Original Instructions
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EMERSON



20MA
Actuator

Instruction Manual

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Manual Change Information

At Branson, we strive to maintain our position as the leader in ultrasonics plastics joining, metal welding, cleaning and related technologies by continually improving our products. These improvements are incorporated as soon as they are developed and thoroughly tested.

Information concerning any improvements will be added to the appropriate technical documentation at its next revision. Therefore, when requesting service assistance for specific units, note the revision information found on this document.

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Chapter 1: Safety

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1.1 About this manual

This manual provides detailed instructions for the setup and operation of 20MA Actuator.

The 2000Xct/2000Xdt series power supply is required to drive the actuator. For detailed information on the power supply, refer to the manual included with the power supply.

1.2 Safety Information

Observe the following safety information in these operating instructions; this information will warn you about risks and their consequences.

DANGER	Indicates an immediate danger
	If these risks are not avoided, death or severe injury will be the result.

WARNING	Indicates a possible danger
	If these risks are not avoided, death or severe injury might result.

CAUTION	Indicates a possible danger
	If these risks are not avoided, slight or minor injury might result.

NOTICE	Indicates a possible damaging situation
	If this situation is not avoided, the system or something in its vicinity might be damaged. Application types and other important or useful information are emphasized.

1.2.1 20MA Actuator Labeling

NOTICE	
	Only Branson service personnel or Branson trained representatives are allowed to open, maintain and service the system. Unauthorized tampering with, modifying, or opening the unit will void the warranty.

Table 1.1 Labels on the 20MA Actuator

Label	Description
	**CAUTION** • **Crush Hazard** Moving parts present. Can result in serious injury to hands or fingers. Keep hands away from moving horn. • **Burn Hazard** Do not touch the tooling. • **Loud Noise Hazard** Ear protection must be worn.
	**WARNING** • **Crush Hazard** Keep hands away from MOVING horn.

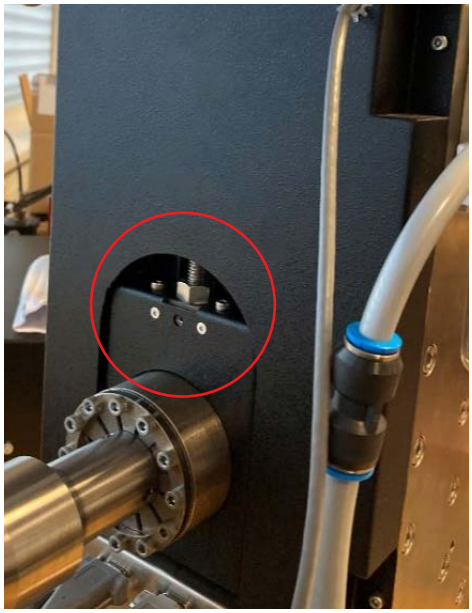
1.3 General Precautions

Ensure that the installation is performed by qualified personnel and in accordance with local standards and regulation.

WARNING	
	Before installing or using this equipment, be sure to read the instruction manual, and know the warnings of safety well. When warnings are not observed, the user will be in danger of serious injury or death.

CAUTION	
	Sound level emissions over 73 dB have been measured using a standard test load. To prevent the possibility of hearing loss, use appropriate hearing protection.

CAUTION	
	Sound level and frequency of the noise emitted during the ultrasonic assembly process may depend upon a. type of application, b. size, shape and composition of the material being assembled, c. shape and material of the holding fixture, d. welder setup parameters and e. tool design. Some parts vibrate at an audible frequency during the process. Some or all of these factors may result in sound levels over 73 dB. In such cases operators may need to be provided with personal protective equipment. See 29 CFR (Code of Federal Regulations) 1910.95 Occupational Noise Exposure. For all other countries, follow your local regulations.

WARNING	
	**Shear Hazard** Moving parts can cause severe injury. Keep hands clear. **Figure 1.1** Shearing Point 

1.3.1 Electrical Shock Prevention

- Check cable connection between devices when installing. If not connected correctly, there will be risk of equipment damage and electrical shock
- Do not turn on the equipment when the cover is open. You will get electrical shock when the body touches device internal parts. And, there is risk of being pinched
- Make sure that the power supply is powered off when connecting or disconnecting the converter and the RF cable
- Connect the ground line to the M4 stud of the rear control cover. If not connected, high voltage will cause electrical shock

1.3.2 Installation/Adjustment

- Do not set up this equipment in the flammable atmosphere since that there is risk of explosion
- Unplug the power plug of the power supply when installing

1.3.3 Operation

- Do not place your hands below the horn. Increased pressure or ultrasonic oscillation may injure your hands. And do not touch the vibrating horn. There is danger of being burnt
- When welding, there may be vibration in the audio frequency. In this case, please wear ear defenders
- Avoid ultrasonic vibrating horn contacting with the metallic spacer and jigs. It may cause equipment damage.
- Do not press the test switch of the power supply, and do not start the cycle when the converter or the RF cable is not connected. High voltage is present in the case, when contacting with the body, it will cause electrical shock and equipment damage

1.3.4 Repair

- When the equipment break down, do not use it until repair and adjustment has been finished
- If convert the control circuit and wiring carelessly, malfunction will occur, the operator may get injured
- High voltage is present in the converter, and it may cause electrical shock. When repairing, Branson specified engineers are at your service
- Do not disassemble the equipment or do additional processing. Machine performance will be weakened. When somewhat conversion is necessary please contact your local Branson representative and service engineer

1.3.5 Intended Use of the System

The 20MA components are designed to be used as part of an ultrasonic welding system. These are designed for a wide variety of welding or processing applications.

If the equipment is used in a manner not specified by Branson, the protection provided by the equipment may be impaired.

Branson Ultrasonics Corporation designs and manufactures machines giving the first priority to safety precautions, to allow customers to use the machines safely and effectively. Only trained personnel should operate or service the equipment. Untrained operators can misuse the equipment or ignore safety instructions that can result in personal injury or equipment damage. It is essential that all operators and service personnel pay attention to safety instructions when operating and servicing the equipment.

1.3.6 Setting up the Workplace

Measures for setting up a workplace for safe operation of the ultrasonic welder are outlined in Chapter 4: Installation and Setup.

1.3.7 Regulatory Compliance

This product meets electrical safety requirements and EMC (Electromagnetic Compliance) requirements for North America and the European Union. This product meets RoHS2.

Chapter 2: Introduction

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2.1 Metal Welding System

The welding system consists of a power supply, a stand, and a converter-booster-horn stack. The system can perform ultrasonic welding. It is designed to perform automated, semi-automated and/or manual production operations.

2.1.1 Power Supply

The 2000Xct/2000Xdt power supply converts conventional 50/60 Hz line current to 20 kHz electrical energy. The power supply is equipped with all the necessary electronic controllers, and can be installed away from the actuator. This enables the operator to remotely adjust the actuator and related welding system, as well as tune and reprogram the welding cycle.

The 2000Xct/2000Xdt power supply is also equipped with a DC power supply that is used to control the actuator as well as the electrical components and control circuits inside the power supply.

2.1.2 Converter

The converter is mounted in the actuator as part of the ultrasonic stack. The electrical energy from the power supply is applied to the converter (sometimes called the transducer.) This transforms the 20 kHz electrical oscillations into mechanical vibrations at the same frequency as the electrical oscillations. The heart of the converter is made of piezoelectric ceramic elements. When subjected to an alternating voltage, these elements alternately expand and contract, resulting in better than 90% conversion of electrical to mechanical energy.

