

TECNA[®]

WELDING CONTROL UNIT INSTRUCTION MANUAL

TE550

FROM SOFTWARE RELEASE N° 1.00

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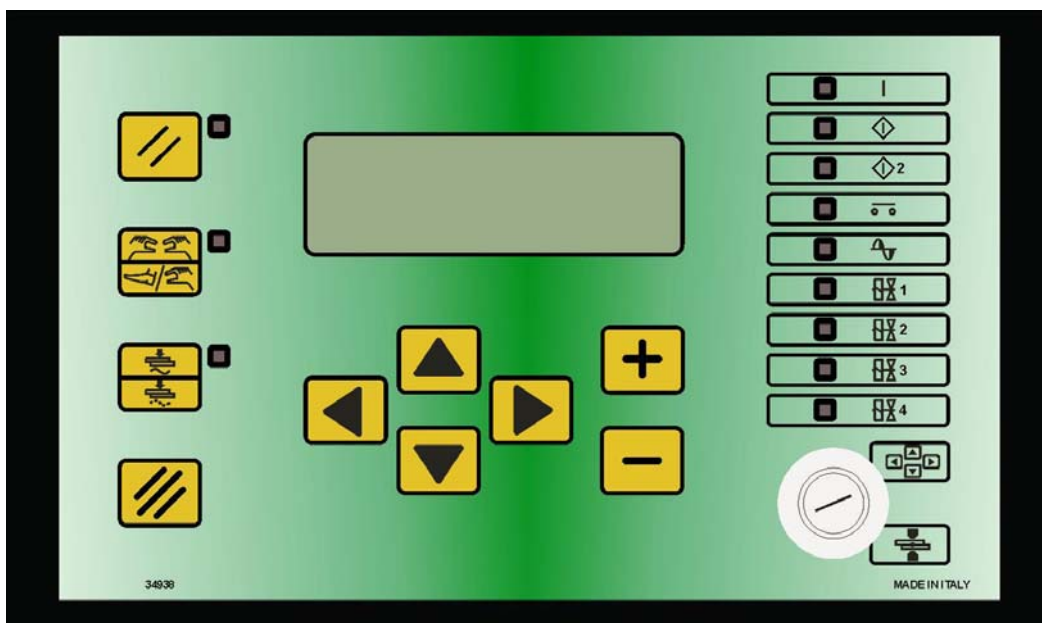
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CHAPTER 1 – TE550 WELDING CONTROL UNIT DESCRIPTION

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 may 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.












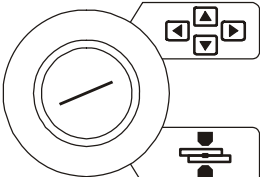
It is possible to store up to 250 different welding programs, 31 of which are recalled directly from an external device. Each program comprises several programmable parameters that describe the work cycle. In addition to the plain 4-stage welding cycle, the control unit allows the running of welding processes with pre-welding current, post-welding current, slope and pulses.








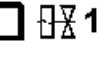
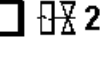
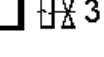
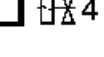
1.1 – MAIN TECHNICAL FEATURES

- Simplified programming via 6 keys and a backlit alphanumeric LCD.
- Synchronous control with controlled diodes, phase control current adjustment.
- Storage of 250 welding programs, 31 recallable from an external drive.
- Up to 25 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.
- Welding current or angle of conduction limits.
- 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 or Portuguese.
- 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

| | |
|---|---|
|  | 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. |
|  | 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. |
|  | The turning on of this LED indicates that the control unit is producing the command impulses for the SCR. |
|  | It indicates that the solenoid valve, which carries out the main cycle, is activated. |
|  | It indicates that the solenoid valve, which controls the back pressure, is activated. |
|  | It indicates that the solenoid valve, which enables the forging, is activated. |
|  | It indicates that the solenoid valve, which controls the double stroke, is activated. |

1.4 – DESCRIPTION OF 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

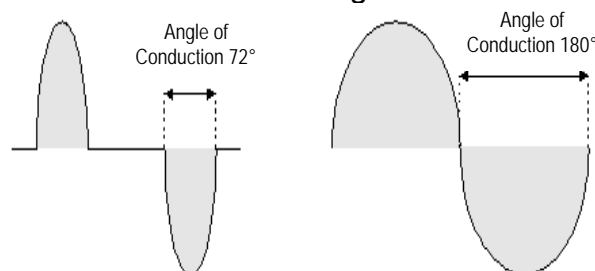
It indicates the current value used for the last weld sequence. In WELD mode it may have a value between 00.00 kA and 90.00 kA. In NO WELD mode its value is 00.00 kA. It represents the average of the RMS values measured for each welding time half-cycle. The value shown always refers to the WELD current 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 WELD 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:



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 CLEAR ELECTRODES LIFE (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 \oplus and \ominus , 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 \blacktriangleright , 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 \blacktriangleright 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.



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



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

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

```
ERRLOG 01 SPOT 00000
ERR 0101
NO EMERGENCY ERROR
OR RELE 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 00000



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 RELE 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
ERR 0101
NO EMERGENCY ERROR
OR RELE RESTART ERR
```



```
ERRLOG 20 SPOT 00000
ERR 0101
THERMOSTAT OR
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 1.00
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. 1.00 --
>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)*

```
-TE550 VER. 1.00 --
  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
SLOPE UP          00
```

2.1 - PROGRAM DATA

```
-TE550 VER.1.00 --  
>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 \oplus and \ominus keys.

Then proceed with the next parameters moving with the \blacktriangle and \blacktriangledown keys, adjusting the desired value always using the \oplus and \ominus 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 parameter.

