iQ Series
AUTOMATION IN MIND
ULTRASONIC POWER SUPPLY

AiM™
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St. Charles, IL 60174 USA

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Specifications subject to change without notice.

This user’s manual documents product features, hardware, and controls software available at the time this user's manual was published.

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SECTION 1

Introduction
Health and Safety

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General User Information

Read This Manual First
Before operating your ultrasonic generator, read this User’s Manual to become familiar with the equipment. This will ensure correct and safe operation. The manual is organized to allow you to learn how to safely operate this generator. The examples given are chosen for their simplicity to illustrate basic operation concepts.

Notes, Cautions and Warnings
Throughout this manual we use NOTES to provide information that is important for the successful application and understanding of the product. A NOTE block is shown to the right.

In addition, we use special notices to make you aware of safety considerations. These are the CAUTION and WARNING blocks as shown here. They have important information that, if ignored, could have increasingly severe outcomes. These statements help you to identify and avoid hazards and recognize the consequences. One of three different symbols also accompany the CAUTION and WARNING blocks to indicate whether the notice pertains to a condition or practice, an electrical safety issue or an operator protection issue.

Drawings and Tables
The figures and tables are identified by the section number followed by a sequence number. The sequence number begins with one in each section. The figures and tables are numbered separately. The figures use Arabic sequence numbers (e.g. 1, 2, 3) while the tables use roman sequence numerals (e.g. I, II, III). As an example, Figure 3-2 would be the second illustration in Section 3 while Table 3-II would be the second table in Section 3.
General Considerations

Please observe these health and safety recommendations for safe, efficient, and injury-free operation of your equipment.

Proper Installation - Operate system components only after they are properly installed.

No Unauthorized Modifications - Do not modify your system in any way unless authorized to do so by Dukane. Unauthorized modifications could cause equipment damage and/or injury to the operator. In addition, unauthorized modifications will void equipment warranty.

Keep the Cover On - Do not remove any equipment cover unless directed to do so by Dukane. The generator produces hazardous electrical voltages which could cause injury.

Grounded Electrical Power - Operate this equipment only with a grounded electrical connection.

See Electrical Safety for grounding instructions, Page 5.

Comply with Regulations - You may be required to add accessories to bring the system into compliance with applicable regulations (OSHA in the USA) for machine guarding and noise exposure.

Use Eye Protection - Wear ANSI approved safety impact goggles.

Acoustic Stack Hazard - When an acoustic stack (transducer, booster, horn and tip) is energized by the ultrasound signal, it presents a potential hazard. Stay clear of an energized stack.

System E-STOP (abort) Switch - Install a system E-STOP (abort) switch at each operator station when ultrasonic plastic assembly equipment is used with automatic material handling equipment in an automated system.

NOTE
These recommendations apply to the welding system. System in this manual refers to a complete group of components associated with the welding of parts, also known as an ultrasonic assembly system. Typical of the iQ Series AiM™ system consists of the iQ generator, cables, transducer, booster, horn, and fixture.

WARNING
Any fixture manufactured by a third party must comply with all OSHA and ANSI requirements. All fixtures must be guarded as necessary. Dukane does not assume any responsibility or liability for fixtures manufactured by the customer or any third party manufacturer.

WARNING
Never operate the generator with the cover off. This is an unsafe practice and may cause injury.

CAUTION
At some time you may be asked to remove equipment covers by the Dukane Service Dept. personnel. Before doing so, disconnect the unit electrically from the incoming line AC power.

Continued
General Considerations

System Electrical Cabling - Electrical power must be off when connecting or disconnecting electrical cables.

Do Not Wear Loose Clothing or Jewelry - They can become caught in moving parts.

Stay Alert - Watch what you are doing at all times. Use common sense. Do not operate the generator when you are tired or distracted from the job at hand.

Do not Operate the Equipment - Your judgement or reflexes could be impaired while taking prescription medications. If so, do not operate the equipment. Be familiar with warning labels and recommended activity restrictions that accompany your prescription medications. If you have any doubt, do not operate the equipment.

Plastics Health Notice

Certain plastic materials, when being processed, may emit fumes and/or gases that may be hazardous to the operator’s health. Proper ventilation of the work station should be provided where such materials are processed. Inquiries should be made to the U.S. Department of Labor concerning OSHA regulations for a particular plastic prior to processing with Dukane ultrasonic equipment.

Electrical Safety

The iQ Series generator provides the operating power and power returns. Make sure the generator is grounded properly.

In addition to the safety considerations, proper grounding is essential for the effective suppression of RFI (Radio Frequency Interference). Every generator contains a RFI filter which blocks noise on the AC power line from entering the generator control circuitry. This filter also prevents ultrasonic RFI from being fed back into the AC power line.

Always connect the included ground wire from the PE ground of the generator to the nearest grounded metal pipe or equivalent.

WARNING
Keep head, hands, limbs and body at least six inches (152 mm) away from an operating press/thruster. A vibrating, descending horn can cause burns and/or crushing injuries.

CAUTION
Parts being joined ultrasonically will at times vibrate at audible frequencies. Wear ear protectors to reduce annoying or uncomfortable sounds. In addition, ultrasound baffles, sound enclosures, or materials that absorb sound may be located to surround the system. Ultrasound pressure level could exceed 110dB.

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Continued
Electrical Safety

Domestic Power Grounding

For safety, the power cords used on this product have a three-wire, grounding-type power cord. Figure 1-1 illustrates the appropriate electrical outlet to use with the power cord that is included with systems shipped to North America.

![Figure 1-1 Example of 220/240 Volt, Grounded, 3-Prong Receptacle](image)

International Power Grounding

The power cable normally provided for international use is compatible with the power outlet used in many Continental European countries (Refer to Figure 1–2). However, if your application requires another type of power cord, check with your equipment supplier, and follow local regulations concerning proper wiring and grounding.

