DUKANE

Intelligent Assembly Solutions

iQ Series

SERVO ULTRASONIC PRESS SYSTEMS

ES

AUTOMATED   **HAND PROBE**   **PRESS**

System Features

Dukane's patented **iQ** Advanced Servo Welders are the next step in the evolution of ultrasonic welding technology. Combining the efficiency and reliability of a 100% digitally controlled Multi-Core **iQ** Series power supply with the precision of an advanced servo press, the Dukane Advanced **iQ** Servo Welder delivers unprecedented **repeatability, accuracy and reliability** to your ultrasonic bonding process.

- Dynamic Servo Motion Control
- Patented Melt-Match® Technology
- Robust Rigid Mount Construction
- Reliable Validation and Calibration
- Superior data acquisition

ALLOW 5" (250mm)
BEHIND WELDER
FOR CABLE EXIT

15.09
[383]

27.20
[691]

TAPPED HOLE
30 DP (4 PLCS)

.252 DOWEL
PIN HOLES

2.66
[68]

43S220 – 20 kHz

43S245 – 30/40/50/ kHz

43S215 – 15 or 20 kHz

.75
[19]

iQ Dynamic Servo Motion Control – NO Pneumatics!

Integrated all-electric true servo technology eliminates the variability associated with pneumatic press components resulting in improved process repeatability and accuracy. Dynamic Servo Motion Control technology delivers precise control of ultrasonic stack velocity, force and location providing a more optimized and robust process.

• Repeatable and accurate Servo Motion Control
• Integrated **Melt-Match**® Technology
• Dynamic Velocity Melt Initiation **(DVMI™)**
    ▪ Precise velocity/force control during initial application of sonic energy allowing for optimization of joint melt initiation. (Patented)
• Programmable stack velocity and location control
    ▪ Reduction in cycle time.
• Ideal for integration into automated assembly systems where high precision and reduced variability is desired.

iQ Calibration and Validation

100% digital all-electric control simplifies the calibration and validation process. By removing the pneumatic components, validating your ultrasonic welding process has never been easier and is ultimately more reliable. The advanced all electric press and digital control features of the *iQ* Series welder will assure that your calibration/validation will stay in tolerance for a longer time. This provides more confidence in the welding output between calibration schedules while maintaining system repeatability.

• Simple calibration procedure – no pneumatic components to adjust
• Only one device required for calibration (Trigger Force Sensor)
• All other parameters validated (no adjustment – functional tests only – distance, time & velocity)
• Optional Dukane calibration/certification prior to shipping.
• Dukane calibration technicians available for on-site calibrations as required

iQ GREEN

No pneumatics = NO compressed Air!

One of the highest cost in manufacturing today is associated with the energy required to generate compressed air for pneumatic operations. It is estimated that only 50% of the compressed air generated is used for operation; the rest is lost due to leaks and waste.

iQ FDA Compliance

• Multi-level password protection
• Process change audit history and documentation (21 CFR part 11)
• Indexed quick change tool system
• UDI – Unique Device Identification
    ▪ Integration with barcode scanner and/or laser marker system for FDA documentation.
• No operator accessible adjustment knobs or controls.
    ▪ Ensures validated process remains unchanged.
• All mechanical changes require a specific tool.
• Clean room friendly
    ▪ No air exhaust to filter
    ▪ Stainless steel panels (43S245)
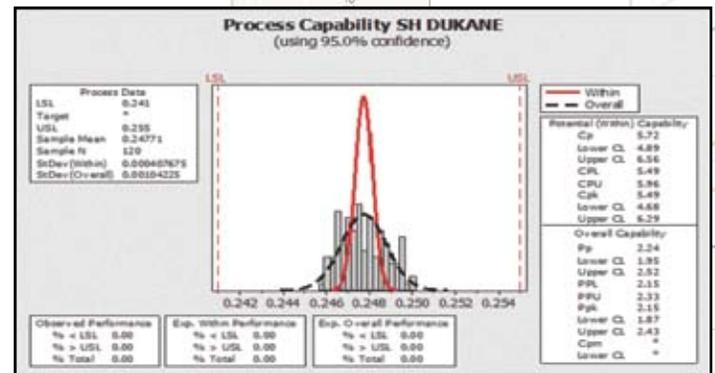
Process Capability (Cpk) – Third party independent study comparing competitive high end pneumatic welder against Dukane iQ Servo. Results demonstrate a large increase in the Process Capability Index (Cpk), proving the iQ Servo's superior welding process.

