welding process.

```
   PROGRAM DATA
>PROGRAM N.      001
 WORKING MODE     IK
 CONTROL MODE    CUR
```

The first choice to make is the number of the program to be used. Choose among the 250 storable programs using the ⊞ and ⊟ keys.
Then proceed with the next parameters moving with the ▲ and ▼ keys, adjusting the desired value always using the ⊞ and ⊟ keys.

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.

Here as follows, the three working modes are described and the three possible programming frames are displayed according to the selected parameter in WORKING MODE. The frames are complete with all the programmable parameters.

2.2 - PERCENTAGE ADJUSTMENT OPERATING MODE

WORKING MODE parameter selected in FIX, the working frame is the following one:

```
PROG. 001 SPOT 12340
 WELD CYCLE 01.0 ~
CURRENT RMS 43.26 kA
CONDUCTION DEG 142°
```

In the FIX percentage adjustment operating mode, it is possible to set the percentage value one wants to carry the welding process out with. In this mode, the control unit measures the true efficacious welding current RMS value and, at the end of the welding process, it displays the current value.

The percentage adjustment operating mode does not foresee any secondary coil feedback during the welding process; for this reason, it is suitable for being used especially when one operates in difficult working conditions, beyond the welding tables, as for instance when using a very short welding time where it would be critical to use one of the more complex working modes foreseen in this control unit.

The correlation map between the set percentage and the controlled diodes (SCR) closing time is set in TECNA and might not be perfectly linear; in order to improve the scale linearity, it has been inserted a parameter in the FEATURES MENU allowing to delay the welding process start time. For further information check the relevant paragraph.

TABLE PERCENTAGE OPERATING MODE PARAMETERS

```
   PROGRAM DATA
>PROGRAM N.      001
 WORKING MODE    FIX
 CONTROL MODE    CUR
```

PARAMETER	VALUE RANGE
PROGRAM N.	001 – 250
WORKING MODE	FIX
CONTROL MODE *	NO
QUALITY – T *	OFF
SQUEEZE 1	00.5 - 99.5 cycles
SQUEEZE	00.5 - 99.5 cycles
PRESSURE	00.5 - 10.0 bar
FORGE DELAY	00 - 99 cycles
FORG.PRESS.	00.5 - 10.0 bar
PRE-WELD	00.0 - 99.5 cycles
PRE-POWER	05 - 99 %
COLD 1	00 - 50 cycles
SLOPE UP	00 - 25 cycles
WELDING TIME	00.5 - 99.5 cycles
POWER	05 - 99 %
IMPULSE N.	01 – 09
COLD 2	00 - 50 cycles
SLOPE DOWN	00 - 25 cycles
COLD 3	00 - 50 cycles
POST-WELD.	00.0 - 99.5 cycles
POST-POWER	05 - 99 %
HOLD TIME	00.5 - 99.5 cycles
OFF TIME	00.0 - 99.5 cycles

CONTROL MODE *	CURR
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA

CONTROL MODE *	DEG
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

CONTROL MODE *	ALL
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

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

INPUT VE/PRE (FEATURES MENU)	PRE
PRES. MIN	0.00 - 10.0 bar
PRES. MAX	0.00 - 10.0 bar

Existing particular conditions:

- If the OFF TIME is set to 0, the control unit will work in single cycle.
- By setting the PRE-WELD parameter to zero, the pre-welding process will not be carried out.
- By setting the POST-WELD parameter to zero, the post-welding process will not be carried out.
- By setting the same value for both CURR. MIN and CURR MAX, the limits of current are disabled.
- By setting the same value for both ANGLE MIN and ANGLE MAX, the limits of the conduction degrees are disabled.
- By setting the same value for both THICK. MIN and THICK. MAX, the limits are disabled.
- By setting the same value for both IDENT. MIN and IDENT. MAX, the limits are disabled.
- By setting the same value for both PRES. MIN and PRES. MAX, a programming error is generated.

It is advisable to activate the CONTROL MODE in CUR and to check, before proceeding with production, the limit use conditions. <u>For instance</u>, if the use is meant with 2 sheets the limit conditions would be those with either 1 or 3 sheets. The welding current is adjusted by the TE550 control unit.

However, it is necessary to check the welding current value with one sheet so to be set as minimum limit and to check it with 3 sheets so to 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.

2.3 - CONSTANT CURRENT OPERATING MODE

WORKING MODE parameter selected in IK: the working frame is the following one:

```
PROG. 001 SPOT 12340
 WELD CYCLE 01.0 ~
CURRENT RMS 43.26 kA
CONDUCTION DEG 142°
```

When the control unit works in constant current, it is possible to directly set the welding current value one wants to carry the welding process out with. During the welding process the control unit measures, for each half-cycle, the true efficacious welding current RMS value and, based on a correcting mathematical algorithm, keeps the set current.

In addition to simplifying the programming operations, this operating 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.

CONSTANT CURRENT BEHAVIOUR READINGS
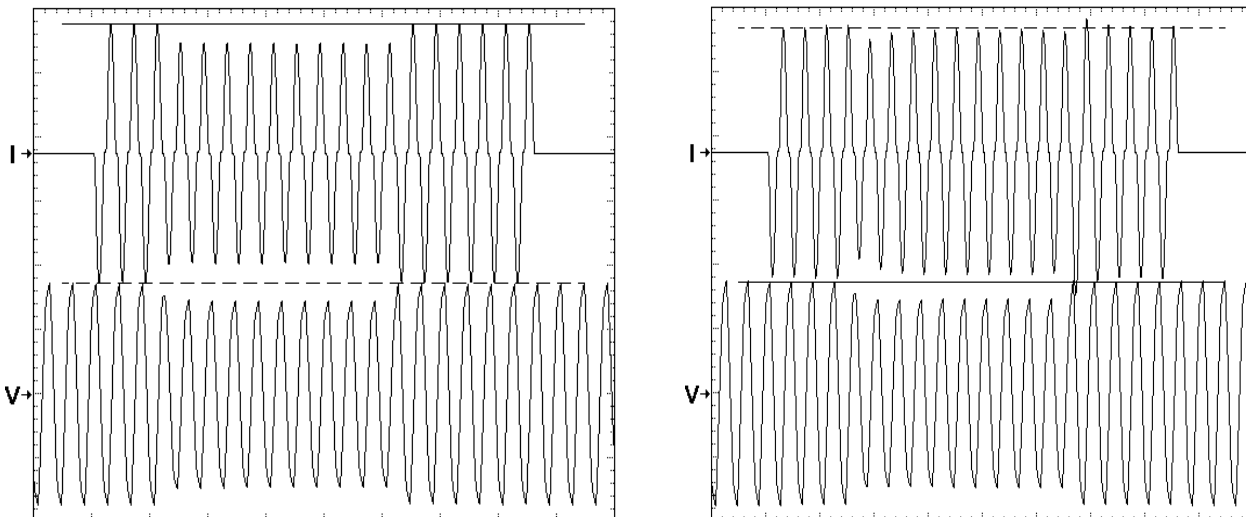
Welding current changes (I) according to the mains voltage (V) variation in standard operating mode

Welding current changes (I) according to the mains voltage (V) in constant current operating mode.

It is advisable to activate the CONTROL MODE in DEG and to check, before proceeding with production, the limit use conditions. For instance, if the use is meant with 2 sheets the limit conditions would be those with either 1 or 3 sheets. The welding constant current is adjusted by the TE550 control unit (if the conduction degrees are not close to the value of 180°). However, still the conduction degrees value has to be checked with one sheet so to be set as minimum limit and to be checked with 3 sheets so to 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.

TABLE CONSTANT CURRENT OPERATING MODE PARAMETERS

```
      PROGRAM DATA
>PROGRAM N.       001
 WORKING MODE      IK
 CONTROL MODE     DEG
```

PARAMETER	VALUE RANGE
PROGRAM N.	001 - 250
WORKING MODE	IK
CONTROL MODE *	NO
QUALITY – T *	OFF
SQUEEZE 1	00.5 - 99.5 cycles
SQUEEZE	00.5 - 99.5 cycles
PRESSURE	00.5 – 10.0 bar
FORGE DELAY	00 - 99 cycles
FORG.PRESS.	00.5 - 10.0 bar
PRE-WELD	00.0 - 99.5 cycles
PRE-POWER	05 - 99 %
COLD 1	00 - 50 cycles
SLOPE UP	00 - 25 cycles
WELDING TIME	00.5 - 99.5 cycles
CURRENT	00.5 - 90.0 kA
IMPULSE N.	01 – 09
COLD 2	00 – 50 cycles
SLOPE DOWN	00 – 25 cycles
COLD 3	00 – 50 cycles
POST-WELD.	00.0 – 99.5 cycles
POST-POWER	05 – 99 %
HOLD TIME	00.5 - 99.5 cycles
OFF TIME	00.0 - 99.5 cycles

CONTROL MODE *	CURR
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA

CONTROL MODE *	DEG
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

CONTROL MODE *	ALL
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

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

INPUT VE/PRE (FEATURES MENU)	PRE
PRES. MIN	0.00 - 10.0 bar
PRES. MAX	0.00 - 10.0 bar

Existing particular conditions:

- If the OFF TIME is set to 0, the control unit will work in single cycle.

- By setting the PRE-WELD parameter to zero, the pre-welding process will not be carried out.

- By setting the POST-WELD parameter to zero, the post-welding process will not be carried out.

- By setting the same value for both CURR. MIN and CURR MAX, the limits of current are disabled.

- By setting the same value for both ANGLE MIN and ANGLE MAX, the limits of the conduction angles are disabled.

- By setting the same value for both THICK. MIN and THICK. MAX, the limits are disabled.

- By setting the same value for both IDENT. MIN and IDENT. MAX, the limits are disabled.

- By setting the same value for both PRES. MIN and PRES. MAX, a programming error is generated.

2.4 - CONSTANT ENERGY OPERATING MODE

WORKING MODE parameter selected in ENE, the working frame is the following one:

```
PROG. 001 SPOT 12340
 WELD CYCLE 01.0 ~
RMS 43.26kA DEG 000°
ENERGY 01351 joule
```

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.
During welding, the control unit reads the true efficacious welding current RMS, the non-inductive component of the voltage at the electrodes in volts (V x cosφ) and the welding duration in cycles. The product of I x V x cosφ 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 operating 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. adjust the minimum welding time to the same as the maximum welding time (WELD MIN = WELD MAX) with the cycles value indicated in the traditional welding tables.
4. carry one spot weld out and verify that it is satisfactory
5. read the value of the total developed energy and set it in the ENERGY parameter of the working program
6. adjust the minimum time (WELD MIN) to the number of periods necessary for carrying the spot out with the new electrodes
7. adjust the maximum time (WELD MAX) to a number of periods that does not spoil the piece

ENERGY TREND READINGS DURING WELDING
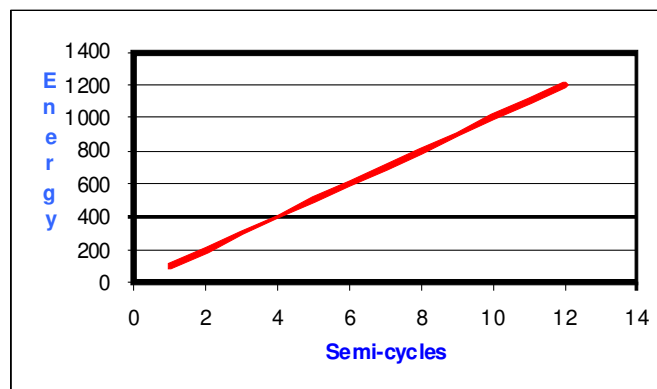
TABLE CONSTANT ENERGY OPERATING MODE PARAMETERS

```
    PROGRAM DATA
>PROGRAM N.      001
 WORKING MODE    ENE
 CONTROL MODE    CUR
```

PARAMETER	VALUE RANGE
PROGRAM N.	001 - 250
WORKING MODE	ENE
CONTROL MODE *	NO
QUALITY – T *	OFF
SQUEEZE 1	00.5 - 99.5 cycles
SQUEEZE	00.5 - 99.5 cycles
PRESSURE	00.5 - 10.0 bar
FORGE DELAY	00 - 99 cycles
FORG.PRESS.	00.5 - 10.0 bar
SLOPE UP	00 – 25 cycles
WELD MIN	00.5 - 99.5 cycles
WELD MAX	00.5 - 99.5 cycles
POWER	05 - 99 %
ENERGY	00060-60000 joule
COLD 3	00 – 50 cycles
POST-WELD.	00.0 – 99.5 cycles
POST-POWER	05 – 99 %
HOLD TIME	00.5 - 99.5 cycles
OFF TIME	00.0 - 99.5 cycles

CONTROL MODE *	CURR
CURR. MIN	1.0 - 90.0 kA
CURR. MAX	1.0 - 90.0 kA

CONTROL MODE *	DEG
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

CONTROL MODE *	ALL
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

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

INPUT VE/PRE (FEATURES MENU)	VE

Existing particular conditions:

- If the OFF TIME is set to 0, the control unit will work in single cycle.

- By setting the PRE-WELD parameter to zero, the pre-welding process will not be carried out.

- By setting the POST-WELD parameter to zero, the post-welding process will not be carried out.

- By setting the same value for both CURR. MIN and CURR MAX, the limits are disabled.

- By setting the same value for both THICK. MIN and THICK. MAX, the limits are disabled.

- By setting the same value for both IDENT. MIN and IDENT. MAX, the limits are disabled.

It is advisable to activate the CONTROL MODE in CUR and to check, before proceeding with production, the limit use conditions. <u>For instance</u>, if the use is meant with 2 sheets the limit conditions would be those with either 1 or 3 sheets. The constant energy is adjusted by the TE550 control unit.

However, it is necessary to check the welding current value with one sheet so to be set as minimum limit and to check it with 3 sheets so to 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.

2.5 - WORKING PROGRAM PARAMETERS DESCRIPTION

All the following parameters indicating times are expressed in periods, also called mains cycles. The mains frequency defines the duration of a period:

Mains frequency of 50 Hz 1 period = 20 ms

Mains frequency of 60 Hz 1 period = 16.6 ms

WORKING MODE
The WORKING MODE parameter defines the mode for adjusting the welding current of the program: power percent (**FIX**), constant current (**IK**) or constant energy (**ENE**).
Welding time (WELDING TIME) is carried out according to the adjustment mode set in this parameter.
This parameter affects the welding time (WELDING TIME) only. The welding process will be carried out according to the adjustment mode defined in this parameter.
(PRE-WELD) and (POST-WELD) times are always run with the power percentage adjustment.

CONTROL MODE
The CONTROL MODE parameter permits to select the control mode of the desired welding current.

- **NO**   *No control is performed on the supplied welding current.*
- **CUR**   *permits to set the welding current min. and max. limits.*
- **DEG**   *permits to set the min. and max. limits of the welding current conduction angle.*
- **ALL**   *It is possible to set the minimum and maximum value of both the welding current and the conduction angle.*

QUALITY - T
Use this parameter to select if and which check should be carried out on the mechanical qualities of the welded material. Checks are run before the weld current flow to measure the initial thickness of the material to be welded and after the weld current flow to measure the indentation of the electrodes into the material to be welded.
Activate this check mode only if the specific position sensor has been installed on the spot welder and if it can be activated through the THICK SENSOR parameter present in the **FEATURES MENU** menu.