![Figure 1-2 International 220/240V Grounding](image)

CAUTION

If there is any question about the grounding of your receptacle, have it checked by a qualified electrician. Do not cut off the power cord grounding prong, or alter the plug in any way. If an extension cord is needed, use a three-wire cord that is in good condition. The cord should have an adequate power rating to do the job safely. It must be plugged into a grounded receptacle. Do not use a two-wire extension cord with this product.

CAUTION

If you have a two-prong electrical receptacle, we strongly recommend that you replace it with a properly grounded three-prong type. Have a qualified electrician replace it following the National Electric Code and any local codes and ordinances that apply. See Figures 1-1 and 1-2.
SECTION 2

Installation

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Connecting Cables
(Quick Start Guide)
Details about the various system connectors and their pin assignments are covered in *Section 3*.

The connections are the same for both the vertical and horizontal generator configurations. However, the panel location of the connectors differs between the two chassis styles.

AC Power
Detached Cords
The AC line cords supplied with the standard generators are matched to the ultrasonic output power rating and the continent of specified use. See Table 2-I.

<table>
<thead>
<tr>
<th>Continent of Use</th>
<th>Power Cord Part Number</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>200-1109</td>
<td>120V, 15A</td>
</tr>
<tr>
<td></td>
<td>200 - 1110</td>
<td>240V, 15A</td>
</tr>
<tr>
<td>Continental Europe</td>
<td>200 - 1111</td>
<td>240V, 16A</td>
</tr>
</tbody>
</table>

*Table 2-I  Standard IEC AC Power Cord Part Numbers*

Attached Cords

240 Volt Single Phase Systems - High power generators with power ratings above 2600W use permanently attached power cords.

No Cords

Three-Phase Systems - High power Three-Phase generators do not include an AC Line Cord and must be directly wired.

---

**CAUTION**

The power cord is equipped with a three-prong, grounded-type plug for your safety. Whenever a two-slot receptacle is encountered, we strongly recommend that it is replaced with a properly grounded three-lead receptacle.

Have a qualified electrician do the replacement in accordance with the National Electrical Code and local codes and ordinances. DO NOT cut off the power cord grounding prong or alter the plug in any way.
Figure 2-1 Generator - Bottom View (Vertical Panel Mount Chassis)

Automation Controlled Probe System

1. Ground the generator chassis using the supplied 14-Gauge wire, and attach it to the grounding stud: A in Figure 2-1.

2. Recommended – Ground the probe support. This is a user-supplied 14-Gauge wire. This is required if the probe support does not have a good earth ground through the machine.

3. Input Cable/Output Cable - Attach the automation control cable from the user-supplied automation equipment to the system input HD-26 connector, J5 on the I/O panel: B in Figure 2-1.

4. Attach the high voltage coaxial cable from the probe to the ultrasound output connector J1: C in Figure 2-1.

5. Connect the AC power cord to the generator IEC power inlet connector, and plug the other end into an approved AC outlet: D in Figure 2-1.
RFI Grounding
In addition to the safety considerations previously mentioned, proper grounding at the generator power cord is essential for the effective suppression of electrical noise or RFI (Radio Frequency Interference). Every ultrasonic generator contains a RFI filter which blocks noise on the AC power line from entering the system control circuitry. This filter also prevents ultrasonic frequency noise from being fed back into the AC power line. In order for the RFI filter to operate properly, it is necessary to correctly ground the system. Run a grounding wire from the grounding stud connection to the nearest grounded metal pipe or equivalent earth ground, and secure it with a ground clamp.

See Figure 2-1 on Page 10.

Proper Handling of Cable Slack

Coil Extra Slack
When taking up slack in cables, the extra length should be coiled up as shown in Figure 2-2 rather than folded as shown in Figure 2-3.

Avoid Excessive Bending
Avoid excessive tension and bends on cables. Cables should be routed so that there are no abrupt bends in the cables, especially near their connectors.

NOTE
Cables shown in the two figures directly above are representative samples. If cables have slack, coil them rather than fold them.
SECTION 3

Standard Connections

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Bottom Panel Layout Overview

This section provides an overview of the generator rear panel layout, which includes panel areas dedicated to various standard system functions and options that are available. Figure 3-1 illustrates the panel layout.

Figure 3-1 Generator Bottom Panel

A IEC Power Inlet Connector – Attaches to an IEC style power cord.
B Power Switch – Circuit Breaker – Used to switch system power ON and OFF.
C Chassis Grounding Stud – Chassis connection for a protective earth ground.
D System Input/Output Connector – Connections for system control input signals and system status output signals.

E Ultrasound Output Connector – Coaxial high voltage connection to ultrasonic stack.
F Configuration Port Connector – Digital control port to modify system parameters.
G Ethernet/IP Connector – Provides for communication between the iQ generator and an automation network.
H Multi-Point Control Connector - Used to connect an MPC module.
I An option module can be installed here.
AC Power Inlet Panel
The standard AC power inlet panel is described in this section.

IEC AC Power Inlet Connector
The IEC AC power inlet connector mounted on the system AC power inlet panel requires a properly configured IEC compliant power cord, which enables worldwide system operation by simply changing the power cord.

This system includes a 16/20 amp rated IEC inlet connector. Single phase 3600W/5000W systems include a non-detachable power cord.

An appropriately rated power cord must be securely attached to the welding system’s IEC inlet connector. If the correct power cord configuration is not included with the system for the local AC power outlet at your location, an appropriate IEC power cord should be available from a local electrical parts supplier.

Power Switch/Circuit Breaker
The power switch/circuit breaker has a rocker type actuator switch that will activate or deactivate the AC power to the system. The power ON position is marked with the internationally recognized I symbol, the power OFF position is marked with the 0 symbol. This power switch also integrates an appropriately sized over-current protection circuit breaker function in the generator.