Easy Fault

Easy Fault is a **Unique** feature to Dukane *iQ* Series power supplies. Should there be a system fault or alarm, the *iQ* display will prompt a fault code, (i.e. "U501"). Enter the code at Dukane's website: www. dukane.com/easyfault and the quick fault search will provide additional tips and process improvement ideas related to the generator fault code. This feature can help expedite solutions to faults and alarms thus reducing down time.
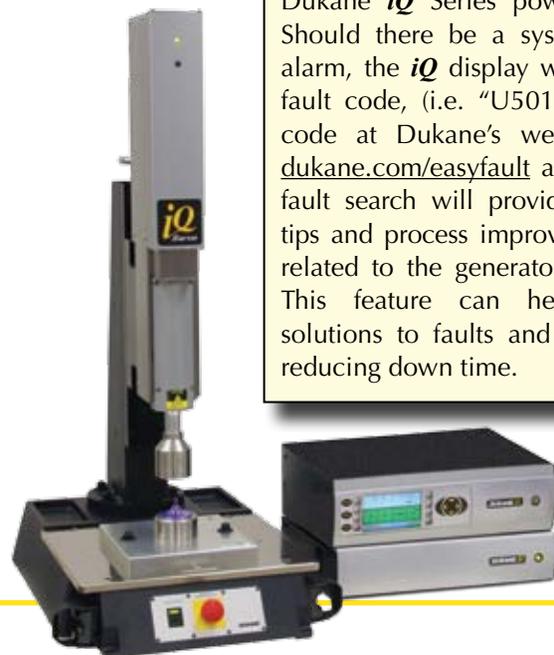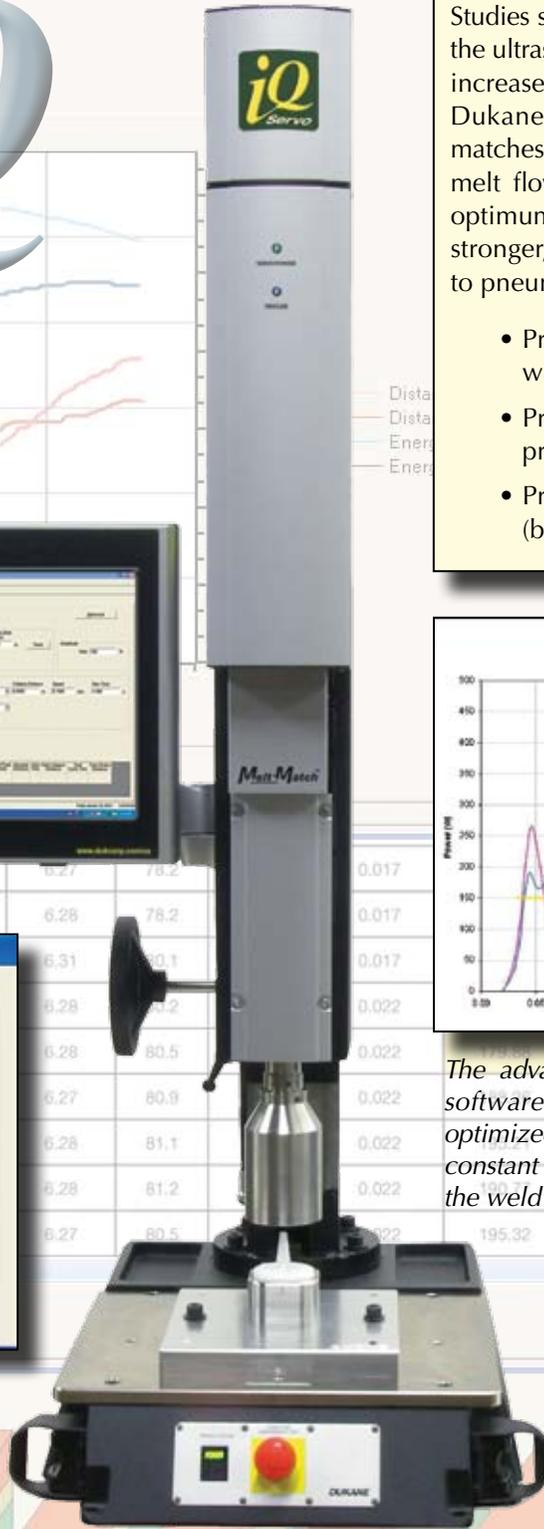
Melt-Match® Patent #8,052,816 & 7,819,158