The QUALITY – T parameter can be set to the following values:

- **OFF** No checks are run on the mechanical dimensions of the material present between the electrodes.

- **ZERO** In this mode, the control unit calculates the ZERO reference coordinate for the thickness and indentation measurements. The TE550 commutates automatically to NO WELD and one weld cycle must be carried out without material between electrodes. **The ZERO procedure is required each time the machine is turned on, when the welder's secondary geometry changes and when electrodes maintenance is performed**.

- **THICK** On the elapsing of the SQUEEZE1 and SQUEEZE times (if present), the thickness of the material to be welded is measured before the weld current flow. Check the THICKNESS measured by the control unit in the quality analysis screen.

```
PRG 005    SPOT 01234

THICKNESS 02.486 mm
IDENTATION 0.000 mm
```

The minimum and maximum limits may be set in the run measurement.

- **IDENT** At the end of the weld current flow, and before the HOLD time execution, the indentation of the electrodes into the material during the weld is measured. Check the IDENTATION of the electrodes measured by the control unit in the quality analysis screen.

```
PRG 005    SPOT 01234

THICKNESS 00.000 mm
IDENTATION 0.123 mm
```

The minimum and maximum limits may be set in the run measurement.

The correct indentation values are outlined in the specific weld tables according to the type of material to be welded.

- **TH+ID** Both measurements are carried out before and after the weld and the minimum and maximum limits may be set in both.

By setting parameter QUALITY - T to THICK or TH+ID, the user activates the **limits on the material's initial thickness**.

In this case, two new parameters are displayed:

THICK. MIN lower initial thickness limit of the material
THICK. MAX upper initial thickness limit of the material

and are to be used to set the thickness limit of the material at the beginning of the weld.

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

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

When checking the initial thickness (QUALITY - T = THICK or TH+ID), if the initial thickness is lower or higher than the values set in the foregoing parameters, one of the following messages appears:

```
     ERR 0124
     THICKNESS
  UNDER LOW LIMIT
```

```
     ERR 0125
     THICKNESS
  OVER HIGH LIMIT
```

By setting parameter QUALITY - T to IDENT or to TH+ID, the user activates the **electrode indentation limits**.

In this case, two new parameters are displayed:

>   IDENT. MIN   lower limit of the electrode indentation at the end of the weld
>   IDENT. MAX   upper limit of the electrode indentation at the end of the weld

and permit setting the electrode indentation limit values at the end of the weld.

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

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

When checking electrode indentation (QUALITY - T = IDENT or TH+ID), if the indentation is less than or greater than the values set in the foregoing parameters, one of the following messages appears:

```
     ERR 0126
    IDENTATION
  UNDER LOW LIMIT
```

```
     ERR 0127
    IDENTATION
  OVER HIGH LIMIT
```

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 interval of time that elapses from the beginning of the head descent to the application of 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
The SQUEEZE time is a wait time like that of the SQUEEZE 1. It is necessary for welding machines with low-pressure squeeze functions. In this case, such time determines the interval from the application of the welding force onto the electrodes (energizing of the EV2 valve) to the beginning of the welding. It should be long enough to allow the electrodes to achieve the proper clamping force before the welding begins. An inadequate adjustment of such time produces sparks among the electrodes and the sheet when the welding begins, causing quality inconsistencies. The squeeze time may be activated by means of the LOW FORCE SQ parameter in the FEATURES MENU. It is advisable to activate this parameter only if the welding machine is programmed for a low-pressure squeeze employing a suitable pneumatic circuit. The SQUEEZE time is added to the SQUEEZE 1 time. If the start cycle signal is deactivated during the squeeze time, the sequence is interrupted.

PRESSURE

This parameter, expressed in bar, expresses the welding pressure value. It is used only if in the pneumatic circuit a proportional valve is present. The set value must be such that it guarantees a proper clamping force during the welding cycle. An inadequate adjustment of such value produces sparks between electrodes and sheet when the welding begins. This parameter may be activated through the PROP. VALVE function in the **FEATURES MENU**.

FORGE DELAY

The FORGE DELAY parameter expresses the delay time elapsing from the welding process beginning and the application of the forging force. It is used exclusively with pneumatic circuits that contemplate the forging function. Such function activates the solenoid valve EV3 which permits to increase the electrode force during the welding cycle.

If the value is set to zero the FORGE DELAY function is disabled. However, the valve EV3 would be anyway activated at the same time of either the SQUEEZE 1 time or the SQUEEZE time, if the relevant function has been activated.

This parameter may be activated through the relevant function in the **FEATURES MENU**.

FORG.PRESS.

This parameter, expressed in bar, describes the forging pressure value; It is used only if in the pneumatic circuit a proportional valve is present. The set value must be such that it guarantees a proper clamping force during the forging. An inadequate adjustment of such value produces sparks between electrodes and sheet during the welding process. This parameter may be activated through the FORGE DELAY and PROP. VALVE parameters in the **FEATURES MENU**.

MOTOR DELAY

This parameter describes the time elapsing between the start of the welding cycle and the activation of the motor by means of the EV3 output in the control unit. This parameter is displayed when the SEAM WELDING MODE is ON, in the **FEATURES MENU**.

PRE-WELD

The PRE-WELD parameter indicates the duration of a current flow that can be carried out before the welding process. This parameter is expressed by three digits since it can be set with half-cycle precision. If this parameter is set to 0, the pre-weld will not be carried out. Pre-weld is carried out with a current adjustment equivalent to that indicated in the PRE-POWER parameter.

This parameter may be activated through the relevant function in the **SETUP MENU**.

PRE-POWER

The value expressed in this parameter indicates the power used for carrying the PRE-WELD out. This parameter may be activated through the relevant function in the **SETUP MENU**.

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 cooling time is not carried out.

This parameter may be activated through the relevant function in the **SETUP MENU**.

SLOPE UP

The SLOPE UP parameter describes the time for attaining the programmed welding current value. The starting value of this slope always corresponds to the minimum current, whereas the final value corresponds to the current value set at parameter POWER. The SLOPE UP inclination is automatically calculated by the microprocessor according to the set values. The SLOPE UP time is added to the welding time.

WELDING TIME

The WELDING TIME parameter indicates the welding current flow duration. It is carried out with the same power value set at parameter POWER.
When the pulse operating mode is activated, this parameter indicates the duration of each pulse. This parameter is expressed by three digits since it can be adjusted with half-cycle precision.

WELD MIN

The minimum weld time parameter (WELD MIN) is expressed in cycles and represents the welding duration minimum time. It is carried out with the same power value set at parameter POWER. Welding will stop if the energy measured at the end of this period of time is above or equal to the programmed rating. This parameter is only displayed when ENE (Constant Energy operating mode) is selected.

WELD MAX

The maximum weld time parameter (WELD MAX) is expressed in cycles and represents the welding duration maximum time. It is carried out with the same power value set at parameter POWER. Welding will stop also if the energy measured at the end of this period of time is below the programmed rating.
This parameter is only displayed when ENE (Constant Energy operating mode) is selected.

POWER

The value expressed in the POWER parameter indicates the power adjustment the welding process is carried out with.
This parameter is only displayed when either FIX (Power operating mode) or ENE (Constant Energy operating mode) are selected.

CURRENT

The value indicated in the CURRENT parameter shows the current adjustment used for carrying out the welding process.
This parameter is only displayed when IK (Constant Current operating mode) is selected.

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 operating mode) is selected.

IMPULSE N.

The IMPULSE N. parameter indicates the number of impulses used for carrying out the welding process. The duration of each impulse corresponds to the time set in weld parameter (WELDING TIME).

The maximum pulse number which can be carried out during a welding cycle varies according to the BUTT WELD MODE parameter adjustment (present in the **FEATURES** menu). If it is set on OFF, the maximum programmable pulse number is equal to 9 while if it is set on ON it is equal to 50.

COLD 2

The COLD 2 parameter is used in the pulse operating mode; it indicates the time that elapses from a welding impulse to the next one. When the impulse number is set to zero, the cold time 2, even if programmed, is not carried out.

SLOPE DOWN

The SLOPE DOWN parameter is a welding time that is added at the end of the welding process: it enables to decrease the welding current from the value set at POWER or at CURRENT down to the minimum value. The slope down inclination is automatically calculated by the microprocessor according to the set values. The SLOPE DOWN time is always added 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 from the WELD time to the POST-WELD time.

This parameter may be activated through the relevant function in the **SETUP MENU**.

POST-WELD

The POST-WELD parameter indicates the duration of a current flow that can be carried out after the welding time in. This parameter is expressed by three digits since it can be adjusted with half-cycle precision. If this parameter is set to 0 the post-weld is not carried out. The post-weld is carried out with the current adjustment set in the POST-POWER parameter.

This parameter may be activated through the relevant function in the **SETUP MENU**.

POST-POWER

The value expressed in this parameter indicates the post-welding power. This parameter may be activated through the relevant function in the **SETUP MENU**.

POWER 3

The value expressed in this parameter indicates the second power which can be recalled by means of the proper input in seam operating mode.

This parameter is only displayed when SEAM WELD MODE on ON is selected.

CURRENT 3

The value expressed in this parameter indicates the second current which can be recalled by means of the proper input in seam operating mode.

This parameter is only displayed when SEAM WELD MODE on ON is selected.

WELDING TIME3

The WELDING TIME time parameter indicates the welding current flow duration. It is carried out with the same power value set at parameter POWER 3 or CURRENT 3.

This parameter is expressed by three digits since it can be adjusted with half-cycle precision. This parameter is displayed when the SEAM WELDING MODE is ON, in the **FEATURES 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 zero, 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.

CURR. 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).
This parameter may be activated by setting the CONTROL MODE in CUR. If the CONTROL MODE parameter is set to NO (no control on the welding current), the parameter is not displayed during the programming phase.

CURR. 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).
This parameter may be activated by setting the CONTROL MODE in CUR. If the CONTROL MODE parameter is set to NO (no control on the welding current), the parameter is not displayed during the programming phase.

ANGLE MIN

This parameter fixes a minimum conduction angle limit value. For each weld, the control unit monitors that the minimum welding current conduction angle 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).
This parameter may be activated by setting the CONTROL MODE in DEG. If the CONTROL MODE parameter is set to NO (no control on the welding current), the parameter is not displayed during the programming phase.

ANGLE MAX

This parameter fixes a maximum conduction angle limit value. For each weld, the control unit monitors that the maximum welding current conduction angle 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).
This parameter may be activated by setting the CONTROL MODE in DEG. If the CONTROL MODE parameter is set to NO (no control on the welding current), the parameter is not displayed during the programming phase.

THICK. MIN

This parameter fixes a lower limit for the minimum thickness of the material located in between the electrodes. Before starting the weld, the measurement of the thickness of the material present between the electrodes should be greater than the minimum limit. Otherwise, an error message is displayed.

Activate this parameter by setting QUALITY - T in THICK or in TH+ID, otherwise the parameter will not be displayed during programming.

THICK. MAX

This parameter fixes a higher limit for the maximum thickness of the material located in between the electrodes. Before starting the weld, the measurement of the thickness of the material present between the electrodes should be less than the maximum set limit. Otherwise, an error message is displayed.

Activate this parameter by setting QUALITY - T in THICK or in TH+ID, otherwise the parameter will not be displayed during programming.

IDENT. MIN

This parameter fixes a lower limit for the minimum electrode indentation measurement at the end of the weld. The measurement of the indentation value should be greater than the set limit at the end of the weld. Otherwise, an error message is displayed.

Activate this parameter by setting QUALITY - T in IDENT or in TH+ID, otherwise the parameter will not be displayed during programming.

IDENT. MAX

This parameter fixes a higher limit for the maximum electrode indentation measurement at the end of the weld. The measurement of the indentation value should be less than the set limit at the end of the weld. Otherwise, an error message is displayed.

Activate this parameter by setting QUALITY - T in IDENT or in TH+ID, otherwise the parameter will not be displayed during programming.

PRES. MIN

This parameter fixes a minimum limit for the pressure measurement at the end of the squeeze phase. The measured pressure value must be greater than the set limit otherwise an error message will be displayed.

This parameter may be activated by setting **INPUT VE/PRE** (available in the **FEATURES MENU**) in **PRE** otherwise the parameter is not displayed when programming.

PRES. MAX

This parameter fixes a maximum limit for the pressure measurement at the end of the squeeze phase. The measured pressure value must be lower than the set limit otherwise an error message will be displayed

This parameter may be activated by setting **INPUT VE/PRE** (available in the **FEATURES MENU**) in **PRE** otherwise the parameter is not displayed when programming.

2.6 - SETUP MENU

```
-TE550  VER. 4.02--
 PROGRAM DATA
>SETUP MENU
 STEPPER MENU
```

In this menu, the operator may find those parameters enabling to simplify the programming and better adjust the control unit to the user's exigencies.

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

SETUP MENU PARAMETERS TABLE

PARAMETER	PARAMETER DESCRIPTION	VALUE RANGE
START 1 PRG	Start cycle 1 program	000 – 250
START 2 PRG	Start cycle 2 program	001 – 250
PRINTER SPOTS	Welding spots print	ALL – NONE – BAD
STOP BAD SPOTS	Number of spots for out-of-limit stop	0 – 15
AMMETER CAP.	Ammeter capacity	40 – 90 kA
LANGUAGE	Language for parameter description	ITA - ENG - SPA - DEU - FRA - UNG - POR - SWE - NL – RUS - POL - CZ
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

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 MENU** paragraph), the user 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 SPOTS
The parameter STOP BAD SPOTS permits to program the control unit so that it stops when out-of-limits welding spots are performed. The set value indicates the number of consecutive "out-of-limits" welding spots after which the machine stops. The limits error occurs when a welding spot is carried out with values either higher or lower than the limits set in parameters CURR MIN and CURR MAX or ANGLE MIN and ANGLE MAX. To set the value use keys ⊞ and ⊟ ; the value can be set from 0 to 15. If the value is set to zero, this function is deactivated; in this case, the welder does not stop even in case of "out-of-limits" welding spots. For further information, please, check the relevant paragraph.

AMMETER CAP.

This parameter indicates the ammeter capacity of the control unit. Keep in mind that the capacity refers to simple harmonic currents and as such overflow conditions might occur even with effective current values lower than the nominal value of the carrying capacity (please, also consult the COIL RATIO parameter relevant to the sensitiveness of the connected transducer, in the SET UP MENU).

LANGUAGE

With this parameter the user 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 – DUTCH – CYRILLIC – POLISH – CZECH.

PRE-WELD

By setting it on ON, it activates the following parameters: PRE-WELD, PRE-POWER and COLD 1 in all the programs.

POST-WELD

By setting it on ON, it activates the following parameters: SLOPE DOWN, COLD 3, POST-WELD and POST-POWER in all the programs.

2.7 - STEPPER MENU

```
–TE550  VER. 4.02––
 PROGRAM DATA
 SETUP MENU
>STEPPER MENU
```

This menu contains parameters associated with the current stepper operations.

```
     STEPPER MENU
>TOTAL STEPS     3
 SPOTS 1      04000
 INCREMENT 1   12 %
```

In order to use this function, it is necessary that the electrodes dressing function (option with board 50200) is disabled.