If an over-current condition trips the circuit breaker, it will automatically switch to the OFF position. If the overload current that caused the circuit breaker to trip is due to a transient condition, the circuit breaker can be reset by switching the actuator back to the ON position. If when resetting the circuit breaker after it has tripped, it immediately trips again, there is likely an internal system malfunction, and the generator will require service.

Do not repeatedly try to reset the circuit breaker. If it trips, this will only cause more damage to the generator.

Chassis Grounding Stud
The chassis grounding stud is used to attach a protective earth ground to the generator. This will aid in the suppression of electrical interference or radio frequency interference (RFI) that is common in an industrial environment. The chassis ground stud is C in Figure 3-2. Proper system grounding is discussed in Section 2.

System Inputs/Outputs Connector
The SYSTEM INPUTS/OUTPUTS connector mounted on the system I/O panel includes connections for all of the basic system control input and output signals that will typically be associated with an automated control system. The cable attached to this connector includes all of the available system control signals, which will be controlled by an output card or output port on the automation controller.

The user can determine which signals to use for each particular welding application, but there must be at least two connections to this connector or the generator will always be in an E-STOP condition. All of the I/O signals on this connector are electrically isolated (signals are NOT referenced to chassis ground). Inputs are activated when there is a 24VDC difference between the input pin and the Input Common pin. The electrically isolated I/O signals can be activated/monitored from an automation controller with either sinking (NPN) or sourcing (PNP) I/O depending upon how the isolated common connection is terminated. All inputs sink or source 10mA of current from a 24VDC power supply. The total output current cannot exceed 500mA when using the +22VDC generator output (pin 1). If an external supply is used the maximum current for each output is 400mA.

Continued
Section 3 – Standard Connections

Continued from Previous Page

Note that a simple switch closure (relay contact) connected to a control input can not activate the input without adding an external power supply to power the input. Adding jumper connections to pins available on the System Inputs connector, can configure switch closure inputs to operate referenced to generator chassis ground (non-isolated), without adding a separate power supply, if desired. Refer to Application Note AN525 found on the Dukane website at:

https://documents.dukane.com/AppNote/AN525.pdf

for detailed wiring diagrams of example applications.

The SYSTEM INPUTS/OUTPUTS connector is a HD-26F (high density D-subminiature 26 circuit female) connector. Table 3-I lists the signal names and descriptions, with detailed descriptions below. The wire color coding for the system input cable is listed in Table 3-I, to assist with custom automation system wiring and assembly.

**System Inputs/Outputs Signal Descriptions**

**Pin 1 (+22V)**
This pin can supply +22VDC at up to 500mA to power the user’s automation controls.

**Pin 2 (Power Gnd)**
Pin 2 is the 22VDC return and is tied to the system chassis ground.

**Pin 3 (E-STOP Output)**
Refer to AN525 for E-STOP wiring.

**Pin 4 (E-STOP Input)**
Refer to AN525 for E-STOP wiring.

**Pin 5 (Remote Setup Selection Bit 0 Input)**
Pin 5 is the Remote Setup Selection Bit 0, which is the least significant bit used to select different welding setups with an automation control system. This input is also used to select different channels when a Multi-Point Controller (MPC) module is connected to J2.

**Pin 6 (Remote Setup Selection Bit 1 Input)**
Pin 6 is the Remote Setup Selection Bit 1, which is the second least significant bit used to select different welding setups with an automation control system. This input is also used to select different channels when a Multi-Point Controller (MPC) module is connected to J2.
**Pin 7 (Remote Setup Selection Bit 2 Input)**

Pin 7 is the Remote Setup Selection Bit 2, which is the third least significant bit used to select different welding setups with an automation control system. This input is also used to select different channels when a Multi-Point Controller (MPC) module is connected to J2.

**Pin 8 (Remote Setup Selection Bit 3 Input)**

Pin 8 is the Remote Setup Selection Bit 3, which is the most significant bit used to select different welding setups with an automation control system. This input is also used to select a different channel when a Multi-Point Controller (MPC) module is connected to J2.

**Pin 9 (Automation Cycle Stop Input)**

Pin 9 is an input control signal that when enabled, can be used by the automation control system as a redundant signal to shut the ultrasound output off.

**Pin 10 (Front Panel Lockout Input)**

Pin 10 is not applicable since this model doesn’t have a user interface.

**Pin 11 (Isolated Input Common)**

Pin 11 is electrically isolated from chassis ground. Using isolated sourcing (PNP) output drivers, this common line would be connected to isolated ground potential. Using isolated sinking (NPN) output drivers, this common line would be connected to the isolated positive supply voltage output. For correct operation of the Ultrasound Activation/Cycle Start input it is critical that this pin is connected to either isolated ground or positive supply.

**Pin 12 (Ultrasound Activation/ Cycle Start Input)**

Pin 12 is used to activate the generator ultrasound output. Activation of this control input will switch the ultrasound output ON, and deactivating this signal will switch ultrasound OFF. This input signal will also function as a cycle start input, where the ultrasound activation and timing are completely under the control of the process controller. Depending on the welding process controller setup, this input signal could be activated momentarily to start a welding cycle.

**Pin 13 (Isolated Ultrasound Common)**

Pin 13 is the common connection for Pin 12 (Ultrasound Activation/Cycle Start Input). Pin 13 is electrically isolated from chassis ground. Using isolated sourcing (PNP) output drivers, this common line would be connected to isolated ground potential. Using isolated sinking (NPN) output drivers, this common line would be connected to the isolated positive supply voltage output. For correct operation of the Ultrasound Activation/Cycle Start input it is critical that this pin is connected to either isolated ground or positive supply.

**Pin 14 (Analog Input (0-10VDC))**

**Pin 15 (Analog Input (0-10VDC))**

**Pin 16 (Analog Ground)**

Pin 16 is the signal common (ground) connection for all of the analog signals (on Pins 14, 15, 17, and 18). This signal common pin is connected to system chassis ground and is not isolated from the generator chassis. This is an analog signal ground connection. Do not connect anything to this ground connection, except the wiring to the inputs/outputs of the analog devices.

