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REV02

User Interface (U22)

ENGLISH

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Introduction

U22 User Interface is used for communication between the device and the user. The U22 interface is standard panel with quick and easy access to the most commonly used welding parameters. Two controls and two buttons allows simple and quick process and parameters selection. Panel includes bright LED displays showing welding voltage and current during welding or parameters value during set-up.

This interface works with following equipment:

- **POWERTEC® series**
- **SPEEDTEC® series**
- **DIGISTEEL series**
- **CITOSTEEL series**
- **YARDTEC® series**
- **Flextec® series**
- **Wire Feeders.**

Possible U22 Interface configurations

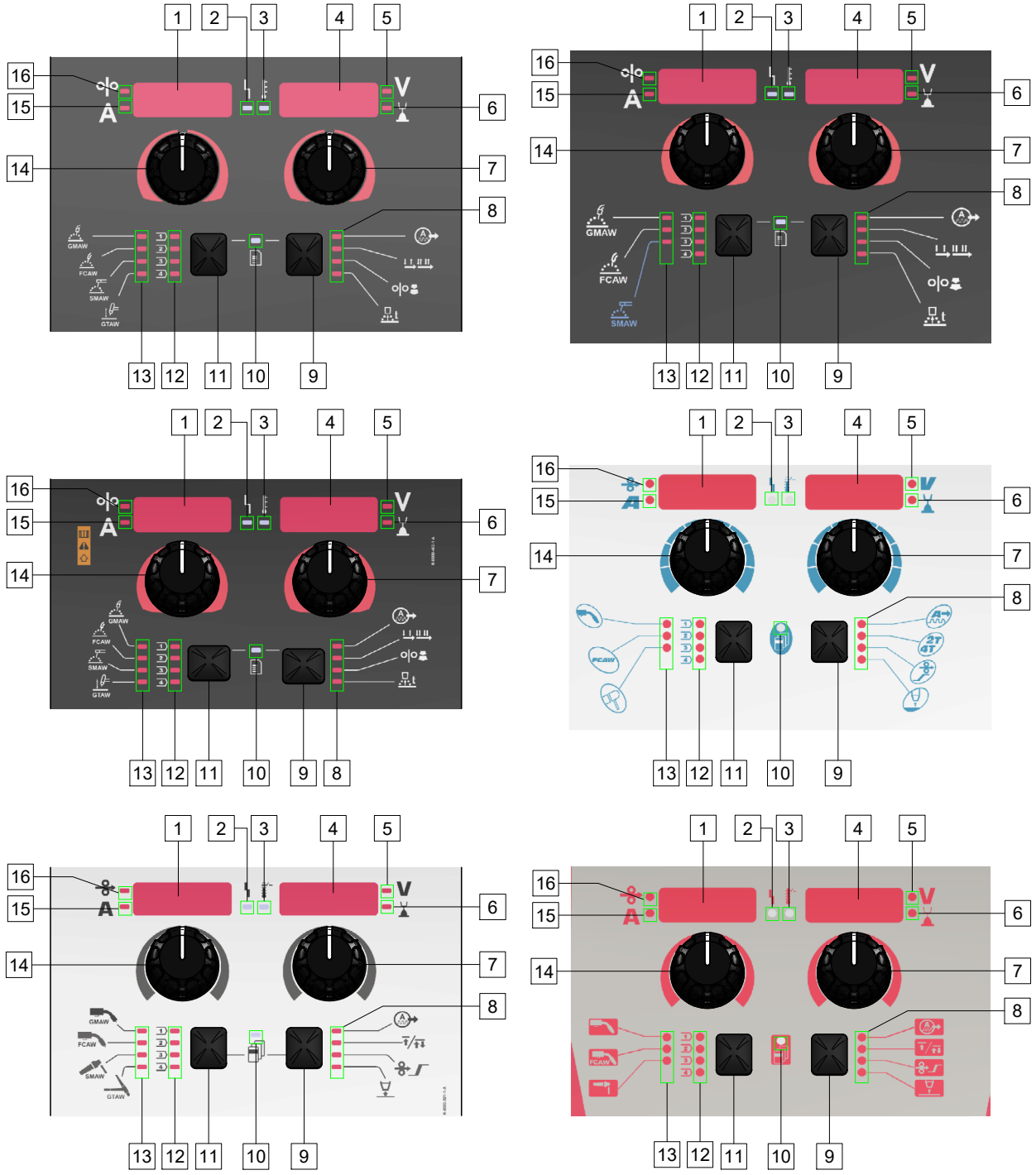
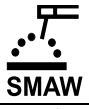
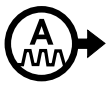
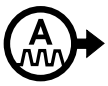
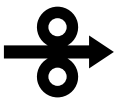
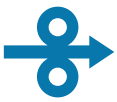


Figure 1

U22 Guide's Marking

Table 1. U22 symbols used depend on the product and brand

GMAW (non-synergic) process				
FCAW-GS process				
SMAW process				
GTAW process				
Arc Control				
Torch trigger mode (2-step / 4-step)				
Run-in WFS (wire feed speed)				
Burnback Time				
LED Status of Work				
Thermal Overload Indicator				
Volts				
Trim				
Ampere				
WFS (wire feed speed)				

User Interface U22

Interface description

1. Left Display: Shows wire feed speed or welding current. During welding shows the actual welding current value.

2. Status LED of Work: A two color light that indicates system errors. Normal operation is steady green light. Error conditions are indicated, per Table 2.

Note: The status light will flash green for up to one minute when the machine is turned on for the first time. When the power source is powered it can take as long as up to 60 seconds for the machine to be ready to weld. This is a normal situation as the machine goes through the initialization.

Table 2

LED Light Condition	Meaning Only machines which using protocol for communication
Steady Green	Power source is operational, and is communicating normally with all healthy peripheral equipment.
Blinking Green	Occurs during power up or a system reset, and indicates the power source is mapping (identifying) each component connect to the system. This behavior occurs for first after power is turned on, or if the system configuration is changed during operation.
Alternating Green and Red	If the status lights are flashing any combination of red and green color, it means that errors are present in the power source. Each digit of the code corresponds to the number of red flashes of the indicator lamp. Individual code digits are flashed in red with a long pause between digits. If more than one code is present, the codes will be separated by green light. Read the error code before the machine is turned off. To clear the errors try to turn off the machine and wait for a few seconds, then turn on again. If the error remains, a it maintenance is required. Please contact the nearest authorized technical service center or Lincoln Electric and report the error code.
Steady Red	Indicate no communication between the power source and device which has been connected to this power source.

3. Thermal Overload Indicator: It indicates that the machine is overloaded or that the cooling is not sufficient.

4. Right Display: Depending on the source welding and the welding program shows the welding voltage in volts or Trim value. During welding shows the actual welding voltage value.

5. LED Indicator: Informs that the value on the Right Display is in volts unit and during welding, it blinks and the display shows the measured voltage.

6. LED Indicator: Informs that the value on the Right Display is Trim. Trim is adjustable from 0.50 to 1.50. 1.00 is the nominal setting.

7. Right Control: Adjusts values on the Right Display.

8. LED Indicator: Quick Access Menu.

9. Right Button: Enables selecting, changing and setting welding parameters. Quick Access Menu.

10. LED Indicator: Indicates that the Settings and Configuration Menu is activated.

11. Left Button: Enables:
    - Checking the active program number. To check the program number, press the Left Button once.
    - Changing the Welding Process.