Studies show that precisely controlling the velocity of the ultrasonic stack during the welding cycle provides increased weld strength and reduced variability. Dukane's **Melt-Match®** technology precisely matches the velocity of the ultrasonic stack with the melt flow velocity of the plastic material ensuring optimum molecular intermingling. This produces stronger, more reliable weld results when compared to pneumatic systems.
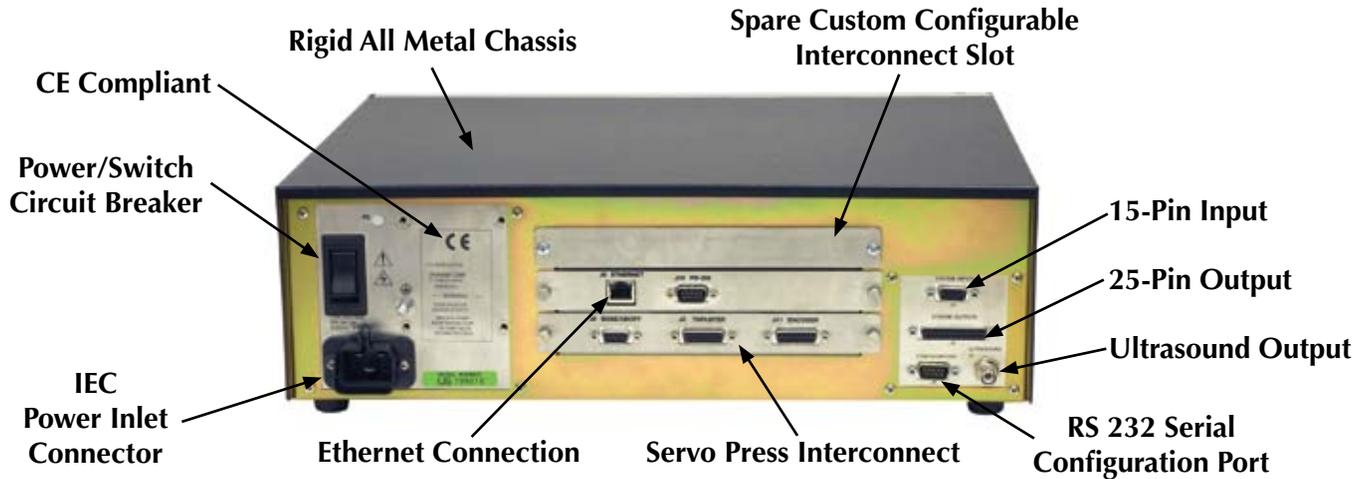
- Precise and reliable velocity control with *iQ* Servo
- Programmable multi-point velocity profile
- Programmable static or dynamic (by distance) post weld hold
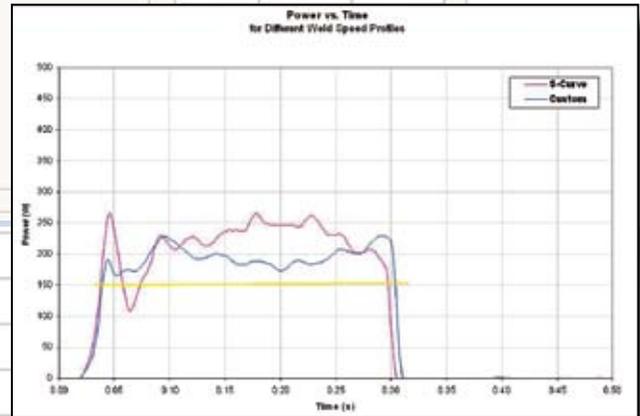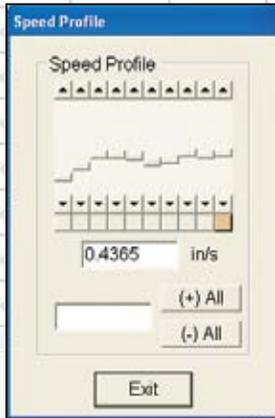
The advanced graphing features of the iQ explorer software make process optimization simple. An optimized weld process (Melt-Match®) will create a constant power output throughout the melt phase of the weld cycle.