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 |
| SQUEEZE 1 | 01 - 99 cycles |
| SQUEEZE | 00 - 99 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 |
| WELD | 00.5 - 99.5 cycles |
| POWER | 05 - 99 % |
| IMPULSE N. | 01 – 09 |
| COLD2 | 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 | 01 - 99 cycles |
| OFF TIME | 00 - 99 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° |

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 CORR MAX, the limits are disabled.
- By setting the same value for both ANGLE MIN and ANGLE 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. For instance, 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:

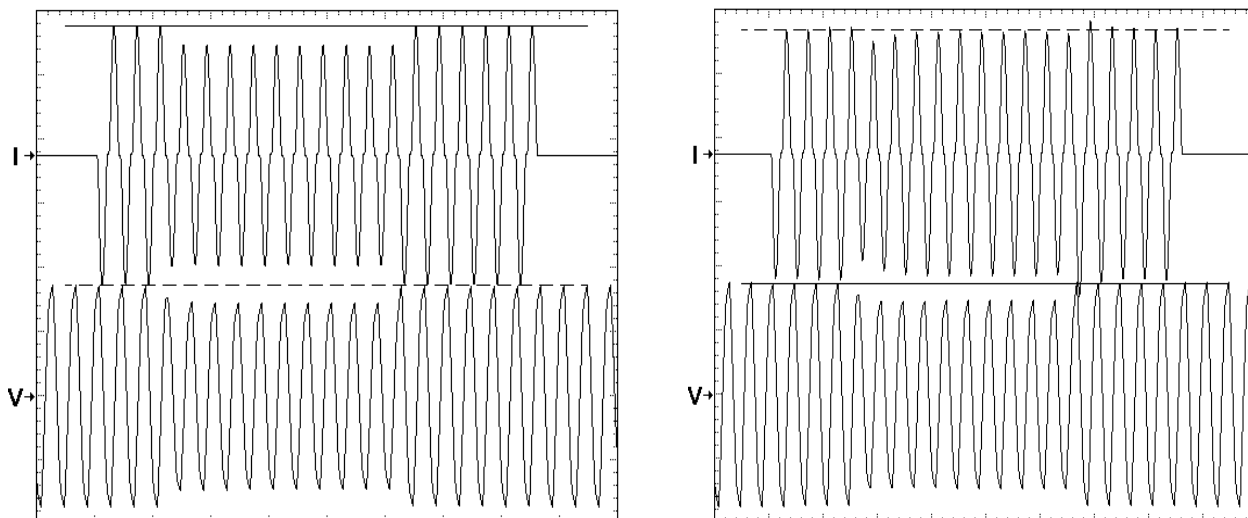
```

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 |
| SQUEEZE 1 | 01 - 99 cycles |
| SQUEEZE | 00 - 99 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 |
| WELD | 00.5 - 99.5 cycles |
| CURRENT | 00.5 - 90.0 kA |
| IMPULSE N. | 00 - 50 cycles |
| COLD2 | 00 - 09 |
| SLOPE DOWN | 00 - 25 cycles |
| COLD 3 | 00 - 50 cycles |
| POST-WELD. | 00.0 - 99.5 cycles |
| POST-POWER | 05 - 99 % |
| HOLD TIME | 01 - 99 cycles |
| OFF TIME | 00 - 99 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° |

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

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 ($V \times \cos \varphi$) and the welding duration in cycles. The product of $I \times V \times \cos \varphi \times \text{time}$ gives the thermal energy produced during welding, expressed in joules ($W \times \text{sec}$).

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

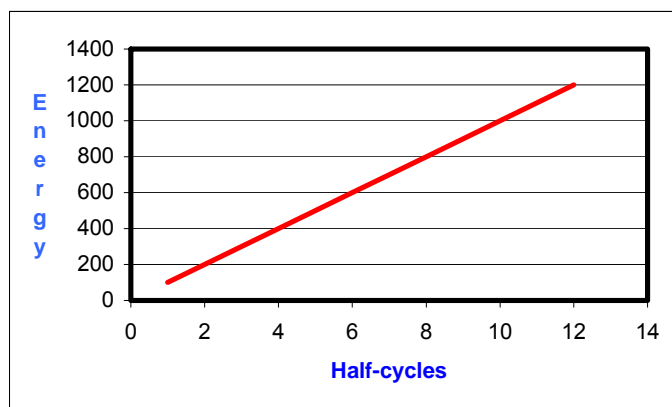


TABLE CONSTANT ENERGY OPERATING MODE PARAMETERS

| | |
|--------------|-----|
| PROGRAM DATA | |
| >PROGRAM N. | 001 |
| WORKING MODE | ENE |
| CONTROL MODE | CUR |

| PARAMETER | VALUE RANGE |
|----------------|--------------------|
| PROGRAM N. | 001 - 250 |
| WORKING MODE | ENE |
| CONTROL MODE * | NO |
| SQUEEZE 1 | 01 - 99 cycles |
| SQUEEZE | 00 - 99 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 | 01 - 99 cycles |
| OFF TIME | 00 - 99 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° |

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 CORR MAX, the limits are disabled.
- By setting the same value for both ANGLE MIN and ANGLE 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. For instance, 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 WELD 1 is carried out according to the adjustment mode set in this parameter.

This parameter affects the welding time (WELD) 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** *TE550 permits to set the welding current min. and max. limits.*
- **DEG** *TE550 permits to set the min. and max. limits of the welding current conduction angle.*

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 the welding pressure. The set value must be long enough to allow the electrodes to reach the work piece to be welded. During the SQUEEZE 1 time, it is possible to end the cycle by disabling the start cycle signal.

SQUEEZE

The SQUEEZE time is a wait time like that of the 1st SQUEEZE. 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**.

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.

WELD

The WELD 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 (WELD).

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.

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.

2.6 - SETUP MENU