12. Welding Programs Indicators (changeable): In the user memory can be stored four user programs. Shine LED indicates that the program is active.

13. Welding Programs Indicators (unchangeable): LED indicates the program for non-synergic process is active. See the table 3.

14. Left Control: Adjusts values on the Left Display.

15. LED Indicator: Informs that the value on the Left Display is in ampere units, blinks during welding and the display shows current measured.

16. LED Indicator: Informs that the wire feed speed is on the Left Display.

Changing the Welding Process or Program

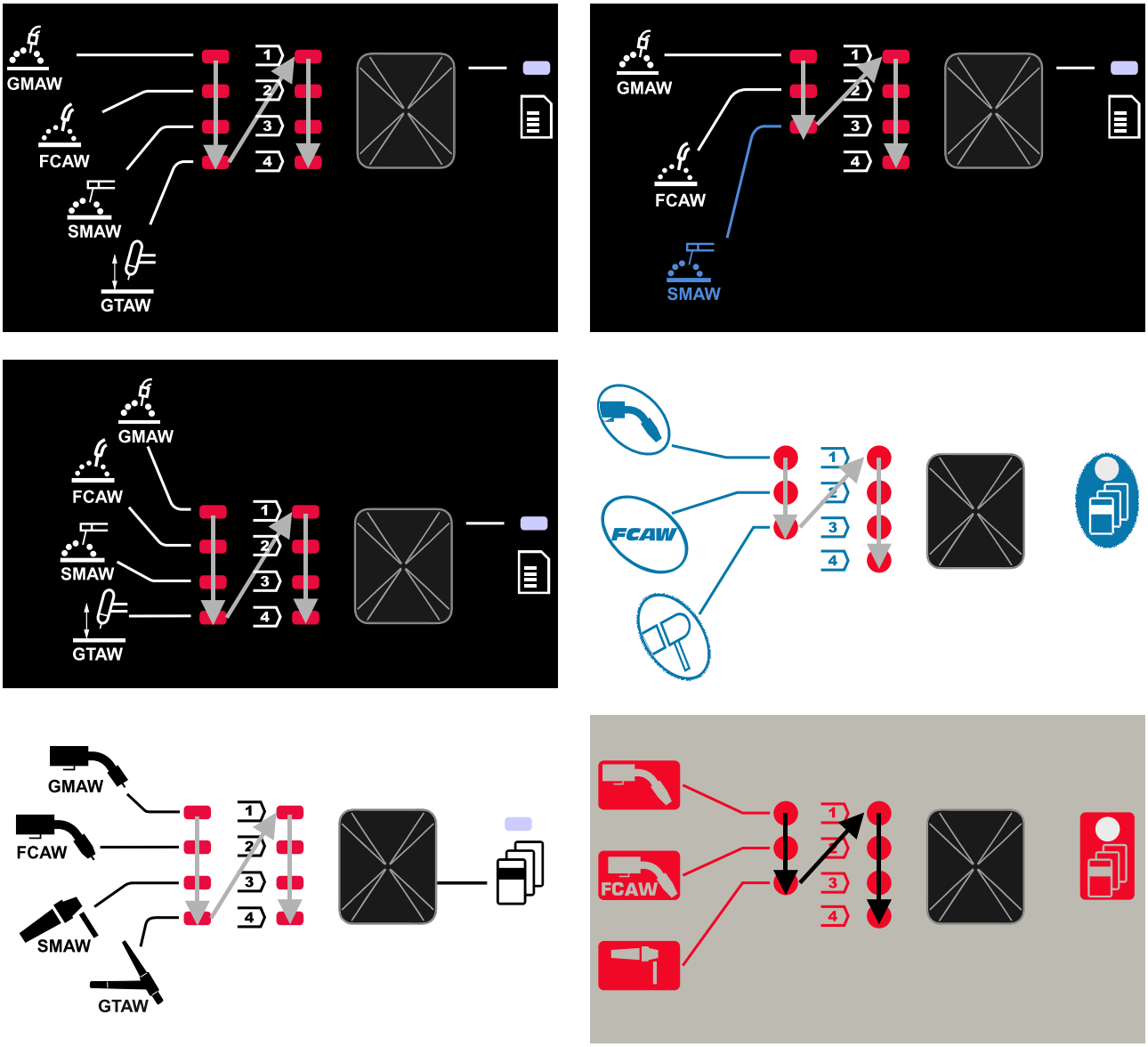


Figure 2 Graphic configuration depends on the product and brand.

Table 3. Unchangeable Welding Programs

Process	Program Number			
	Powertec® DIGISTEEL CITOSTEEL	Speedtec®	Flextec®	Yardtec®
GMAW (non-synergic)	2	5	10	2
FCAW-GS	7	7	81	7
SMAW	1	1	1	1
GTAW	-	3	3	3

Note: The list of available programs depends on the power source. If the power source does not support one of unchangeable programs, the LED indicating this program does not light up.

It is possible to quick recall one of the seven or eight welding programs. Three / four programs are fixed and cannot be changed - Table 3.
Four programs can be changed and assigned to one of four user memory. By default, user memories store the first available welding program. To use a welding program other than the fixed welding program, the program must first be stored in User Memory.

Note: The list of available welding programs depends on the power source.

To change the welding process / welding program:

- Press the Left Button [11]. "Pr" is shown on the Left Display [1] and the actual program number on the Right Display [4].
- Again, press the Left Button [11] the welding programs indicator (12 or 13) will pass to the next program in the sequence shown in Figure 2.
- Press the Left Button [11] until the LED Indicator (12 or 13) will indicate desired welding program.

Note: After the restart the device remembers the last selected welding program with its parameters.

User Memory

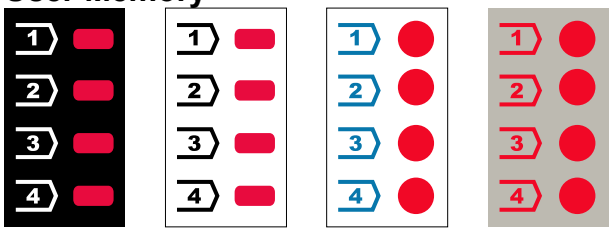


Figure 3. Graphic configuration depends on the product and brand

Only four welding programs can be stored in the User Memory.
Default settings: user memories store the first available welding program.

Note!: Only the number of welding program is saved in the User Memory. The welding parameters are not saved in the User Memory.

To assign the weld program to user memory:

- Use the Left Button [11] to select the user memory number (1, 2, 3 or 4) - LED Indicator [12] will light up selected memory.
- Press and hold the Left Button [11] it until LED Indicator [12] will blink.
- Use the Right Control [7] to select the welding program.
- To save the selected program, press and hold the Left Button [11] until LED Indicator will stop blinking.

  Note: The list of available programs depends on the power source.

Quick Access Menu

Quick Access Menu includes:

- Arc Control
- Torch trigger mode (2-step / 4-step)
- Run-in WFS
- Burnback Time

Quick Access Menu allows access to the arc parameters as well as start and end process parameters according to Table 4 and 6.

To enter the menu (base menu):

- Press the Right Button [9] until the LED Indicator [8] illuminates the required parameter.
- Set the parameter value by the Right Control [7]. The set value is automatically saved.
- The parameter value is shown on the Right Display [4].
- Press the Right Button [9] to go to the next parameter.
- Press the Left Button [11] to exit.

⚠ WARNING

Access to the menu is not available under welding, or if there is a fault (status LED [2] is not solid green).

Availability of the parameters in the Quick Access Menu depend on the selected welding program / welding process.