iQ Generator/Power Supply Features

CE Compliant

Rigid All Metal Chassis

Spare Custom Configurable Interconnect Slot

Power/Switch Circuit Breaker

15-Pin Input

25-Pin Output

Ultrasound Output

IEC Power Inlet Connector

Ethernet Connection

Servo Press Interconnect

RS 232 Serial Configuration Port

Digital Features

- **100% digital control** of all power supply functions and parameters allows for unique configurations and future upgrades or requirements.

- Industry leading data **acquisition rate speed of .5 ms** due to advanced **multi-core architecture**. Increased weld accuracy and repeatability.

- **Digi-Trac tuning** automatically tracks the resonant frequency digitally. Adjust the output frequency to match the acoustic stack (sonotrode, booster, and transducer).

- **Ultrasonic overload protection**, with status indicator for ease of troubleshooting. The overload power limit is based on true RMS power output level.

- **Line voltage regulation** compensates for line fluctuations assuring consistent amplitude.

- **Load regulation** provides constant ultrasound amplitude automatically regardless of the power draw. The ultrasonic output amplitude level is held to within +/-1 %, to provide weld process consistency and reduced weld cycle times.

- **Pulse-Width Modulation** design delivers power more efficiently with substantially less stress on the electrical and acoustic components for superior performance, reliability and extended life.

- **Linear ramp up (soft-start)** algorithm brings the acoustic stack to operating amplitude smoothly, minimizing start-up surges and abnormal stresses to the stack and power supply.

- Unique **patented modular hardware design** incorporates motherboard/interconnect of internal components. Reduces internal cabling while increasing reliability and performance.

## *iQ Digital Power Supply Patent* #7,475,801

Precise ultrasonic welding requires a consistent and robust power supply. The Dukane *iQ* Advanced Power Supply's 100% digital control with 0.5 ms multi-core processing rate collects twice as many data points during the welding cycle when compared to the current generation of ultrasonic power supplies. The increased processing speed improves repeatability and enhances the reliability of your welding output and programmed quality controls.

Mechanical Features

- **Flow through cooling** tunnel with a matched high performance heat sink and thermostatically controlled fan reduces thermal gradients, minimizes dirt infiltration and increases component life.

- **RS232 serial configuration port** is used for field software upgrades, troubleshooting and advanced hardware setup with optional PC based *iQ* configurator.

- **Advanced I/O is standard** with 25-pin output, and 15-pin input, user configurable from the utility menu.