**Pin 17 (Analog Power Output (0-10VDC))**

Pin 17 is an analog output signal used to monitor the power output from the welding system. The scaling on this output signal is as shown below:

\[
1 \text{ Watt} = 0.001 \text{ VDC} \quad (1\text{mV per Watt})
\]

**Example:**

- 20kHz system measures 0.525 VDC on Power Monitor Output = 525 W

**Pin 18 (Analog Amplitude Output (0-10VDC))**

Pin 18 is an analog output signal used to monitor the system amplitude setting. The scaling on this output signal is 100% amplitude = 10.0 VDC, or 0.1 VDC per 1% amplitude. Using this monitor output, the control system can verify that the amplitude is set to the expected programmed amplitude level.

**Pin 19 (Ultrasound Status Output)**

Pin 19 is a digital output that activates when the system is delivering ultrasonic power to the load attached to the ultrasound output connector. This output will be an open circuit when the ultrasound output is off.

**Pin 20 (Any Fault Status Output)**

Pin 20 is a digital output that activates whenever any fault condition is detected that terminates/inhibits ultrasound output and normal system operation. This output will be an open circuit when no system fault conditions are
Fault output remains active until cleared by the System Latch Reset input or by the start of the next weld cycle. Generator faults that will activate the Any Fault output:

- Overload (Average, Peak, Frequency, Over Voltage)
- Over Temperature Fault
- System Power Fault

**Pin 21 (Overload Status Output)**

Pin 21 is a digital output that activates whenever any overload condition is tripped. Activation of the overload status output signal could be caused by an Average, Peak Frequency, or Over Voltage overload condition. After the overload status output activates, it will remain active until cleared by the System Latch Reset input or by the start of the next weld cycle. This output will be an open circuit when no overload conditions have been detected.

**Pin 22 (Bad Part Status Output)**

Pin 22 is a digital status output that activates, either momentarily or until the start of the next welding cycle, when the welding parameters recorded during the previous welding cycle are outside of the programmed bad part limits. This output will be an open circuit when a bad part has not been detected.

**Pin 23 (Good Part Status Output)**

Pin 23 is a digital status output that activates, either momentarily or until the start of the next welding cycle, when the welding parameters recorded during the previous welding cycle do not exceed the programmed suspect or bad part limits. This output will be an open circuit after a welding cycle when either a suspect or bad part has been detected.

**Pin 24 (Ready Status Output)**

This status output signal will activate only when the system is ready to activate ultrasound or begin a weld cycle. Pin 24 is a digital status output that activates when a weld processing cycle is completed and the welding process control system is ready to start the next welding cycle. This output will be an open circuit when the welding process controller determines that the next welding cycle cannot be started. This includes system faults or E-STOP active, but not a process fault like Overload.

**Pin 25 (MPC Ready Status Output)**

This status output signal will activate only when an MPC module is connected to the generator. Pin 25 is a digital status output that activates when the MPC controller is ready to start the next MPC welding cycle. This output will be an open circuit when the MPC system is not ready to start an MPC weld cycle. Any changes to the probe selection control bits will not be acted on until the completion of the current weld cycle. This status output signal will also be open (MPC NOT READY) if a fault condition is detected inside the MPC module. If this status output will not activate, check for a red fault status indication, the SYSTEM STATUS LED, on the front of the MPC module.

**Pin 26 (Isolated Output Common)**

Pin 26 is electrically isolated from chassis ground. For isolated sourcing (PNP) inputs, this common line would be connected to isolated ground potential. Using isolated sinking (NPN) output drivers, this common line would be connected to the isolated positive supply voltage output.
<table>
<thead>
<tr>
<th>Pin</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J5-1</td>
<td>BLK/RED</td>
<td>+22V CURRENT LIMITED POWER SUPPLY (500mA MAX)</td>
</tr>
<tr>
<td>J5-2</td>
<td>RED/BLK</td>
<td>+22V RETURN (iQ CHASSIS GROUND)</td>
</tr>
<tr>
<td>J5-3</td>
<td>BLK/WHT</td>
<td>E-STOP OUTPUT</td>
</tr>
<tr>
<td>J5-4</td>
<td>WHT/BLK</td>
<td>E-STOP INPUT</td>
</tr>
<tr>
<td>J5-5</td>
<td>BLK/GRN</td>
<td>REMOTE SETUP SELECTION BIT 0 INPUT</td>
</tr>
<tr>
<td>J5-6</td>
<td>GRN/BLK</td>
<td>REMOTE SETUP SELECTION BIT 1 INPUT</td>
</tr>
<tr>
<td>J5-7</td>
<td>BLK/BLU</td>
<td>REMOTE SETUP SELECTION BIT 2 INPUT</td>
</tr>
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<td>J5-8</td>
<td>BLU/BLK</td>
<td>REMOTE SETUP SELECTION BIT 3 INPUT</td>
</tr>
<tr>
<td>J5-9</td>
<td>BLK/YEL</td>
<td>AUTOMATION CYCLE STOP INPUT</td>
</tr>
<tr>
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<td>YEL/BLK</td>
<td>FRONT PANEL LOCKOUT INPUT</td>
</tr>
<tr>
<td>J5-11</td>
<td>BLK/BRN</td>
<td>ISOLATED INPUT COMMON</td>
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<td>J5-12</td>
<td>BRN/BLK</td>
<td>ULTRASONIC ACTIVATION/CYCLE START INPUT</td>
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<td>ISOLATED ULTRASONIC COMMON</td>
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<td>J5-14</td>
<td>ORN/BLK</td>
<td>ANALOG DISTANCE INPUT (0-10VDC)</td>
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<td>RED/WHT</td>
<td>ANALOG AMPLITUDE INPUT (0-10VDC)</td>
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<td>J5-16</td>
<td>WHT/RED</td>
<td>ANALOG GROUND</td>
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<td>RED/GRN</td>
<td>ANALOG POWER OUTPUT (0-10VDC)</td>
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<td>J5-18</td>
<td>GRN/RED</td>
<td>ANALOG AMPLITUDE OUTPUT (0-10VDC)</td>
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<td>J5-19</td>
<td>RED/BLU</td>
<td>ULTRASONIC STATUS OUTPUT</td>
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<tr>
<td>J5-20</td>
<td>BLU/RED</td>
<td>ANY FAULT STATUS OUTPUT</td>
</tr>
<tr>
<td>J5-21</td>
<td>RED/YEL</td>
<td>OVERLOAD STATUS OUTPUT</td>
</tr>
<tr>
<td>J5-22</td>
<td>YEL/RED</td>
<td>BAD PART STATUS OUTPUT</td>
</tr>
<tr>
<td>J5-23</td>
<td>RED/BRN</td>
<td>GOOD PART STATUS OUTPUT</td>
</tr>
<tr>
<td>J5-24</td>
<td>BRN/RED</td>
<td>READY STATUS OUTPUT</td>
</tr>
<tr>
<td>J5-25</td>
<td>RED/ORN</td>
<td>MPC READY STATUS OUTPUT</td>
</tr>
<tr>
<td>J5-26</td>
<td>ORN/RED</td>
<td>ISOLATED OUTPUT COMMON</td>
</tr>
</tbody>
</table>