```

--TE550 VER.1.00 --
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
  
```

SET UP MENU PARAMETERS TABLE

| PARAMETER | PARAMETER DESCRIPTION | VALUE |
|----------------|---|--|
| 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 |
| 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 \oplus and \ominus ; 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.

PRE-WELD

By setting it on ON, it activates the following parameters: PRE-WELD, PRE-POWER e 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.1.00
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:

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

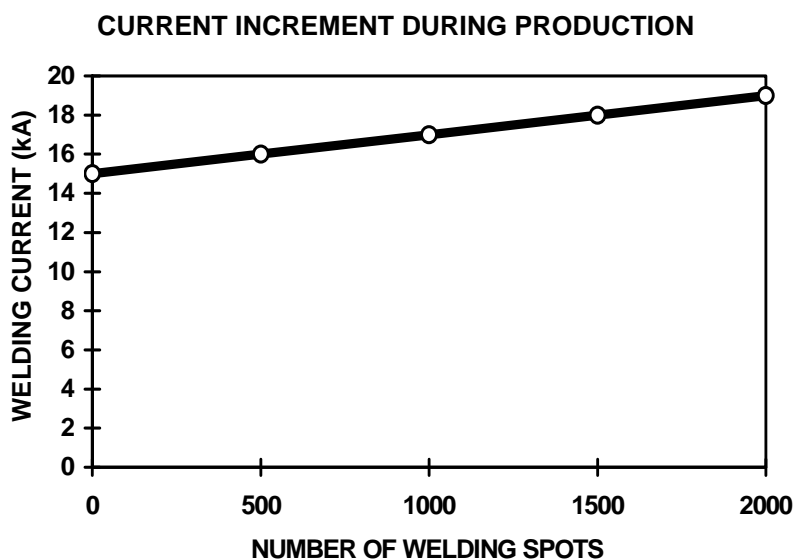
Consequently the following parameters are set in the “**STEPPER MENU**”:

| 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.

INITIAL CURRENT = 15 kA
 END CURRENT = 19 kA
 INCREMENT PERCENT = 26 %
 NUMBER OF WELDING SPOTS = 2000



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

ERR 104
 MAX SPOTS NUMBER

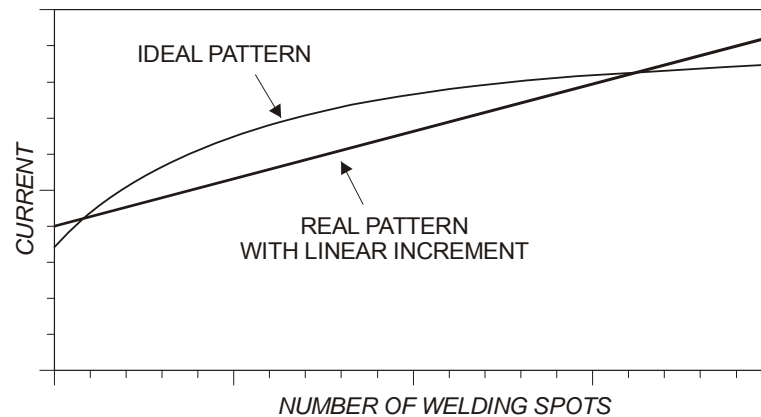
At this point the operator replaces the electrodes (or resets their original diameter) and clears the spots counter to clear stepper calculations.

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

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

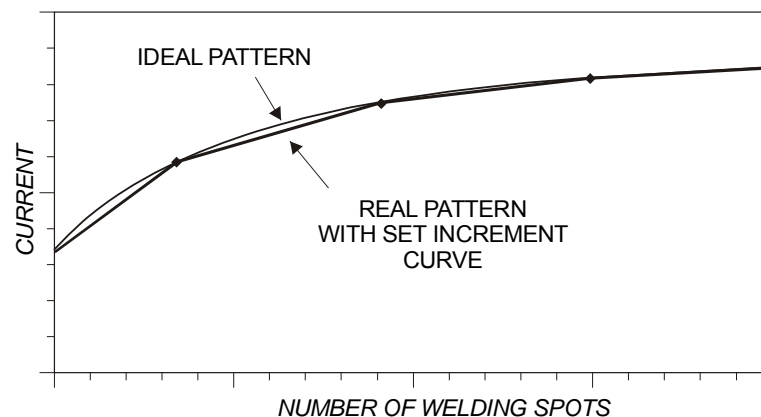
It is possible to use the non-linear increment curve function by knowing the real electrodes consumption only.

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

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

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

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

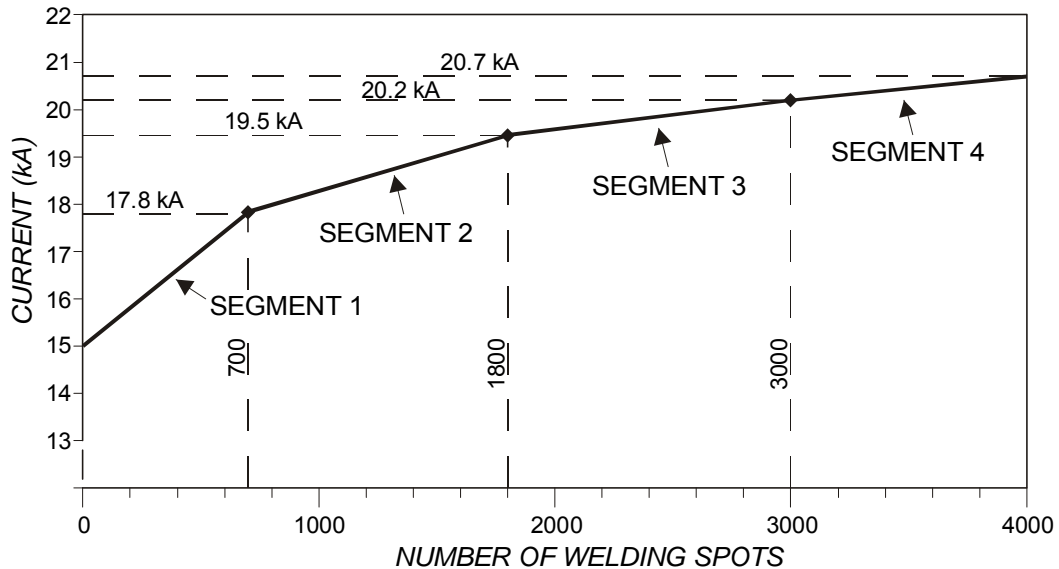
$$\text{Change \% segment 4} = \frac{\text{enecurrent} - \text{initialcurrent}}{\text{initialcurrent}} \times 100 = \frac{20.8 - 20.2}{20.2} \times 100 = 3\%$$

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.



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. 1.00--
  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.