2.1.3 Booster

Success in ultrasonic assembly depends on the right amplitude of movement at the horn face. Amplitude is a function of horn shape, which is largely determined by the size and form of the parts to be assembled. The booster can be used as a mechanical transformer to increase or decrease the amplitude of vibrations applied to the parts through the horn.

The booster is a resonant half-wave section of aluminum or titanium. It is mounted between the converter and the horn, as part of the ultrasonic stack. It also provides a clamping point for rigid stack mounting.

The booster is designed to resonate at the same frequency as the converter with which it is used. It is usually mounted at a nodal (minimum vibration) point of axial motion. This minimizes the loss of energy and prevents vibrations from being transmitted into the actuator.

The actuator uses an AMTECH polar mount booster to maintain optimal pressure resistance against the horizontal load.

2.1.4 Horn

The horn is selected or designed for a specific application. Each horn is tuned typically as a half-wave section that applies the necessary force and vibration uniformly to the parts to be assembled. It transfers ultrasonic vibrations from the converter to the work piece. The horn is mounted to the booster as part of the ultrasonic stack.

Depending on their profile, horns are referred to as stepped, conical, exponential, bar, or catenoidal. The shape of the horn determines the amplitude at the face of the horn. Depending on the application, horns can be made from titanium alloys, aluminum, or iron. Titanium alloys are the best materials for horn fabrication due to their high level of strength and low loss. An iron horn is used for applications that require hardness and resistance to abrasion.

2.1.5 S-Beam Load Cell and Dynamic Follow Through

The load cell measures the force being applied to the part to measure the timing of triggering ultrasonics, and to measure welding pressure.

To maintain horn-to-part contact and force as the joint collapses, the load cell assembly provides dynamic follow-through. As the metal melts, the load cell assembly ensures smooth transmission of ultrasonic energy into the part.

2.1.6 Linear Encoder

The linear encoder measures the distance the horn has traveled. You can use the power supply to set up and monitor the encoder.

2.2 Overview of 20MA

The actuator is the compact, rigid unit used in the manual, semi-automated, or automated system. It is connected to the Branson 2000Xct/2000Xdt-series power supply.

The actuator is available in the following configurations:

- Actuator (pressure mechanism) mounted on the base. This is called the stand
- Standalone actuator removed from the base and is used in the automated system (20MA)

The actuator contains all the necessary air units. The air pressure sensor, the load cell (increased pressure sensor) and the linear encoder (position sensor) provide detailed information on operations.

You can use the power supply to monitor the actuator's settings. With the exception of the downspeed and air pressure, you can configure the actuator's settings from the power supply.

2.2.1 Carriage and Slide Mechanism

After steel carriage, booster and horn stack is assembled, dovetailed clamp is used to install the assembly onto the linear guide and it is activated by the air cylinder. This slide system ensures the accuracy of the horn position, smooth linear movement, and long-term reliability.

2.2.2 Nodal Support

The special resonant bolt secures the horn at a nodal point to minimize deflections from the horn and the booster, and ensure accuracy of welding.

2.2.3 Air Pressure Mechanism

The air pressure mechanism is installed in the actuator (pressure mechanism), and is composed of the solenoid valve, the air cylinder, the pressure gauge, and the pressure regulator. You can use the knob speed regulating valve on the front panel to control the horn downspeed, while the speed controller above the cylinder can be used to control the up-speed.

The actuator is equipped with an analog air pressure sensor, which is mounted on the board. This sensor monitors air pressure during operation. The pressure values are sent to the 2000Xct/2000Xdt power supply during monitoring and at the end of each welding cycle, and are displayed on the display.

2.2.4 Dynamic Trigger and Dynamic Follow Through

In many welding applications, pressure must be applied to the workpiece before triggering ultrasonics. For this reason, the actuator is equipped with a load cell (increased pressure sensor) that is located beneath the air cylinder. This cell monitors the pressure applied to the workpiece. To trigger ultrasonics, a predetermined pressure should be applied to the part.

The load cell uses the pressure values to:

- Determine the timing for triggering ultrasonics
- Create a graph of the pressure during operation as a function of time
- Determine the minimum and maximum pressure values

To ensure quality of welding, the dynamic follow through stabilizes the pressure placed on the workpiece being welded.

The dynamic trigger and the dynamic follow through are performed in the following manner:

When the welder receives the start signal, the solenoid valve in the actuator activates and supplies air to the upper part of the cylinder. This causes the horn to move down and make contact with the workpiece. Then, load cell values are read while pressure is applied to the workpiece. When the pressure value is equal to the value predetermined by the 2000Xct/2000Xdt power supply and the horn is positioned within the specified area (by the linear encoder as described in the next section), the signal is then sent to the power supply to trigger ultrasonics.

After metal welding starts, pressure applied to the workpiece is kept stable. This enables the repulsion of the spring in the dynamic trigger mechanism to maintain the smooth and effective transmission of ultrasonic energy.

NOTICE	
	The minimum stroke must be at least 11 mm.

2.2.5 Linear Encoder

The linear encoder measures the distance the horn has traveled. Depending on the power supply settings, it can:

- Allow for distance welding
- Detect improper setup controls
- Monitor the quality of the weld

CAUTION	
	You cannot use the unit if the upper limit switch (described in the next section) does not turn off at the end of the stroke. Even if you turn the switch on, starting the next cycle before the carriage (horn) returns to the home position may change the absolute value and affect welding.

2.2.6 Upper Limit Switch

The optical upper limit switch (ULS) tells the power supply that the carriage (horn) has returned to the home (ULS) position and is ready for the next operation cycle. The next cycle is then ready to start. This switch activates when the distance from the upper limit of the stroke to the carriage is 3.2 mm or less.

The upper limit switch position is the starting point for the linear encoder count. The counter is reset to zero when the upper limit switch turns on.

2.2.7 Cooling the Converter

Exposing the piezoelectric ceramic elements of the converter to temperatures exceeding 60°C (140°F) can affect the performance and reliability of the converter. Make sure that the ambient temperature of the converter front driver does not exceed 50°C (122°F) during operation.

WARNING	
	Before handling the converter or measuring the temperature, make sure that ultrasonics have been deactivated.

The converter has the male hose nipple to which the cooling air tube is connected. (The inner diameter of the air tube is 1/4 inch.)

To check if the converter is being operated near the maximum allowable temperature, perform one of the following procedures:

- Place the surface temperature probe on the front driver of the converter assembly. Wait until the temperature reading stabilizes. If the reading is above 48°C (120°F), the converter must be cooled.

To cool the converter, perform the following procedure:

1. Supply at least 50psi (340kPa) of clean dry air through the 0.060inch (inner diameter) orifice
2. Perform a welding operation
3. Immediately after you finish the welding operation, check the converter temperature
4. Continue to use a different orifice with a progressively wider diameter until the converter temperature is below 48°C (120°F)

Using 50 psi (340 kPa) of air for a 0.060 inch orifice, you can obtain a readout of 80 ft3/h (24.4 m3/h). This value is sufficient to cool the converter during most operations that require air flow.