Table 3-I  System Input/Output Connector Signals

Note: The descriptions shown are for the default I/O settings. Almost all Inputs are programmable to other input functions and all outputs to other output functions. The exception is the ULTRASONIC ACTIVATION / CYCLE START INPUT which cannot be programmed to another function.
Ultrasound Output Connector

The ultrasound output connector used with all standard generators is a high voltage (5000V) coaxial style SHV-BNC connector. This connector provides superior shielding of electrical noise, compared to other types of connectors. The ultrasound output connector mates with fully shielded coaxial ultrasound cables that are secured with a simple and reliable quarter-turn bayonet style attachment mechanism.

Figure 3-4 Ultrasound Output Connector

CAUTION

The ultrasonic output from this connector (that drives the attached ultrasonic load) is a very high AC voltage. At high power levels this can exceed 2 amperes of current and must be securely terminated via the ultrasound cable for safe operation. Use original equipment ultrasound cables for safe and reliable system operation. Improperly assembled ultrasound cables can result in high voltage arcing and will destroy the ultrasound connectors.

Do not use your generator if there is any evidence of arcing (black carbon deposits) on either the ultrasound output connector or the ultrasound cable connectors.
EtherNet/IP Port Connector

The EtherNet/IP or Modbus TCP/IP connector allows the iQ generator to connect to an EtherNet/IP or Modbus TCP/IP network.

NOTE
Refer to Section 4, Pg. 31, for more information.

Figure 3-5 J9 Ethernet/IP or Modbus TCP/IP Port Connector
**USB Port Connector**

Connect a Windows PC to this port using the included USB cable in order to use Dukane’s PC interface tool, *iQ Commander™*. This tool works with all *iQ AiM™* power supplies and allows the user to easily perform field firmware updates, product setup, parameter configuration and system diagnostics along with other functions.

**To install *iQ Commander™***

1. Download the installation file from (http://update.dukane.com/) and save to the desired location on the PC.
2. Double-click on the installation file.
3. Once prompted, click on “Next >” on the “Welcome to the InstallShield Wizard for iQ Commander” page. The executable will start the installation process.
4. When the progress bar is nearly full, a new window will appear asking to install the FTDI CDM Drivers. This window may appear behind the *iQ Commander™* installation window. If the FTDI CDM Driver window is not visible, move the *iQ Commander™* installation window to the side to see the FTDI CDM Drivers installation window.
5. On the FTDI CDM Drivers installation window, click on “Extract”, “Next >”, accept the agreement, “Next >”, and then “Finish” to install the first set of FTDI drivers.
6. Another window will pop up asking to install another set of FTDI CDM Drivers. Repeat step 5 to install the second set of drivers.
7. Once the drivers are installed, Click on “Finish” to complete the process. The user can connect a USB cable from the PC to the AiM generator and start the program.

**Operations that can be done via *iQ Commander™***

1. Update the *iQ AiM* generator firmware.
2. Test the ultrasonic stack.
3. Scan an ultrasonic stack to determine the optimal Free Run Frequency.
4. Weld a part.
5. Select a probe when an MPC module is connected.
Control parameters available via *iQ Commander™*

1. Set weld method to Time, Energy, Peak Power, Distance, or Position and the associated value in seconds, joules, watts, or millimeters.
2. Configure custom I/O.
4. Enable and set Trigger by Power parameters.
5. Enable and set Hold Time.
6. Enable and set Afterburst delay and duration.
7. Enable checking for Suspect Parts. Set maximum and minimum values for Time, Power, Energy, Distance, and/or Position.
8. Enable checking for Bad Parts. Set maximum and minimum values for Time, Power, Energy, Distance and/or Position.
9. Configure advanced hardware settings including, Free Run Frequency, Frequency Tracking, Frequency Lock and Hold, and Frequency Limits.

Parameters that can be obtained via *iQ Commander™*

1. All parameters that are configured via *iQ Commander™*.
2. Real time data which includes welder state (ultrasound active or not), frequency, power, position, and amplitude.
3. Weld cycle data from previous weld which includes: Cycle Count; Good, Bad, and Suspect Part information; Process Limit setting exceeded or not reached if Bad or Suspect Part checking is enabled; Weld Time; Weld Energy; Peak Power; Weld Distance; Weld Position.
SECTION 4

Standard System Status and Controls

Status LED .......................................................... 27
Multi-Point (MPC) Interface ................................. 29

iQLinQ™ ................................................................. 31
  Control Parameters Available via iQLinQ™ ............ 31
  Control Parameters Available via Ethernet/IP ........ 31
This page intentionally left blank
Status LED
The Status LED provide operating status for system power, the system operating mode and system output status as described below:

Status LED

STEADY GREEN = Generator is Ready to weld

BLINKING GREEN = Generator is Not Ready but there isn’t a fault. This can occur during power up while the DC BUS is charging or if an MPC module is connected and it isn’t ready.