```

FEATURES MENU
>FIRST INSERT      70
SERIAL COM.        OFF
NET ADDRESS        01
    
```



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 – 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 RIC5 | Recall function 5 | RIC – ODD - EVEN |
| 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 | OFF |
| SEAM WELD MODE | Spots / seams | ON – OFF |
| CASCADE MODE | Electric cascade function | ON – OFF |
| ADJUST POWER% | Power map correction | 00 - 10 |
| VOLTAGE RANGE | Electrodes voltage capacity | 5V – 10V – 20V |

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 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 | 40 – 90 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 RIC5

This parameter indicates the function associated to the Recall 5 input.

- _ Input for the direct recalling of the work program up to 31 (RIC).
- _ EVEN parity test input for the other recalls.
- _ ODD parity test input for the other recalls.

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.

By setting the parameter on the OFF value, the working cycle is stopped the moment the cycle start signal is disabled and does not complete the welding time. This occurs even if the welding current is in its flowing phase. The welding time is always completed whenever the value is set on ON.

This function is specifically to be used when the machine works with mechanical devices instead of pneumatic ones.

NC CONTACTS

This parameter activates the normally closed inputs of the cycle start signal, 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.

At present, this function is always on OFF and, therefore, it is disabled.

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**.

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.

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.

ADJUST POWER%

This parameter allows modifying the welding insertion delay time for correcting the power map and adjusting the control unit to the transformer it is connected to.

2.10 - PROGRAM COPY

```
-TE550 VER. 1.00--
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 $\frac{1}{4}$ 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. 1.00--
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. 1.00--
  FEATURES MENU
  PROGRAM COPY
>CHECK INPUT

```

This menu displays the input status on the welding control unit. It is used for checking 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 | 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 |
| START2 | 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 4 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 |

(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. 1.00--
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 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 \oplus key it is possible to increase the welding spots counter to the following spot or to the desired one, while, by means of the \ominus key it is possible to go back of one or more positions along the spots to be carried out.

Display data

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



Display data after key

```
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/mm²) 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.

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

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



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 |
|------------------|--|-----------|
| DRESSING NUMBER | Number of tip-dressing to be carried out | 00 - 20 |
| SPOT DRESSING | Number of welding spots per tip-dressing | 001 - 999 |
| DRESSING STEPS | Stepper percentage per tip-dressing | 01 - 50% |
| DRESSING ALARM | Notice welding spots number | 00 - 40 |
| 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

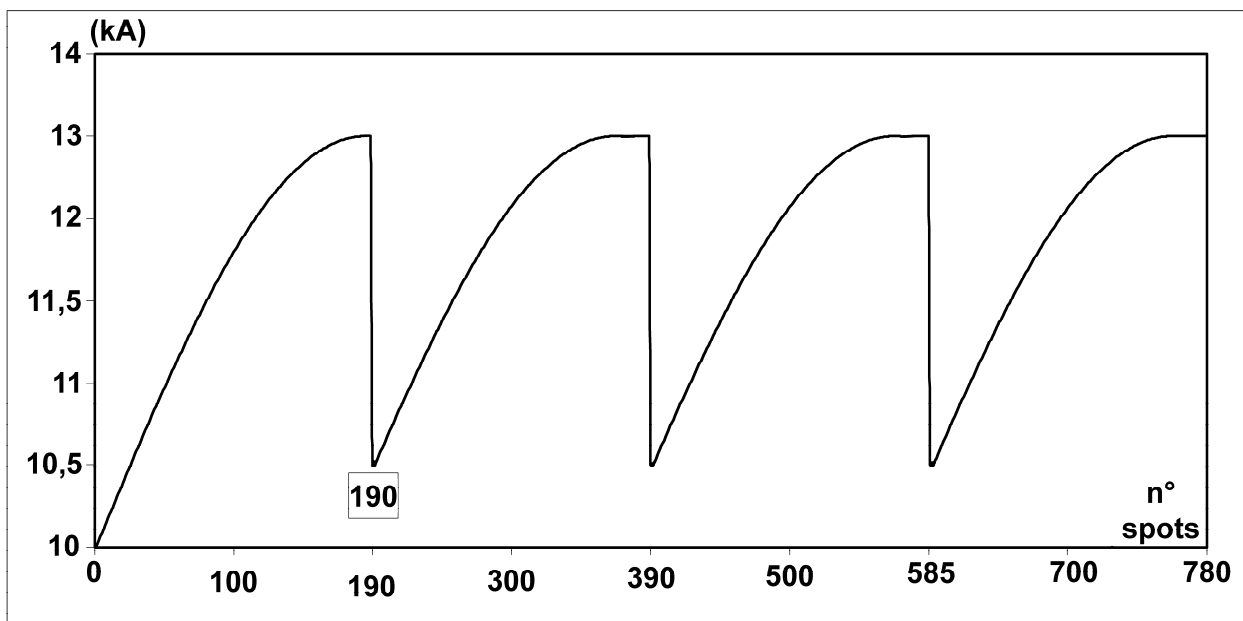
Use this parameter to increase, in percentage, the starting value of the dressings welding current after the first one.

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.