2.2.8 Cooling the Horn

During a continuous welding operation or applications that are longer than the duty cycles, it may be necessary to cool the horn. During the welding cycle, this unit supplies the horn cooling air from the accordion nozzle located on the side. The cooling settings at the power supply allow you to change the air blow cycle. Closing the cock stops the air supply.

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3.1 20MA Configuration

Table 3.1 20MA Configuration

Feature	Description
Cylinder Diameter/ Stroke	ø100 50 mm (11-45 mm valid)
	ø80 50 mm (11-45 mm valid) - Optional
	ø60 50 mm (11-45 mm valid) - Optional
Horn Up/Down Speed	The speed is adjusted by using the speed controllers mounted in the front of the unit and above the cylinder.
Nodal Support	Hold the booster nodal tightly by clamp to make linkage between booster and cylinder to minimize the shake between the horn and the booster.
Filter Regulator	The filter removes dust and water. The regulator sets the welding pressure supplied to the cylinder. (This unit is equipped with a precision regulator.)
Pressure Sensor	Used to set the welding pressure and provides judgment basis for ultrasonic on/ off.
Solenoid Valve for Activating the Horn	The unit houses a solenoid valve for horn travel. This valve is controlled by the power supply.
Solenoid Valve for Cooling the Horn	The actuator houses the solenoid valve that cools the horn.
Lower Limit Stopper	The stopper adjusts the lower limit to which the horn travels.
Upper Limit Switch	The optical upper limit switch (ULS) tells the power supply that the horn has returned to the home position and is ready for the next operation cycle.
Linear Encoder	The encoder is the optical sensor that measures the distance the carriage has traveled.
Return Spring	This compression coil spring is used to return the carriage to the home position.

3.1.1 20MA Specifications

NOTICE	
	All specifications are subject to change without notice.

Table 3.2 20MA Specifications

Feature	Description
Horn Up/Down Speed	The speed is adjusted by using the speed controllers mounted in the front of the unit and above the cylinder.
Maximum Effective Pressure	3500 N - ø100 CYL
	2100 N - ø80 CYL
	1100 N - ø63 CYL
Factory Air	0.7 MPa clean dry air, 5 µm
Machine Parts	Copperless (excluding certain parts and the conducting material).
Power Supply	24 VDC is provided by the 2000Xct/2000Xdt power supply.

3.1.2 Environmental Specifications

Table 3.3 Environmental Specifications

Environmental Condition	Acceptable Range
Ambient Operating Temperature	+5°C to +50°C
	+41°F to +122°F
Storage / Shipping Temperature	-25°C to +55°C
	-13°F to +131°F
Operating Altitude	2000 m
	6561 ft
Humidity	30% to 95% non-condensing

3.1.3 Compatibility

Table 3.4 Compatibility

Power Supply	2000Xct/2000Xdt series (20 kHz) power supply
Converter	105 (connector type)
Booster	AMTECH polar mount booster

CAUTION	
	The converter must always be used with a compatible power supply. Failure to do so can result in electrical damage.

3.2 Physical Description

NOTICE	
	Dimensions are nominal.

Table 3.5 Dimensions and Weights of the 20MA Actuator

Width	Height	Depth	Weight
329 mm	750 mm	425 mm	90 kg
13 in	30 in	17 in	199 lb

For detailed dimensional information refer to section A.2 External View of 20MA.

3.3 Declaration of Conformity

Figure 3.1 Declaration of Conformity

EC DECLARATION OF CONFORMITY
According to the Machinery Directive 2006/42/EC, Annex II A
EMC Directive 2014/30/EU

We, the manufacturer
BRANSON Ultrasonics (Shanghai) Co., Ltd.
2nd Floor, Building No. 5
No 758, East Rong Le Road,
Song Jiang Industrial Zone, Shanghai, PRC, 201613

declare under our sole responsibility, that following Metal Welding Systems consisting of:

1. Actuator: 20DP; Ultrasonic Power Supply (incl. controller): 2000Xdt 20kHz, 4.0kW; Converter: 932R
2. Actuator: 20DP; Controller: 2000Xct HP 20:5,5 (20kHz; 5,5kW); Converter: 20kHz 5.5kW
3. Actuator: 20MA; Ultrasonic Power Supply (incl. controller): 2000Xdt 20kHz, 4.0kW; Converter: 932R
4. Actuator: 20MA; Controller: 2000Xct HP 20:5,5 (20kHz; 5,5kW); Converter: 20kHz 5.5kW

to which this declaration relates is in conformity with the following European Directives:
2006/42/EC, Machinery Directive
2014/30/EC, EMC Directive
2011/65/EU, ROHS

The safety objectives set out in the Low Voltage Directive 2014/35/EC were kept in accordance Annex 1 No. 1.5.1 of the Machinery Directive 2006/42/EC.

The described systems are in conformity with the following standards:
EN ISO 12100:2010, EN 60204-1:2018, EN ISO 13849-1:2015, EN ISO 13849-2:2012, EN 13850:2015, EN ISO 13851: 2019, EN ISO 13855:2010, EN 55011:2016 + A1, EN 61000-6-2:2005, EN IEC 61000-6-2:2019

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3.4 Declaration of Incorporation

Figure 3.2 Declaration of Incorporation

DECLARATION OF INCORPORATION OF PARTLY COMPLETED MACHINERY
According to the Machinery Directive 2006/42/EC, Annex II B

We, the manufacturer
BRANSON Ultrasonics (Shanghai) Co., Ltd.
2nd Floor, Building No. 5
No 758, East Rong Le Road,
Song Jiang Industrial Zone, Shanghai, PRC, 201613

declare under our sole responsibility, that all relevant essential requirements of the **2006/42/EC Machinery Directive** are applied on the partly completed machinery identified in this document, except following: *Protective devices.* It is supposed that safety and emergency interlock will be provided by the superior system in which the system identified in this document is to be integrated.

Partly completed machinery, Metal Welding Systems consisting of:
1. Actuator: 20DP; Ultrasonic Power Supply (incl. controller): 2000Xdt 20kHz, 4.0kW; Converter: 932R
2. Actuator: 20DP; Controller: 2000Xct HP 20:5,5 (20kHz; 5,5kW); Converter: 20kHz 5.5kW
3. Actuator: 20MA; Ultrasonic Power Supply (incl. controller): 2000Xdt 20kHz, 4.0kW; Converter: 932R
4. Actuator: 20MA; Controller: 2000Xct HP 20:5,5 (20kHz; 5,5kW); Converter: 20kHz 5.5kW

The safety objectives set out in the Low Voltage Directive 2014/35/EC were kept in accordance Annex 1 No. 1.5.1 of the Machinery Directive 2006/42/EC.

In addition, described systems are in conformity with the following European Directives:
2011/65/EU, ROHS

The described systems are in conformity with the following standards:
EN ISO 12100:2010, EN 60204-1:2018, EN ISO 13849-1:2015, EN ISO 13849-2:2012, EN 55011:2016 + A1, EN 61000-6-2:2005.

Relevant technical documentation is compiled in accordance with part B of Annex VII of Directive 2006/42/EC on Machinery.

We are committing to present any information relevant to health and safety and, in particular, the relevant technical documentation, in response to a duly reasoned request from the market surveillance authorities of one of the Member States.