ORANGE = In cycle or ultrasound active.

STEADY YELLOW = Indicates the unit is E-Stopped

BLINKING YELLOW = This could indicate an incorrect AC line voltage connected to the generator. To operate, the generator needs AC line voltage to be within this range: For “a 240V” model a minimum 190 VAC; maximum 265 VAC. For a “U” model a minimum 90VAC; maximum 265VAC. If this range is not maintained, a line voltage fault will inhibit system operation, and the Status LED will blink yellow. If the AC Line voltage is within the valid range, and the fault cannot be cleared by cycling power to the generator, it should be returned for service.

STEADY RED = Average Overload Fault. The output power has exceeded the rated power of the generator model. This fault inhibits the ultrasound output when it occurs, but will automatically reset when the next ultrasound activation signal begins.

BLINKING RED = Peak Overload Fault. The generator output current has exceeded it’s safe operating level and has terminated the ultrasound output. Will automatically reset when the next ultrasound activation signal begins.

STEADY BLUE = Frequency Overload Fault 1. The generator was unable to find the stacks frequency by twice the time of the Ramp Up setting. This fault inhibits the ultrasound output when it occurs, but will automatically reset when the next ultrasound activation signal begins.

Continued
NOTE
A welding cycle cannot be started when the generator is in E-Stop because this blocks the ultrasound output.
Multi-Point Control (MPC) Interface

The MPC Interface connector powers and controls an external MPC module. This external module, (that can be ordered with a minimum of two probe controls up to a maximum of 16 probe controls), must be purchased in addition to a basic generator for a fully functional MPC system.

Connections required for the external MPC module are described below.

MPC Interface Connections

Complete the steps for the basic connections as described on Pages 10-11. These involve:

- Grounding
- Ultrasound Output
- System Control Status Inputs/Outputs
- AC Line Input

In addition to completing these first four steps, complete the two steps below to wire the MPC Control Inputs/Status Outputs as described.

Details about the various system connectors and their pin assignments are covered below.

- MPC I/O - MPC control/input signals and status output signals are carried in the I/O cable that should already be connected - See Table 4-II (Page 30)

- MPC INTERFACE - Attach one end of the MPC Interface cable (Dukane # 200-1408-XX) to the MPC connector on the iQ generator panel in Figure 4-2. Connect the other end of the cable to the MPC INTERFACE connector on the right rear of the MPC module.

NOTE

The MPC Interface cable is a separate line item on the iQ generator system order. The -XX at the end of the cable number specifies cable length. This will vary depending on your MPC installation.

Figure 4-2 Generator Bottom View (Vertical Panel Mount Chassis)
MPC I/O Connections
Signal names and Pin numbers and the connectors related to the MPC option are shown in the table below. See the pages referred to in the table for more information about the signals.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Setup Bit 0 Input</td>
<td>J5 (Pages 17 -19)</td>
</tr>
<tr>
<td>6</td>
<td>Setup Bit 1 Input</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Setup Bit 2 Input</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Setup Bit 3 Input</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>MPC Ready Out</td>
<td>J5 (Page 17 - 19)</td>
</tr>
</tbody>
</table>

Table 4-I MPC I/O Connector Signals

MPC Probe Control
When the optional MPC module and MPC I/O are used, the generator has the capability of controlling as many as sixteen compatible probes. One probe can be turned on at a time while the sequence of probe activation is determined by the user’s automation. The table below shows how the setup bit inputs correspond to the probes.

<table>
<thead>
<tr>
<th>MPC I/O</th>
<th>Probe Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>Off</td>
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<td>On</td>
<td>Off</td>
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<tr>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
</tr>
</tbody>
</table>

Table 4- II MPC Setup Bit Inputs

NOTE

Ultrasound Output Connector
The ultrasound output connector used with all standard generators is a high voltage (5000V) coaxial style SHV-BNC connector. This connector provides superior shielding of electrical noise, compared to other types of connectors. The ultrasound output connector mates with fully shielded coaxial ultrasound cables that are secured with a simple and reliable quarter-turn bayonet style attachment mechanism. The ultrasonic output from this connector (that drives the attached ultrasonic load) is a very high AC voltage. At high power levels this can exceed 2 amps of current and must be securely terminated via the ultrasound cable for safe operation. Use original equipment ultrasound cables for safe and reliable system operation. Improperly assembled ultrasound cables can result in high voltage arcing and will destroy the ultrasound connectors.
iQLinQ™

iQLinQ™ communication options allow automated systems to monitor and change settings in iQ generators. These options provide machine builders the ability to integrate the generator into an electrical cabinet and to use the machine’s HMI to program or monitor weld settings.

All Dukane iQ AiM™ generators include iQLinQ™ EtherNet/IP and Modbus TCP/IP communication protocol support. Using one of these protocols avoids adding expensive analog cards into PLC racks. iQLinQ™ is available for PROFIBUS, PowerLink, Profinet, EtherCAT, and CC-Link with the optional ANYBUS module.

iQLinQ Demos are available to provide complete ladder logic and HMI screens that can be dropped into Allen Bradley (RSLogix 5000; Studio 5000 Logix Designer; Factory View Studio ME) Siemens (TIA Portal) and B&R (Automation Studio) PLC projects. Contact your local Dukane representative for more information about the iQLinQ options.