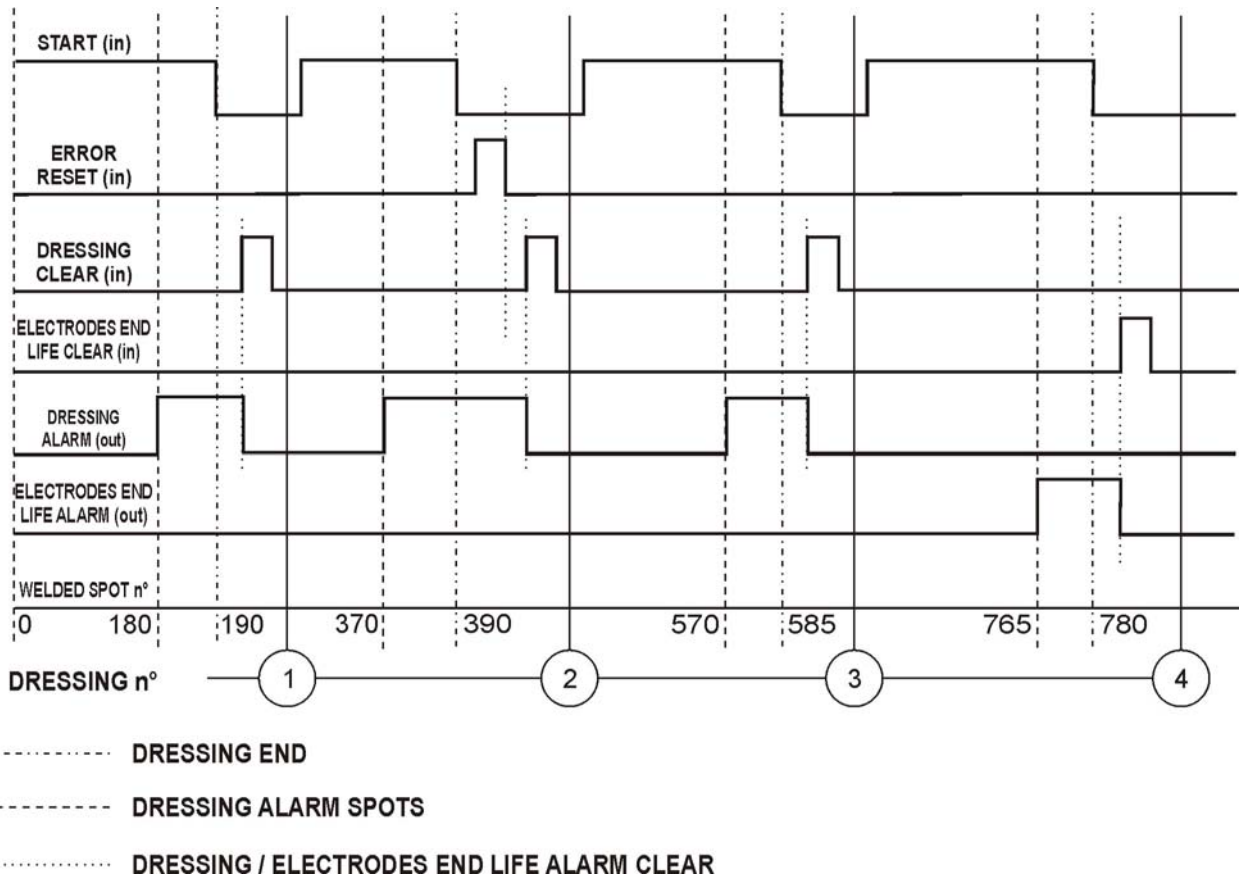
| PARAMETER | VALUE |
|------------------|-------|
| DRESSING NUMBER | 3 |
| SPOT DRESSING | 200 |
| DRESSING STEPS | 30% |
| DRESSING ALARM | 20 |
| ELECTRODES ALARM | 20 |
| DRESSING OFFSET | 5 % |

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.

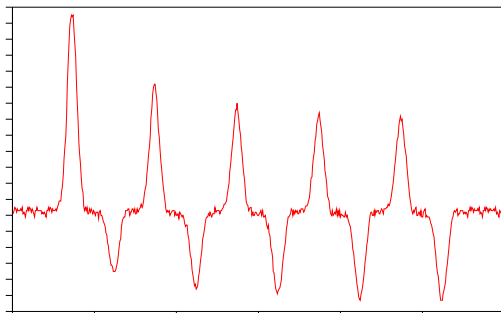
2.14 – ADJUSTING THE FIRST INSERT DELAY

During **installation** it is compulsory to adjust the first insert delay both to reduce absorption from the power line and to reduce power dissipated 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. The following two solutions may be adopted to measure the primary current:

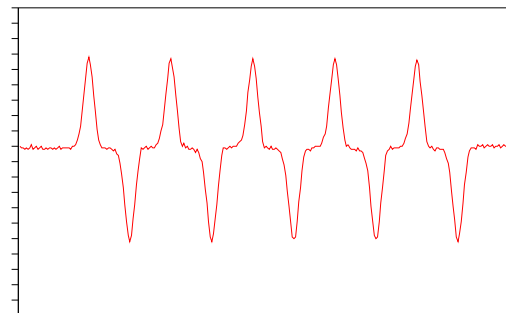
Use an ammeter that is capable of measuring the max positive and negative peak values (such as the TECNA TE1600). As such, the adjustment will be correct when the positive peak value is similar to the negative one. The current value absorbed by the no load welder might be too low for the instrument's minimum capacity. This problem is solved by routing the cable (being used for the measurement) several times inside the current sensor. In this case the read value is multiplied by the same number of cable routings run inside the sensor.