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of Directive 2006/42/EC on Machinery, where appropriate, and until the EC Declaration of Conformity according to Annex II A is issued.

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Chapter 4: Installation and Setup

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4.1 Handling and Unpacking

20MA actuator units are carefully checked and packed before dispatch. It is recommended, however, that you follow the inspection procedure below after delivery.

Table 4.1 Handling and Unpacking

Step	Instructions
1	Check the equipment immediately after delivery to ensure that they have not been damaged during transport.
2	Verify that all parts are complete according to the delivery note.
3	Determine if any component has become loose during shipping and, if necessary, tighten screws.

NOTICE	
	If the goods delivered have been damaged during shipping, please contact the forwarding agent immediately. Retain packing material (for possible inspection or for sending back the unit).

CAUTION	
	The actuator and the controller are heavy. Handling, unpacking, and installation might require assistance of a colleague or the use of a lifting device.

4.2 Installation Requirements

1. Install the actuator away from air conditioners and heat vents.
2. The actuator should be installed in the following environment:

Table 4.2 Environmental Specifications

Environmental Condition	Acceptable Range
Ambient Operating Temperature	+5°C to +50°C
	+41°F to +122°F
Storage / Shipping Temperature	-25°C to +55°C
	-13°F to +131°F
Operating Altitude	2000 m
	6561 ft
Humidity	30% to 95% non-condensing

4.3 Installation Steps

The actuator is fixed to the aluminum frame for transportation. Take out the lock bolt, move the actuator to the installation location, and then mount it on the rigid base. Tighten the four screws at the bottom (M10 bolts).

CAUTION	
	The 20MA actuator is heavy and can cause a pinching or crushing injury during installation or adjustment. Keep clear of moving parts and do not loosen clamp unless directed to do so. Handling, unpacking, and installation can require help or the use of lifting platforms or hoists. Use the lifting points to interface with lifting equipment.

Figure 4.1 Lifting Points

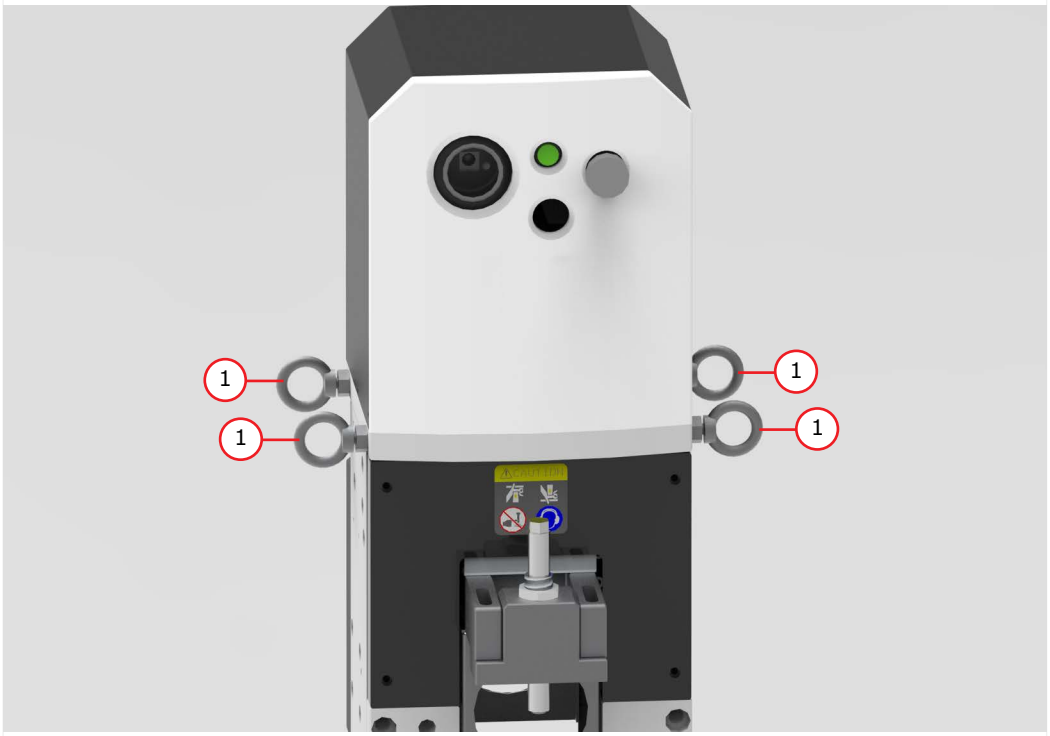


Table 4.3 Lifting Points Location

Item	Description
1	Lifting Point

CAUTION	
	Do not mount the actuator on an unstable workbench or other insecure location. Failure to do so may cause the actuator to fall or move unexpectedly.

1. Verify that there is no interference among the devices.
2. The actuator is equipped with the coupler 20PM plug that is connected to the air supply source. Insert the plug into the socket.

4.4 Electrical Connection

Two cables connect the power supply and the actuator: the actuator interface cable, and the RF cable. If the system is to be automated, you may also need a J911 start cable and a user I/O cable. Check your invoice for details on the cable types and lengths.

Table 4.4 Electrical Connection

Step	Instructions
1	Use the J925 interface cable to connect the 37-pin D-Sub connector on the actuator rear panel and the 37-pin D-Sub connector located at the rear of the power supply.
2	Use the J931 RF cable to connect the 3-pin RF connector for the converter and the 3-pin connector located at the rear of the power supply.
3	Connect the start cable from the base to the 9-pin D-Sub connector on the rear panel of the actuator.
4	If the base is not to be used because the system is automated, connect the J911 start cable that runs from the start/emergency stop circuit. In addition, connect the J957 user I/O cable to your control circuit. If the actuator is to be connected to the automated system, make sure to contact a Branson engineer.
5	Tighten the screws securely.

Details about the ports in the rear of the actuator is as below.