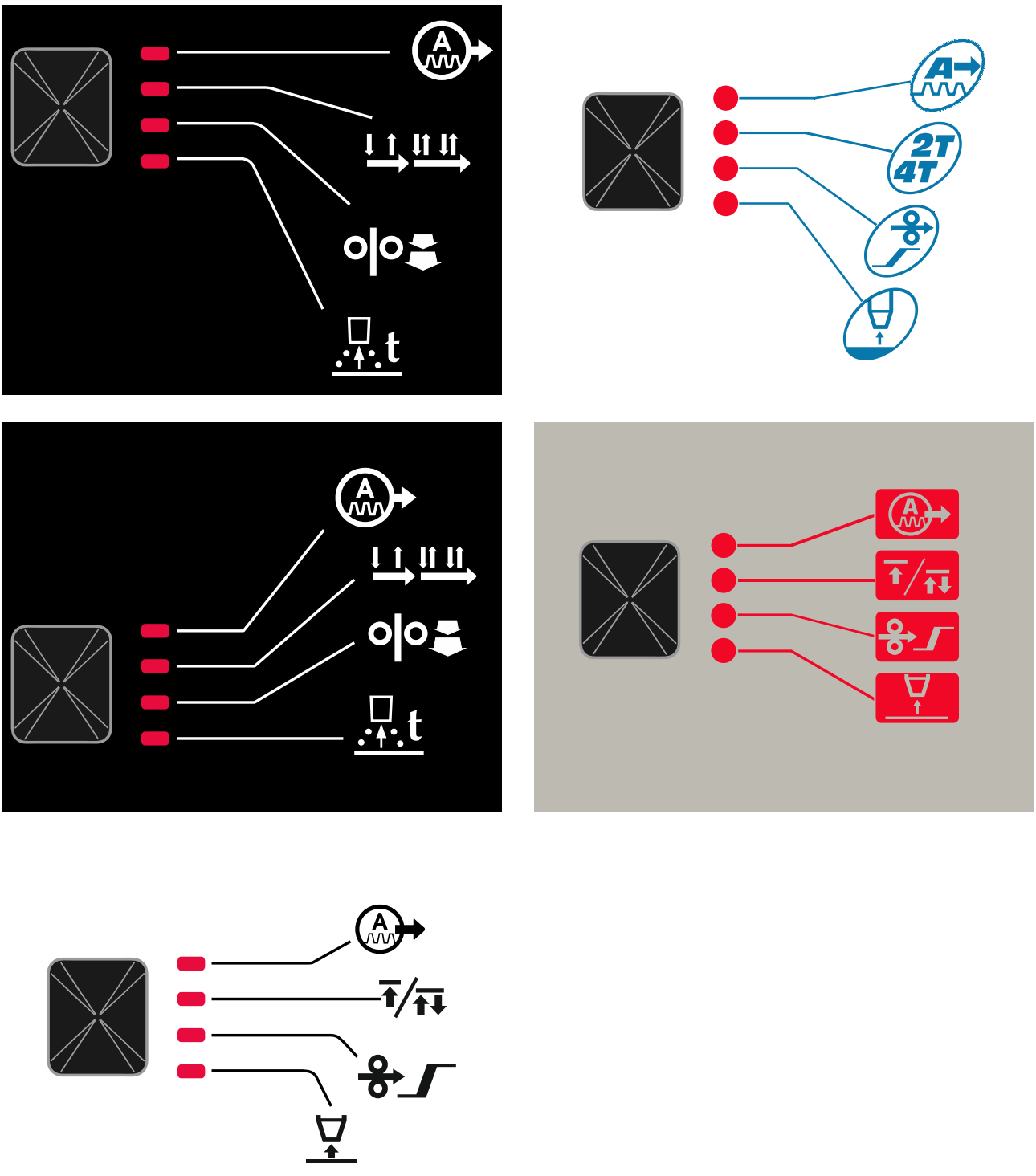


Figure 4. Quick Access Menu - graphic configuration depends on the product and brand.

Table 4 Arc Controls

Parameter	Definition
	**Pinch –** controls the arc characteristics during short-arc welding. Increasing Pinch value results in a crisper arc (more spatter) while decreasing provides a softer arc (less spatter). • Regulation range: from -10.0 to +10.0. • Default value: 0.
	**Frequency** - influences the width of the arc and the amount of heat input to the weld. • Default value: 0. **Note:** Adjust range depends on the power source.
	**Background Current-** percentage value of nominal welding current. Adjusts the overall heat input into the weld. Changing the background current changes the shape of the back bead. **Note:** Adjust range depends on the power source.
	**UltimArc™** – for pulse welding programs adjusts the focus or shape of the arc. In consequence of increasing UltimArc™ value the arc is tight, stiff for high speed sheet metal welding. • Adjust range: from -10 to +10. • Default value: 0.
	**ARC FORCE** - the output current is temporarily increased that prevents the electrode from sticking and facilitates the welding process. Lower values will provide less short circuit current and a softer arc. Higher settings will provided a higher short circuit current, more forceful arc and possibly of more spatter. • Adjust range: from -10 to +10. • Default value: 0.
	**HOT START** - temporarily increases the nominal current value during arc start with electrode to make the arc start easier. • Regulation range: from 0 to +10.0. • Default value: +5.
	**Pulse Period** - influences the width of the arc and the amount of heat input to the weld. If the value of parameter is lower: • Improves penetration and the microstructure of the weld. • The arc is narrower, more stable. • Reduces the amount of heat input to the weld. • Reduces distortions. • Increases welding speed. **Note:** Adjust range depends on the power source.

Table 5 Process start and end parameters

Parameter	Definition
	**Torch trigger mode (2-step / 4-step) -** changes the function of the torch trigger. • 2 Step trigger operation turns welding on and off as direct response to the trigger. Welding process starts when the torch trigger is pressed. • 4-Step mode allows to continue welding, when the torch trigger is released. To stop welding, the torch trigger should be pressed again.4-step model facilitates to make long welds. • Default settings: 2-step.
	**Run-in WFS –** sets the wire feed speed from the time the torch trigger is pressed until an arc is established. • Regulation range: from 1,49 m/min (59 in/min) to 3,81 m/min (150 in/min). • Default settings for non-synergic mode: OFF. • Default settings for synergic mode: AUTO.
	**Burnback Time –** amount of time that the welding is continued after the wire stops feeding. It prevents the wire from sticking in the puddle and prepares the end of the wire for the next arc ignition. • Regulation range: from OFF to 0,25 seconds. • Default settings for non-synergic mode: 0,07s. • Default settings for synergic mode: AUTO.

Setting and Configuration Menu

To access the menu, press the Left [11] and the Right [9] Buttons simultaneously.

Parameter Selection Mode – the Parameter Name on the Left Display [1] blinking.

Parameter Change Value Mode – the parameter value on the Right Display [4] blinking.

⚠ WARNING

To exit the menu with changes saved, press the Left [11] and the Right [9] Buttons simultaneously.
After one minute of inactivity the Menu will exit without saving.

Table 6 Interface Components and functions when the Settings and Configuration Menu is active.

