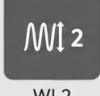


Control icon reference

LightBOT AP - icons to control the IPG LightWELD Laser Welder

									
Rapid Fire	LINE	Laser Cleaning	Wirefeed Off	Laser Off Confirm	Laser Off	Wirefeed On	Power 3	Power 4	Laser On
									
Power 1	Power 2	P.O.W.	Set Power	WF1	WF2	Power 5	WL1	Set Program	WF3
									
WL2	WL5	WL3	WL4	WP1	Wobble Frequency	Wobble Length	WP4	WP2	WP3
									
WS2	WP5	WS1	WS5	WS3	WS4	Wire Speed			

One timeline for motion and laser control

The LightBOT icon set works alongside FANUC motion icons to create weld paths and control the LightWELD laser welder from the FANUC CRX pendant.

Presets at the pendant

Enter an IPG welding preset from the Weld Mode Chart, or create user presets. The IPG interface runs on the FANUC tablet, allowing weld settings to be managed from the robot controller.

Adjust the process along the weld

Use power commands to change laser output at programmed points. Adaptive wire feed links wire delivery to robot tool speed and allows the adjustment factor to be changed during the weld.

Teach the path your way

Teach positions by moving the arm by hand, using the pendant, or programming offline in FANUC ROBOGUIDE. FANUC CRX functions such as joint-angle locking support weld-path teaching.

New and existing systems

LightBOT can be integrated with new or existing LightWELD laser welders. The following pages retain the original control screens and detailed operating descriptions.

Programs and presets



Set Program Icon is where the welder inputs the IPG Preset Welding condition or a user Preset. Look on the IPG weld mode chart, find the letter number combination under the PROGRAM column, and input here. Check the Override Power button and input power setting for depth of penetration. Icons below do an identical function and are designed for weldments needing different weld programs.

Set Program

Program Character

X (User)

A

C

E

F

H

J

L

P

U

Y

Program Index

0

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

☐ Override power

☐ Override wobble frequency

☐ Override wobble length

T



These icons are identical to the Set Program Icon but several can be set for quick change on a weldment if different conditions are used

LightBOT / Weld Program Config

WP1

WP2

WP3

WP4

WP5

Weld Program 1

Program Character

X (User)

A

C

E

F

H

J

L

P

U

Y

Program Index

0

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

☐ Override power

☐ Override wobble frequency

☐ Override wobble length

Laser On



Laser On Icon is the key Icon for LightBOT. This icon fires the Laser and is placed where the weld will start. For Fusion welding the FusionLock box can be checked which allows non contact fusing welding. If wire welding the wire feeder can be selected - the LightBOT can be calibrated to work with up to 5 different wire feeders including double wire feeders. If wire welding Adaptive Wirefeed Control can be set - which means TCP speed of the robot controls the wire speed. Ratio can be altered with the Adaptive Adjustment Factor so extra wire can be fed into the weld pool. Power Compensation can be set - no need to go to the IPG user settings

Laser On

Extra Pre-Flow Delay

ms

-1000

-100

100

1000

This is in addition to the Gas Pre-Flow parameter stored in the LightWELD preset.

Power Ramp-Up

ms

-1000

-100

100

1000

Wire feeder

test wf

▼

Adaptive Wirefeed Control

Manual Wirefeed Control

Adaptive Wirefeed Control

The wire feeder will follow the speed of the robot.

Adaptive Adjustment Factor

%

-10

-5

5

10

Changing this value will run the wire feeder at the specified percentage over or under the robot TCP speed.

For example, if the robot speed is 50cm/min, the wire feeder will run at 50cm/min with 0% adjustment.

☐ Enable Fusion Lock

☐ Enable Sure-Fire

☐ Turn On Auxiliary Device 1

☐ Turn On Auxiliary Device 2

☒ Use Power Compensation

Power Compensation

13%

SureFire is convenient when weave welding. Up to 2 auxillary devices can be turned on by checking box 1 or 2, such as turning on a rotary or starting a weld fume collector. Power Compensation adjusts the power distribution over the wobble width, meaning even depth of penetration or deeper penetration can be acheieved.

Wire feeder configuration

This is the configuration screen for the wire feeders. Up to 5 can be set up and named. LightBOT AP includes a calibration program to figure out the settings. Calibrated wire feeding is standard on LightBOT

LightBOT / Wire Feeder Setup

Wire Feeder 1

Wire Feeder 2

Wire Feeder 3

Wire Feeder 4

Wire Feeder 5

Wire Feeder 1

Name

test wf

Enable DOUT

3

-10

-1

1

10

Speed AOUT

1

-10

-1

1

10

Slope

1

-1

-0.1

0.1

1

Intercept

1

-1

-0.1

0.1

1

Use the [Wire Feeder Calibration](#) setup page to determine the response parameters.