Figure 4.2 Ports in the rear of the actuator

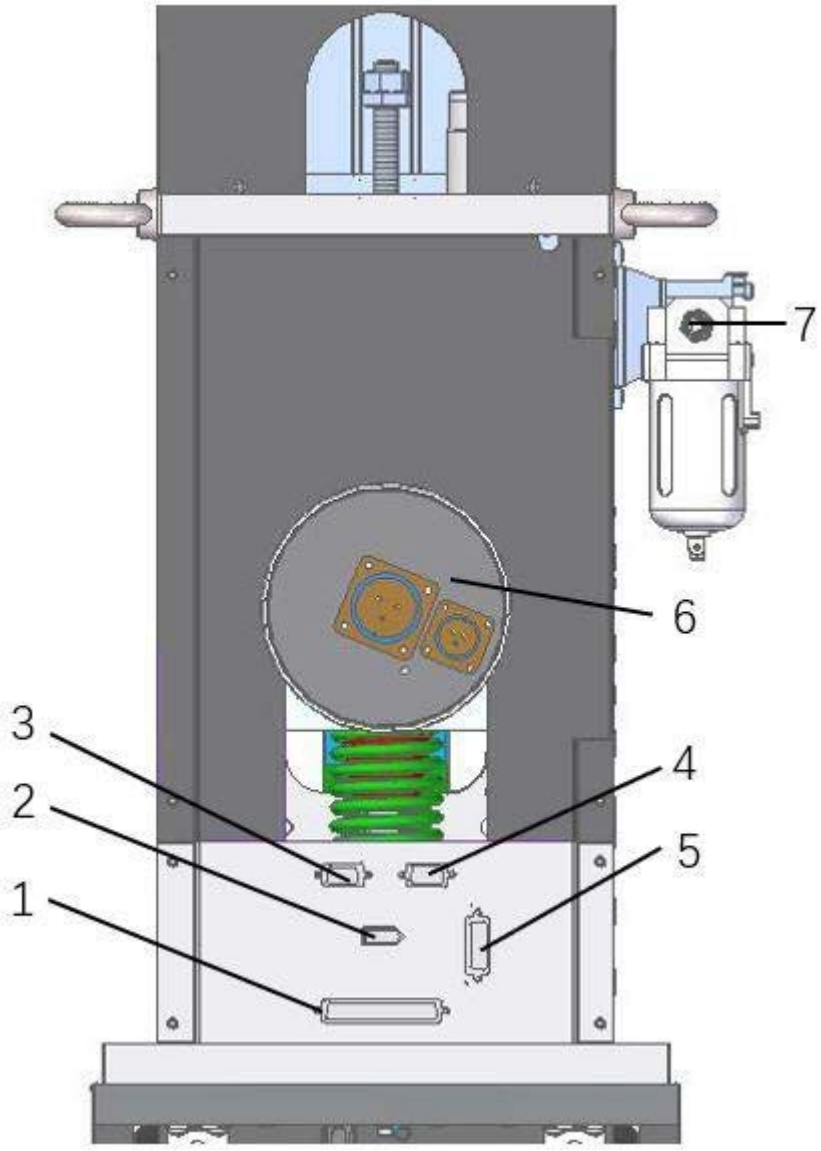
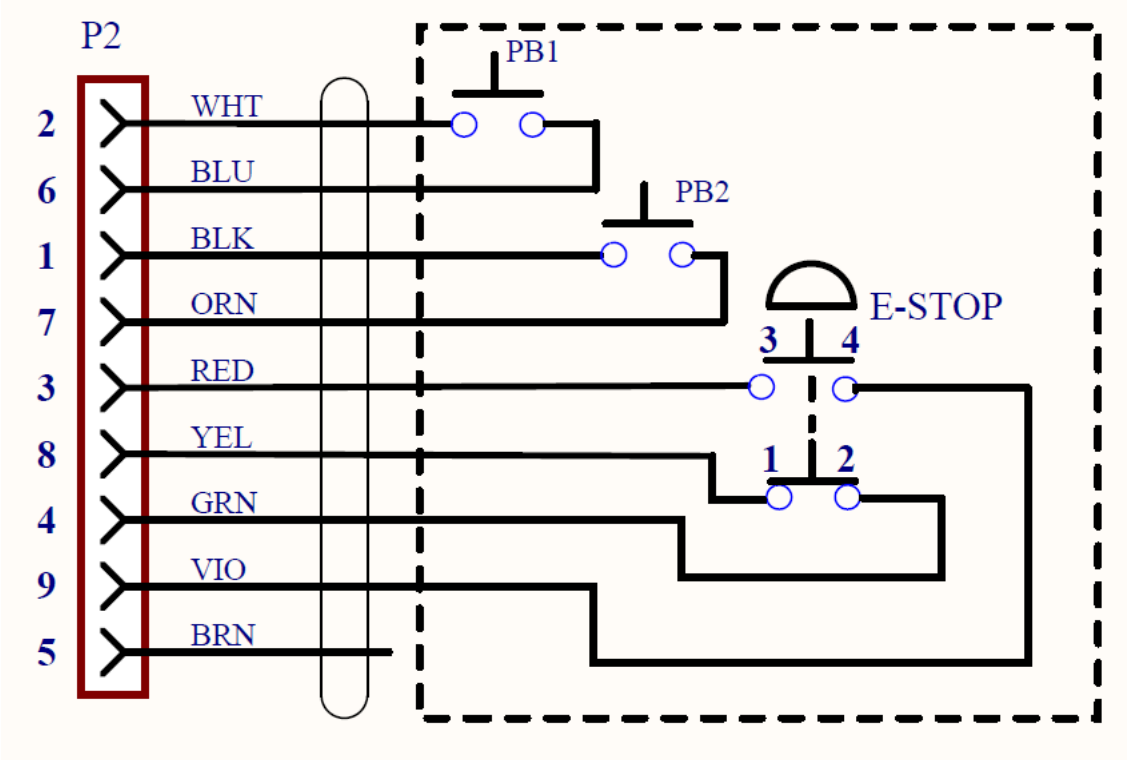


Table 4.5 Ports in the rear of the actuator

Item	Description	Item	Description
1	Actuator Interface Port	5	Remote Pneumatics Port
2	GDS Port	6	RF and Cooling Fan Port
3	Palm Button Start and Emergency Stop Ports	7	Air Inlet Port
4	Linear Encoder Port		

4.4.1 Palm Button Start and Emergency Stop Connection

Figure 4.3 Palm button start and emergency stop connection



4.5 Air Connection

The air supply must be clean (to a 5 micron level), dry and unlubricated air with a regulated maximum pressure of 0.7 MPa.

CAUTION	
	The air supply must not exceed 0.7 MPa. Otherwise, damage to the devices may occur. Set the pressure gauge to zero before connecting/disconnecting air supply.

Supply the factory air to the actuator. Start from zero, and gradually raise the air supply pressure.

NOTICE	
	The air supply switch with LOTO function should be supplied by customer. The actuator should be locked off when the 20MA welder system stopped.

This clean actuator is equipped with a central exhaust port for air connection. The air filter exhaust port is screwed into place. If needed, you can connect the port.

CAUTION	
	Properly connect each port appropriately. Failure to do so may cause the actuator to operate abnormally.

4.6 Manual System Connection

The two-hand start switch is required to manually operate the actuator. If the start/ emergency stop circuit is used, connect the start cable from the circuit to the start connector of the actuator.

WARNING	
	If the start/emergency stop circuit is used, refer to the OSHA requirements and specify start positions that will ensure safe operation and prevent accidental startup. Make sure there is sufficient space between the two start buttons so that the operator must simultaneously press and hold the buttons down with his/her hands until the horn makes contact with the workpiece. The emergency stop button must be conveniently located so that the operator can press the button whenever necessary.

4.7 Automated System Connection

Refer to the power supply instruction manual for details on the automated system connection.

WARNING	
	Please review the following precautions before installing and operating the actuator. 1. Keep hands out from under the horn. Do not touch or look inside the horn when it is vibrating. Down force (pressure) and ultrasonic vibrations can cause injury 2. Some large plastic parts vibrate at an audible frequency during welding. To prevent injury, take soundproofing measures and other precautions 3. Make sure that the vibrating horn is not in contact with the metal base or the fixture. It may cause equipment damage 4. Do not push the test switch of the power supply and do not start the cycle when the converter and the RF cable is not connected. There is high voltage in the case, when touch the body, electrical shock and equipment damage will be caused

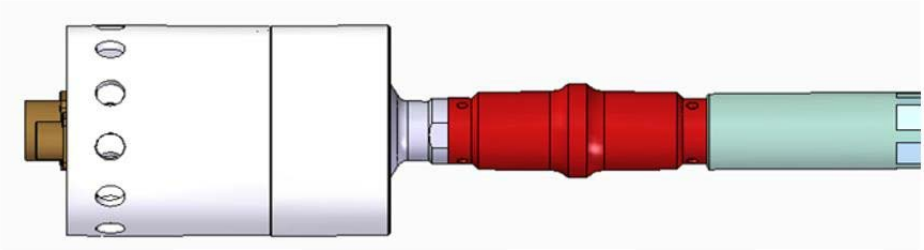
Chapter 5: Operation

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5.1 Installing the Ultrasonic Stack

Connect converter and boosters sequentially as shown in the figure below by a wrench spanner. Specific torques are required between each connection. Torque between converter and booster is 74.6N·m and torque between booster and horn is 108.5N·m.