- **Rear panel expansion** slot is available to allow for custom configurations for OEM and cost effective designed solutions.
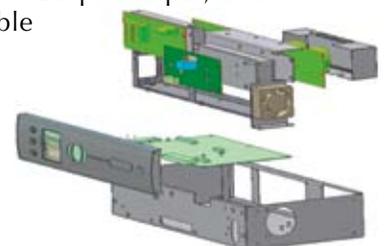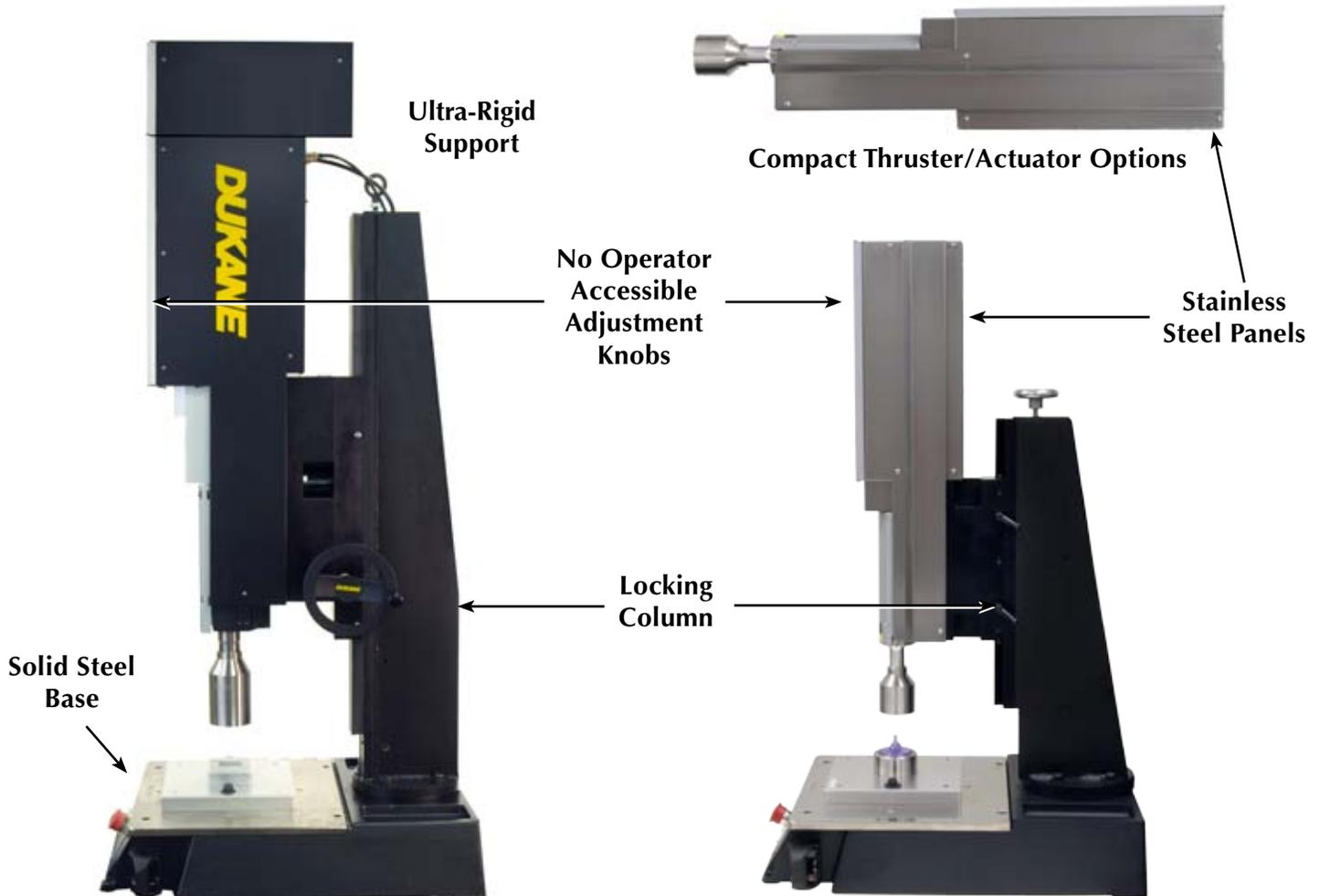
Ultra-Rigid *iQ Servo Press*

Features

- **Linear servo actuator** with integral roller screw mechanism.

- **5" (127mm) stroke 20 kHz, 3.5″ (89mm) 30/40/50 kHz** with electronic teachable mechanical stop. Adjustable in .001" (.025mm) increments.