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 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 WELD 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 WELD 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 | 01 - 99 cycles |
| SQUEEZE | 00 - 99 cycles |
| PRESSURE | 00.5 – 10.0 bar |
| MOTOR DELAY | 05 - 99 cycles |
| SLOPE UP | 00 - 25 cycles |
| WELD | 00.5 - 99.5 cycles |
| POWER | 5 - 99 % |
| COLD 2 | 00 – 50 cycles |
| POWER 3 | 05 – 99 % |
| HOLD TIME | 01 – 99 cycles |
| OFF TIME | 00 – 99 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° |

```

-- 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 | 01 - 99 cycles |
| SQUEEZE | 00 - 99 cycles |
| PRESSURE | 00.5 – 10.0 bar |
| MOTOR DELAY | 05 - 99 cycles |
| SLOPE UP | 00 - 25 cycles |
| WELD | 00.5 - 99.5 cycles |
| CURRENT | 00.5 - 90.0 kA |
| COLD 2 | 00 – 50 cycles |
| CURRENT 3 | 00.5 – 90.0 kA |
| HOLD TIME | 01 – 99 cycles |
| OFF TIME | 00 – 99 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° |

CHAPTER 4 – CASCADE WORK MODE

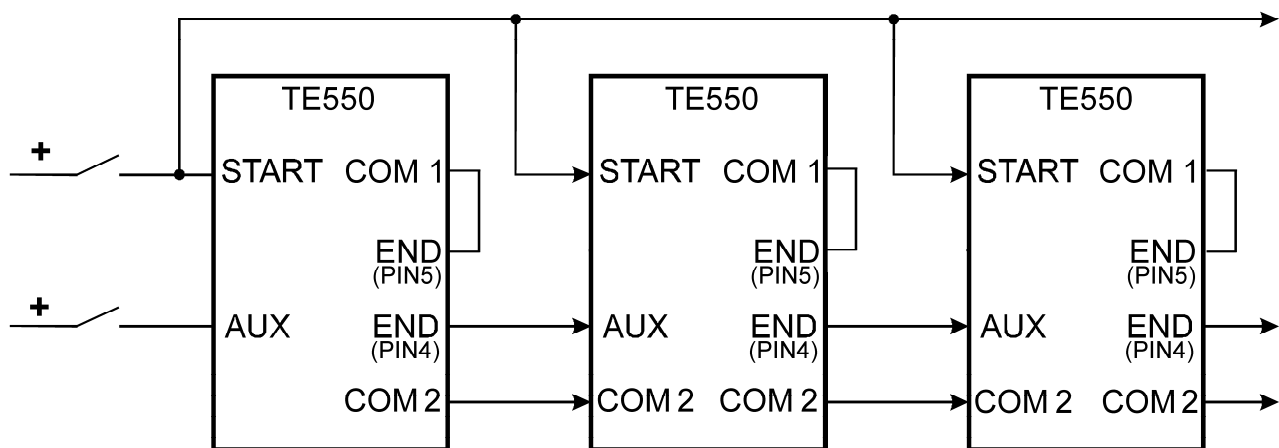
| FEATURES MENU | |
|----------------|-----|
| NC CONTACTS | OFF |
| SEAM WELD MODE | OFF |
| >CASCADE MODE | ON |

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

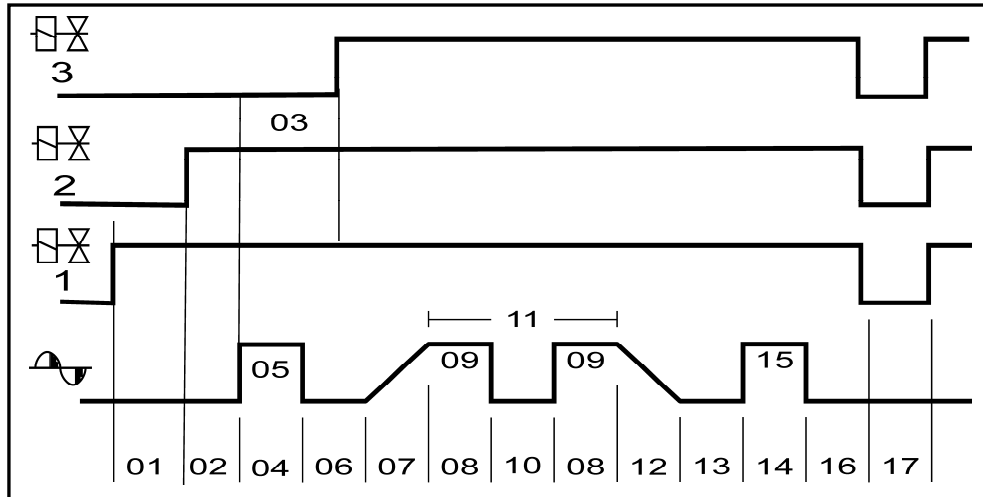


The cascade work mode excludes the possibility of using the control unit in SEAM WELD MODE.

CHAPTER 5 – 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 | WELD | 17 | OFF TIME |
| 09 | POWER / CURRENT | | |

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



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

CHAPTER 6 - STOP BAD SPOTS

The machine may be stopped when a consecutive series of welds fall out of the regulated limits. The number of consecutive welds that 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 |
| SQUEEZE | 10 |

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 |
| SQUEEZE | 10 |

| | |
|--------------|--------|
| PROGRAM DATA | |
| >OFF TIME | 00 |
| 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 |
| SQUEEZE | 10 |

| PROGRAM DATA | |
|--------------|-----|
| >OFF TIME | 00 |
| 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 |

CHAPTER 7 – 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 8 – DESCRIPTION OF THE INTERFACE OUTPUTS

8.1 – WELD ERROR (WRONG)

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

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

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).

WRONG SIGNAL ACTIVATION TABLE

| WORKING MODE → | FIX | IK | ENE |
|--------------------------|--|--|---|
| CONTROL MODE ↓ | | | |
| NO | / | <ul style="list-style-type: none"> • Error due to no current signal | <ul style="list-style-type: none"> • Min time • Max time • VE out of scale • Error due to no electrodes voltage |
| CUR | <ul style="list-style-type: none"> • Minimum current limit • Maximum current limit | <ul style="list-style-type: none"> • Minimum current limit • Maximum current limit • Error due to no current signal | <ul style="list-style-type: none"> • Minimum current limit • Maximum current limit • Min time • Max time • VE out of scale • Error due to no electrodes voltage |
| DEG | <ul style="list-style-type: none"> • Minimum conduction limit • Maximum conduction limit | <ul style="list-style-type: none"> • Minimum conduction limit • Maximum conduction limit • Error due to no current signal | <ul style="list-style-type: none"> • Minimum conduction limit • Maximum conduction limit • Min time • Max time • VE out of scale • Error due to no electrodes voltage |

