

Trigger by Power in Dukane iQ Series Systems

Introduction - Dukane's patented Trigger by Power (US Patent 7,475,801) option can be used to produce more consistent welds by requiring a sufficient and repeatable amount of pressure/force to be applied to the part before the actual weld cycle starts. Trigger by Power is a cost effective alternative to trigger by force. However, unlike trigger by force, it does not require additional expensive components such as a load cell, amplifier board or cabling. In effect, the system uses the ultrasonic stack as a load cell. When the ultrasound is activated, the amplitude is ramped up to the Trigger Amplitude setting and held there until enough force is applied to the part to reach the Trigger Power setting. At that point the weld cycle begins and will continue until the weld control parameter (Time, Energy, or Power) is reached. Sufficient force must be applied to the part to trigger the weld cycle. Otherwise, the Trigger Timeout is reached without starting the weld cycle.

Trigger by Power Settings:

Trigger Amplitude – This is the percentage of amplitude that the generator applies to the horn prior to reaching the Trigger Power setting. The range of the Trigger Amplitude setting is from 20-100%. This value should be set so it is low enough not to scuff the part but large enough that the Trigger Power setting is reached when the desired force is applied to the part.

Trigger Power – This is the power level that must be reached at the Trigger Amplitude setting for the weld cycle to start. The range of the Trigger Power setting is based on the power rating of the specific **iQ** generator used. This setting must be large enough that the **iQ** generator does not trigger while ramping up to the Trigger Amplitude but low enough so that it can be reached at the current Trigger Amplitude setting when the desired force is applied.

Trigger Timeout – This is the maximum time the welder remains at the Trigger Amplitude setting before aborting the weld cycle. The range of the Trigger Timeout setting is from 0 to 30.000 seconds. This setting should be large enough so that there is sufficient time to apply the force required to reach the Trigger Power setting. However, the Trigger Timeout setting should not be so long that the weld could be adversely affected by the horn being in contact with the part for too long at less than the Trigger Power setting.

How is Trigger by Power Used? – Ultrasound must always be activated before contact is made with the part. Once the horn comes in contact with the part the force is increased until the Trigger Power setting is reached. At this point the weld cycle starts and continues until the control parameter (Time, Energy, or Peak Power) is reached. If the Trigger Power setting can't be reached then, either increase the Trigger Amplitude setting, decrease the Trigger Power setting, or increase the amount of force applied to the part.