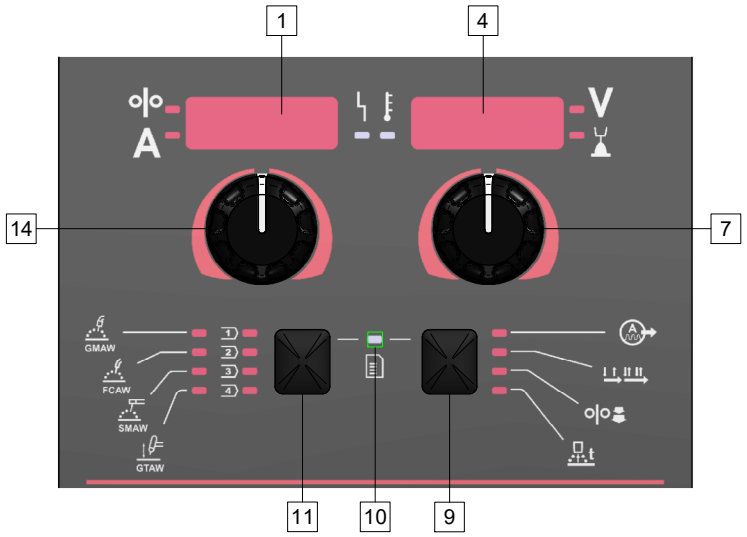


Figure 5

Functions of Interface Components
1. Parameter Name. 4. Parameter Value. 7. Changing Parameter Value. 9. Entering to parameter edition. Confirm Parameter Value change. 10. Setting and Device Configuration Menu is active. 11. Cancelation / Exit. 14. Parameter Selection.

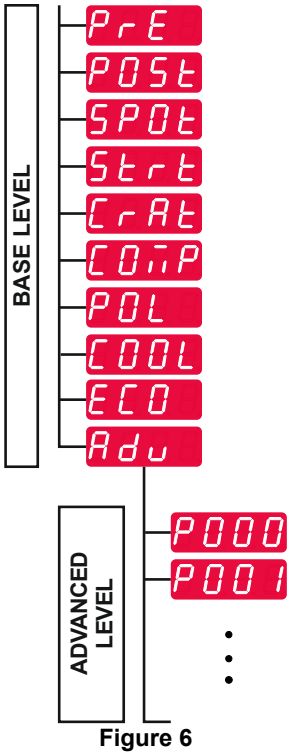


Figure 6

User has access to two menu levels:

- Basic Level – Basic Menu which is connected with settings of Welding Parameters. The Basic Level includes the parameters described in Table 7.
- Advanced Level – Advanced Menu, configure device menu. The Advanced Level includes the parameters described in Table 8.

Note: The availability of parameters in the Setting and Configuration Menu depends on the selected welding program / welding process.

Note: After the restart the device remembers the last selected welding program with its parameters.

Table 7 The default settings of Basic Menu

Parameter	Definition
	**Preflow Time –** the time that shielding gas flows after the torch trigger was pressed before wire feeding. • Regulation range: from OFF (0 second) to 25 seconds. • Default settings for non-synergic mode: 0,2 s. • Default settings for synergic mode: AUTO mode.
	**Postflow Time –** the time that shielding gas flows after stop of welding. • Regulation range: from OFF (0 second) to 25 seconds. • Default settings for non-synergic mode: 0,5 s. • Default settings for synergic mode: AUTO mode.
	**Spot Timer** – the time after which the welding will end even if the trigger is still pulled. • Regulation range: from 0 second (OFF) to 120 seconds. • Default settings: OFF. **Note**: Spot Timer has no effect in 4-Step Trigger Mode.
	**Start Procedure** – controls the WFS (or value in ampere units) and Volts (or Trim) for a specified time at the beginning of welding. During the start time, the machine will ramp up or down from the Start Procedure to the preset Welding Procedure. • Adjust time range: from OFF (0 seconds) to 10 seconds. • Default settings for non-synergic and synergic mode: OFF. Start parameters: • Start Time • Wire Feed Speed or welding current. • Voltage or Trim value. **Note:** Starts parameters depend on welding process. To set a start parameters for the non-synergic mode: • Press the Right Button [9]. • "SEC" appears on the Left Display [1]. • On the Right Display [4] OFF flashes. • Set the start time with the Right Control [7] – turn the Right Control to the right. • Confirm the setting of the start time with the Right Button [9]. • The Left Display [1] shows the value of the wire feed speed or welding current, the Right Display [4] shows the voltage or the Trim value. • Set the value on the Left Display [1] by the Left Control [14]. • Set the value on the Right Display [4] with the Right Control [7]. • Confirm the settings - press the Right Button [9]. In synergic mode only, the start parameters can be set directly by user or by the machine's software (AUtO value). To set the Start Procedure to AUtO value: • Press the Right Button [9]. • "SEC" appears on the Left Display [1]. • On the Right Display [4] OFF flashes. • Set the start time with the Right Control [7] – turn the Right Control to the left. • On the Right Display [4] AUtO flashes. • Confirm the setting of the start time with the Right Button [9].

	**Crater Procedure** controls the WFS (or value in ampere units) and Volts (or Trim) for a specified time at the end of the welding after the trigger was released. During the crater time, the machine will ramp up or down from the Weld Procedure to the Crater Procedure. • Adjust time range: from OFF (0 seconds) to 10 seconds. • Default settings for non-synergic and synergic mode: OFF. Crater parameters: • CraterTime • Wire Feed Speed or welding current. • Voltage or Trim value. **Note:** Crater parameters depend on welding process. To set a crater parameters for the non-synergic mode: • Press the Right Button [9]. • "SEC" appears on the Left Display [1]. • On the Right Display [4] OFF flashes. • Set the crater time with the Right Control [7] – turn the Right Control to the right. • Confirm the setting of the crater time with the Right Button [9]. • The Left Display [1] shows the value of the wire feed speed or welding current, the Right Display [4] shows the voltage or the Trim value. • Set the value on the Left Display [1] by the Left Control [14]. • Set the value on the Right Display [4] with the Right Control [7]. • Confirm the settings - press the Right Button [9]. In synergic mode only, the crater parameters can be set directly by user or by the machine's software (AUtO value). To set the Start Procedure to AUtO value: • Press the Right Button [9]. • "SEC" appears on the Left Display [1]. • On the Right Display [4] OFF flashes. • Set the crater time with the Right Control [7] – turn the Right Control to the left. • On the Right Display [4] AUtO flashes. • Confirm the setting of the start time with the Right Button [9].
	**Compensation of voltage drop through welding leads** - to eliminate the influence of voltage drop through the welding leads: • "OFF" (default) - Compensation of voltage drop is off • "ON" - Compensation of voltage drop in ON. **NOTE**: First calibration procedure must be performed correctly. • "CAL" - Calibration procedure. See Compensation of voltage drop through welding leads subchapter for details
	**Polarization** – Used for configuration of the work and electrode sense leads: • "Positive" (default) = Most GMAW welding procedures use Electrode Positive welding. • "Negative" = Most GTAW and some inner shield procedures use Electrode Negative welding. **Note**: Not apply to **Powertec®** and **Yardtec®**.
	**Cooler** – option is available when cooler is connected. This function allows following cooler modes: • FILL – Start of the filling procedure. • AUTO – Automatic mode. • On – Cooler on in the continuous mode. • Off – Cooler off. Refer cooler instruction manual for more details**.** **Note:** Not apply to **Flextec® 350x** i **Flextec® 500x**.