Figure 5.1 Ultrasonic Stack



5.2 Installing and Testing the Horn

Table 5.1 Installing and Testing the Horn

Step	Instructions
1	Make sure the power supply is turned off. Mark the position where the resonance bolt against the horn with a marker pen. This position is called “node” (if you cannot determine the node, please consult our sales engineer).
2	Loosen the bolts holding the converter carriage and the resonant bolts fixing nut.
3	Adjust the ultrasonic stack to make the front of the horn keep the same the forward and backward direction of the part. Confirm the horn and tight the fixing bolts with a hex wrench.
4	Loosen the bracket mounted on the top of the converter which is used to install the resonance bolt.
5	Adjust the location of the bracket so that the position of the resonance bolt is same as the marked position, and then re-fix the bracket. The distance between the resonant bolt and the mark shall between 1 and 1.5 mm. Adjust the position of the fixture if necessary.
6	Screw in the resonant bolt until the front end is in contact with the horn. If the resonant bolt is not parallel to the horn, loosen the carriage and rotate the stack until the resonant bolt is parallel to the horn, then secured the carriage reliably again.
7	After the resonance bolt is in contact with the horn, continue to tighten it about 30 degrees (about 0.1mm in depth).
8	Adjust the position of the fixture to make the front of the horn same as the right and left direction of the part. Secured the fixture again.
9	Connect each circuit, pneumatic circuit, ultrasonic stack and TEST the power loss of the horn after starting up. There is a TEST key on the 2000Xct/2000xd power box. Click the button to check the power loss. Power less than 300 W is considered normal, and frequency between 19850 kHz and 20050 kHz is considered normal. If the power is too high or the frequency is too high, please check the assembly type of the stack.

5.3 Adjusting the Air Pressure and Cylinder Speed

The pressure of the air supplied to the cylinder increases when the regulator is turned clockwise, and the value is read in the pressure gauge. When adjusting the regulator, always start with an air pressure that is lower than the desired setting, and then gradually raise the pressure. When you use the regulator to lower the air pressure, the supply pressure readout may not be correct. This is because the pressure gauge is affected by the additional pressure in the cylinder.

The horn downspeed increases when you turn the speed control on front panel of the unit counterclockwise; the horn stops when you turn the controller clockwise to the limit. Changing the air pressure also changes the downspeed. Make sure to adjust the downspeed after you finish setting the air pressure. And make sure to adjust the decreasing speed (downspeed) after you adjusting the increasing speed (upspeed).

5.4 Operation Preparation

Actuator is controlled by the 2000Xct/2000Xdt power supply. Actuator sends the cycle data of velocity, pressure etc. and alarm information to the power supply, based on the data and information, power supply decides start/stop time of welding and sends operation parameters to the actuator.

In actuator, we can only set air pressure, velocity and mechanical stop. For other settings, please use power supply.

The equipment is operational when the following three connections are finished: cable connection between actuator and power supply (in case of automatic system, including start and I/O connection), air supply connection, power connection to power supply. Perform welding setup as the following procedure.

Table 5.2 Operation Preparation

Step	Instructions
1	Adjust the regulator handle of actuator until air pressure equals the setting pressure. (Confirm the air gauge)
2	Turn on the power switch of power supply, the power light indicating that actuator is powered on lights up. And the main menu is displayed in the power supply display.
3	Select the horn down switch on the main menu. It comes to be able to drive the actuator. Press the start switch (input start signal), horn moves down. When want horn up, press the rising switch on the display. Adjust the mechanical stop (4.2) and down speed by repeating this operation. (Down speed is displayed on the display.) And the system pressure (setting pressure) can be confirmed on the display, when advanced setting is necessary, adjust by operating the regulator
4	Set various welding parameters when all above settings are finished. Then start welding.

For advanced setting of power supply, welding result and all other navigations, please refer to power supply instruction manual.

WARNING	
	Do not place your hands below the horn. And do not touch or look into the vibrating horn. Increased pressure or ultrasonic oscillation may injure you.

WARNING	
	Avoid the ultrasonic vibrating horn contacting with metallic spacer and jigs. It may cause equipment damage.

WARNING	
	When the system is running, only one person can operate it.

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Chapter 6: Maintenance

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6.1 General Maintenance Considerations

NOTICE	
	There are no customer replaceable components inside the system. Have all servicing done by a qualified Branson technician.

NOTICE	
	When performing maintenance on the welder, make sure that no other automated systems are active.

WARNING	
	Use LOTO (Lock Out Tag Out) lockable plug cover over line cord plug during any maintenance.

6.2 Periodically Clean the Equipment

6.2.1 External Covers

External covers may be cleaned with a damp sponge or cloth using a solution of mild soap and water. Do not allow cleaning solution to enter the unit.

To prevent rust in areas of high humidity, exposed steel surfaces, may require a very light film of rust preventing oil.

6.3 Calibration

The actuator does not normally require a regularly scheduled full system calibration. However, if you significantly change the welding conditions or you need to recalibrate the actuator because of a calibration error, make sure to contact your Branson representative before performing recalibration. Regularly obtain information to check whether the oscillation version has been upgraded.

6.4 Periodic and Preventive Maintenance

The following preventive measures will help ensure long term operation of your Branson Actuators.

6.4.1 Periodically Clean the Equipment

Periodically disconnect the unit from power, remove the cover and vacuum out any accumulated dust and debris. Remove material adhering to the circuit boards, cooling intake vents and exhaust ports. Periodically disconnect the airline from the air supply, open the air filter and clean the element and bowl with mild soap and water. External covers may be cleaned with a damp sponge or cloth using a solution of mild soap and water. Do not allow cleaning solution to enter the unit. Exposed steel surfaces, such as handles, hardware and the main column may require a very light film of oil, such as WD-40, to prevent rust in areas of high humidity.

6.4.2 Recondition the Stack (converter, booster, and horn)

Stack components function with greatest efficiency when the mating interface surfaces are in proper condition. For 15kHz, 20kHz and 30kHz products, a Branson Mylar washer should be installed between the horn and the booster, and booster and converter. Replace the washer if torn or perforated. We recommend that stacks using Mylar washers be inspected every three months.

Stacks used with silicone grease, as with certain 20 kHz installations and with all 40 kHz products, should be periodically reconditioned to eliminate fretting corrosion. We recommend that a stack using silicone grease be inspected every two weeks for corrosion. The inspection interval can then be adjusted longer or shorter as required, when experience is gained for specific stacks. See the Branson instruction manuals for correct stack interface reconditioning procedures.