- **Top-of-stroke limit switch** for automation application

- **Compact, single-rail linear ball slide assembly system** offers accurate positioning, stable movement, and friction-free travel.

- **Linear distance encoder** with 1 μm resolution.

- **Thrust capacity** 20kHz 560 lb (2500 N) 40/30/50kHz 150 lb (660 N)

- **Programmable trigger force .**1 lb resolution (1 lb 20 kHz version) Ideal for precise delicate assemblies.

- **Programmable home position** for reduced cycle time and setup optimization.

- **Ergonomic base and cycle activation switches** reduce operator fatigue.

- **Status indicators in base** for Power, In Cycle, and Abort clearly communicate system conditions.

- Twist-release **emergency stop switch** meets international safety standards.

- **Ultra-Rigid** support provides reduced deflection for superior weld consistency. Column crank and gas strut assist ensures easy setup. Column can be locked to eliminate unauthorized adjustments. Standard round support columns available.

Options

- **Magnum transducer** provides a 25% boost in amplitude. Consult Dukane about suitability/application of this option.

- **Wide band transducer**

- **Patented resonant mount booster.**

- **Longer press columns** to increase part load area height.

- **19″ (483mm) rack or press-mounted** generator option.

Ultra-Rigid Support

Compact Thruster/Actuator Options

No Operator Accessible Adjustment Knobs

Stainless Steel Panels

Locking Column

Solid Steel Base

The *iQ*-HMI includes a 15″ color industrial PC with touch screen, compact flash solid state drive (no moving parts), two USB ports, and one Ethernet port. Windows Embedded Standard operating system. Rugged metal housing with mounting holes for standard VESA 75 support arms. IEC C14 plug w/ internal 110/230 VAC power supply.
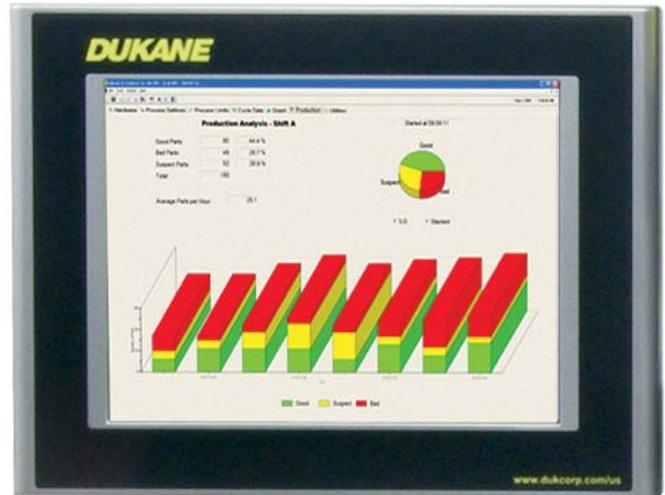
FEATURES

iQ Explorer User Interface

- **Windows operating system** uses familiar file folder menu structure, requires no special training to program and operate.

- **Touch screen input** for ease of programming. All welder setup parameters are programmed from one menu page.

- **Ethernet connectivity** for connection to local area network or stand-alone applications.

- **Supervisory password** control features for lock-out of system controls.

- **Remote connectivity** to Dukane's 24-hour hotline for system diagnostics and troubleshooting ensures minimized down time.

iQ Process Control

To optimize the welding process and produce the strongest and most consistent weld results, it is critical to look at all phases of the welding process for each application.

Pre-weld Control

- **Programmable home position**

- **Two-stage programmable down speed,** allows for fast approach prior to trigger and reduces cycle time.

- **Patented Trigger by Power** or pretrigger by distance modes.

Weld Controls/Modes

- **Linear optical encoder** with a one-micron resolution over seven inches of usable travel for excellent precision and repeatability.

- **Start motion after force drop.** Velocity is static until system senses material melt transition. This reduces part stress and provides superior bond strength. (Patent Pending)

- **Programmable motion control modes**
  - **Speed mode** allows for either constant or 10-segment velocity profile during weld phase.
  - **Force mode** allows for either constant or 10-segment force profile during weld phase.