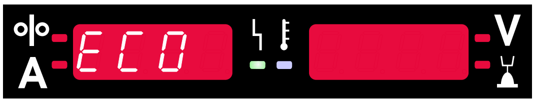
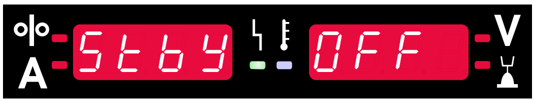
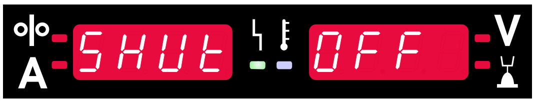
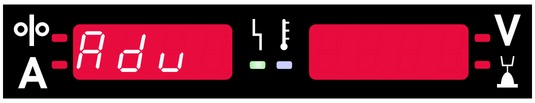
  	**Green Mode –** is a power management feature that enables welding equipment to switch to low power state and reduce power consumption while is not used. **Note:** Not apply to **Flextec® 350x** i **Flextec® 500x**. Display Configuration Settings: • Standby • Shutdown **Standby** – this option allows you to reduce energy consumption to the level below 50W when the welding equipment is unused. Default value: OFF. To set the time for Standby option: • Press the Right Control [7] to enter the Standby menu. • By the Right Control [7] set require time from 10-300min range or Off this function. • Press the Right Control [7] to confirm. • When machine is under Standby mode any action on user interface or trigger activates normal work of welding machine. **Shutdown** – this option allows you to reduce energy consumption to the level below 10W when the welding equipment is unused. • Default value: OFF. To set the time when Shutdown option will be turned on: • Press the Right Control [7] to enter in to Shutdown menu • By the Right Control [7] set require time from 10-300min range or Off this function. • Press the Right Control [7] to confirm. **Note:** Operating system will information about activate Shutdown Mode. The countdown starts 15 s before the Shutdown. **Note:** When machine is under Shutdown mode it is required to switch the machine off and on to activate normal operation. **Note:** Under Standby and Shutdown displays are disabled.
	**Advanced Menu** – Device Configuration Menu. **Note:** To access to advanced menu: • In Base Menu select the Advanced Menu (Adv). • Use the Right Button [9] to confirm the selection.

Table 8 The default settings of Advanced Menu (Device Configuration Menu)

Parameter	Definition
	**The Menu Exit –** enables exit from menu. **Note**: This parameter cannot be edited. To exit from menu: • In Advanced Menu select P000. • Confirm the selection, push the Right Button.
	**Wire Feed Speed (WFS)** units – enables change the WFS unit: • CE (factory default) = m/min; • US = in/min.
	**Crater Delay -** this option is used to skip the Crater sequence when making short tack welds. If the trigger is released before the timer expires, Crater will be bypassed and the weld will end. If the trigger is released after the timer expires, the Crater sequence will function normally (if enabled). • Regulation range: from OFF to 10.0 seconds. • Default settings: OFF.
	**Display Trim as Volts** – determines how Trim is displayed: • "Yes" = all trim values are displayed as a voltage; • "No" = the trim is displayed in the format defined in the weld set. **Note:** This option may not be available on all machines. The power source must support this functionality, or this option will not appear in the menu.
	**Arc Start/Loss Error Time** - This option can be used to optionally shut off output if an arc is not established, or is lost for a specified of time. Error 269 will be displayed if the machine times out. If the value is set to OFF, machine output will not be turned off if an arc is not established or arc is lost. The trigger can be used to hot feed the wire (default). If a value is set, the machine output will shut off if an arc is not established within the specified amount of time after the trigger is pulled or if the trigger remains pulled after an arc is lost. To prevent nuisance errors, set Arc Start/Loss Error Time to an appropriate value after considering all welding parameters (run-in wire feed speed, weld wire feed speed, electrical stick out, etc). • Regulation range: from OFF to 10.0 seconds. • Default settings: OFF. **Note:** This parameter is disabled while welding in SMAW, GTAW or GOUGING.
	**Display Workpoint as Amps** – determines how workpoint is displayed: • "No" (factory default) = the workpoint is displayed in the format defined in the weld set. • "Yes" = all workpoint values are displayed as an amperage. **Note**: This option may not be available on all machines. The power source must support this functionality, or this option will not appear in the menu.
	**Feedback Persist –** determines how feedback values are displayed following a weld: • "No" (factory default) – last recorded feedback values will blink for 5 seconds following a weld, then return to present display mode. • "Yes" – last recorded feedback values will blink indefinitely following a weld until a Control or Button is touched, or an arc is struck.
	**Sense From Studs -** Use this option for diagnostic purposes only. When power is cycled, this option is automatically reset to False. • "No" = Voltage sensing is automatically determined by the selected weld mode and other machine settings. • "Yes" = Voltage sensing is forced to "studs" of the power source. **Note:** This option may not be available on all machines. The power source must support this functionality, or this option will not appear in the menu.

	**Brightness Control** - enables the brightness level. • Regulation range: from 1 to 10. • Default settings: 5.
	**Restore Factory Settings** – to restore Factory Settings: • Use the Right Button to confirm the selection. • Use the Right Control to select "YES". • Use the Right Button to confirm the selection. **Note:** After the device has been restarted the P097 value is "NO".
	**Show Test Modes**– used for calibration and tests. To use the Test Modes: • The Right Display shows "LOAD". • Use the Right Button to confirm the selection. • The Right Display shows "DONE". **Note:** After the device has been restarted the P099 value is "LOAD".
 	**View Software Version Info** – used for viewing the software versions for user interface. To read the software version: • In Advanced Menu select P103. • Confirm the selection, push the Right Button. • The displays will show the software version. **Note:** P103 is a diagnostic parameter, to read only.

U22 locking

U22 Locking function prevents accidental parameter changes.

To lock U22:

- Press the Right Button [9] and hold it for 4 seconds.
- After this time, the information about blocking U22 will be shown on the displays (figure 7).

Figure 7

To unlock U22:

- Press the Right Button [9] and hold it for 4 seconds.
- After this time, The User Interface will be unlocked and the displays will show the following information (figure 8).

Figure 8

Welding GMAW, FCAW-GS and FCAW-SS Process in non-synergic mode

Table 9. GMAW and FCAW non-synergic Welding Programs

Process	Gas	Program Number			
		Powertec® DIGISTEEL CITOSTEEL	Speedtec®	Flextec®	Yardtec®
GMAW	ArMIX	2	5	10	2
	CO_2	3			
	Ar	4			
FCAW-GS	ArMIX	7	7	81	7
	CO_2	8			
FCAW-SS	-	6	6	80	6

Note: The list of available programs depends on the power source.

In non-synergic mode wire feed speed and welding voltage are independent parameters and must be set by the user.

For GMAW and FCAW-GS program can set:
- Wire Feed Speed, WFS
- The welding voltage
- Burnback Time
- Run-in WFS
- Preflow Time/ Postflow Time
- Spot Time
- Start Procedure:
  - Start Time
  - Wire Feed Speed
  - Voltage
- Crater:
  - Crater Time
  - Wire feed speed
  - Voltage
- Polarity
- 2-Step/4-Step
- Arc Control:
  - Pinch

For FCAW-SS program can set:
- Wire Feed Speed, WFS
- The welding voltage
- Burnback Time
- Run-in WFS
- Spot Time
- Start Procedure:
  - Start Time
  - Wire Feed Speed
  - Voltage
- Crater:
  - Crater Time
  - Wire feed speed
  - Voltage
- Polarity
- 2-Step/4-Step
- Arc Control:
  - Pinch

Pinch controls the arc characteristics during short-arc welding. Increasing Pinch Control results in a crisper arc (more spatter) while decreasing provides a softer arc (less spatter).
- Adjust range: from -10 to +10.
- Default value: 0.