NOTICE	
	The operating efficiency of the equipment will be greatly affected if the mating interfaces of the converter, booster, and horn are not flat, make poor contact with each other, or become corroded. A poor contact condition wastes power and makes tuning difficult. It may also affect the noise level and damage the converter.

To recondition the interfaces:

1. Remove the stack from the actuator.
2. Disassemble the converter, booster, and horn stack. Observe the following rules:
3. In the event that you must disassemble a Stack, always use the correct spanner wrench and a suitable soft-faced vise to remove a horn or booster, and reverse the procedures described earlier in this Section.

CAUTION	
	NEVER attempt to remove a horn or booster by holding the converter housing or booster clamp ring in a vise.

NOTICE	
	Use a soft-jawed vise (brass or aluminum) to remove square or rectangular horns, or horns otherwise unremovable.

4. Wipe the interfaces with a clean cloth or paper towel.
5. Examine all interfaces. If any interface is corroded or shows a dark, hard deposit, it should be reconditioned.
6. If the interfaces appear to be in good condition, go to step 13.
7. If necessary, remove the coupling studs.
8. Tape a clean sheet of #400 grit (or finer) emery cloth to a clean, smooth flat surface. A piece of glass is suitable.
9. Hold the part to be conditioned at its lower end and carefully stroke it in one direction across the emery cloth. Do not press down. the weight of the component provides enough pressure.
10. Perform a second stroke. Rotate the part 1/3 around and stroke it twice across the cloth.

NOTICE	
	Use no more than two strokes in one position. Use the same number of strokes at each location.

11. Turn the part the remaining 1/3 and repeat.
12. Re-examine the interface and repeat steps 8, 9, and 10 until the surface appears clean and smooth. This should not take more than 2 or 3 complete rotations of the part being reconditioned.
13. Clean the threaded hole, using a clean cloth or paper towel.
14. Replace the stud with a new one if removed. Torque the 3/8-24 studs to 290 inch pounds (32.77 Nm). Torque 1/2-20 studs to 450 inch pounds (50.84 Nm).Torque M8x1-1/4 studs to 70 inch pounds (7.9 Nm).

NOTICE	
	The use of a Branson torque wrench or the equivalent is recommended. P/N 101-063-787 for 20kHz systems and 101-063-618 for 40kHz systems.

CAUTION	
	Failure to follow torque specifications may cause the stud to loosen or break, and the system to overload. The use of a Branson torque wrench or equivalent is required.

15. Reassemble the stack and install it in the actuator.

6.4.3 Routine Component Replacement

The lifetime of certain parts is based on the number of cycles the unit has completed, or on hours of operation. Table 6.1 lists the average number of hours or cycles one should use in determining when components should be replaced. Ambient operating temperature also affects lifetime. Higher temperatures reduce the number of cycles and hours before replacement is suggested. The charts below are for equipment operating at a temperature of 72 to 75°F (22 - 24° C).

The lifetime of system pneumatic components is influenced by the quality of the compressed air provided. All Branson systems require clean, dry, (normal) factory compressed air. When oil or moisture is present in the compressed air, the lifetime of the pneumatic components will be reduced. This table lists pneumatic parts with an average factory compressed air condition.

Table 6.1 Component Replacements Based on Cycles Run

Interval	Component Replacements
At 10 Million Cycles	Air Cylinder
	Hydraulic snubber
At 20 Million Cycles	Base Palm Buttons
At 40 Million Cycles	Solenoid Valves
	Pressure Regulator
	Air Filter
	Cooling Valve
	S-Beam Load Cell Assembly
	Encoder Assembly
	Linear Bearing (2" stroke or greater)

For Reference Purposes:

1. A system operating at 60 welds per minute, 8 hours per day, 5 days per week, 50 weeks per year completes approximately 7.2 million cycles in 2000 hours.
2. The same system at 24 hours per day, 5 days per week, in 50 weeks completes 21.6 million cycles in 6000 hours.
3. 24 hours per day, 365 days per year produces 31.5 million cycles in 8760 hours.

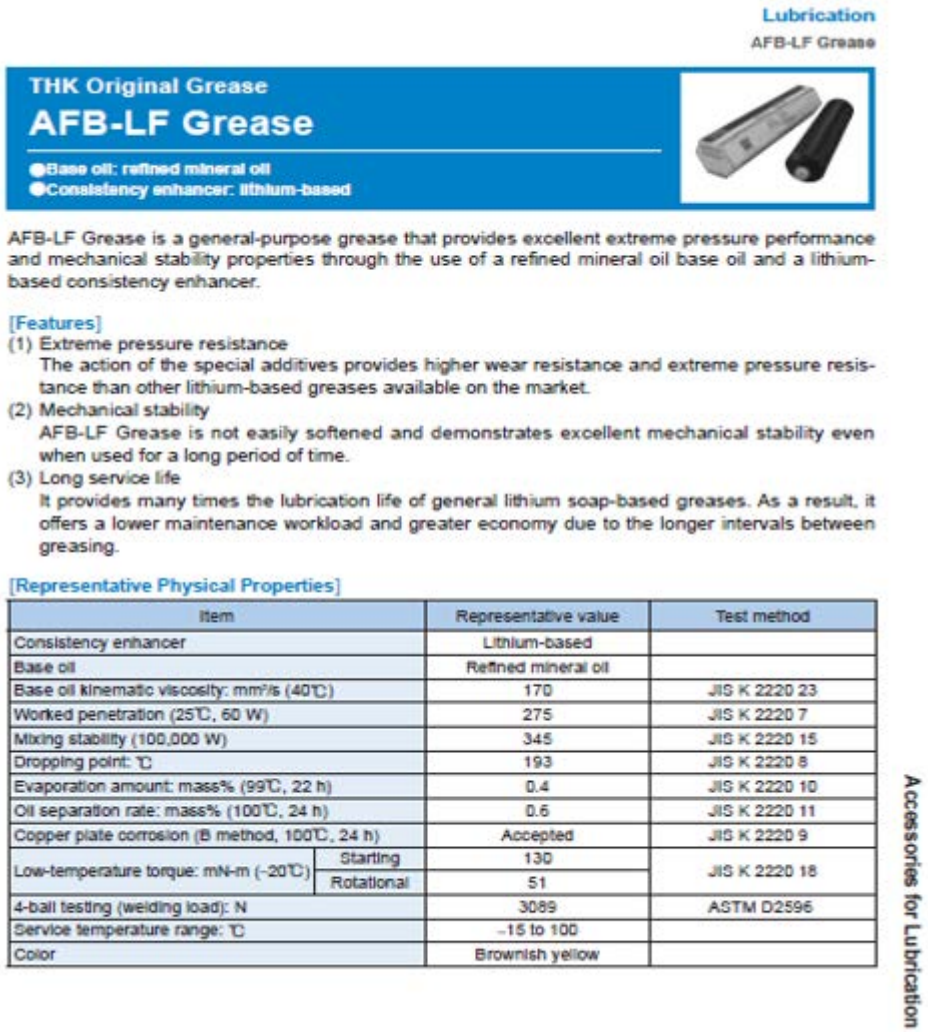
Please note that parts replaced during preventive maintenance constitute normal wear and tear. They are not covered by warranty.