8.2 - END CYCLE

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

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

8.3 - LOCK

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

CHAPTER 9 – SELECTING THE WORK PROGRAM THROUGH EXTERNAL RECALLS

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

| PROG. N. | RIC1 | RIC2 | RIC3 | RIC4 | RIC5 | RIC5 EVEN | RIC5 ODD |
|----------|------|------|------|------|------|--------------|-------------|
| 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 | • | • | • | • | • | | |

• = input active

The user may choose among 31 programs, when using input RIC5 as additional recalling input, or 15 programs when using input RIC5 as parity control. The use of input RIC5 as parity control is activated in the **FEATURES MENU** (see specific paragraph), in which the user also chooses the type of parity, Even or Odd. The parity control consists in checking that the number of activated inputs, for calling a program, is even or odd.

Example:

Recalling of Prog. N. 06 with odd parity control.

In order to call program 6, two inputs, RIC2 and RIC3 must be activated but since parity is odd the user must also activate input RIC5 to obtain an odd number of active inputs.

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.

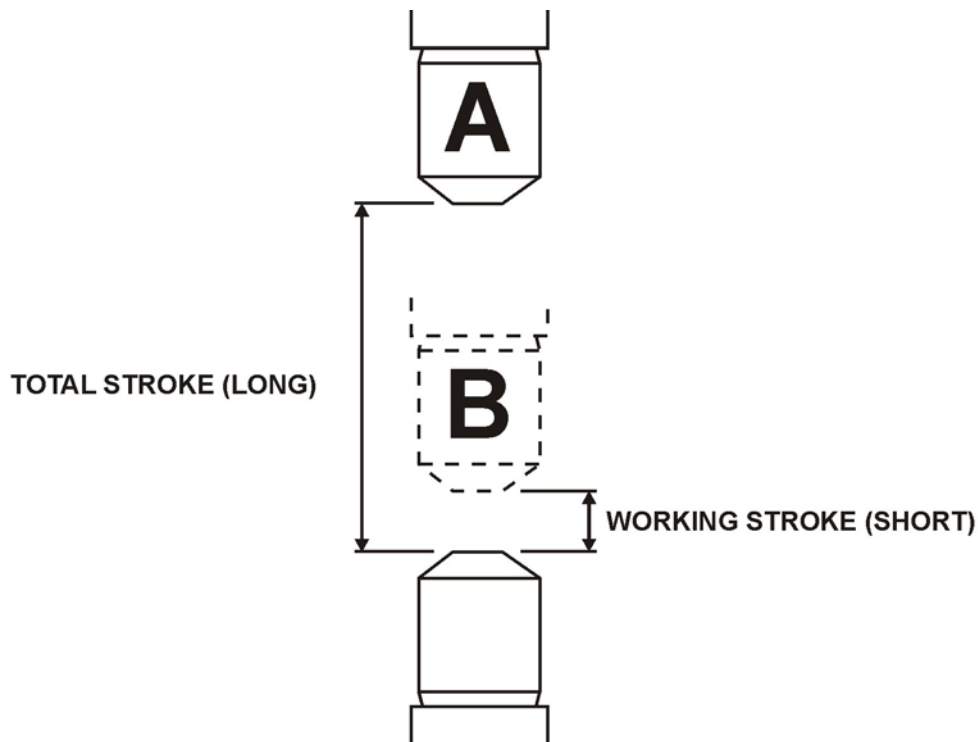
CHAPTER 10 – DOUBLE STROKE FUNCTION

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



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

On turning on the machine, with input (D.STROKE) active, the output is disabled. In this case, during the first 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 11 – OPTIONS

11.1 - 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

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 |
|------|--------|---------|--------|--------|-------|-------|
| 001 | 10,0 | 08.01 | 061 | 00356 | 00001 | ----- |
| 001 | 10,0 | 07.90 | 061 | 00353 | 00002 | ----- |
| 001 | 10,0 | 07.90 | 061 | 00353 | 00003 | ----- |
| 001 | 10,0 | 07.97 | 061 | 00358 | 00004 | ----- |

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

| PROG | CYCLES | CURRENT | DEGREE | ENERGY | SPOTS | LIMIT |
|------|--------|---------|--------|--------|-------|---|
| 01 | 10,0 | 06.00 | 062 | 00356 | 00009 | CUR OK |
| 01 | 10,0 | 06.00 | 062 | 00356 | 00010 | CUR OK |
| 01 | 10,0 | 06.00 | 062 | 00356 | 00012 | CUR MIN(<i>Current lower than MIN limit</i>) |
| 01 | 10,0 | 06.00 | 062 | 00356 | 00013 | CUR MIN |
| 01 | 10,0 | 06.00 | 062 | 00356 | 00014 | CUR MAX |
| 01 | 10,0 | 06.00 | 062 | 00356 | 00015 | CUR MAX(<i>Current higher than MAX limit</i>) |
| 01 | 10,0 | 06.00 | 062 | 00356 | 00016 | CUR MAX |

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

| PROG | CYCLES | CURRENT | DEGREE | ENERGY | SPOTS | LIMIT |
|------|--------|---------|--------|--------|-------|---|
| 01 | 10,0 | 06.00 | 062 | 00356 | 00009 | DEG MIN |
| 01 | 10,0 | 06.00 | 062 | 00356 | 00010 | DEG MIN(<i>Degrees lower than MIN limit</i>) |
| 01 | 10,0 | 06.00 | 062 | 00356 | 00012 | DEG MIN |
| 01 | 10,0 | 06.00 | 062 | 00356 | 00013 | DEG OK |
| 01 | 10,0 | 06.00 | 062 | 00356 | 00014 | DEG OK |
| 01 | 10,0 | 06.00 | 062 | 00356 | 00015 | DEG MAX(<i>Degrees higher than MAX limit</i>) |
| 01 | 10,0 | 06.00 | 062 | 00356 | 00016 | DEG MAX |

Print example of the work program parameters values:

WELD CONTROL UNIT TE550 REV. 1.00