Welding GMAW and FCAW-GS Process in synergic mode CV

Table 10. Exemplify GMAW and FCAW-GS synergic programs for POWERTEC®

Wire material	Gas	Wire diameter [mm]						
		0.8	0.9	1.0	1.2	1.32	1.4	1.6
Steel	CO_2	11		13	15			19
Steel	ArMIX	10		12	14	16	17	18
Stainless	ArMIX	25		26	27			
Aluminum AlSi	Ar				30			32
Aluminum AlMg	Ar				31			33
Metal Core	ArMIX			20	21		22	23
Cored Wire	CO_2				42			46/71
Cored Wire	ArMIX			40	41			70
Si Bronze	Ar	35		36				

Table 11. Exemplify GMAW and FCAW-GS synergic programs for SPEEDTEC®

Materiał drutu	Gaz	Wire diameter [mm]						
		0.8	0.9	1.0	1.2	1.32	1.4	1.6
Steel	CO_2	93		10	20			105
Steel	ArMIX	94	60/61	11	21	156	25	107
Stainless	ArMIX	61		31	41			
Aluminum AlSi	Ar			146	71			73
Aluminum AlMg	Ar			151	75			77
Metal Core	ArMIX				81		83	85
Cored Wire	CO_2				90			
Cored Wire	ArMIX				91			
Si Bronze	Ar	190		191				

Table 12. Exemplify GMAW and FCAW-GS synergic programs for FLEXTEC®

Wire material	Gas	Wire diameter [mm]						
		0.030	0.035	0.040	0.045	3/64	0.052	1/16
Steel	CO_2	11	14	17	20		23	
Steel	ArMIX	12	15	18	21		24	27
Stainless	ArMIX	30	34		38			41
Stainless	Ar/He/CO_2	31	35		39			
Aluminum AlSi	Ar		48			50		52
Aluminum AlMg	Ar		54			56		58
Metal Core	ArMIX				70		72	74
Cored Wire	CO_2				82		84	86
Cored Wire	ArMIX				83		85	87

Table 13 Exemplify GMAW and FCAW-GS synergic programs for YARDTEC®

Wire material	Gas	Wire diameter [mm]				
		0.6	0.8	0.9	1.0	1.2
Steel	CO_2		18		28	33
Steel	Ar + (8÷12)% CO2	12	17		27	32
Steel	Ar + (15÷25)% CO2	11	16		26	31
Stainless	Ar + 2% CO2		52		54	55
Aluminum AlSi	Ar					65
Aluminum AlMg	Ar					75
Si Bronze	Ar				148	
Metal Core	Ar + (8÷12)% CO2					105
Metal Core	Ar + (15÷25)% CO2			93	94	95
Rutil	CO_2			82		86
Rutil	Ar + (15÷25)% CO2			81	83	85

Note: The list of available programs depends on the power source.

In synergic mode, the welding voltage is not set directly by user. The correct welding voltage will be set by the machine's software.

Optimal voltage value is related to the input data:
- Wire Feed Speed, WFS.

If it is needed, the welding voltage can be adjusted by the Right Control [7]. When the Right Control is rotated, the display will show a positive or negative bar indication if the voltage is above or below the optimal voltage.

- Voltage setup above optimal value

- Voltage setup at optimal value

- Voltage setup below optimal value

Additionally can manually set:
- Burnback Time
- Run-in WFS
- Preflow Time/ Postflow Time
- Spot Time
- Start Procedure:
  - Start Time
  - Wire Feed Speed
  - Voltage
- Crater:
  - Crater Time
  - Wire feed speed
  - Voltage
- Polarity
- 2-Step/4-Step
- Arc Control:
  - Pinch

Pinch controls the arc characteristics during short-arc welding. Increasing Pinch Control results in a crisper arc (more spatter) while decreasing provides a softer arc (less spatter).
- Adjust range: from -10 to +10.
- Default value: 0.

Welding High Penetration Speed (HPS) Process in synergic mode

Table 14 Exemplify synergic programs for HPS for SPEEDTEC®

Wire material	Gas	Wire diameter [mm]						
		0.8	0.9	1.0	1.2	1.32	1.4	1.6
Steel	ArMIX			117	127			

Note: The list of available programs depends on the power source.

In synergic mode, the welding voltage is not set directly by user. The correct welding voltage will be set by the machine's software.

Optimal voltage value is related to the input data:
- Wire Feed Speed, WFS.

HPS is a modified welding process designed by Lincoln Electric that combines the advantages of the spray and short arc modes.
Lower welding voltage than in the classic spray arc mode cause lower energy and more concentrated arc.
Advantages:
- The possibility of welding with long stick out.
- Concentrated arc that increases penetration.
- Reduction of workpiece distortion (lower voltage = input less energy into the weld).
- Increased productivity (higher welding speed and reduced requirements for preparing the material for welding).

If it is needed, the welding voltage can be adjusted by the Right Control [7]. When the Right Control is rotated, the Right Display [4] will show a positive or negative bar indication if the voltage is above or below the optimal voltage.

- Preset voltage above ideal voltage

- Preset voltage at ideal voltage

- Preset voltage below ideal voltage

Additionally can manually set:
- Burnback Time
- Run-in WFS
- Preflow Time/ Postflow Time
- Spot Time
- Start Procedure:
  - Start Time
  - Wire Feed Speed
  - Voltage
- Crater:
  - Crater Time
  - Wire feed speed
  - Voltage
- Polarity
- 2-Step/4-Step
- Arc Control:
  - Pinch

Pinch controls the arc characteristics during short-arc welding. Increasing Pinch Control results in a crisper arc (more spatter) while decreasing provides a softer arc (less spatter).
- Adjust range: from -10 to +10.
- Default value: 0.

Welding Speed Short Arc (SSA) Process in synergic mode

Table 15. Exemplify synergic programs for SSA for SPEEDTEC®

Wire material	Gas	Wire diameter [mm]						
		0.8	0.9	1.0	1.2	1.32	1.4	1.6
Steel	ArMIX	97		15	24			
Stainless	ArMIX	65		35	45			

Note: The list of available programs depends on the power source.

In synergic mode, the welding voltage is not set directly by user. The correct welding voltage will be set by the machine's software.

Optimal voltage value is related to the input data:
- Wire Feed Speed, WFS.

Speed Short Arc (SSA) provides greater comprehensiveness during steel and stainless welding. Up to fast arc control during increasing the wire feeding speed, standard short arc naturally shifts to SSA mode, extending the range of the short arc to higher current and prevents the globular mode, which is characterized by high spattering and higher energy than short arc.

Advantages:
- Reduction of welded material distortions (less energy introduced into the weld).
- Wider range of feeding speed with maintaining the short arc.
- Reduction of spattering in comparison to standard CV mode.
- Fume reduction in comparison to the standard CV mode (up to 25% less).

If it is needed, the welding voltage can be adjusted by the Right Control [7]. When the Right Control is rotated, the Right Display [4] will show a positive or negative bar indication if the voltage is above or below the optimal voltage.

- Preset voltage above ideal voltage

- Preset voltage at ideal voltage

- Preset voltage below ideal voltage

Additionally can manually set:
- Burnback Time
- Run-in WFS
- Preflow Time/ Postflow Time
- Spot Time
- Start Procedure:
  - Start Time
  - Wire Feed Speed
  - Voltage
- Crater:
  - Crater Time
  - Wire feed speed
  - Voltage
- Polarity
- 2-Step/4-Step
- Arc Control:
  - Pinch

Pinch controls the arc characteristics during short-arc welding. Increasing Pinch Control results in a crisper arc (more spatter) while decreasing provides a softer arc (less spatter).
- Adjust range: from -10 to +10.
- Default value: 0.