- **Weld by Time**.

- **Weld by Energy** delivers a specific amount of energy to the part.

- **Weld by Distance** controls the collapse distance to ensure that the same volume of material melts on each part so the finish joint strength is consistent.

- **Weld by Absolute Distance** controls the finish part height to yield uniform assemblies.

- **Weld by Peak Power** terminates the ultrasound when the available joint material is completely melted.

Post-weld Control

- **Dynamic hold** method allows for precise programmable collapse distance and programmable collapse speed, ensuring overall part collapse is accurate.

- **Static hold** method stops motion at a fixed position for a programmable length of time during the hold phase.

User Interface Features
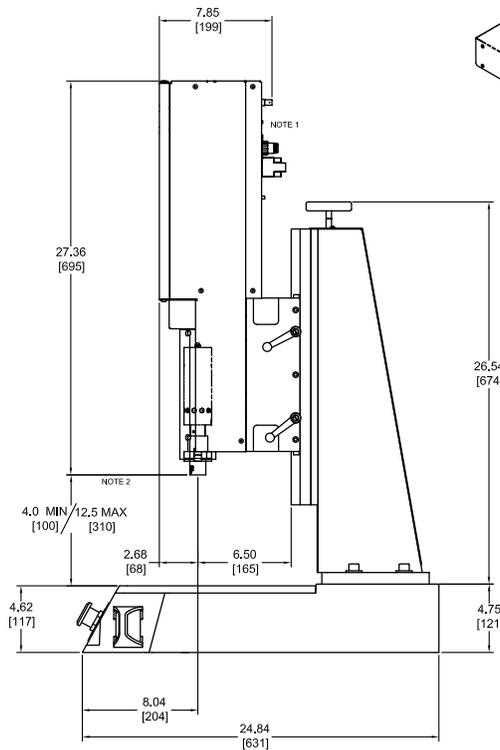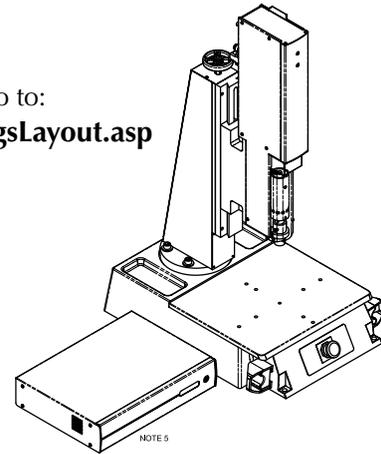

- **Intuitive menu structure**, uses familiar Windows file folder layout and icons.

- **One screen process settings page** last weld data displayed simplifies programming.

- **F1 Help command** instantly displays explanation of function.

- **User-programmable cycle data screen** displays up to 16 unique weld parameters for monitoring operating parameters.

- **User programmable process limits** are displayed on cycle data screen. Bad Part and Suspect Part limits - up to 13 parameters are available. Eliminate the need for expensive SPC packages.

- **Two user-selectable data storage locations** store data on USB drive, local area network, C drive and generator memory.

- **Data is stored based on user-selectable time intervals**. Shifts can be specified to create unique data file for each programmed period.

- **Save part data from multiple welders to one file option**. Ideal for multi-headed weld applications or multi-welder work cells.

- **Reference footprint** consists of the user-selectable weld graph that gives a tool for finite weld process parameter optimization.

- **Seven user-selectable graph parameters** -velocity, energy, power, distance, amplitude, frequency, and force for viewing and storage of each weld. Exportable in CSV and XML formats for easy integration in SPC programs.

- **Production analysis screen** displays 8-hour shift production statistics: good, bad, suspect quantities and percentages. Ideal for instant monitoring of production.

- **Advanced stack diagnostics** includes power and frequency graphs for stack (horn) documentation and future reference for troubleshooting.

iQ Explorer II operates on Windows operating system independently of the ultrasonic system. Usable on most computer platforms, desktop, tablet, notebook or industrial PC, and does not require proprietary hardware from Dukane.