STEPPER MENU PARAMETERS TABLE

PARAMETER	PARAMETER DESCRIPTION	VALUE RANGE
TOTAL STEPS	Number of incremental steps	0 – 7
SPOTS 1	Spots step 1	00000 - 10000
INCREMENT 1	Percent increment step 1	00 - 60
SPOTS 2	Spots step 2	0001 - 5000
INCREMENT 2	Percent increment step 2	00 - 60
SPOTS 3	Spots step 3	0001 - 5000
INCREMENT 3	Percent increment step 3	00 - 60
SPOTS 4	Spots step 4	0001 - 5000
INCREMENT 4	Percent increment step 4	00 - 60
SPOTS 5	Spots step 5	0001 - 5000
INCREMENT 5	Percent increment step 5	00 - 60
SPOTS 6	Spots step 6	0001 - 5000
INCREMENT 6	Percent increment step 6	00 - 60
SPOTS 7	Spots step 7	0001 - 5000
INCREMENT 7	Percent increment step 7	00 - 60

TOTAL STEPS
This parameter indicates how many segments are to be created for implementing the stepper curve. When it is set to zero, the stepper function is disabled.

SPOTS 1
This parameter indicates the number of spots of which the associated segment is composed. When it is set to zero, the stepper function is disabled.
When TOTAL STEPS = 0 and SPOTS 1 ≠ 0, the value set in the SPOTS 1 parameter is equal to the number of welding maximum spots.

INCREMENT 1
This parameter indicates the current stepper percentage to be attained upon the completing of the spots set in the associated segment.
When it is set to zero, the stepper function is disabled.

SPOTS 2

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

INCREMENT 2

This parameter indicates the current stepper percentage to be attained upon the completing of the spots set in the associated segment.

SPOTS 3

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

INCREMENT 3

This parameter indicates the current stepper percentage to be attained upon the completing of the spots set in the associated segment.

SPOTS 4

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

INCREMENT 4

This parameter indicates the current stepper percentage to be attained upon the completing of the spots set in the associated segment.

SPOTS 5

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

INCREMENT 5

This parameter indicates the current stepper percentage to be attained upon the completing of the spots set in the associated segment.

SPOTS 6

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

INCREMENT 6

This parameter indicates the current stepper percentage to be attained upon the completing of the spots set in the associated segment.

SPOTS 7

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

INCREMENT 7

This parameter indicates the current stepper percentage to be attained upon the completing of the spots set in the associated segment.

2.8 - CURRENT STEPPER FUNCTION

The stepper function enables to compensate the wear of the electrodes that affects the quality of the welding spots. When the electrode diameter is enlarged, the contact section area between the electrode and the work piece to be welded increases and, as a consequence, the welding current density (Ampere/mm2) decreases. If the current adjustment is maintained at a fixed value throughout the whole electrodes life, it will be noticed that the quality of the last spots is poorer than the first ones. The stepper function is used for overcoming this problem. It gradually increases the current adjustment during the welding process when the diameter of the electrodes increases: this enables to maintain a constant current density.

An increment curve is programmed to describe the pattern of the current during the electrodes' life. This curve is described by one or more segments for each of which the number of welding spots and the associated current increment in percentage are programmed.

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

If the current or conduction angle limits are used, they will be increased by the same percentage, as are the settings for the pre-welding current and post-welding current, and the energy level to attain.

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

In order to start a new stepper curve, it is necessary to clear the counter and restore the starting diameter of the electrodes.

SIMPLIFIED USE OF THE STEPPER FUNCTION (LINEAR INCREMENT)

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.

```
      STEPPER MENU
>TOTAL STEPS      1
 SPOTS 1       02000
 INCREMENT 1   26 %
```

The user 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.

For the "simplified" use of the stepper function, always set parameter TOTAL STEPS to 1 (since the segment to be programmed is only one). Enter the number of welding spots to be carried out in parameter SPOTS 1, i.e. the foreseen life span of the electrodes. Enter the percent increment to be achieved in parameter INCREMENT 1.

Example:

After having run the welding tests, the result was that the usable life of the electrodes = 2000 welding spots. Another fact that ensued was that the required current for new electrodes = 15 kA, whereas after 2000 welding spots the diameter increase of the electrodes requires a current of 19 kA.

Therefore calculate the change in percent 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
TOTAL STEPS	Number of segments for stepper function	1
SPOTS 1	First segment spots number	2000
INCREMENT1	First segment increment percent	26%

The welding program should be adjusted for carrying out the first welding spot followed by the adjustment that permits to obtain the required current with the starting electrode diameter: 15 kA. It does not matter whether the TE550 is programmed for a percent adjustment or a constant current adjustment since the stepper function is operational in both modes.

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

CURRENT INCREASE DURING THE PRODUCTION

INITIAL CURRENT = 15 kA

FINAL CURRENT = 19 kA

INCREMENT PERCENT = 26 %

WELDING SPOTS NUMBERS = 2000

WELDING CURRENT (kA)

NUMBER OF WELDING SPOTS
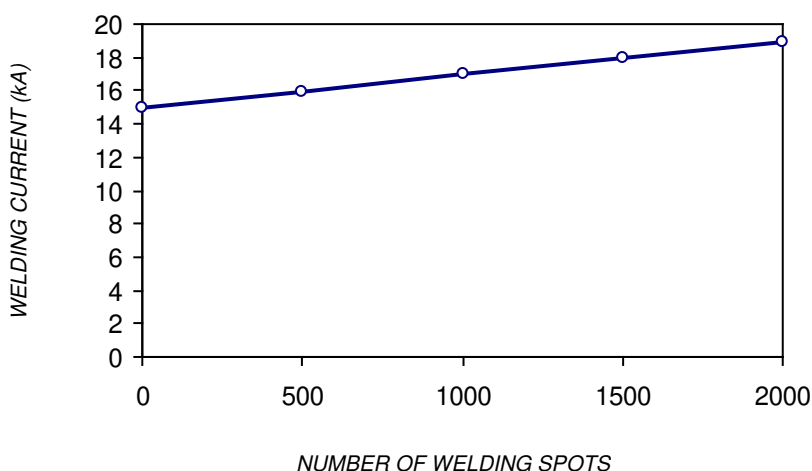
Upon having completed all 2000 welding spots the TE550 stops the production cycle and displays the following message:

```
      ERR 104
  MAX SPOTS NUMBER
```

At this point the operator replaces the electrodes (or resets their original diameter) <u>and clears the spots counter to clear stepper calculations.</u>

The TE550 resets the initial work parameters and begins a new increment phase.

COMPLETE USE OF THE STEPPER MENU 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.
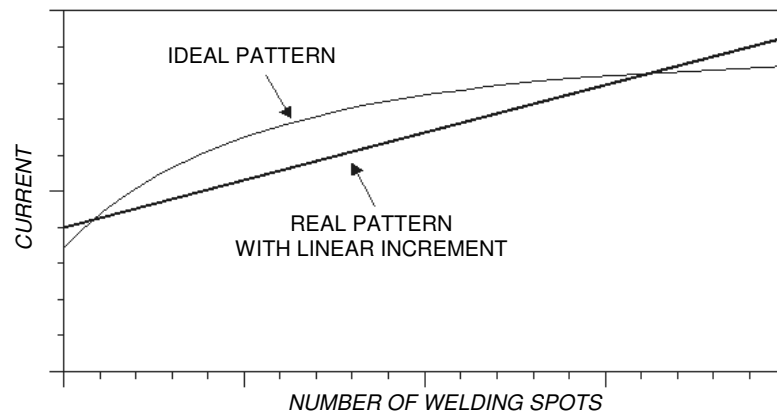
As such the use of the linear increment is an approximation which nonetheless permits to achieve good results in most applications. However when the user wishes to achieve utmost constancy during work conditions, a non-linear increment curve can be set that is described by defining a certain number of 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.
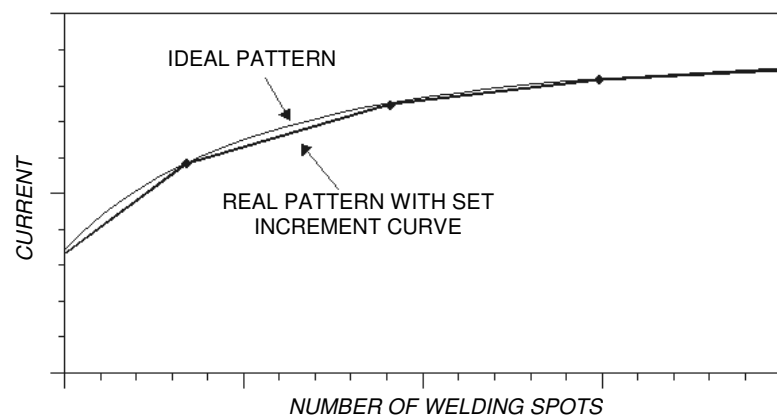
The increment curve is set by assessing a certain number of linear segments. The number of welding spots and the desired increment are assessed for each segment.

```
        STEPPER MENU
>TOTAL STEPS        4
 SPOTS 1         00700
 INCREMENT 1      19 %
```

The TOTAL STEPS parameter determines the number of segments to be inserted in the increment curve. Enter the number of welding spots that make up the segment in the SPOTS 1,2… parameters. Enter the corresponding percent increment to be achieved in the INCREMENT 1,2… parameter.

The programming procedure is outlined in the **STEPPER MENU** paragraph.

Example:
After a number of welding tests, the ensuing life of the electrodes resulted to be 4000 welding spots and the following current values are required during the different moments of the electrodes' life.

SPOTS PERFORMED	REQUIRED CURRENT
0 (initial electrodes diameter)	15 kA
700	17.8 kA
1800	19.5 kA
3000	20.2 kA
4000 (end electrodes diameter)	20.7 kA

Therefore calculate the duration (in number of welding spots) and the percent increment of each segment.
Keep in mind that the percent increment must always be calculated in relation to the beginning of the segment being examined.

$$Duration\ of\ segment\ 1 = 700 - 0 = 700\ spots$$

$$Duration\ of\ segment\ 2 = 1800 - 700 = 1100\ spots$$

$$Duration\ of\ segment\ 3 = 3000 - 1800 = 1200\ spots$$

$$Duration\ of\ segment\ 4 = 4000 - 3000 = 1000\ spots$$

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

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

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

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

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

PARAMETER	PARAMETER DESCRIPTION	VALUE
TOTAL STEPS	Number of segments per stepper function	4
SPOTS 1	Number of spots of the first segment	700
INCREMENT1	Increment percent of first segment	19
SPOTS 2	Number of spots of the second segment	1100
INCREMENT2	Increment percent of second segment	10
SPOTS 3	Number of spots of the third segment	1200
INCREMENT3	Increment percent of third segment	4
SPOTS 4	Number of spots of the fourth segment	1000
INCREMENT4	Increment percent of fourth segment	3

The welding program should be adjusted for carrying out the first welding spot followed by the adjustment that allows the achieving of the required current with the starting diameter of the electrodes: 15 kA.

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

CURRENT INCREASE DURING THE PRODUCTION

NUMBER OF WELDING SPOTS
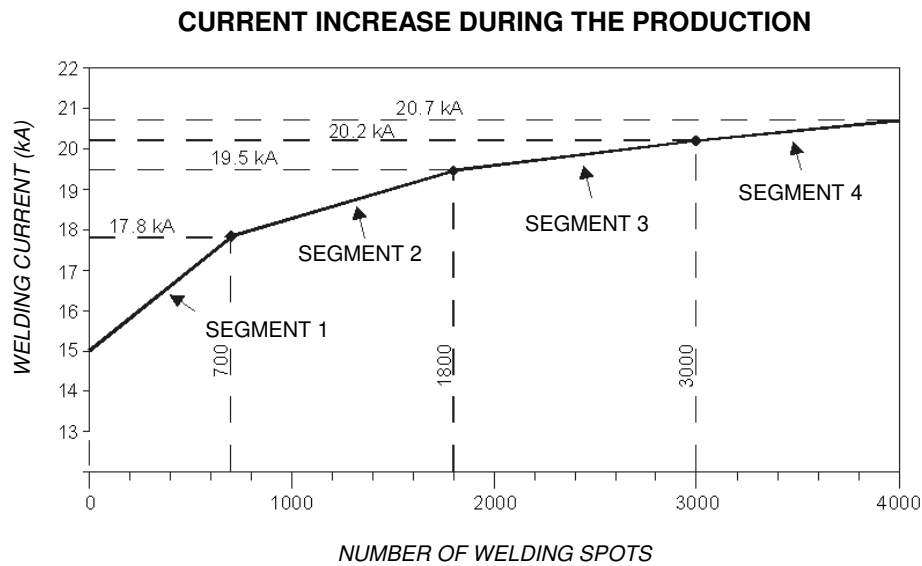
Once the 4000 welding spots have been carried out, the control unit stops the production and displays the following message:

```
        ERR 104
   MAX SPOTS NUMBER
```

At this point the operator replaces the electrodes (or resets their original diameter) and clears the spots counter, by means of the proper key, to clear stepper calculations.
The TE550 resets the initial work parameters and begins a new increment phase.

2.9 - **FEATURES MENU**

```
-TE550  VER. 4.02--
 SETUP MENU
 STEPPER MENU
>FEATURES MENU
```

The features menu contains the parameters that describe the complexity and typology of the welder on which the control unit works. Due to their importance, access to this menu is protected by a code.

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

If the user 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.

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

PARAMETER	PARAMETER DESCRIPTION	VALUE RANGE
FIRST INSERT.	1st Insertion delay	01 –99
SERIAL COM.	Serial communication	232 – 485 – USB – OFF
NETWORK ADDRESS	Network address	01 – 31
COIL RATIO	Rogowski ratio	X 0.5 – X1 –X5 – X10
LOCK/END OUT	Output function	END – LOCK
FUNCTION RIC6-7	Recall function 6 and 7	RIC
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
NC CONTACTS	Also NC functions of the cycle starts	ON – OFF
SEAM WELD MODE	Spots / seams	ON – OFF
BUTT WELD MODE	Butt weld function	ON – OFF
SER. SPOT MODE	High speed function	ON – OFF
CASCADE MODE	Electric cascade function	ON – OFF
ADJUST POWER%	Power map correction	00 - 10
WELD / NO WELD	WELD / NO WELD management	INT – EXT – BOTH
THICK SENSOR	Position sensor function	ON – OFF
EV LOCK ON ERR.	Head lock function in case of error	ON – OFF – KEY
INPUT VE/PRE	Input selector VE/PRE	VE – PRE
VOLTAGE RANGE	Electrodes voltage capacity	5V – 10V – 20V
BACKUP USB	Usb backup function	<+>
RESTORE USB	Usb restore function	<+>
SET DATE-TIME	Usb set calendar-clock	<+>

FIRST INSERT

The FIRST INSERT parameter shows the first insertion delay. This function permits to optimize the balance of the primary consumption of the welder. After having selected this parameter, the value can be adjusted from 1 to 99.
For more information refer to the specific chapter.

SERIAL COM.

The user 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 connect an external memory storage support (USB), or not 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.

COIL RATIO

This parameter shows the sensitivity of the current transducer installed on the welder.