Welding GMAW-P Process in synergic mode

Table 16. Exemplify GMAW-P programs for SPEEDTEC®

Wire material	Gas	Wire diameter [mm]						
		0.8	0.9	1.0	1.2	1.32	1.4	1.6
Steel	ArMIX	95	140	12	22	157	26	108
Stainless	ArMIX	66		36	46			56
Metal Core	ArMIX						84	
Aluminum AlSi	Ar				72			74
Aluminum AlMg	Ar			152	76			78
Cored Wire	ArMIX				92			

Table 17. Exemplify GMAW-P programs for FLEXTEC®

Wire material	Gas	Wire diameter [mm]						
		0.030	0.035	0.040	0.045	3/64	0.052	1/16
Steel	ArMIX		16	19	22		25	28
Stainless	ArMIX		36		40			43
Aluminum AlSi	Ar		49			51		53
Aluminum AlMg	Ar		55			57		59
Metal Core	ArMIX				71		73	75

Note: The list of available programs depends on the power source.

Synergic GMAW-P (Pulsed MIG) welding is ideal for low spatter, out of position. During pulse welding, the welding current continuously switches from a low level to a high level and then back again. Each pulse sends a small droplet of molten metal from the wire to the weld puddle.

Wire Feed Speed is the main control parameter. As the Wire Feed Speed is adjusted, the power source adjusts the waveform parameters to maintain good welding characteristics.

Trim is used as a secondary control – the Right Display. The Trim setting adjusts the arc length. Trim is adjustable from 0.50 to 1.50. 1.00 is the nominal setting.

Figure 9

Increasing the Trim value increases the arc length. Decreasing the Trim value decreases the arc length.

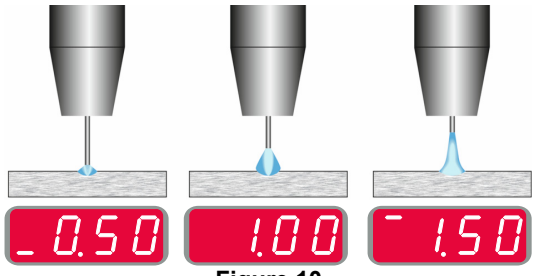


Figure 10

When Trim is adjusted, the power source automatically recalculates the voltage, current and time of each part of the pulse waveform for the best result.

Additionally can manually set:

- Burnback Time
- Run-in WFS
- Preflow Time/ Postflow Time
- Spot Time
- Start Procedure:
  - Start Time
  - Wire Feed Speed
  - Voltage or Trim value
- Crater:
  - Crater Time
  - Wire feed speed
  - Voltage or Trim value
- Polarity
- 2-Step/4-Step
- Arc Control:
  - UltimArc™

UltimArc™ – for pulse welding programs adjusts the focus or shape of the arc. In consequence of increasing UltimArc™ value the arc is tight, stiff for high speed sheet metal welding.

- Adjust range: from -10 to +10.
- Default value: 0.

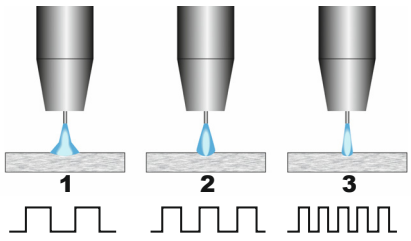


Figure 11

1. UltimArc™ Control "-10.0": Low Frequency, Wide.
2. UltimArc™ Control OFF: Medium Frequency and Width.
3. UltimArc™ Control "+10.0": High Frequency, Focused.

Welding Soft Silence Pulse (SSP™) Process in synergic mode

Table 18. Exemplify synergic programs for SSP.

Wire material	Gas	Wire diameter [mm]						
		0.8	0.9	1.0	1.2	1.32	1.4	1.6
Steel	ArMIX			13	23			
Stainless	ArMIX			39	49			
Aluminum AlSi	Ar			150	69			79
Aluminum AlMg	Ar			153	70			80

Note: The list of available programs depends on the power source.

SSP™ is a modified especially pulse process characterized by a very soft and silent arc. This process is dedicated to welding stainless steel materials and provide much better wetting of the welded edge than the standard pulse. Soft and quieter characteristic of the arc than standard pulse process, makes welding more enjoyable and less tiring. Additionally the stability afforded by this transfer allows to weld in all positions.

During pulse welding, the welding current continuously switches from low to high level in the loop. Each pulse delivers a small drop of molten metal from the wire to the welding pool.

Wire Feed Speed is the main control parameter. As the Wire Feed Speed is adjusted, the power source adjusts the waveform parameters to maintain good welding characteristics.

Trim is used as a secondary control – the value of parameter in the upper right side of display. The Trim setting adjusts the arc length. Trim is adjustable from 0.50 to 1.50. 1.00 is the nominal setting.

Figure 12

Increasing the Trim value increases the arc length. Decreasing the Trim value decreases the arc length.

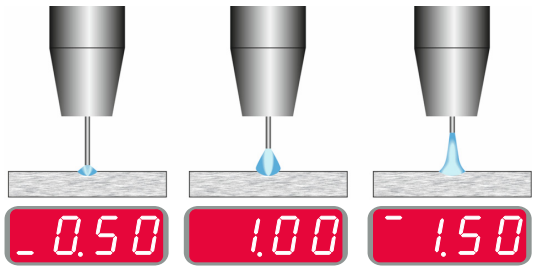


Figure 13

When Trim is adjusted, the power source automatically recalculates the voltage, current and time of each part of the pulse waveform for the best result.

Additionally can manually set:

- Burnback Time
- Run-in WFS
- Preflow Time/ Postflow Time
- Spot Time
- Start Procedure:
  - Start Time
  - Wire Feed Speed
  - Voltage or Trim value
- Crater:
  - Crater Time
  - Wire feed speed
  - Voltage or Trim value
- Polarity
- 2-Step/4-Step
- Arc Control
  - Frequency

Frequency – for pulse welding adjusts the focus or shape of the arc. In consequence of increasing frequency Control value the arc is tight, stiff for high speed sheet metal welding.

- Adjust range: from -10 to +10
- Default value: 0.

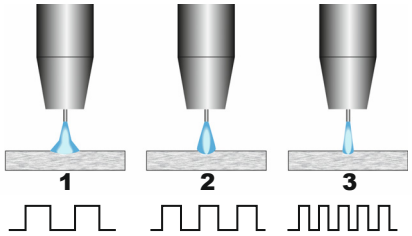


Figure 14

1. Frequency Control "-10.0": Low Frequency, Wide.
2. Frequency Control OFF: Medium Frequency and Width.
3. Frequency Control "+10.0": High Frequency, Focused.

Welding SMAW (MMA) Process

Table 19 SMAW Welding Programs

	Program number			
Process	**Powertec®**	**Speedtec®**	**Flextec®**	**Yardtec®**
SMAW	1			

Note: The list of available programs depends on the power source.

For program number 1 can be set:
- Welding current
- Switch on / switch off the output voltage on the output lead
- Arc Controls:
  - ARC FORCE
  - HOT START

ARC FORCE - the output current is temporarily increased that prevents the electrode from sticking and facilitates the welding process.
Lower values will provide less short circuit current and a softer arc. Higher settings will provided a higher short circuit current, more forceful arc and possibly of more spatter.
- Adjust range: from -10.0 to +10.0.
- Default value: 0.