```

PROGRAM N.      001
WORKING MODE   IK
CONTROL MODE   NO
SQUEEZE 1      20
SQUEEZE        10
PRESSURE       bar 10.0
FORGE DELAY    00
FORG.PRESS.    bar 09.0
PRE-WELD       00.0
PRE-POWER      % 05
COLD 1         00
SLOPE UP       00
WELD           06.0
CURRENT        kA 08.0
IMPULSE N.     01
COLD 2         00
SLOPE DOWN     00
COLD 3         00
POST-WELD      00.0
POST-POWER     % 05
HOLD TIME      20
OFF TIME       20
  
```

11.2 - 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 “**t e c n a Net**”, 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 that connects the devices must not be longer than 1200 m, it must be shielded and have metallic or metallized connecting connectors. We recommend using Belden 8777 cable at 24 AWG with “Phoenix” “SUBCON 9/F – SH” type connectors.

11.3 – 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.

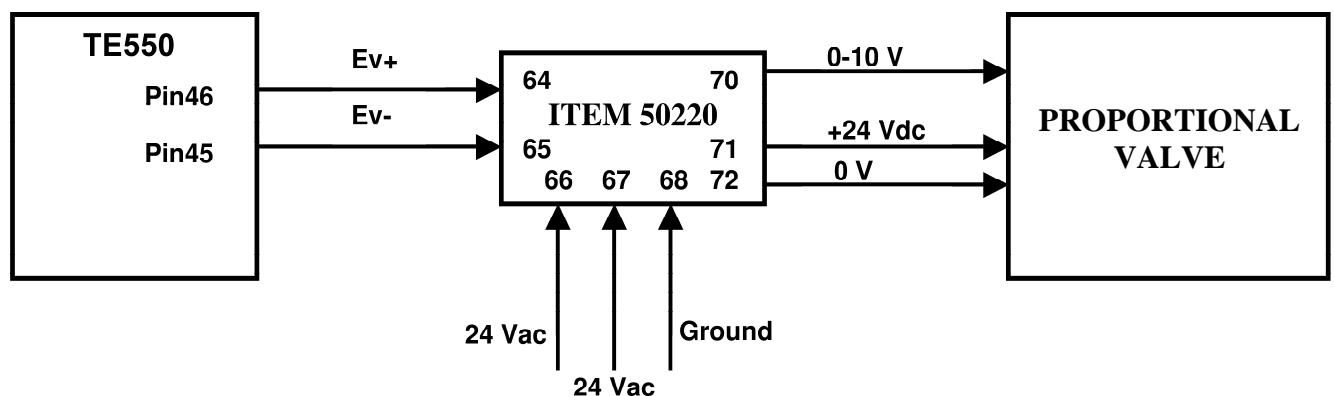
| TERMINAL STRIP CONNECTIONS | |
|----------------------------|------------------------------------|
| 64 | EV+ from the control unit (PIN 46) |
| 65 | EV- from the control unit (PIN 45) |
| 66 | 24VAC |
| 67 | 24VAC |
| 68 | Ground |
| 69 | OUT-I |
| 70 | 0-10VDC to the proportional EV |
| 71 | +24VDC 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:

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

CONNECTIONS DIAGRAM:



N.B.

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

CHAPTER 12 – 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. |
| 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 on a load of 35Ω. The user must use trigger modules manufactured by TECNA with opto-isolators. |
| 11 | COM1 | Common for inputs with 24VDC reference. |
| 12 | RIC5 / PARITY | This input closed on COM1 may have different functions depending on the selection made in the FEATURES MENU . The first function is the external recall whilst the second one is the parity control during the recall. If the control unit is set to SEAM WELD mode, this input recalls the second welding current (parameters POWER 3 or CURRENT 3). |
| 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 | BIC1 NC | Currently this input is not used |
| 27 | DOUBLE STROKE | This input is used to manually control the double stroke in welders fitted with this function. |
| 28 | BIC2 NC | Currently this input is not used. |
| 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 | SV1 | 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 | SV2 | 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 | SV3 | Connect to solenoid valve 3 (FORGE). Command suitable for coil control at 24VDC. Max 5W. |
| 43 | COM2 | Common for outputs with 0V reference. Connected to GND conforming to regulation EN60204 |
| 44 | SV4 | Connect to solenoid valve 4 (DOUBLE STROKE). Command suitable for coil control at 24VDC. Max 5W. |
| 45 46 | SV PROP- SV 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. |

| | | |
|----------|----------------------------------|---|
| 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 works in series with the button on the control unit's keypad. If using only the weld/no weld via the keypad, this input must be connected to the COM1 present on card TE550. |
| 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 VE | Input for the acquisition of the secondary voltage. Works only with card code 50097. |
| 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. |



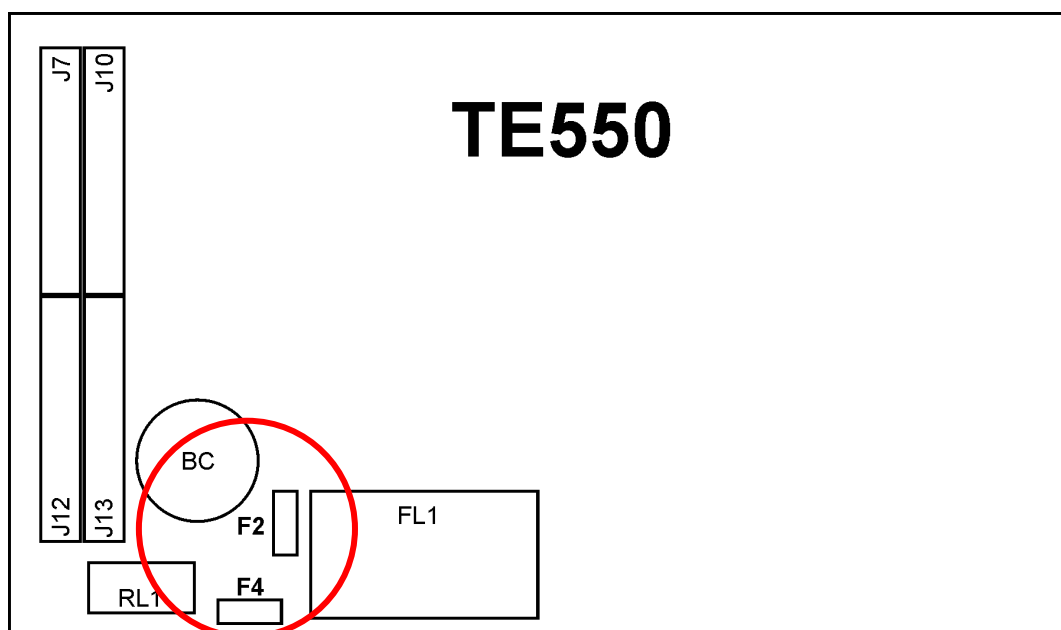
Before turning on the TE550 control unit with the supplementary expansion card, code 50200, check that the ELECTRODES END LIFE CLEAR input (Pin 52) is NOT active. Otherwise the control unit does not recognize card 50200.

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 PROGRAM - RUN key lock installed on the control unit's front panel, traced as code “RS” 321054 or as a Tecna article, Code 21955.



CHAPTER 13 – LIST OF TE550 MESSAGES**13.1 – 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 eeprom. 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. |

13.2 – WORK ERRORS

| MESSAGE | NUM | CAUSE | REMEDY |
|---|-----|--|---|
| NO EMERGENCY ERROR OR RELE 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 WELD. |
| 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 WELD. |
| 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. |

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|--|------------|---|--|
| 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. |

13.3 - 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 WELD 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. |

CHAPTER 14 – TECHNICAL SPECIFICATIONS

POWER SUPPLY: 24VAC +/- 10%

FREQUENCY: 50/60Hz +/- 1%

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

MAX ALTITUDE: 1000m

RELATIVE HUMIDITY: from 40% to 80%

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

WEIGHT: 530g / 1.1685 lb

PROTECTION RATING: IP40