OPTIONS	SIGNAL RATIO	AMMETER CAPACITY
X 0.5	75 mV/ kA	80 – 180 kA
X 1	150 mV / kA	40 – 90 kA
X 5	750 mV / kA	8 – 18 kA
X 10	1.5 V / kA	4 – 9 kA

OUT LOCK/END

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

FUNCTION RIC6-7

This parameter indicates the function associated to the two inputs RIC6 (pin 26) and RIC7 (pin 28). At present, this function is always on RIC.

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 cycle start signal AUTORETAIN.
The welding time is always completed whenever the value is set to ON.

By setting the parameter to OFF, 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. This function is specifically to be used when the machine works with mechanical devices instead of pneumatic ones.

When the AUTORETAIN parameter is set to OFF, the following question is asked:

```
RELEASE MESSAGE?
KEY[+]=YES KEY[-]=NO
```

- by pressing the key ⊞ any time the spot performed is not accomplished, but it has been interrupted during the welding time, the message error 118 has been displayed;
- by pressing the key ⊟, instead, the display of the same message is cancelled.

NC CONTACTS

This parameter setted on ON activates the normally closed inputs of the cycle start signal, START NC(pin24) and START2 NC(pin20), allowing the weld cycle start. However, this is possible only if the exchange double contact is present. This contact would enable the following operation: the normally open contact would close while the normally closed one would open up.

In case the contact, usually closed, should remain open, on the control unit will be displayed one of the following messages

```
!!CHECK NC START 1!!
```

```
!!CHECK NC START 2!!
```

With the parameter CONTACTS NC set instead on OFF, it is enough to close the starting cycle contacts that usually is open START NO or START2 No (pin 19) to start up the welding cycle. In this case, if the contact that is usually open should remain closed, on the control will be displayed the following message

```
      DISATTIVARE
COMANDI AVVIO CICLO
```

SEAM WELD MODE

By means of this parameter, it is possible to enable the function for adjusting the control unit to the seam welders' specifications.
Further pieces of information are described in the paragraph **SEAM WELD MODE**.

BUTT WELD MODE

By means of this parameter, it is possible to enable the function for adjusting the control unit to the butt welders' specifications.
Further pieces of information are described in the paragraph **BUTT WELD MODE**.

SER. SPOT MODE

By means of this parameter, it is possible to enable the function for adjusting the control unit to the high speed spot welders.

Further pieces of information are described in the paragraph **SER. SPOT MODE**.

CASCADE MODE

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

ADJUST POWER%

This parameter allows modifying the weld switch-on delay time for correcting the power map and adjusting the control unit to the transformer it is connected to.

WELD / NO WELD

This parameter, with **optional card** code 50200 installed, is used for selecting the priority of the WELD / NO WELD command.

When the parameter is set to INT, the functionality of the WELD / NO WELD external line on the card, coded 50200 (PIN 54), is OFF whilst the button on the control unit remains active.

When this parameter is set to EXT, the functionality of the WELD / NO WELD external line on the card, coded 50200, is ON whilst the button on the front panel of the TE550 unit is disabled.

When this parameter is set to BOTH, both WELD / NO WELD commands are active: the one on the TE550 front panel and the external command line on card coded 50200. Since the two commands are in sequence, only one of the two commands set to NO WELD is needed to commute the unit to NO WELD. Both commands must be commutated to WELD to commutate the unit to WELD.

THICK SENSOR

Activate this parameter to make available both the QUALITY – T parameter inside the programs and the THICKNESS SENSOR menu to parameterize the position sensors connected to the control unit.

EV LOCK ON ERR.

This parameter allows to keep the control unit's solenoid valves energized and to stop the head of a welder when an error rises in the welding cycle diagram.

When this parameter is set on OFF, this function is disabled.

When this parameter is set on ON, the head lock function is enabled in case of error.

To unlock the TE550, it is necessary to press the CLEAR ⌫ key or to use the ERROR RESET input (when the extra board is present).

When the parameter is set on KEY, a second function for locking the head is enabled.

In this very case, in order to unlock the TE550 it is necessary first to turn the key in the PROG position and then to press the CLEAR ⌫ key or to use the ERROR RESET input (when the extra board is present).

As long as the control unit is in the error condition and the solenoid valves outputs are closed, the WRONG output signal is kept activated.

INPUT VE/PRE

This parameter allows to set which optional board (either item 50200 or item 50189) has been connected to the TE550 control unit. This parameter is displayed only when either one of these boards is present.

When having a 50200 board (for measuring the electrodes voltage), it is necessary to set the parameter on VE.

When having a 50189 board (for measuring the welding pressure), it is necessary to set the parameter on PRE.

VOLTAGE RANGE

This parameter allows selecting the capacity/maximum rating of the voltage measured across the welding electrodes that are to be selected. The rating for this parameter **must correspond** to the capacity selected on the acquisition board (item 50097). The control unit allows enabling this function only if the supplementary board item 50200 is present.

BACKUP USB

By pressing the key <+> level with this parameter, it is activated the procedure for saving the data relevant to the parameters of all the control unit's menus on an external USB memory.
The control unit displays this parameter only when the USB optional board is present and if the SERIAL COM. parameter is set on USB.
For further information, please, refer to the installation and user manuals of the USB board.

RESTORE USB

By pressing the key <+> level with this parameter, it is activated the procedure for restoring the data relevant to the parameters of all the control unit's menus from an external USB memory.
The control unit displays this parameter only when the USB optional board is present and if the SERIAL COM. parameter is set on USB.
For further information, please, refer to the installation and user manuals of the USB board.

SET DATE-TIME

By pressing the key <+> level with this parameter, it is possible to set the current time and date for the external memory storage support.
The control unit displays this parameter only when the USB optional board is present and if the SERIAL COM. parameter is set on USB.
For further information, please, refer to the installation and user manuals of the USB board.

2.10 - PROGRAM COPY

```
-TE550  VER. 4.02--
 STEPPER MENU
 FEATURES MENU
>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 (so to make the programming quicker).

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

After selecting the source program and the programs where it is to be saved, press the ◄ key for starting the copying procedure. The following message will be displayed. The bar indicates the copy progress.

```
   COPY PROGRAMS
    IN PROGRESS

  ▌▌▌▌▌▌▌▌▌
```

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

```
-TE550  VER. 4.02--
 STEPPER MENU
 FEATURES MENU
>PROGRAM COPY
```

PROGRAM COPY MENU PARAMETERS TABLE

PARAMETER	PARAMETER DESCRIPTION	VALUE RANGE
SOURCE PROGRAM	Source program	001 – 250
COPY FROM PRG	Program start copy/target	001 – 250
TO PROGRAM	Copy end program	001 – 250

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

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

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

2.11 - CHECK INPUT

```
-TE550  VER. 4.02--
 FEATURES MENU
 PROGRAM COPY
>CHECK INPUT
```

This menu displays the input status on the welding control unit. It is uses for check both the efficiency and the proper working of the external devices connected to the control unit and necessary for using the welder.

```
   CHECK INPUT
>START          OFF
 AUX            OFF
 AUX 3          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 NO	It indicates the status of the cycle start signal	ON – OFF
START 1 NC	It indicates the status of the cycle start signal	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	ON – OFF
START 2 NO	It indicates the status of the cycle 2 start signal	ON – OFF
START 2 NC	It indicates the status of the cycle 2 start signal	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
PRG RECALL 5	It indicates the status of the recall 5 signal	ON – OFF
PRG RECALL 6	It indicates the status of the recall 6 signal	ON – OFF
PRG RECALL 7	It indicates the status of the recall 7 signal	ON – OFF
SAFETY START 1	It indicates the status of the two-hand control push-button 1 signal	ON – OFF
SAFETY START 2	It indicates the status of the two-hand control push-button 2 signal	ON – OFF
EMERGENCY	It indicates the status of the emergency signal	ON – OFF
(When the option item 50200 is present)		
RESET DRESSING	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.

2.12 - PROG. SEQUENCE

```
-TE550  VER. 4.02--
 PROGRAM COPY
 CHECK INPUT
>PROG. SEQUENCE
```

The parameters necessary for activating the program sequence operating mode are entered in this menu. When using this operating mode, the welding control unit orders the welder to carry a welding spots sequence out by automatically deciding both the working program at each spot and the spots welding order without needing a program external selection.

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

PROG. SEQUENCE MENU PARAMETERS TABLE

PARAMETER	PARAMETER DESCRIPTION	VALUE RANGE
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 program number that the welder has to carry out and is always coupled with the STEP 1 WELDS parameter.
When this parameter is set to zero, the programs sequence is disabled.

STEP 1 WELDS
This parameter's value indicates the welding spots number to be carried out with the program coupled with the same step.

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

STEP 2 WELDS
This parameter's value indicates the welding spots number to be carried out with the program coupled with the same step.

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

STEP 3 WELDS

This parameter's value indicates the welding spots number to be carried out with the program coupled with the same step.

STEP 4 PRG.

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

STEP 4 WELDS

This parameter's value indicates the welding spots number to be carried out with the program coupled with the same step.

STEP 5 PRG.

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

STEP 5 WELDS

This parameter's value indicates the welding spots number to be carried out with the program coupled with the same step.

After activating this operating mode and setting the parameters of the **PROG. SEQUENCE** menu as aforesaid, it is possible to start carrying the welding spots out. By turning the key on RUN position, the display will show the sequences data as per the below picture.

```
WELD N.008 TOTAL 013
PROG N.003 RMS 10.45
TIME 10.0 SPOT 00050
NEXT 009 NEXTPRG 002
```

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

Example of sequence operating mode after setting the following values in the parameters:

PARAMETER	VALUE
STEP 1 PRG.	03
STEP 1	04
STEP 2 PRG.	07
STEP 2	02
STEP 3 PRG.	11
STEP 3	06
STEP 4 PRG.	04
STEP 4	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 welding spots with program 03
- 2 welding spots with program 07
- 6 welding spots with program 11
- 1 welding spot 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
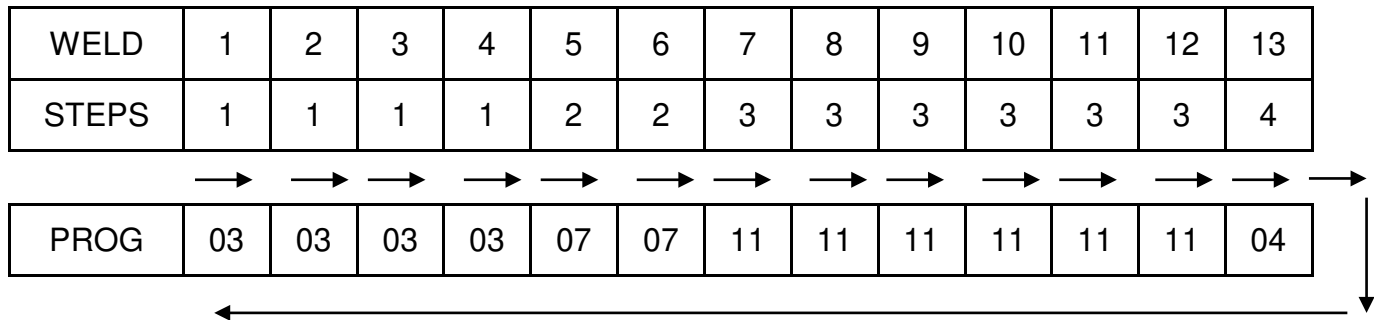
This operating mode typology is usually applied to a manual welder, where the operator carries the welding spots out always in the same order but with different working parameters. This operating mode prevents the operator from manually changing the program and, therefore, from diverting his attention away from the piece to be welded, from changing the foot-pedal or other cycle start device.

However, the operator must pay great attention while working so not to carry less welding spots out than the programmed ones, neither overlapped spots, nor welding spots in a different order.

However, should any error occur in the sequence operating 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

```
WELD N.006 TOTAL 013
PROG N.007 RMS 10.45
TIME 12.5 SPOT 00050
NEXT 007 NEXTPRG 011
```

+

```
WELD N.007 TOTAL 013
PROG N.011 RMS 09.57
TIME 12.5 SPOT 00057
NEXT 008 NEXTPRG 011
```

```
WELD N.013 TOTAL 013
PROG N.004 RMS 05.00
TIME 12.5 SPOT 00065
NEXT 001 NEXTPRG 003
```

−

```
WELD N.012 TOTAL 013
PROG N.011 RMS 07.50
TIME 12.5 SPOT 00073
NEXT 013 NEXTPRG 003
```

2.13 - TIP-DRESSING

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.

Usually, the tip dressing function allows interfacing the welding control unit with the dresser and may be used with automated equipment.

Once it is programmed, the current stepper is applied to all the used welding programs.

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

```
    TIP-DRESSING
>DRESSING NUMBER  02
 SPOT DRESSING   003
 DRESSING STEPS  07%
```

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

⚠ Before switching the TE550 control unit on with the 50200 supplementary expansion board, check that the ELECTRODES END LIFE CLEAR inlet (Pin 52) is disabled.
Otherwise, the 50200 board is not recognized by the control unit.

By enabling this function, the **STEPPER MENU** programming is disabled.

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

PARAMETER	PARAMETER DESCRIPTION	VALUE RANGE
DRESSING NUMBER	Number of tip-dressing to be carried out	00 – 99
SPOT DRESSING	Number of welding spots per tip-dressing	001 – 650
DRESSING STEPS	Stepper percentage per tip-dressing	01 – 50%
DRESSING ALARM	Notice welding spots number	00 – 40
ELECTRODES 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.

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 warned welding spots number during which the ALARM DRESSING outlet is enabled for requiring the welding electrodes maintenance.

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:

```
            ERR 0116
        SPOTS FINISHED
        DRESS ELECTRODES
```

In order to restore operations, first clear the screen via the ERROR RESET input followed by the activation of the signal that indicates that the dressing was done.

ELECTRODES ALARM

This parameter indicates the notice welding spots number during which the ELECTRODES ALARM output is enabled for requiring 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:

```
            ERR 0117
       ELECTRODE END LIFE
        REPLACE WITH NEW
```

In order to restore operations, first clear the screen via the ERROR RESET input followed by the activation of the signal that indicates that the electrodes were replaced.

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.
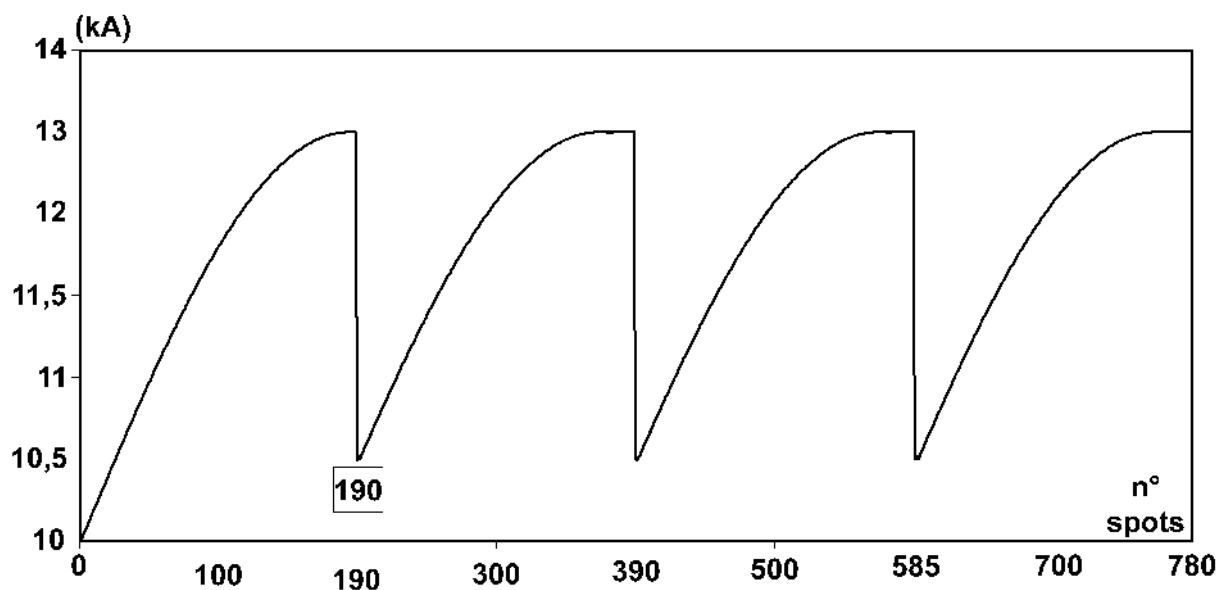
Notice that the initial current of the first dressing starts at 10KA whilst a percentage is added to the starting current value of the subsequent dressings (parameter DRESSING OFFSET).