Control Parameters Available via iQLinQ™

1. Set weld method to Time, Energy, Peak Power, Distance, and/or Position. Set associated values in seconds, joules, watts, or millimeters/inches.
2. Set Amplitude, Ramp Up Time, and Ramp Down Time.
3. Enable and set Trigger by Power or Trigger By Position parameters.
4. Enable and set Hold time.
5. Enable and set Afterburst delay and duration.
6. Enable checking for Suspect Parts. Set maximum and minimum values for Time, Power Energy, Distance, and/or position.
7. Enable checking for Bad Parts. Set maximum and minimum values for Time, Power, Energy, Distance, and/or Position.
8. Configure advanced hardware settings including Frequency Tracking, Free Run Frequency, Frequency Lock and Hold, and Frequency limits.

Control Parameters Available via Ethernet/IP

1. All parameters that are configured via EtherNet/IP.
2. Real time data which includes welder state (ultrasound active or not), frequency, power, amplitude, and position.
3. Weld cycle data from previous weld which includes:
   - Cycle Count
   - Good, Bad, and Suspect Part information
   - Process Limit setting exceeded or not reached if Bad or Suspect Part checking is enabled
   - Weld Time
   - Weld Energy
   - Peak Power
   - Weld Distance
   - Weld End Position

For information on how to control and/or monitor specific parameters, iQ Generator iQLinQ™ Communication and Control documentation is available.

Sign a non-disclosure agreement is required to obtain this documentation.
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SECTION 5

Contacting Dukane
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Contacting Dukane

Identify Equipment

When contacting Dukane about a service–related problem, be prepared to give the following information:

- Model number, line voltage and serial number
- Fault/error indicators from the Status LED and/or iQ Commander.
- Software version (Displayed in the “MAIN” tab in iQ Commander.
- Problem description and steps taken to resolve it

Many problems can be solved over the telephone, so it is best to call from a telephone located near the equipment.

Intelligent Assembly Solutions

Mailing Address: Dukane
2900 Dukane Drive
St. Charles, IL 60174 USA

Phone: (630) 797–4900
Fax:
Main (630) 797–4949
Service & Parts (630) 584–0796
E-mail: ussales@dukane.com

Website

The website has information about our products, processes, solutions, and technical data. Downloads are available for many kinds of literature. This is our main web address:

www.dukane.com

You can locate your local representative at:

www.dukane.com/contact-us/
SECTION 6
Specifications

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**Drawing** .......................... 39
**Operating Environment** .............. 40
**AC Power Requirements** ................ 41
**Interpreting the Model Number** ........ 42
**Regulatory Agency Compliance** .......... 43
Figure 6-1 Vertical 2600 watt and below Generator Drawing
Operating Environment

Operate the generator within these guidelines:

<table>
<thead>
<tr>
<th><strong>Temperature</strong></th>
<th>40°F to 100°F (+4°C to +38°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air Particulates</strong></td>
<td>Keep the equipment dry</td>
</tr>
<tr>
<td></td>
<td>Minimize exposure to moisture, dust, dirt, smoke and mold</td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>5% to 95% Non-condensing @ +5°C to +30°C</td>
</tr>
</tbody>
</table>

Storage guidelines (generator is not operating):

<table>
<thead>
<tr>
<th><strong>Temperature</strong></th>
<th>-4°F to 158°F (-20°C to +70°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air Particulates</strong></td>
<td>Keep the equipment dry</td>
</tr>
<tr>
<td></td>
<td>Minimize exposure to moisture, dust, smoke and mold</td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>5% to 95% Non-condensing @ 0°C to +30°C</td>
</tr>
</tbody>
</table>
### Generator AC Power Requirements

**NOTES:**
- For 480 VAC Generators, the 24V power supply that connected to power source (24V) shall be listed or labeled with 3rd party North America marking (UL, CSA, TUV, etc).
- An X used above in the Model Numbers is a "wildcard" character meaning any valid character combination.
- If the input line voltage is less than 100V, the output current will exceed 15 Amps.

#### Table 6-11

<table>
<thead>
<tr>
<th>Generator Model Number</th>
<th>Generator (Nominal)</th>
<th>Operating Frequency</th>
<th>AC Voltage (Nominal)</th>
<th>Input AC Power Requirements</th>
<th>Output Current (Nominal)</th>
<th>Output Current (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15kHz</td>
<td>15HB360-4P-XX</td>
<td>15kHz</td>
<td>380-480V 50/60 Hz</td>
<td>30 Amps</td>
<td>3600</td>
<td>1200</td>
</tr>
<tr>
<td></td>
<td>40HB120-UP-XX</td>
<td>20kHz</td>
<td>100-240V 50/60 Hz</td>
<td>15 Amps</td>
<td>2000</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>40HB150-UP-XX</td>
<td>25kHz</td>
<td>100-240V 50/60 Hz</td>
<td>15 Amps</td>
<td>3000</td>
<td>4500</td>
</tr>
<tr>
<td></td>
<td>40HB200-UP-XX</td>
<td>30kHz</td>
<td>100-240V 50/60 Hz</td>
<td>15 Amps</td>
<td>3000</td>
<td>6000</td>
</tr>
<tr>
<td></td>
<td>40HB260-UP-XX</td>
<td>35kHz</td>
<td>100-240V 50/60 Hz</td>
<td>15 Amps</td>
<td>3000</td>
<td>9000</td>
</tr>
<tr>
<td></td>
<td>40HB360-4P-XX</td>
<td>40kHz</td>
<td>100-240V 50/60 Hz</td>
<td>15 Amps</td>
<td>3000</td>
<td>12000</td>
</tr>
</tbody>
</table>

**WARNING:**
- Do not operate machine at voltages lower than 100V.
- Current will exceed rating causing a shock hazard.

### Generator AC Power Requirements

**NOTES:**
- The AC Line voltage and current needs depend on whichever generator has been chosen for your system. See the table below.