Wirefeed Slow Speed

10

cm/min

-1

-0.1

0.1

1

This is used during the laser on sequence to advance the wire until contact is made.

Wirefeed Interlock Timeout

1000

ms

-100

-10

10

100

The robot will post an alarm if the wire has not made contact in this amount of time.

Direction Control Pin Enable

☐

This enables the wirefeed retract function on laser off.

Wire feeder calibration

LightBOT Calibration is used to calibrate different wire feeders. Part of the LightBOT wirefeed system.

LightBOT / Wire Feeder Calibration

The first step is to determine what analog output value feeds the wire at ~150cm/min. This will determine the range for calibration.

Enter an analog output value below and press the button below to run the wire feeder for ten seconds.

Analog Output Value (0-4095)

1

-10

-1

1

10

Use Direction Control Pin
☐

Start Wire Feeder for 10 seconds

Measure the wire length in centimeters and input the value here to calculate the feed rate in cm/min

Measured Length (cm)

0

-10

-0.1

0.1

10

Calculated Feed rate: 0 cm/min

Once the maximum analog output value has been determined, we need to run several tests over the usable range to determine the wire feeder response.

Enter the AOUT value that produced the ~150cm/min feed rate below. This will populate the ten tests in the table below.

Max AOUT value

4095

-10

-1

1

10

Run each 10 second feed test and enter the measured wire length.

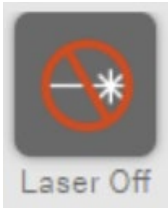
Test	Wire Length (cm)
0	Run 0 -10 -1 1 10
455	Run 0 -10 -1 1 10
910	Run 0 -10 -1 1 10
1365	Run 0 -10 -1 1 10
1820	Run 0 -10 -1 1 10
2275	Run 0 -10 -1 1 10
2730	Run 0 -10 -1 1 10
3185	Run 0 -10 -1 1 10
3640	Run 0 -10 -1 1 10
4095	Run 0 -10 -1 1 10

Click the button below to calculate the wire feeder setup values once you've completed the test table.

Calculate Wire Feeder Setup Values

Please enter valid setup data.

Laser Off and confirmation



The Laser Off Icon is placed on the timeline where the welder wants the welder to shut off. Extra time can be allotted to assure shield gas coverage and extra wire can be added for crater fill. The Auxiliary devices turned on with the Laser On Icon can be turned off by checking the box.

Laser Off

Ramp Down Time

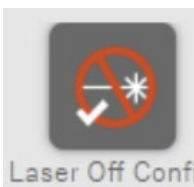
ms

Crater Fill Time

ms

The wire feeder will continue to run for this amount of time after emission is turned off.

☐ Turn Off Auxiliary Device 1
☐ Turn Off Auxiliary Device 2



Laser Off confirm is always put after the Laser Off Icon. It allows everything to be turned off before the Fanuc executes its next function. The IPG and LightWELD cross communicate and there is timing involved when the Laser Off Icon is executed. Normally this is not set other than initial set up of the LightWELD.

Laser Off Confirm

The Laser Off icon runs asynchronously, which allows you to add additional motion, etc. while the laser off sequence is running.

Use this icon to wait until the laser off sequence completes and both the emission and trigger outputs are off.

Timeout

ms

Laser power



Set Power Icon changes the power output of the LightWELD - on the fly in milliseconds. On many weldments going into a corner or at the end of the weld less power is better. In these cases the Set Power Icon is used to change the power. This is another function that the LightBOT can do that you cannot do by hand. The Power Icons below do the identical function but allow the welder to set up several Power Changes that can be set.

Set Power

Power

watts

-100

-10

10

100

NOTE: The LightWELD will round up or down to the nearest 10W increment.



On Weldment that might have several power changes these can be preset and executed as needed. Does the same function as Set Power Icon.

LightBOT / Power Presets

Power Preset 1

Power

watts

-100

-10

10

100

NOTE: The LightWELD will round up or down to the nearest 10W increment.

Power Preset 2

Power

watts

-100

-10

10

100

NOTE: The LightWELD will round up or down to the nearest 10W increment.

Power Preset 3

Power

watts

-100

-10

10

100

NOTE: The LightWELD will round up or down to the nearest 10W increment.