HOT START - temporarily increases the nominal current value during arc start with electrode to make the arc start easier.
- **.**Adjust range: from 0 to +10.0.
- Default value: +5.

Welding GTAW / GTAW-PULSE Process

Table 20. The Welding Programs

	Program number			
Process	**Powertec®**	**Speedtec®**	**Flextec®**	**Yardtec®**
GTAW	-	3		
GTAW-P	-	8	-	-

Note: The list of available programs depends on the power source.

For program number 3 can be set:
- Welding current
- Switch on / switch off the output voltage on the output lead
  Note: It does not work in the 4-Step.
- Postflow Time
- 2-Step / 4-Step
- Start Procedure:
  - Start Time
  - Welding current
- Crater:
  - Crater Time
  - Welding current
- Arc Control:
  - HOT START

For program number 8 can be set:
- Welding current
- Switch on / switch off the output voltage on the output lead
  Note: It does not work in the 4-Step.
- Postflow Time
- 2-Step / 4-Step
- Start Procedure:
  - Start Time
  - Welding current
- Crater:
  - Crater Time
  - Welding current
- Arc Control:
  - Pulse Period
  - Background current

NOTE: Availability of the parameters depend on selected welding program / welding process and welding source.

HOT START - temporarily increases the nominal current value during arc start with electrode to make the arc start easier.
- Default value: +5.
- Regulation range: from 0 to +10.0.

Pulse Period influences the width of the arc and the amount of heat input to the weld. If the value of parameter is lower:
- Improves penetration and the microstructure of the weld.
- The arc is narrower, more stable.
- Reduces the amount of heat input to the weld.
- Reduces distortions.
- Increases welding speed.

Note: Adjust range depends on the power source.

Background Current - percentage value of nominal welding current. Adjusts the overall heat input into the weld. Changing the background current changes the shape of the back bead.
Note: Adjust range depends on the power source.

Gouging

Table 21. The Welding Program – gouging

	Program number			
Process	**Powertec®**	**Speedtec®**	**Flextec®**	**Yardtec®**
Gouging	9			

Note: The list of available programs depends on the power source.

For program number 9 can be set:
- Gouging current
- Switch on / switch off the output voltage on the output lead

Compensation of voltage drop through welding leads

The compensation allows taking into account the voltage drop through the welding leads during the welding process. This is important to ensure optimal welding parameters, especially when using long interconnection welding cables. For this purpose, to eliminate the influence of voltage drop through the welding leads, calibration should be performed.

Note: Calibration should always be performed after changing the configuration of the welding system.

Preparation of the welding system to calibration procedure:

- Prepare the welding set.
- Connect the GMAW, FCAW-GS or FCAW-SS gun to Euro Socket.
- Connect the work lead to output sockets of the power source and lock it.
- Connect the work lead to the welding piece with the work clamp.
- Depending on the gun type, either nozzle or protection cap must be removed.
- Turn the welding machine on.
- Insert the wire into the welding gun.

  Note: Cut the electrode wire just behind the contact tip and make sure that the electrode wire does not protrude from the contact tip!
- Go to the compensation setting in Basic Menu to run the calibration procedure.

The calibration procedure:

- The default setting:

Figure 15

- Press the Right Button [9].
- On the Right Display [4] OFF flashes.
- Set the "CAL" on the Right Display [4] – turn the Right Control to the right.

Figure 16

- Confirm with the Right Button [9].
- The Left Display [1] shows "rEAd", the Right Display [4] shows "MAnU". Information on the displays indicates that the user must read and follow the operator's manual.

Figure 17

- Confirm that the manual has been read – press the Right Button [9].
- The Left Display [1] shows "tOUC", the Right Display [4] shows "trI9". Displays show the information to touch the contact tip to the welding material and pull the trigger.

  Note: Ensure that the electrode wire does not protrude from the contact tip!

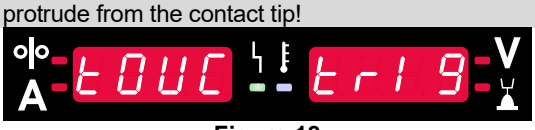


Figure 18

- If the calibration procedure has been performed in accordance with the steps described, then the procedure has ended successfully. The information will appear on the displays:

Figure 19

- Confirm the calibration - press the Right Button [9].

if the calibration procedure failed, the message will appear on the displays:

Figure 20

This means that the procedure was not performed as described. In this case, perform the procedure again as described in the instruction manual.

Error

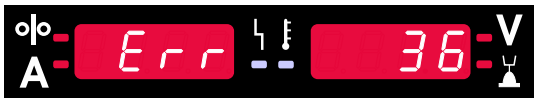


Figure 21. Example of Error Code

Table 22 shows list of basic errors that can appear. To get full list of error codes, please contact with authorize Lincoln Electric service.

Table 22 Error codes

Error Code	Error Description	Cause	Recommended Course of Action
6	Power source is not connected.	The User Interface cannot seem to communicate with the Power Source.	• Check cable connections between the power source and the user interface.
18	Configuration error	The machine could not properly configure the devices that are attached to it. This configuration problem could be caused by the type of devices that are connected to the machine or a required device that is not connected.	• Consult the Operators Manual for proper device configuration. • Verify all devices in the system are properly powered.
36, 791,792	The machine has shut down because it has overheated.	System detected a temperature level beyond the normal system operating limit.	• Be sure process does not exceed duty cycle limit of the machine. • Check the setup for proper air flow around and through the system. • Check that the system has been properly maintained, including removal of accumulated dust and dirt from the intake and outlet louvers. • When the machine has cooled down to a safe level, the interface signals this by flashing two LEDs next to Button or start welding operation by the torch trigger.
46,54	Output current exceeded	The average value of the output current has been exceeded.	• Verify that the welding circuit does not have a short in it. • Verify stick out, wire size, and gas are correct for the process that is selected. • Decrease the value of the output parameters. • Check the weld circuit for short circuits and other leakage paths that may result in excessive current.
49	Lack of phase	Single phase input operation has been detected.	• Verify all fuses are good. • Verify all three legs of the input power are present at the input contactor. When the contactor closes, be sure all three legs are present on the output side as well (toward the rectifier). • Check the condition of the electrical system.
71	Output power exceeded	The machine detected excessive output power.	• Verify stick out, wire size, and gas are correct for the process that is selected. • Decrease the value of the output parameters. • Check the weld circuit for short circuits and other leakage paths that may result in excessive current.
81	Motor overload, long term.	The wire drive motor has overheated. Check that the electrode slides easily through the gun and cable.	• Remove tight bends from the gun and cable. • Check that the spindle brake is not too tight. • Verify the adequacy of the electrode to the welding process. • Verify a high quality electrode is being used. • Check drive rolls alignment and gears. • Wait for the error to reset and the motor to cool (approximately 1 minute).

92	No coolant flow	There is no coolant flow in the cooler after 3 seconds of welding.	• Make sure there is enough coolant in the tank and that auxiliary power is supplied. • Make sure the pump is working. When the trigger is pulled the pump should run.
262	Incompatible equipment	Required configuration could not be found in the machine. Verify the configuration and the status of the devices connected to the machine.	• Check if the connected power source is in the list of compatible power sources. • Update the system with the latest firmware.

WARNING

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Local Lincoln Authorized Field Service Facility for technical troubleshooting assistance before you proceed.