The chart below shows the time-study and modalities of the signals used for this operating mode (referring to the values in the foregoing table).
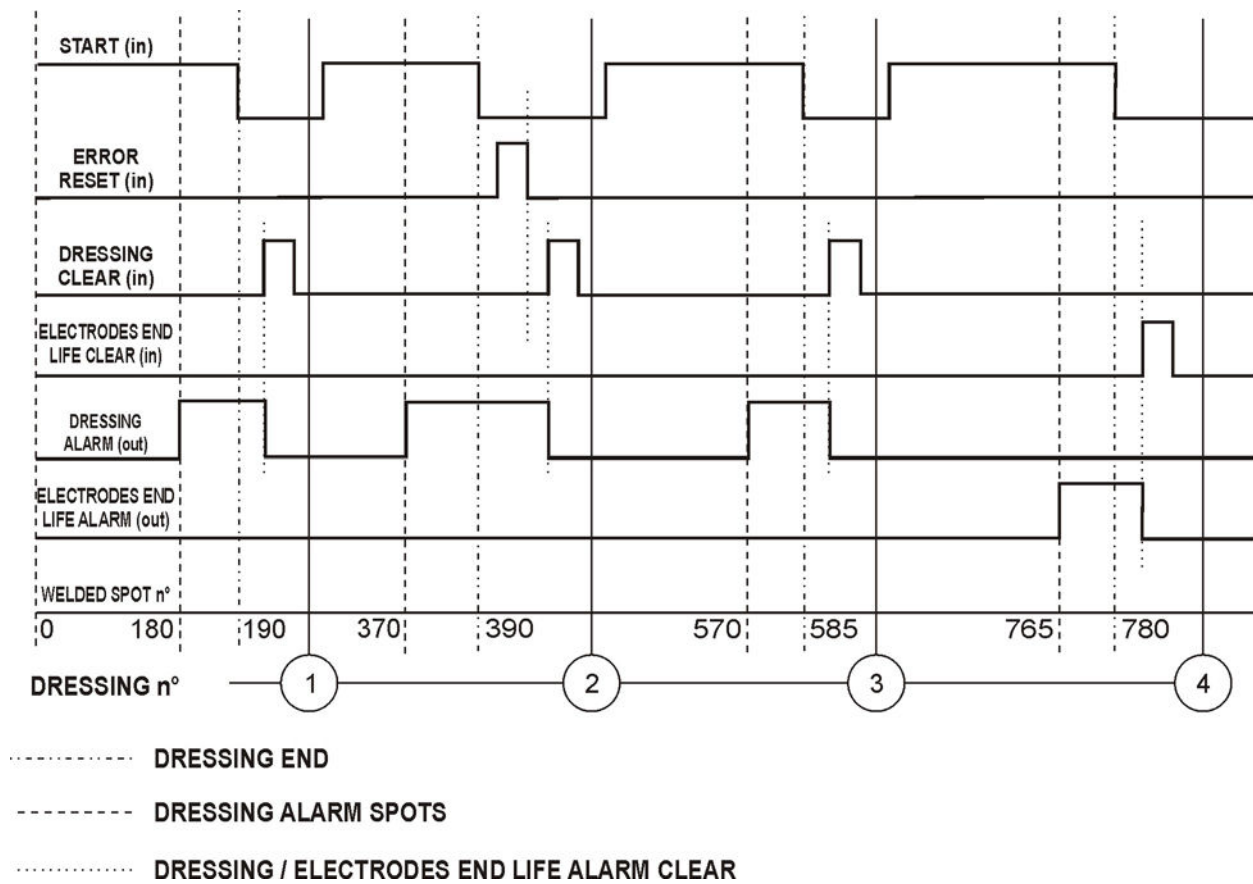
From the moment the control unit activates the DRESSING ALARM output, it may be reset at any time by activating the DRESSING CLEAR input as shown in the foregoing chart for dressings 1, 3 and 4.

In the example, the last DRESSING spot was reached for DRESSING n°2 without clearing the DRESSING ALARM. In this case the control unit stops and displays the relevant message (ERROR 116). In this case, first delete the screen from the control unit either using the ERROR RESET input or using the CLEAR key, and then clear 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.

2.14 - THICKNESS SENSOR

```
-TE550  VER. 4.02--
 CHECK INPUT
 PROG. SEQUENCE
>THICKNESS SENSOR
```

In order to view and access this menu, the user must commutate parameter THICKNESS SENSOR to ON inside the FEATURES MENU.

The THICKNESS SENSOR menu contains the parameters for configuring the linear position sensor. Due to their importance, their access in protected by a code.

```
    ACCESS CODE
   TO ENTER MENU
    - - - - -
```

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

```
    WRONG CODE
    TRY AGAIN!
```

Sensor parameters may be changed after having keyed in the correct access code.

```
   THICKNESS SENSOR
>LINEAR SENSOR   OFF
 SENSOR S/N_P1: 0000
 SENSOR S/N_P2: 0000
```

If the position sensors are activated, the position sensors initialize each time the control unit is switched on. If an initialization error occurs, it is displayed on the control unit through the following message:

```
     CAN LINE
  NOT INITIALIZABLE
```

and the sensors disable automatically.

Therefore, solve the initialization problem, re-enter the THICKNESS SENSOR menu and manually re-enable the position sensors.

PARAMETER	PARAMETER DESCRIPTION	VALUE RANGE
LINEAR SENSOR	Linear sensors activation – deactivation	ON – OFF
SENSOR S/N_P1:	Part 1 sensor serial no. 1	XXXX
SENSOR S/N_P2:	Part 2 sensor serial no. 1	XXXX
SENSOR ID CAN:	CAN ID for sensor 1	100 – 119
DELAY IDENT.	Delay for measuring the indentation	0 – 1000 mS

LINEAR SENSOR

This parameter activates or deactivates the linear position sensors. If a sensor initialization error occurs, the parameter commutates to OFF automatically. Sensor identification parameters are not deleted.

The enabling of the position sensors makes available the measurements relative both to the initial thickness of the sheets to be welded and the indentation of the electrode at the end of the weld, and relative limits.

SENSOR S/N_P1:

This parameter contains the first part of the serial number of the linear sensor, which can be read on the sensor's body.

SENSOR S/N_P2:

This parameter contains the second part of the serial number of the linear sensor, which can be read on the sensor's body.

SENSOR ID CAN:

This parameter is for setting the sensor's ID in the CAN network. In order to work efficiently, the sensors present in the CAN network must have univocal identifiers.

DELAY IDENT.

This parameter specifies the delay, in mS, that the system must wait after the weld current flow to measure the coordinate with which to obtain the electrode indentation value during the weld.

Below is explained the procedure for adjusting the DELAY IDENT. parameter.

DELAY IDENT. PARAMETER ADJUSTMENT

The machine's mechanical structure might vibrate during the welding stage, when current flows, further to the current's electrodynamic action. Vibrations induced by the current flow do not stop immediately when current stops flowing but might require a certain amount of time to lessen. Said time depends on the resilience of the spot welder structure. The execution of the measurement of a coordinate during this transient phase might be altered by the vibrations induced in the structure. Therefore, depending on each structure, a minimum delay should be set to execute coordinates measurements in static type situations.

How to determine the minimum wait time before executing the measurement:

1) Configure the linear position sensor for use.

2) Set parameter DELAY IDENT. to ZERO.

3) Go to the PROGRAM DATA menu: set parameter QUALITY - T to ZERO in the weld program. **Weld a short circuited spot to zero the coordinate (electrodes with no material in between)**.

4) Go to the PROGRAM DATA menu: set parameter QUALITY - T to IDENT. in the weld program.

5) **Weld a short circuited spot and observe the measurement of the IDENTATION displayed on the TE550 control unit at the end of the weld.**

```
PRG 005    SPOT 01234

THICKNESS 00.000 mm
IDENTATION 0.000 mm
```

If the IDENTATION value is zero even after several weld spots, the set delay is correct.

6) **If the displayed indentation value does not remain constant on executing a number of welds, return to the THICKNESS SENSOR menu and increase the DELAY IDENT. parameter**.

7) Repeat a few welds as specified in step 6.

2.15 - ADJUSTING THE FIRST INSERT DELAY

During **installation** it is <u>compulsory</u> to adjust the first insert delay both to reduce absorption from the power line and to reduce power dissipation at the transformer's primary (risk of damaging the weld transformer permanently). This adjustment permits optimizing the machine line absorption balance.

In order to carry out the adjustment, set the control unit to max power value (POWER=99%) and carry out "no load" welds, cutting off the secondary circuit (e.g.: by placing insulation between electrodes).

Adjust parameter FIRST INSERT, in the **FEATURES MENU**, so that positive and negative line absorptions are balanced. Use an ammeter allowing measuring the maximum positive and negative peak values. The adjustment will be correct when the positive peak value is similar to the negative one.

It is necessary to use a proper current measurement device providing CAT III 600V insulating class and operate with suitable insulating gloves for intervening on supplied mains.

In order to simplify the FIRST INSERT adjustment, it is advisable to use an ammeter that shows the waveform on a digital oscilloscope. In this case carry out the adjustment so that all the primary current half-waves have the same amplitude.

The following charts show waveforms obtained through a wrong and a correct adjustment.
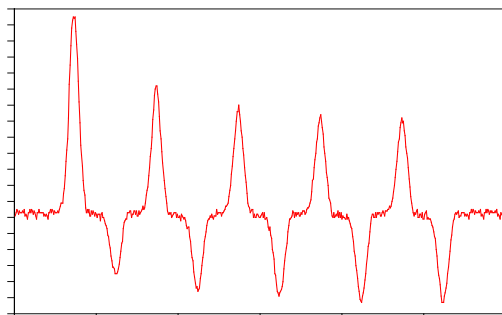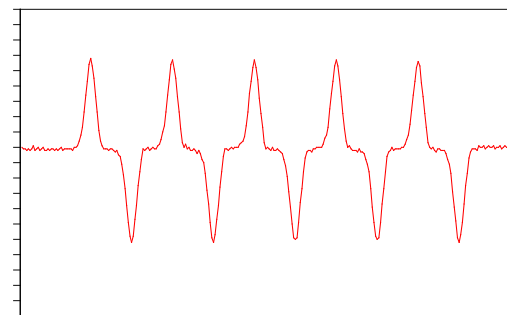
Unbalanced absorption   Balanced absorption

CHAPTER 3 - SEAM WELD WORK MODE

```
    FEATURES MENU
 AUTORETAIN        ON
 NC CONTACTS       OFF
>SEAM WELD MODE    ON
```

With parameter SEAM WELD MODE set to ON, the work screen is as follows:

```
PROG. 001 SPOT 12340
 WELD CYCLE 01.0 ~
CURRENT RMS 43.26 kA
CONDUCTION DEG 142°
```

This function allows the user 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.

The welding current is measured during the WELDING TIME only regardless of the program set-up, that is to say either pulsed cycle or continuous cycle.

With the cycle-start command ON, the control unit keeps repeating the time set in the WELDING TIME parameter. We suggest using short weld times to prevent the control unit from finishing a long weld time, when the cycle start command is cleared.
In the seam operating mode, output EV3 is used as the roller-start command instead of being used for the forging. On selecting the seam weld function, the control unit may work either in WORKING MODE in FIX or in IK.

SEAM WELD MODE PARAMETERS TABLE

Below you may see the 2 possible programming screens according to the parameter selected in the WORKING MODE. The screens contain all the programmable parameters.

```
    PROGRAM DATA
>PROGRAM N.       001
 WORKING MODE     FIX
 CONTROL MODE     NO
```

PARAMETER	VALUE RANGE
PROGRAM N.	001 - 250
WORKING MODE	FIX
CONTROL MODE *	NO
SQUEEZE 1	00.5 – 99.5 cycles
SQUEEZE	00.5 – 99.5 cycles
PRESSURE	00.5 – 10.0 bar
MOTOR DELAY	00 - 99 cycles
SLOPE UP	00 - 25 cycles
WELDING TIME	00.5 - 99.5 cycles
POWER	5 - 99 %
COLD 2	00 – 50 cycles
WELDING TIME 3	00.5 - 99.5 cicli
POWER 3	05 – 99 %
COLD 3	00 – 50 cicli
HOLD TIME	00.5 – 99.5 cycles
OFF TIME	00.0 – 99.5 cycles

CONTROL MODE *	CURR
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA

CONTROL MODE *	DEG
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

CONTROL MODE *	ALL
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

```
-- PROGRAM DATA --
>PROGRAM N.      001
 WORKING MODE    IK
 CONTROL MODE    NO
```

PARAMETER	VALUE RANGE
PROGRAM N.	001 - 250
WORKING MODE	IK
CONTROL MODE *	NO
SQUEEZE 1	00.5 - 99.5 cycles
SQUEEZE	00.5 - 99.5 cycles
PRESSURE	00.5 - 10.0 bar
MOTOR DELAY	00 - 99 cycles
SLOPE UP	00 - 25 cycles
WELDING TIME	00.5 - 99.5 cycles
CURRENT	00.5 - 90.0 kA
COLD 2	00 – 50 cycles
WELDING TIME 3	00.5 - 99.5 cicli
CURRENT 3	00.5 – 90.0 kA
COLD 3	00 – 50 cicli
HOLD TIME	00.5 - 99.5 cycles
OFF TIME	00.0 - 99.5 cycles

CONTROL MODE *	CURR
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA

CONTROL MODE *	DEG
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

CONTROL MODE *	ALL
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

NOTES FOR THE SEAM WELDING WORKING MODE ONLY:

- The welding currents set in the POWER 3 and CURRENT 3 parameters can be recalled by means of the closing of RIC5 (Pin12) input. In this case the control will perform the welding time set on the parameter WELDING TIME 3 and eventually the pulsed cycle with the parameter COLD 3.

- The external recalls RIC5, RIC6 and RIC7 are not activated in the function of recall from an external device program.

- When the SEAM WELD MODE is set to ON, the butt welding (BUTT WELD MODE) and high speed welding (SER. SPOT MODE) functions are disabled. Should one activate them, this will make a programming error be displayed.