Process Settings

Cycle Data

Advanced Graphing

Production Data

iQ Specifications
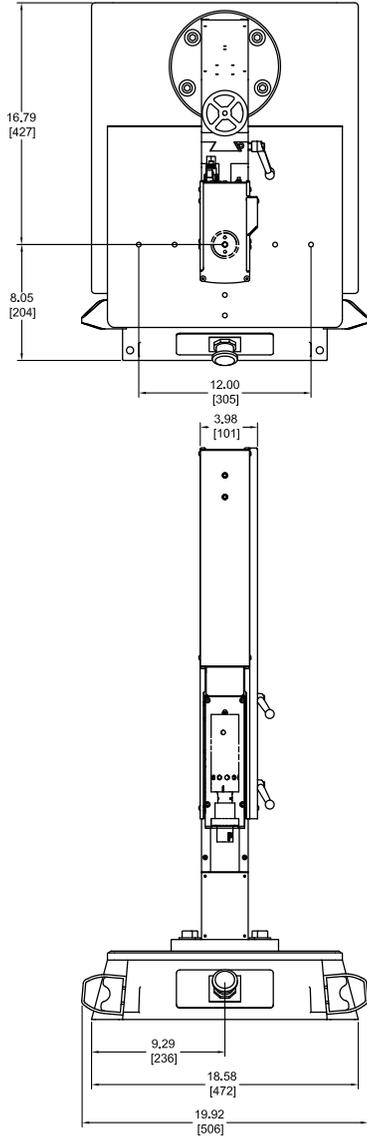
Note: Partial data shown here.
For complete dimensional data go to:
http//www.dukane.com/us/DL_DrawingsLayout.asp

16.79 [427]

8.05 [204]

12.00 [305]

3.98 [101]

7.85 [199]

NOTE 1

27.36 [695]

26.54 [674]

NOTE 2

4.0 MIN/12.5 MAX [100]/[310]

2.68 [68] 6.50 [165]

4.62 [117]

4.75 [121]

9.29 [236]

18.58 [472]

19.92 [506]

8.04 [204]

24.84 [631]

NOTE 5

Model 43S245

Available Frequencies	Wattage
43S245	
50 kHz	150
40 kHz	600/900/1200
30 kHz	900/1200/1800
43S220	
20 kHz	1200/1800/2400/3600
43S215	
20 kHz (Super 20)	4800
15 kHz	4800

Dimensions	iQ 43S220 Thruster	iQ 220 Press System w/Base	iQ Mini Servo Thruster	iQ Mini Servo System w/Base	Mini Servo Control Box
Base Width		18.6 (472)		18.6 (472)	
Base Depth		24.8 (631)		24.8 (631)	
Base Height		4.6 (117)		4.6 (117)	
Column Height		44.6 (1132)		26.5 (674)	
Maximum Height		70.1 (1780)		39.9 (1013)	
Housing Width	5.2 (132)	5.2 (132)	4.0 (102)	4.0 (102)	17.2 (436)
Housing Height	38.0 (968)	38.0 (968)	27.2 (691)	27.2 (691)	12.6 (320)
Housing Depth	13.2 (336)	13.2 (336)	7.1 (181)	7.1 (181)	3.5 (88)
Usable Throat	3.94 (100)	8.2 (209)	3.38 (86)	8.3 (210)	
Stroke	5.50 (140)	5.50 (140)	3.50 (88)	3.50 (88)	
Weight	74 lbs (33 Kg)	250 lbs (114 Kg)	25 lbs (11.4 Kg)	230 lbs (105 Kg)	20 lbs (9 Kg)
Maximum Weld Force	550 lbs (2447 N)	550 lbs (2447 N)	150 lbs (667 N)	150 lbs (667 N)	

Measurements: In. (mm)

Note: All specifications are subject to change without notice. Please consult Dukane Ultrasonics for any updated information.

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DUKANE Corporation
UL
#A5284
ISO 9001:2008
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