---

**Table 6-11**

<table>
<thead>
<tr>
<th>Generator Model Number</th>
<th>Generator (Nominal)</th>
<th>Operating Frequency</th>
<th>AC Voltage (Nominal)</th>
<th>Input AC Power Requirements</th>
<th>Output Current (Nominal)</th>
<th>Output Current (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15kHz</td>
<td>15HB360-4P-XX</td>
<td>15kHz</td>
<td>380-480V 50/60 Hz</td>
<td>30 Amps</td>
<td>3600</td>
<td>1200</td>
</tr>
<tr>
<td></td>
<td>40HB120-UP-XX</td>
<td>20kHz</td>
<td>100-240V 50/60 Hz</td>
<td>15 Amps</td>
<td>2000</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>40HB150-UP-XX</td>
<td>25kHz</td>
<td>100-240V 50/60 Hz</td>
<td>15 Amps</td>
<td>3000</td>
<td>4500</td>
</tr>
<tr>
<td></td>
<td>40HB200-UP-XX</td>
<td>30kHz</td>
<td>100-240V 50/60 Hz</td>
<td>15 Amps</td>
<td>3000</td>
<td>6000</td>
</tr>
<tr>
<td></td>
<td>40HB260-UP-XX</td>
<td>35kHz</td>
<td>100-240V 50/60 Hz</td>
<td>15 Amps</td>
<td>3000</td>
<td>9000</td>
</tr>
<tr>
<td></td>
<td>40HB360-4P-XX</td>
<td>40kHz</td>
<td>100-240V 50/60 Hz</td>
<td>15 Amps</td>
<td>3000</td>
<td>12000</td>
</tr>
</tbody>
</table>

---

**WARNING:**
- Do not operate machine at voltages lower than 100V.
- Current will exceed rating causing a shock hazard.
The example model number shown here is 20HB120-2P-C3.

This means:

- A 20kHz generator rated for 1,200 watts, horizontal bench, operating on a 200-240 VAC line with an ANYBUS PROFINET module in the options slot.

Interpreting the Model Number

<table>
<thead>
<tr>
<th>Options Slot Board</th>
<th>AC Line Input</th>
<th>Power Level</th>
<th>System Process Control</th>
<th>Chassis Style</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>200 = 20000 Watts</td>
<td></td>
<td>HB = Horizontal Bench Chassis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>360 = 3600 Watts</td>
<td></td>
<td>VB = Vertical Panel Mount Chassis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>260 = 2600 Watts</td>
<td></td>
<td>Blank = Ethernet/IP or Modbus TCP/IP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>180 = 1800 Watts</td>
<td></td>
<td>C1 = iQLinQ™ PROFIBUS INTERFACE Module</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120 = 1200 Watts</td>
<td></td>
<td>C3 = iQLinQ™ PROFINET INTERFACE Module</td>
</tr>
<tr>
<td></td>
<td></td>
<td>090 = 900 Watts</td>
<td></td>
<td>C4 = iQLinQ™ CC-LINK INTERFACE Module</td>
</tr>
<tr>
<td></td>
<td></td>
<td>060 = 600 Watts</td>
<td></td>
<td>C5 = iQLinQ™ POWERLINK INTERFACE Module</td>
</tr>
<tr>
<td></td>
<td>2 = 200-240V for 1800, 2000, 2600</td>
<td>600 = 600 Watts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 = 480V Three-Phase Extended Chassis</td>
<td>900 = 900 Watts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>U = 100-240V Universal Voltage Input for 1200W and below</td>
<td>1200 = 1200 Watts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 = 200-240V for 1800, 2000, 2600</td>
<td>1800 = 1800 Watts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>600 = 600 Watts</td>
<td>2600 = 2600 Watts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>360 = 3600 Watts</td>
<td>3600 = 3600 Watts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200 = 20000 Watts</td>
<td>20000 = 20000 Watts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Regulatory Agency Compliance

FCC
The generator complies with the following Federal Communications Commission regulations.

CE Marking
This mark on your equipment certifies that it meets the requirements of the EU (European Union) concerning interference causing equipment regulations. CE stands for Conformité Européenne (European Conformity). The equipment complies with the following CE requirements.
- The EMC Directive 2014/30/EU for Heavy Industrial —
  - EN 61000-6-4
  - EN 55011
  - EN 61000-6-2
  - EN61000-4-2
  - EN61000-4-3
  - EN61000-4-4
  - EN61000-4-5
  - EN61000-4-6
  - EN61000-4-8
  - EN61000-4-11
- The Low Voltage Directive 2014/35/EU.
- The Machinery Directive 2006/42/EC.
- EN ISO 12100: Safety of Machinery - General principles of design, risk assessment, and risk reduction.

IP Rating
The iQ generator has an IP (International Protection) rating from the IEC (International Electrotechnical Commission).
The rating is IP2X, in compliance with finger-safe industry standards.

UL
The iQ generator complies with these standards:
- Underwriters Laboratories:
  - UL 61010-1, and
- National Standards of Canada:
  - CAN/CSA C22.2 No. 61010-1-12
as verified by TÜV Rheinland.

CAUTION
DO NOT make any modifications to the generator or associated cables as the changes may result in violating one or more regulations under which this equipment is manufactured.
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Dukane chose to become ISO certified in order to demonstrate to our customers our continuing commitment to being a quality vendor. By passing its audit, Dukane can assure you that we have in place a well-defined and systematic approach to quality design, manufacturing, delivery and service. This certificate reinforces Dukane’s status as a quality vendor of technology and products.

To achieve ISO certification, you must prove to one of the quality system registrar groups that you meet three requirements:

1. Leadership
2. Involvement

The ISO standards establish a minimum requirement for these requirements and starts transitioning the company from a traditional inspection-oriented quality system to one based on partnership for continuous improvement. This concept is key in that Dukane no longer focuses on inspection, but on individual processes.

Dukane’s quality management system is based on the following three objectives:

1. Customer oriented quality. The aim is to improve customer satisfaction.
2. Quality is determined by people. The aim is to improve the internal organization and cooperation between staff members.
3. Quality is a continuous improvement. The aim is to continuously improve the internal organization and the competitive position.

Please refer to our website at:

www.dukane.com/contact-us/

to locate your local representative.