CHAPTER 4 - BUTT WELD WORK MODE

```
       FEATURES MENU
 CONTACTS NC        OFF
 SEAM WELD MODE     OFF
>BUTT WELD MODE      ON
```

With parameter BUTT WELD MODE set to ON, the work screen is as follows:

```
PROG. 001 SPOT 12340
 WELD CYCLE 01.0 ~
CURRENT RMS 43.26 kA
CONDUCTION DEG 142°
```

This function allows the user to adapt the control unit to the requirements of butt welding providing the possibility of carrying out a welding cycle with up to 50 programmable pulses (IMPULSE N. parameter).
The welding current is measured during the WELDING TIME only regardless of the program set-up and the displayed current value corresponds to the last carried-out pulse.

BUTT WELD MODE PARAMETERS TABLE

Below you may see the 2 possible programming screens according to the parameter selected in the WORKING MODE. The screens contain all the programmable parameters.

```
       PROGRAM DATA
>PROGRAMME N.      001
 WORKING MODE      FIX
 CONTROL MODE      CUR
```

PARAMETER	VALUE RANGE
PROGRAM N.	001 – 250
WORKING MODE	FIX
CONTROL MODE*	NO
SQUEEZE 1	00.5 - 99.5 cycles
SQUEEZE	00.5 - 99.5 cycles
PRESSURE	00.5 - 10.0 bar
FORGE DELAY	00 - 99 cycles
FORG.PRESS.	00.5 - 10.0 bar
PRE-WELD	00.0 - 99.5 cycles
PRE-POWER	05 - 99 %
COLD 1	00 - 50 cycles
SLOPE UP	00 - 25 cycles
WELDING TIME	00.5 - 99.5 cycles
POWER	05 - 99 %
IMPULSE N.	01 – 50
COLD 2	00 - 50 cycles
SLOPE DOWN	00 - 25 cycles
COLD 3	00 - 50 cycles
POST-WELD	00.0 - 99.5 cycles
POST-POWER	05 - 99 %
HOLD TIME	00.5 - 99.5 cycles
OFF TIME	00.0 - 99.5 cycles

CONTROL MODE*	CURR
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA

CONTROL MODE *	DEG
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

CONTROL MODE *	ALL
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

```
    PROGRAM DATA
>PROGRAMME N.     001
 WORKING MODE      IK
 CONTROL MODE     DEG
```

PARAMETER	VALUE RANGE
PROGRAM N.	001 – 250
WORKING MODE	IK
CONTROL MODE*	NO
SQUEEZE 1	00.5 - 99.5 cycles
SQUEEZE	00.5 - 99.5 cycles
PRESSURE	00,5 - 10,0 bar
FORGE DELAY	00 - 99 cycles
FORG.PRESS.	00,5 - 10,0 bar
PRE-WELD	00.0 - 99.5 cycles
PRE-POWER	05 - 99 %
COLD 1	00 - 50 cycles
SLOPE UP	00 - 25 cycles
WELDING TIME	00.5 - 99.5 cycles
CURRENT	00.5 - 90.0 kA
IMPULSE N.	01 – 50
COLD 2	00 – 50 cycles
SLOPE DOWN	00 – 25 cycles
COLD 3	00 – 50 cycles
POST-WELD	00.0 – 99.5 cycles
POST-POWER	05 – 99 %
HOLD TIME	00.5 - 99.5 cycles
OFF TIME	00.0 - 99.5 cycles

CONTROL MODE*	CURR
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA

CONTROL MODE*	DEG
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

CONTROL MODE*	ALL
CURR. MIN	0.5 - 90.0 kA
CURR. MAX	0.5 - 90.0 kA
ANGLE MIN	005°-180°
ANGLE MAX	005°-180°

NOTES FOR THE BUTT WELDING WORKING MODE ONLY:
- When the BUTT WELD MODE is set to ON, the seam welding (SEAM WELD MODE) and high speed welding (SER. SPOT MODE) functions are disabled. Should one activate them, this will make a programming error be displayed.

CHAPTER 5 – SER. SPOT MODE

```
      FEATURES MENU
 SEAM WELD MODE    OFF
 BUTT WELD MODE    OFF
>SER. SPOT MODE     ON
```

This mode enables to increase the welding spots number which can be carried out per minute when compared to a standard working mode.

⚠ **It is advisable to contact TECNA before activating this mode due to the welding speed reached when working in HIGH SPEED.**

The TE550 control unit carries the first cycle out with a squeeze phase value equal to the sum of the times set in the SQUEEZE1 and SQUEEZE parameters, while, in the following cycles, the value is equal to the time set in the SQUEEZE parameter.
In both the phases, just the EV1 solenoid valve output is commanded.

NOTES FOR THE HIGH SPEED WELDING WORKING MODE ONLY:

- When the HIGH SPEED parameter is set to ON, the TE550 manages always and only the EV1 solenoid valve output. In the FEATURES MENU, the parameter LOW FORCE SQ. is fixed to ON while FORGE is fixed to OFF.

- When the SER. SPOT MODE is set to ON, the seam welding (SEAM WELD MODE) and butt welding (BUTT WELD MODE) functions are disabled. Should one activate them, this will make a programming error be displayed.

- When the SER. SPOT MODE is set to ON, also the following functions are deactivated:
  - Print-out of the welding spots in all the available communication protocols (RS232, RS485, USB);
  - RS485 communication protocol for TecnaNet;
  - Usage of the position sensor;
  - Usage of the cascade mode among the control units.

- When the SER. SPOT MODE is set to ON, the following functions are enabled:
  - Saving of the menu parameters on USB support by means of BACKUP USB;
  - Restoring of the menu parameters on USB support by means of RESTORE USB;

CHAPTER 6 - CASCADE WORK MODE

```
        FEATURES MENU
  BUTT WELD MODE   OFF
  SER. SPOT MODE OFF
>CASCADE MODE      ON
```

This function allows the cycle-end signal to be normally closed instead of normally open. As such, multiple TE550 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

- END CYCLE output

All the TE550 control units receive the cycle start signal simultaneously.
Connect the END CYCLE 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 END CYCLE signal with the normally open contact.
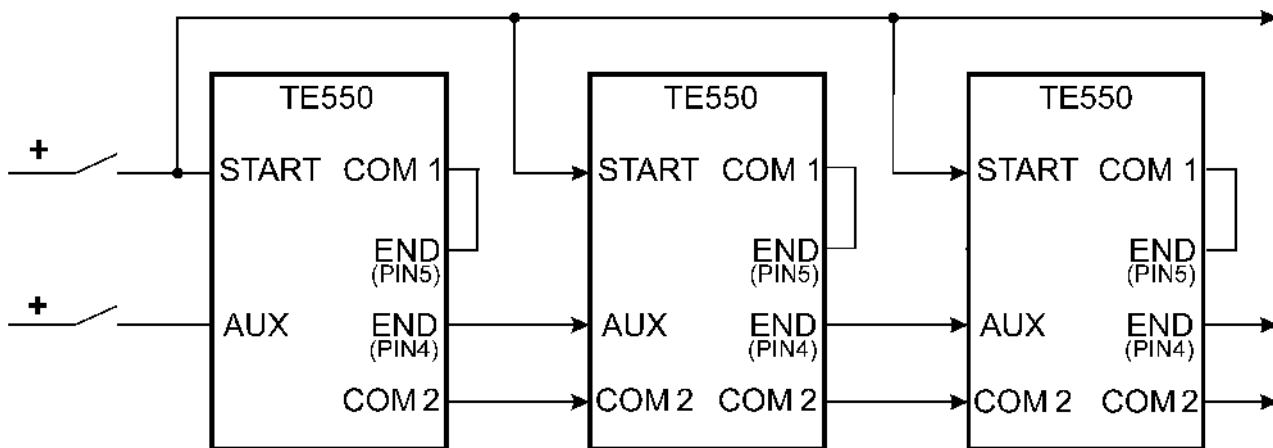
The cascade work mode excludes the possibility of using the control unit in SEAM WELD MODE

CHAPTER 7 - THE WORK CYCLE

The work cycle carried out by the TE550 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.
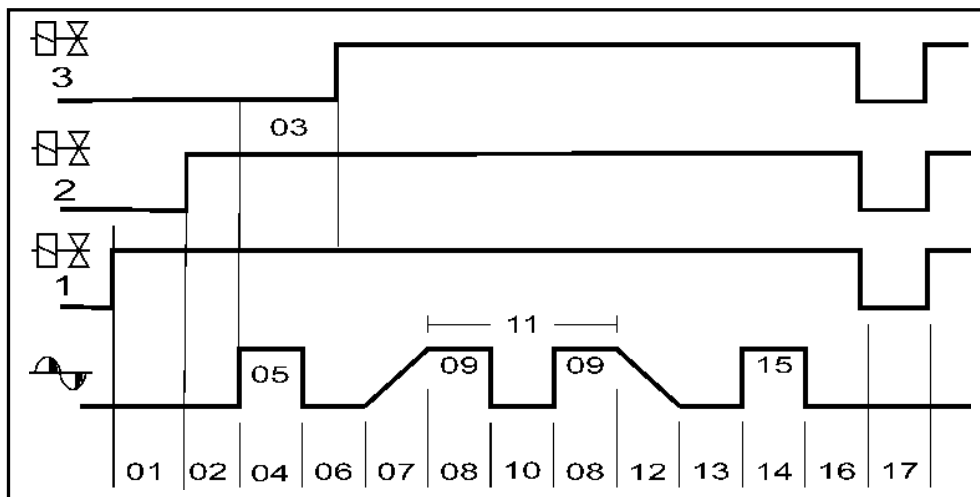
The numbers below refer to the following types of parameters:

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	WELDING TIME	**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 work mode but just stop the control unit. Just turn off the machine and then turn it on again to restore operations.

CHAPTER 8 - **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 causes the control unit to stop is regulated through parameter STOP BAD SPOTS in the **SETUP MENU** (for the programming directions, see the relevant paragraph).

```
           SETUP MENU
>STOP BAD SPOTS    01
 AMMETER CAP.   40 kA
 LANGUAGE          ITA
```

This value may vary from 0 to 15. When programmed to 0, the function is disabled and therefore the welder does not stop under any circumstance on exceeding set limits.

It is important to point out that out-of-limits welds must be consecutive in order to count them.

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

```
          PROGRAM DATA
>CONTROL MODE     CUR
 SQUEEZE 1        25.0
 SQUEEZE          10.0
```

These parameters allow the user to keep the consistency of the welding current under control to help achieve constant quality results.
The control unit may work in one of the two following control modes:

Welding current limits

This mode is activated by setting parameter CONTROL MODE to CUR.
In this case two new parameters are displayed:

CURR MIN   lower current limit
CURR MAX higher current limit

that permit setting welding current limit values.

```
          PROGRAM DATA
>CONTROL MODE     CUR
 SQUEEZE 1        25.0
 SQUEEZE          10.0
```

```
          PROGRAM DATA
>OFF TIME         00.0
 CURR. MIN     10.0kA
 CURR. MAX     15.0kA
```

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:

```
         ERR 0106
        STOP LIMIT
       LOW CURRENT
```

```
         ERR 0107
        STOP LIMIT
       HIGH CURRENT
```

Conduction angle limits

This mode is activated by setting parameter CONTROL MODE to DEG.
In this case two new parameters are displayed:

ANGLE MIN   conduction angle lower limit
ANGLE MAX   conduction angle upper limit

that permit setting current conduction angle limit values.

```
      PROGRAM DATA
>CONTROL MODE    DEG
 SQUEEZE 1      25.0
 SQUEEZE       10.0
```

```
      PROGRAM DATA
>OFF TIME       00.0
 ANGLE MIN       120
 ANGLE MAX       145
```

In conduction angle control mode (CONTROL MODE = DEG), if the current conduction angle value of the last weld is less than or greater than the values set in the foregoing parameters, one of the following messages is displayed:

```
      ERR 0108
      STOP LIMIT
      LOW ANGLE
```

```
      ERR 0109
      STOP LIMIT
      HIGH ANGLE
```

Limits of welding current and conduction angle

This mode is activated by setting the parameter CONTROL MODE to ALL.
In this way the following four new parameters will be displayed:

CURR. MIN   Minimum current limit
CURR. MAX   Maximum current limit
ANGLE MIN   Minimum conduction angle limit
ANGLE MAX   Maximum conduction angle limit

They enable setting both the welding current value limits and the conduction angle current limits.

```
      PROGRAM DATA
>CONTROL MODE    ALL
 SQUEEZE 1      25.0
 SQUEEZE       10.0
```

```
      PROGRAM DATA
>MIN CURR     10.0kA
 MAX CURR     15.0kA
 ANGLE MIN       120
```

Whenever one of the programmed conditions takes place, the control unit stops and an error message is displayed. The message shown refers to the error condition of the last welding process that has been performed.

CHAPTER 9 **- WELDS COUNTER FUNCTION**

A counter has been built into the control unit to count the run welds. The max limit may be programmed. During operations, the counter's current value is displayed. The counter increases at each weld. The cycles carried out in NO WELD mode are not counted.

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

```
PROG. 001 SPOT 12340
  WELD CYCLE 01.0 ~
CURRENT RMS 43.26 kA
 CONDUCTION DEG 142°
```

As such, press the CLEAR key ⬜ and the following message is displayed:

```
   CLEAR   COUNTER
   SPOTS?  [-]=YES
```

Press key ⊟ to clear the counter otherwise just wait 3 seconds and the control unit quits the procedure without resetting the counter.
The max number of welds to be carried out is adjusted through the same procedure described for the incremental function.
For example, if the user wishes the control unit to carry out 2840 welds and then stop, the following parameters are set in the **STEPPER MENU**:

```
    STEPPER MENU
>TOTAL STEPS        0
 SPOTS 1         2840
 INCREMENT 1       00
```

PARAMETER	PARAMETER DESCRIPTION	VALUE
TOTAL STEPS	Number of segments for incremental function	0
SPOTS 1	Number of spots of the first segment	2840
INCREMENT 1	Increase percentage of the first segment	0%

Further information about the parameters is supplied in the **STEPPER MENU** function paragraph.
The control unit displays the following message when the counter reaches the number of welds set herein, and will not allow any other welds to be carried out until the counter is reset.

```
      ERR 104
   MAX SPOTS NUMBER
```

If parameter SPOTS 1 is set to zero, the stop function is disabled.

CHAPTER 10 - DESCRIPTION OF THE INTERFACE OUTPUTS

10.1 - 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.

In those cases in which an error message appears on the control unit, the 'wrong' signal remains high until the error is cleared on the display through the CLEAR ⌧ key or through the ERROR RESET input (when additional card 50200 is installed).

In WORKING MODE – FIX, the output is activated by the current or degrees limits, conforming to the setting of parameter CONTROL MODE.

In CONTROL MODE = NO (deactivated), the error output is never activated.

In WORKING MODE – IK, the output is activated by the current or degrees limits, conforming to the setting of parameter CONTROL MODE and by the omission of the current signal.

In CONTROL MODE = NO (deactivated) the error output is activated only by the omission of the current signal.

In WORKING MODE – ENE, the output is activated by the current or degrees limits, by the minimum or maximum weld time, by the omission of the voltage signal or by the exceeding of the voltage signal (out of scale).