Power Preset 4

Power

watts

-100

-10

10

100

NOTE: The LightWELD will round up or down to the nearest 10W increment.

Power Preset 5

Power

watts

-100

-10

10

100

NOTE: The LightWELD will round up or down to the nearest 10W increment.

Wire feed control



Wirefeed On Icon allows independent control of the wire feeder - outside of the Laser On icon that normally turns on the wire feeder. Laser can be fired to preheat the weldment before wire is added to the weld pool. Changing the Adaptive Adjustment factor can add more wire in the middle of a weld as needed.

Wirefeed On

Wire feeder

test wf

Adaptive Wirefeed Control

Manual Wirefeed Control

Adaptive Wirefeed Control

The wire feeder will follow the speed of the robot.

Adaptive Adjustment Factor

0

%

-10

-5

5

10

Changing this value will run the wire feeder at the specified percentage over or under the robot TCP speed.

For example, if the robot speed is 50cm/min, the wire feeder will run at 50cm/min with 0% adjustment.

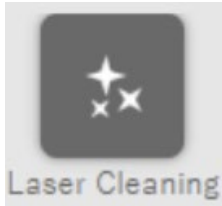


The Wirefeed Off Icon shuts the wire feeder off - independent of the Laser Off Icon. This can be very helpful when pulse welding - which can sometimes cause an issue when cutting off the wire at the end of the weld. The welder would put Wirefeed Off Icon on the timeline before the Laser Off Icon - so wire feed would stop feeding and retract while laser was still firing.

Wirefeed Off

The wire feeder will be turned off.

Cleaning and Point of Weld



The Laser Cleaning Icon is used to set up the Laser Cleaning function of the LightWELD. This can also be set with the Weld Program Icon but this is a simple way to set and understand. Type of metal is selected and intensity level. If Power Adjustment is needed Override Power box is checked and new power input. Wobble length can also be changed or set to adjust cleaning path width. No need to access the IPG interface page to tune in the cleaning path.

Laser Cleaning

LightWELD Model: XR

NOTE: You can change your LightWELD model on the LightBOT configuration screen.

Metal

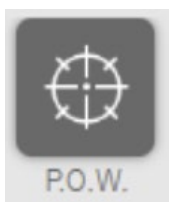
Steels, Titanium, Nickel Alloys ▾

Intensity

Low ▾

☐ Override power

☐ Override wobble length



The POW Icon is used on mostly weld set up. It allows the HE NE to illuminate which is helpfull when setting up the weld path as this will show where the weld will be. This can be toggled on or off or only put where the welder wants it - such as to show the start of the weld and the weld path.

Point of Weld

Enable Guide Beam Disable Guide Beam

Wobble length



Wobble Length Icon changes the Wobble Length on the fly. If using a IPG preset the change is in percentage of factory preset and if a user preset its the actual wobble length. Straight forward this can also be done with a weld program. Its very convenient to adjust the wobble width on an outside corner weld to catch both corners.

Wobble Length

User or Factory Preset

The function of this icon depends on the current program. If you are using a user preset ('X'), it will specify the wobble length between 0 and 5 mm. If you are using a factory preset, you will adjust the nominal length by +/- 50%.

Please indicate whether a user or factory preset is expected to be active here to accurately validate your input.

User

Factory

Wobble Length

0

%

-10

-1

1

10



Same as Wobble Length Icon - allows the welder to set up to 5 different wobble lengths that can be set with WL1 to WL5.

LightBOT / Wobble Length Presets

WL1

WL2

WL3

WL4

WL5

Wobble Length Preset 1

User or Factory Preset

The function of this icon depends on the current program. If you are using a user preset ('X'), it will specify the wobble length between 0 and 5 mm. If you are using a factory preset, you will adjust the nominal length by +/- 50%.

Please indicate whether a user or factory preset is expected to be active here to accurately validate your input.

User

Factory

Wobble Length

5

mm

-1

-0.1

0.1

1

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10 / 15

Wobble frequency



Wobble Frequency Icon changes the Wobble Frequency on the fly. If using a IPG preset the change is in percentage of factory preset and if a user preset its the actual wobble IFrequency Straight forward this can also be done with a weld program. Its very convenient to adjust the wobble frequency if setting up a zig zag weld pattern. Below allows the same control with the addition of presetting several settings.

Wobble Frequency

User or Factory Preset

The function of this icon depends on the current program. If you are using a user preset ('X'), it will specify the wobble frequency between 0 and 300 Hz. If you are using a factory preset, you will adjust the nominal frequency by +/- 50%.