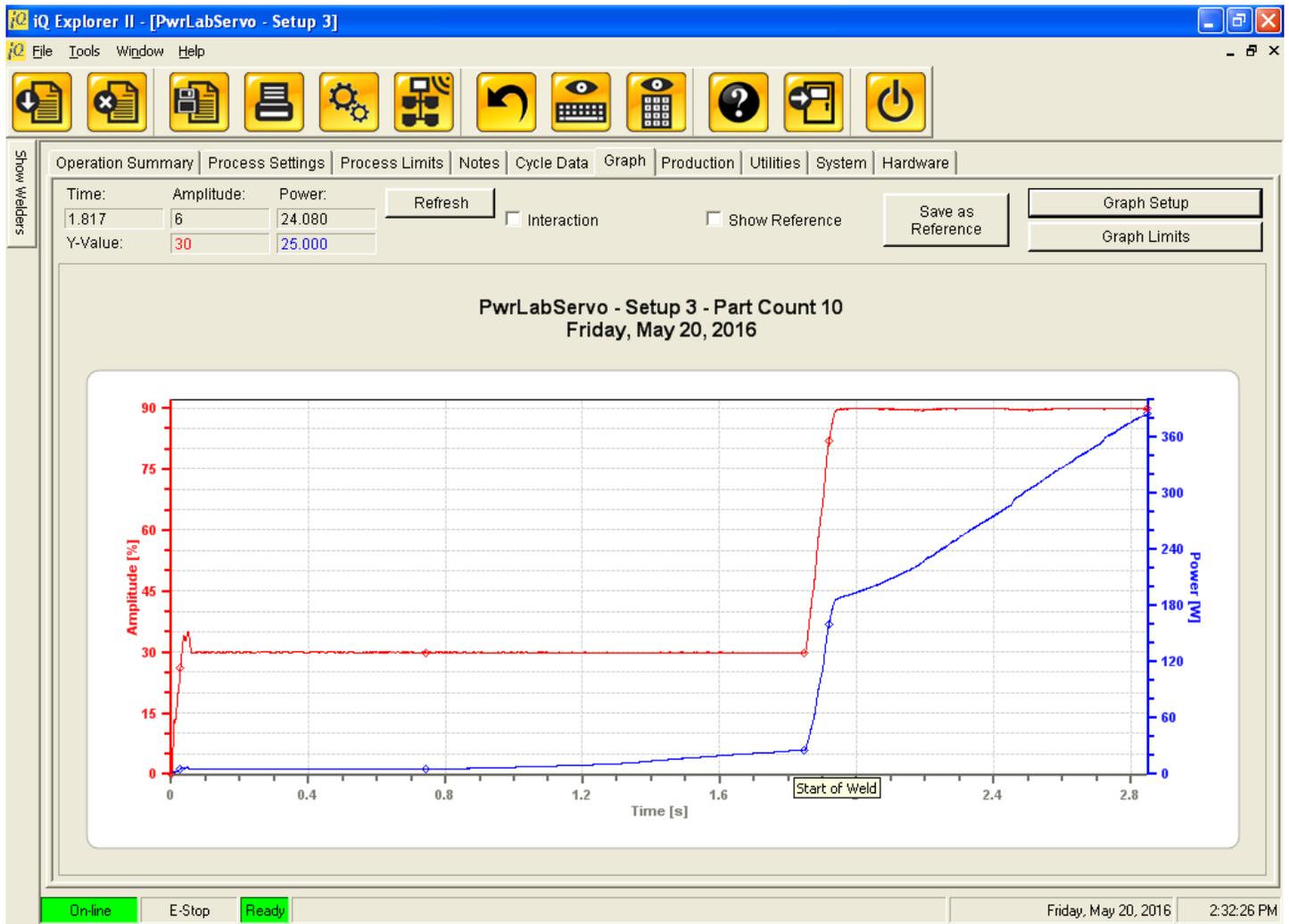
Trigger by Power Setup Sequence for a Typical Probe Application:

- Step 1 - With Trigger by Power disabled, set the amplitude to 20-40% and activate the ultrasound. Measure the power draw of the stack in free air.
- Step 2 - Increase the amplitude to the required weld amplitude and measure the power again in free air.
- Step 3 - Enable the Trigger by Power feature.
- Step 4 - Set the Trigger Amplitude to the same amplitude used in Step 1.
- Step 5 - The Trigger Power should be set between the values measured in Steps 1 and 2, but typically 25% above the value measured in Step 1.
- Step 6 - Set the Trigger Timeout per the description above.
- Step 7 - Start the probe in free air, and confirm that a Trigger Timeout occurs. If a Trigger Timeout does not occur, set the Trigger Power to a larger value or lower the Trigger Amplitude.
- Step 8 – Run a weld cycle and verify proper operation.

Trigger by Power Example in a Typical Press Application

These notes explain the sample Graph Display shown below.

1. The Amplitude was set to 30%. Power was measured to be 6 Watts.
2. The Amplitude was increased to 90%. Power was measured to be 37 Watts.
3. The Trigger By Power feature was enabled.
4. The Trigger Amplitude was set to 30% as done in Step 1.
5. The Trigger Power was set to 25 Watts.
6. The Trigger Timeout was set to 4.000 seconds.
7. A weld cycle was initiated without a part (stack in free air) and the Trigger Timeout occurred after 4.000 seconds.
8. A weld cycle was initiated with a part and the weld cycle began when the Trigger Power setting of 25 Watts was reached (indicated by the change in amplitude from 30% to 90%).



This graph is a feature of Dukane's *iQ Explorer II* graphic user interface software, which is available with the *iQ Series ES* generators.

Dukane IAS, LLC
Intelligent Assembly Solutions

2900 Dukane Drive
St. Charles, IL 60174 USA
Tel: (630) 797-4900
Fax: (630) 797-4949
<http://www.dukane.com/us>

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