In CONTROL MODE = NO (deactivated), the error output is activated by the minimum or maximum weld time, by the omission of the voltage signal or by the exceeding of the voltage signal (out of scale).

PARTICULAR FUNCTIONING OF THE WRONG WITH PRESSURE SENSOR

When an activated pressure sensor is present (where the INGR.VE/PRE parameter is set to PRE) and the pressure measured during the squeeze phase results out of the limits set in program data, should the start cycle signal be removed, then WRONG signal is activated and an error message is displayed on the control unit.

For further information, please, check the paragraph FUNCTIONING WITH THE PRESSURE SENSOR.

WRONG SIGNAL ACTIVATION TABLE

WORKING MODE -► CONTROL MODE | ▼	FIX	IK	ENE
NO	/	• Error due to no current signal	• Min time • Max time • VE out of scale • Error due to no electrodes voltage
CUR	• Minimum current limit • Maximum current limit	• Minimum current limit • Maximum current limit • Error due to no current signal	• Minimum current limit • Maximum current limit • Min time • Max time • VE out of scale • Error due to no electrodes voltage
DEG	• Minimum conduction limit • Maximum conduction limit	• Minimum conduction limit • Maximum conduction limit • Error due to no current signal	• Minimum conduction limit • Maximum conduction limit • Min time • Max time • VE out of scale • Error due to no electrodes voltage
ALL	• Minimum current limit • Maximum current limit • Minimum conduction limit • Maximum conduction limit	• Minimum current limit • Maximum current limit • Minimum conduction limit • Maximum conduction limit • Error due to no current signal	• Minimum conduction limit • Maximum conduction limit • Min time • Max time • VE out of scale • Error due to no electrodes voltage

QUALITY-T | ▼	
THICK	• Material minimum initial thickness limit • Material maximum initial thickness limit
IDENT	• Final indentation minimum limit • Final indentation maximum limit
INPUT VE/PRE ▼	
PRES. MIN/MAX	• Minimum pressure limit • Maximum pressure limit

10.2 - **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

10.3 - **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 11 - SELECTING THE WORK PROGRAM THROUGH EXTERNAL RECALLS

The table below shows which inputs are required to call the work program. The selection is made through seven inputs, suitably activated in the following combinations.

PROG. N.	RIC1	RIC2	RIC3	RIC4	RIC5	RIC6	RIC7
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		•				•	
.....							
61	•		•	•	•	•	
62		•	•	•	•	•	
63	•	•	•	•	•	•	
64							•
65	•						•
66		•					•
.....							
123	•	•		•	•	•	•
124			•	•	•	•	•
125	•		•	•	•	•	•
126		•	•	•	•	•	•
127	•	•	•	•	•	•	•

• = input active

The recallable programs are maximum 127.

In order to recall the welding programs correctly, the direct-recall inputs must be activated before or at the same time as the cycle-start signal.

CHAPTER 12 - 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 weld the control unit first activates solenoid valve EV4 before the work cycle (this solenoid valve moves the electrode from position "A" to position "B"). It then carries out the programmed weld cycle after a fixed time of 0.6 seconds. At the end of the weld, solenoid valve EV4 does not deactivate and the electrode remains in position "B" as shown in the figure below.
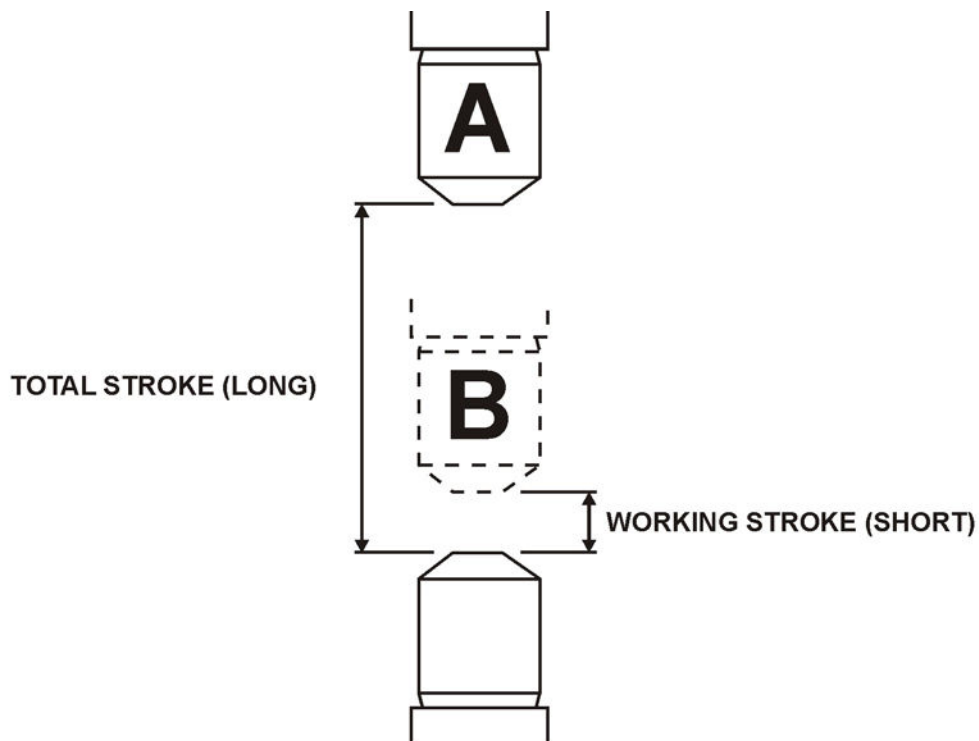
A - MOVABLE ELECTRODE POSITION WHEN THE DOUBLE STROKE IS DISABLED (LONG STROKE)
B - MOVABLE ELECTRODE POSITION WHEN THE DOUBLE STROKE IS ACTIVATED (SHORT STROKE)

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 13 - OPTIONS

13.1 - RS-232 SERIAL INTERFACE

The RS-232 serial expansion card, code 50214, permits the user to connect the TE550 to a printer or a personal computer which must be fitted with a RS232 serial interface card, to document production data. The card 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, i.e. 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 user to choose whether or not to activate the print. The following data is printed for each weld:

- Number of the weld program
- Number of the cycles with which the weld was carried out
- Welding current
- Welding current conduction angle
- Weld spot progressive number
- Measured energy value (only in WORKING MODE = ENE)
- Spot out-of-limit warning
- Thickness of the intervening material (optional)
- Penetration of the electrodes within the intervening material (optional)
- Pressure exerted by the cylinder after the squeeze phase (optional)

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:

```
PROG CYCLES CURRENT DEGREE ENERGY SPOTS   LIMIT   THICK   IDENT  PRES
 001  10,0   08.00   061   00000  00001  -----  00.000  0.000  00.0
 001  10,0   07.90   061   00000  00002  -----  00.000  0.000  00.0
 001  10,0   07.90   061   00000  00003  -----  00.000  0.000  00.0
 001  10,0   07.97   061   00000  00004  -----  00.000  0.000  00.0
```

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

```
PROG CYCLES CURRENT DEGREE ENERGY SPOTS  LIMIT    THICK   IDENT  PRES
 001  10,0   06.00   062   00000  00009 CUR OK  00.000  0.000  00.0
 001  10,0   06.00   062   00000  00010 CUR OK  00.000  0.000  00.0
 001  10,0   06.00   062   00000  00012 CUR MIN 00.000  0.000  00.0
 001  10,0   06.00   062   00000  00013 CUR MIN 00.000  0.000  00.0
 001  10,0   06.00   062   00000  00014 CUR MAX 00.000  0.000  00.0
 001  10,0   06.00   062   00000  00015 CUR MAX 00.000  0.000  00.0
```

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

```
PROG CYCLES CURRENT DEGREE ENERGY SPOTS  LIMIT    THICK   IDENT  PRES
 001  10,0   06.00   062   00000  00009 DEG OK  00.000  0.000  00.0
 001  10,0   06.00   062   00000  00010 DEG OK  00.000  0.000  00.0
 001  10,0   06.00   062   00000  00012 DEG MIN 00.000  0.000  00.0
 001  10,0   06.00   062   00000  00013 DEG MIN 00.000  0.000  00.0
 001  10,0   06.00   062   00000  00014 DEG MAX 00.000  0.000  00.0
 001  10,0   06.00   062   00000  00015 DEG MAX 00.000  0.000  00.0
```

Print example of the work program parameters values:

WELD CONTROL UNIT TE550 REV. 4.02

```
PROGRAM N.            001
WORKING MODE          IK
CONTROL MODE          NO
SQUEEZE 1            10.0
SQUEEZE             20.0
PRESSURE      bar   05.0
FORGE DELAY          00
FORG.PRESS.   bar   07.0
PRE-WELD            00.0
PRE-POWER      %     05
COLD 1              00
SLOPE UP.           00
WELDING TIME       05.0
CURRENT       kA   05.0
IMPULSE N.          01
COLD 2              01
SLOPE DOWN.         00
COLD 3              00
POST-WELD          00.0
POST-POWER     %    05
HOLD TIME          10.0
OFF TIME           00.0
```

13.2 - RS-485 SERIAL INTERFACE

The RS-485 serial expansion card, code 50209, permits connecting the control unit in the network to other welding control units and to a central personal computer for programming the control unit or for documenting production data. The card interfaces with the control unit through a 6-pin connector, and with the outside network, through a standard male 9-pin connector with the following signals:

PIN 1	Ground
PIN 2	Y (TX+)
PIN 3	A (RX+)
PIN 4	R1A
PIN 5	R2A
PIN 6	Z (TX-)
PIN 7	B (RX-)
PIN 8	R1B
PIN 9	R2B

The card may be connected only when the control unit is powered-off. Moreover, it is advisable to connect the 6-pin connector first (the one that connects the welding control unit) followed by the RS485 connection. Then power-on the control unit and activate function **NET/485** in the **FEATURES MENU**.
During network communication, the welding control unit (slave) must be assigned with an identifying address to be recognized by a Master, for example a Personal Computer. Even this parameter, called NET ADDRESS, is set in the **FEATURES MENU**.
In order to manage data and communication among control units connected in the network, a personal computer software is available, called TECNANet, which allows the user to: check the network's structure (i.e. how many and which control units are connected), remotely program each control unit and acquire & save production data.

The interface is isolated up to 1500V, without the need for any external power supply and works as a connection with standard RS485 signals in half duplex or full duplex mode. The male D-sub 9-pin connector has two screws with 4-40 UNC threading that also have a threaded head. These screws will be used for wall-mounting purposes (max 3mm) and for locking the mobile connector. The card is fitted with a protective black cap that protects it from dust and electrostatic charges. It is advisable to always leave this cap on the card's connector when the interface is not used.

The cards are fitted with termination resistances to be connected only to the first and last network connector. Do not forget to connect the ground wire among the various devices connected to the network.
The cable must not be longer than 1200 m, it must be shielded and have metallic or metallised connecting connectors. We recommend using Belden 8777 cable at 24 AWG with "Phoenix" "SUBCON 9/F – SH" type connectors.

13.3 - INTERFACE FOR PROPORTIONAL VALVE

This interface card, 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 strip permits the connection of the proportional valve, the control unit and the interface power supply.

TERMINAL STRIP 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)

The user may program the control voltage range of the proportional valve directly via the welding control unit. The **FEATURES MENU** contains parameter PRESSURE RATIO with which to choose the most suitable **bar**/**Volt** ratio according to the solenoid valve to be used.

Example:

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

CONNECTIONS DIAGRAM:
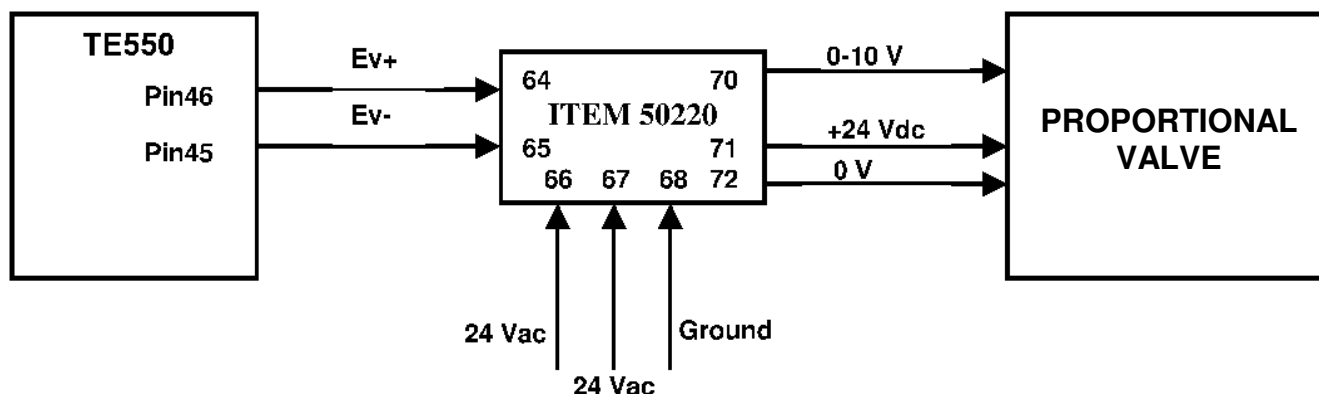
N.B.

_ The card is fitted with a red LED, indicated by acronym D1 (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 user must check for the correct 24VAC (Pin 66 and Pin 67) and ground (Pin 68) connections.

_ The card 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 <u>MUST NEVER be moved away from its natural position</u> so as not to alter the signal in the output.

13.4 - **INTERFACE FOR PRESSURE SENSOR**

The TE550 welding control unit, besides its standard features, may measure the voltage at the electrodes tips of a welder for the constant energy functioning by means of the optional board 50200. Or, it may measure the welding pressure detected by a pressure sensor externally placed from the unit by means of the optional board 50189.
According to the optional board which is set on the control unit, it will be necessary to properly set the parameter INPUT VE/PRE in the FEATURES MENU.

```
    FEATURES MENU
 THICK SENSOR      OFF
 EV LOCK ON ERR. OFF
>INPUT VE/PRE      PRE
```

By setting the parameter INPUT VE/PRE to PRE in the PROGRAM DATA menu, the PROGRAM DATA menu will display the two limits relevant to the pressure value measured by the sensor.

PARAMETER	VALUE RANGE
PROGRAM N.	001 - 250
WORKING MODE	FIX (IK)
CONTROL MODE *	NO
QUALITY – T *	OFF
SQUEEZE 1	00.5 – 99.5 cycles
SLOPE UP	00 - 25 cycles
WELDING TIME	00.5 - 99.5 cycles
POWER (CURRENT)	05 - 99 % (00.5 – 90.0 KA)
IMPULSE N.	01 – 09
COLD 2	00 – 50 cycles
HOLD TIME	00.5 – 99.5 cycles
OFF TIME	00.0 – 99.5 cycles

INPUT VE/PRE	PRE
PRES. MIN	0.00 – 10.0 bar
PRES. MAX	0.00 – 10.0 bar

If PRES. MIN gets a value greater or equal to PRES. MAX, a programming error will be displayed.

The input signal to the board 50189 (between the PIN 58 and 59) must be a 4 - 20mA signal having a range 0 - 10bar.

The polarity of the input signal does not affect the measurement of the measured pressure value.