Please indicate whether a user or factory preset is expected to be active here to accurately validate your input.

User

Factory

Wobble Frequency

%

-10

-1

1

10



Same as Wobble Frequency Icon - allows the welder to pres set up to 3 different wobble frequencies that can be used where needed.

LightBOT / Wobble Frequency Presets

WF1

WF2

WF3

WF4

WF5

Wobble Frequency Preset 1

User or Factory Preset

The function of this icon depends on the current program. If you are using a user preset ('X'), it will specify the wobble frequency between 0 and 300 Hz. If you are using a factory preset, you will adjust the nominal frequency by +/- 50%.

Please indicate whether a user or factory preset is expected to be active here to accurately validate your input.

User

Factory

Wobble Frequency

%

-10

-1

1

10

Line function



Line Icon controls the Line Function of the LightWELD which was developed for battery welding. Wobble length, speed of the wobble, power of the wobble, ramp up and ramp down of the wobble, can be set. This function can also be used for stitch welding. Multiple presets are possible.

LINE

LINE Preset ID

1

NOTE: You can make changes to LINE presets via Menu > PLUGINS > LightBOT > Presets > LINE

☐ Override power

Preset Settings

Power	200W
Line Speed	10mm/s
Line Length	1mm
Ramp Up Length	0µm
Ramp Down Length	0µm
Galvo Ramp Up Delay	1000ms
Material	Steel
Enable Fusion Lock	No
Turn On Auxiliary Device 1	No
Turn On Auxiliary Device 2	No
Turn Off Auxiliary Device 1	No
Turn Off Auxiliary Device 2	No

LightBOT / LINE Presets

LINE Preset 1

LINE Preset 2

LINE Preset 3

LINE Preset 4

LINE Preset 5

LINE Preset 1

Power

200

watts

-100

-10

10

100

NOTE: The LightWELD will round up or down to the nearest 10W increment.

Line Speed (5-999 mm/s)

10

-10

-1

1

10

Line Length (0-14mm)

1

-5

-1

1

5

Ramp Up Length (0-20000µm)

0

-1000

-100

100

1000

Ramp Down Length (0-20000µm)

0

-1000

-100

100

1000

Galvo Ramp Up Delay

1000

ms

-1000

-100

100

1000

This is in addition to the Gas Pre-Flow parameter stored in the LightWELD preset.

Extra PostFlow Delay (ms)

0

-1000

-100

100

1000

This is in addition to the calculated delay based on length, speed, preflow, etc:

Material

Steel

☐ Enable Fusion Lock
 ☐ Turn On Auxiliary Device 1
 ☐ Turn On Auxiliary Device 2
 ☐ Turn Off Auxiliary Device 1
 ☐ Turn Off Auxiliary Device 2

Rapid Fire



Rapid Fire allows the LightWELD to fire on the fly without the axis of the Fanuc stopping.

Rapid Fire

Position

P[6] ▼

Touch Up

Move To

Speed

50

cm/min ▼

-100

-10

10

100

Route

FINE ▼

Options

☐ Enable Fusion Lock

☐ Turn On Auxiliary Device 1

☐ Turn On Auxiliary Device 2

☐ Use Power Compensation

Wire speed



Wire Speed Icon can change the wire speeds on the fly. Multiple wire speeds may be preset. Not used when Adaptive Wire Speed Control is being used.

Wire Speed

Wire Speed

cm/min

-10

-1

1

10

WS1

WS1

WS2

WS2

WP3

WP3

WS4

WS4

WS5

WS5

LightBOT / Wirefeed Speed Presets

Wire Speed 1

cm/min

-10

-1

1

10

Wire Speed 2

cm/min

-10

-1

1

10

Wire Speed 3

cm/min

-10

-1

1

10

Wire Speed 4

cm/min

-10

-1

1

10

Wire Speed 5

cm/min

-10

-1

1

10

Additional control screens



Gas Station

Choose Gas

Gas 1

Gas Purge Time

1

-10

-1

1

10

LightBOT / Gas Config

Gas 1 Name

Gas 1

Gas 2 Name

Gas 2

Gas 1 DOUT

1

-10

-1

1

10

Gas 2 DOUT

2

-10

-1

1

10

Gas AOOUT

3

-10

-1

1

10

Laser On Gas AOOUT Delay

1000

ms

-10

-1

1

10

Default Purge Time

1

s

-5

-1

1

5