FUNCTIONING DESCRIPTION

When the squeeze time is over, if the pressure value measured by the control unit is within the limits set in the program, then the TE550 proceeds with the welding phase itself.

Otherwise, as long as there is a start cycle, the control unit will display a screen showing the measured pressure value (PRESSURE) and the limits set in the program (PRESS. MIN and PRESS. MAX).

```
PRG 005    SPOT 01234
PRESSURE     03.8 bar
PRESS. MIN  01.5 bar
PRESS. MAX  02.5 bar
```

During this phase, should the start cycle signal be removed, the control unit stops showing an error when measuring the pressure

```
       ERR 0129
   PRESSURE SENSOR
    MEASURE ERROR
```

And activates the output signal WRONG.

The error will be cleared and the WRONG signal deactivated by means of the CLEAR ▨ key or by means of the ERROR CLEAR input on the relevant expansion board.

CHAPTER 14 - DESCRIPTION OF THE SIGNALS ON THE 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 user when a cycle ends if END CYCLE is selected; when in LOCKED 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. In order to acknowledge all the signal activation cases, please, refer to the relevant paragraphs.
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	This is the SCR switch-on command output. The output is a rectangular wave, amplitude of approximately 30V. The user must use trigger modules manufactured by TECNA with opto-isolators.
11	COM1	Common for inputs with 24VDC reference.
12	RIC5	This input is used for calling the weld programmes directly from the outside. This input is active closed on the COM1. If the TE550 control unit is set to SEAM WELD mode, this input calls the second weld current (POWER 3 or CURRENT 3 parameters).
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 microswitches 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	Currently this input is not used.
21	COM1	Common for inputs with 24VDC reference.
22	AUX	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.
23	START NO	To be connected to the microswitches 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	Currently this input is not used.
25	BIC1 NO	This input may be connected to the 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. This value was chosen conforming to international safety standards.

26	**RIC6**	This input is used for the direct recall of the welding programs from outside. For the correct recall of the programs this input must be enabled before the signal of the start cycle. The input is activated when closed to the common COM1.
27	**D. STROKE**	This input is used to manually control the double stroke in welders fitted with this function.
28	**RIC7**	This input is used for the direct recall of the welding programs from outside. For the correct recall of the programs this input must be enabled before the signal of the start cycle. The input is activated when closed to the common COM1.
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, i.e. 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 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.
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. In case the TE550 is set to SEAM WELD mode, this output controls the seam start (MOTOR DELAY parameter).
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 card 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 cutoff voltage to all outputs.
49 *50*	**ROG** **AGND**	The current transducer (or Rogowski loop) must be connected to this analog input.
51	**SHIELD**	Shield for transducer cable.

NOTE: The EV1, EV2, EV3, EV4, TRIGGER outputs are protected against short-circuit with automatically restorable electronic elements.

14.1 - DESCRIPTION OF THE SIGNALS ON THE OPTIONAL BOARDS 50200 OR 50189

52	**ELECTRODES END LIFE CLEAR**	This input clears the ELECTRODES END LIFE ALARM output and it is active closed on the common COM1.
53	**DRESSING CLEAR**	This input clears the DRESSING ALARM output and it is active closed on the common COM1.
54	**WELD/NO WELD**	Input for enabling/disabling the weld. The command changes depending on how the WELD-NO WELD parameter was programmed in the FEATURES MENU. This input is active when closed on the common COM1.
55	**ERROR RESET**	This input is to be used to delete displayed error messages and it is active closed on the common COM1.
56	**GND**	Ground.
57	**COM2**	**To be connected with COM2 present on card TE550.** Connected to GND conforming to regulation EN60204.
58 *59*	**VE/PRE** **VE/PRE**	VE inputs for measuring the secondary voltage. It works only with the optional boards item 50200 and 50097. PRE inputs for measuring the optional external pressure sensor. It works only with the optional board 50189. To these inputs, it must be applied a signal 4-20mA having a range 0-10bar.
60 *61*	**DRESSING ALARM**	This output warns that the dressing pre-alarm weld spots number has been attained.
62 *63*	**ELECTRODES END LIFE ALARM**	This output warns that the electrodes end life pre-alarm weld spots number has been attained.

⚠️ Before turning on the TE550 control unit with the supplementary expansion card, code 50200, check that the ELECTRODES END LIFE CLEAR input (Pin 52) is NOT active.
Otherwise the control unit does not recognize card 50200.

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 article, Code 21954.

Component "**BC**" stands for the two-position PROG - RUN key lock installed on the control unit's front panel, traced as code "*RS*" 321054 or as a Tecna article, Code 21955.
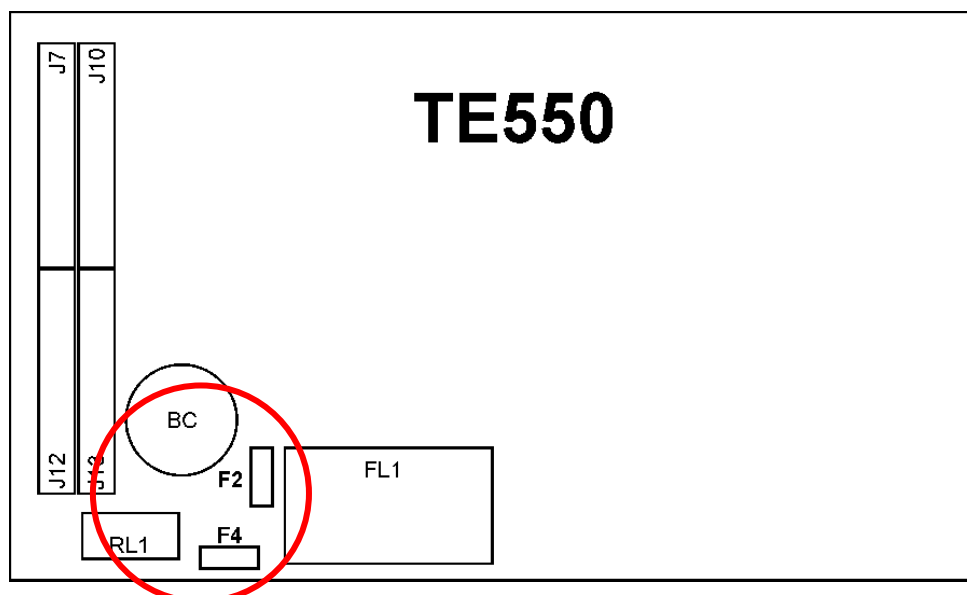
CHAPTER 15 - LIST OF TE550 MESSAGES

15.1 - SYSTEM ERRORS

MESSAGE	NUM	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 INSIDE RELAYS ARE 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 EPROM. This ensued from the checksum calculation on the data in this memory.	Contact service center.
FAULT/MISSING MAINS SYNCHRONISM	7	A "synchronism" error occurred due to the temporary omission of the power line reference signal or to line interference.	Clear the error and check the working efficiency of the devices that cutoff 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.

15.2 - WORK ERRORS

MESSAGE	NUM	CAUSE	REMEDY
NO EMERGENCY ERROR OR RELAY RESTART ERR	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 FLOWSWITCH 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.
MAX SPOTS NUMBER	104	The weld spots counter has attained the max set limit for replacing the electrodes.	Clear the welds counter; refer to relevant chapter.
STOP LIMIT LOW CURRENT	106	A certain number of welds were run out of the set limits. The last weld was carried out with a current value lower than the minimum set limit.	Clear the error as outlined.
STOP LIMIT HIGH CURRENT	107	A certain number of welds were run out of the set limits. The last weld was carried out with a current value higher than the maximum set limit.	Clear the error as outlined.
STOP LIMIT LOW ANGLE	108	A certain number of welds were run out of the set limits. The last weld was carried out with a conduction angle value lower than the minimum set limit.	Clear the error as outlined.
STOP LIMIT HIGH ANGLE	109	A certain number of welds were run out of the set limits. The last weld was carried out with a conduction angle value higher than the maximum set limit.	Clear the error as outlined.
REACHED ENERGY WITHIN MIN TIME	110	Energy required during the weld was attained within the minimum welding time.	Clear the error as outlined and check the program to change certain parameters such as ENERGY, POWER and WELDING TIME.
NO REACHED ENERGY WITHIN MAX TIME	111	The energy that the control unit read during the welding is less than the programmed one.	Clear the error as outlined and check the program to change certain parameters such as ENERGY, POWER and WELDING TIME.
NO SIGNAL CURRENT ERROR	112	During the last weld cycle there was no secondary current circulation.	Select, if possible, the lower ammeter rate. Check for the correct connection and position of the current transducer.
NO ELECTRODES VOLTAGE ERROR	113	During a work cycle in CONTROL MODE ENE, no electrode voltage signal was detected.	Check the wires connection at the weld transformer secondary and the rate of the isolating transformer on card code 50097.

ERROR CURRENT OVERFLOW	*114*	A weld was carried out with a current signal that was too high.	Select, if possible, the higher ammeter rate. Check for the correct connection and position of the current transducer.
VOLTAGE ERROR OVERFLOW	*115*	During the last weld cycle the upper electrodes voltage limit was overrun. It is advisable to change the voltage range on card 50097.	Check the wires connection at the weld transformer secondary and the rate of the isolating transformer on card code 50097.
SPOTS FINISHED DRESS ELECTRODES	*116*	The maximum number of welds was attained without having cleared the DRESSINGS ALARM output.	Clear the error, carry out the electrodes dressing procedure and then activate the dressing-done signal.
ELECTRODE END LIFE REPLACE WITH NEW	*117*	The maximum number of welds was attained without having cleared the ELECTRODES END LIFE ALARM output.	Clear the error, change the electrodes and then activate the change-done signal.
START RELEASED! SPOT NOT FINISHED	*118*	With parameter AUTORETAIN set to OFF, the cycle-start signal was issued before the weld ended.	Clear the error to continue.
POSITION SENSOR ZERO PROCEDURE	*119*	The QUALITY - T function was activated during a weld programme but the coordinate zeroing procedure was not carried out.	Set the QUALITY - T parameter to ZERO and carry out a weld without material between electrodes to define the ZERO coordinate. Then restore the original value of the QUALITY-T parameter.
POSITION SENSOR QUOTE FAIL	*120*	Error during the calculation of the position sensor coordinate measurement.	Ensure the sensor is powered and that the CAN cable is plugged in correctly. Contact service center.
POSITION ERROR MODIFIED STRUCTURE	*121*	Error when the position sensor measured the coordinate, the electrode has worn out or the geometry of the spot welder structure changed.	Check for the absence of anomalous movements in the spot welder structure. Clear the error and repeat the coordinate zeroing procedure.
POSITION SENSOR FAIL COMUNICATION	*122*	Position sensor communication error.	Check that the position sensor has been wired correctly. Contact service center.
POSITION SENSOR NOT PROGRAMMABLE	*123*	The CAN card coded 50274 was not detected at switch-on.	Check that the CAN is properly connected to the TE550 control unit.
THICKNESS UNDER LOW LIMIT	*124*	The initial thickness of the sheets in between the electrodes is less than that set in the THICK. MIN limit.	Reset the error and check the material between the electrodes.

THICKNESS OVER HIGH LIMIT	**125**	The initial thickness of the sheets in between the electrodes is greater than that set in the THICK. MAX limit.	Reset the error and check the material between the electrodes.
IDENTATION UNDER LOW LIMIT	**126**	Sheet indentation between electrodes is less than that set in the IDENT. MIN limit.	Reset the error and check the material between the electrodes.
IDENTATION OVER HIGH LIMIT	**127**	Sheet indentation between electrodes is greater than that set in the IDENT. MAX limit.	Reset the error and check the material between the electrodes.
POSITION SENSOR NOT FOUND	**128**	You are using a weld programme that requires the presence of the position sensors but they are not present.	Check the weld programme used: if the QUALITY-T function is ON, deactivate it.
PRESSURE SENSOR MEASURE ERROR	**129**	The start cycle command has been removed during the adjustment and pressure measurement phase by means of an external sensor.	Reset the error and check that the pressure measured by the sensor is actually within the set programming limits.

15.3 - PROGRAMMING ERRORS

MESSAGE	NUM	CAUSE	REMEDY
WORKING MODE ENE MIN TIME > MAX	200	During a work cycle in CONTROL MODE ENE, the minimum weld time is higher than the maximum weld time.	Modify the parameter that triggered the error.
CURRENT MIN LIMIT > CURRENT MAX LIMIT	201	The value set in CURR MIN is higher than the value set in CURR MAX.	Modify the parameter that triggered the error.
DEGREES MIN LIMIT > DEGREES MAX LIMIT	202	The value set in ANGLE MIN is higher than the value set in ANGLE MAX.	Modify the parameter that triggered the error.
TOTAL PULSE WELDS > WELD MAX TIME	203	The number of impulses IMPULSE N. multiplied by the WELDING TIME make up a number of cycles higher than the maximum admissible number.	Modify the parameter that triggered the error.
NOT PROGRAMMABLE TIP-DRESS. ENABLED	204	The user attempted to enter the STEPPER MENU while the TIP-DRESSING function was active. This situation is incompatible.	Deactivate the TIP-DRESSING function to activate the STEPPER MENU function.
NOT PROGRAMMABLE STEPPER ENABLED	205	The user attempted to enter the TIP-DRESSING MENU while the STEPPER MENU function was active. This situation is incompatible.	Deactivate the STEPPER MENU function to activate the TIP-DRESSING function.
CURRENT PARAMETER HIGHER THAN RANGE	206	The required work program contains the CURRENT parameter the value of which is higher than the AMMETER CAP parameter.	Modify the parameter that triggered the error.
OFFSET DRESSING % HIGHER THAN STEPPER	207	The DRESSING OFFSET parameter is higher than the required DRESSING STEPS increment value.	Modify the parameter that triggered the error.
CURRENT MAX LIMIT HIGHER THAN RANGE	208	The required work program contains the CURR. MAX parameter the value of which is higher than the AMMETER CAP parameter.	Modify the parameter that triggered the error.
THICKNESS MIN LIMIT > THICK MAX LIMIT	209	The value set in parameter THICK. MIN is greater than the value set in THICK. MAX.	Modify the parameter that triggered the error.
IDENT MIN LIMIT > IDENT MAX LIMIT	210	The value set in parameter IDENT. MIN is greater than the value set in IDENT. MAX.	Modify the parameter that triggered the error.
NON PROGRAMMABLE SEAM MODE ENABLED	211	One tried to activate either BUTT WELD or HIGH SPEED while SEAM was activated. This is incompatibile.	Deactivate SEAM to activate either BUTT WELD or HIGH SPEED.
NON PROGRAMMABLE BUTT WELD ENABLED	212	One tried to activate either SEAM or HIGHT SPEED while BUTT WELD was activated. This is incompatible.	Deactivate BUTT WELD to activate either SEAM or HIGH SPEED.
NON PROGRAMMABLE SERIAL SPOT ENABLED	213	One tried to activate either SEAM or BUTT WELD while HIGH SPEED was activated. This is incompatible.	Deactivate HIGH SPEED to activate either SEAM or BUTT WELD.
PRESS. MIN LIMIT >= PRESS. MAX LIMIT	214	The value set to PRES. MIN is greater or equal to the value set to PRES. MAX.	Modify the parameter generating the error.

CHAPTER 16 **- 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