6.5 Lubrication

Table 6.2 Lubrication Plan

Product	GMX-20MA
EDP-Linear Guide	890-053-121
Grease Nipple	B-M6F
Grease Gun	MG70+TYPE H
Lubricate type	AFB-LF Grease-THK or equivalent
Dosage	2~4g/Block
Method of Lubrication	Manual fat-feeding
Maintenance Interval	Add grease based on every 100KM

Figure 6.1 AFB-LF Grease



Lubrication
AFB-LF Grease

THK Original Grease
AFB-LF Grease

●Base oil: refined mineral oil
●Consistency enhancer: lithium-based

AFB-LF Grease is a general-purpose grease that provides excellent extreme pressure performance and mechanical stability properties through the use of a refined mineral oil base oil and a lithium-based consistency enhancer.

[Features]

(1) Extreme pressure resistance
The action of the special additives provides higher wear resistance and extreme pressure resistance than other lithium-based greases available on the market.

(2) Mechanical stability
AFB-LF Grease is not easily softened and demonstrates excellent mechanical stability even when used for a long period of time.

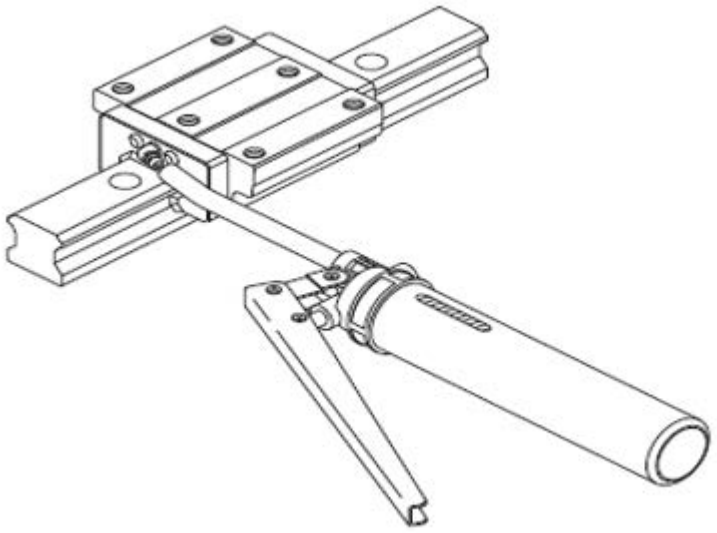
(3) Long service life
It provides many times the lubrication life of general lithium soap-based greases. As a result, it offers a lower maintenance workload and greater economy due to the longer intervals between greasing.

[Representative Physical Properties]

Item		Representative value	Test method
Consistency enhancer		Lithium-based	
Base oil		Refined mineral oil	
Base oil kinematic viscosity: mm²/s (40℃)		170	JIS K 2220 23
Worked penetration (25℃, 60 W)		275	JIS K 2220 7
Mixing stability (100,000 W)		345	JIS K 2220 15
Dropping point: ℃		193	JIS K 2220 8
Evaporation amount: mass% (99℃, 22 h)		0.4	JIS K 2220 10
Oil separation rate: mass% (100℃, 24 h)		0.6	JIS K 2220 11
Copper plate corrosion (B method, 100℃, 24 h)		Accepted	JIS K 2220 9
Low-temperature torque: mN-m (-20℃)	Starting	130	JIS K 2220 18
	Rotational	51	
4-ball testing (welding load): N		3089	ASTM D2596
Service temperature range: ℃		-15 to 100	
Color		Brownish yellow	

Accessories for Lubrication

Figure 6.2 Grease Gun



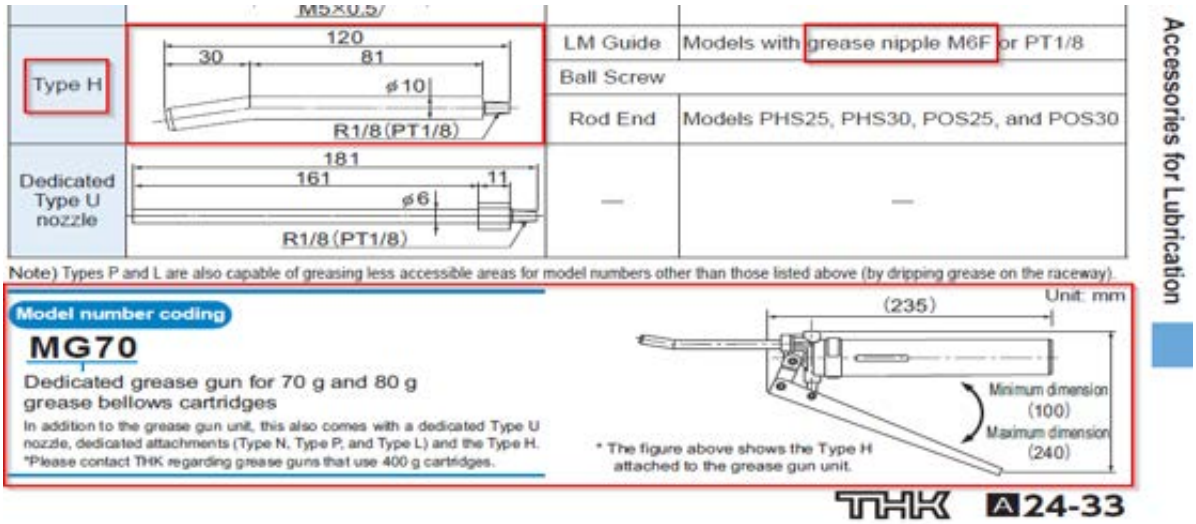


Figure 6.3 AFB-LF SDS

SAFETY DATA SHEET

1. Identification

Product identifier	**AFB-LF GREASE**
Other means of identification	
SDS number	1030-T20483-1
Product code	AFB-LF+70, AFB-LF+400
Recommended use	Industrial lubricating grease (Package size 70gr and 400gr)
Recommended restrictions	None known.
Manufacturer/Importer/Supplier/Distributor information	
	THK Co.,LTD
	HEAD OFFICE: 2-12-10, Shibaura, Minato-ku, Tokyo 108-8506 Japan
	THK America, Inc.: 200 E. Commerce Drive, Schaumburg, IL 60173, U.S.A.
	Telephone: (847) 310-1111 (THK America) between the hours of 8 am - 5 pm
	Emergency telephone: (847) 310-1111 (THK America) between the hours of 8 am - 5 pm
	E-mail: chicago@thk.com, thk022@thk.co.jp

2. Hazard(s) identification

Physical hazards	Not classified.	
Health hazards	Serious eye damage/eye irritation	Category 1
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 3
	Hazardous to the aquatic environment, long-term hazard	Category 3
OSHA defined hazards	Not classified.	
Label elements		



Signal word	Danger
Hazard statement	Causes serious eye damage. Harmful to aquatic life with long lasting effects.
Precautionary statement	
Prevention	Wear eye/face protection. Avoid release to the environment.
Response	If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center/doctor.
Storage	Store away from incompatible materials.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	Not classified.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Distillates (petroleum), solvent-dewaxed heavy paraffinic	Proprietary	10 - 30

Distillates (petroleum), hydrotreated heavy naphthenic	Proprietary	10 - 20
Distillates (petroleum), solvent-refined heavy naphthenic	Proprietary	10 - 20
Residual oils (petroleum), solvent-refined	Proprietary	10 - 20
Phosphorodithioic acid, O,O-di-C1-14-alkyl esters, zinc salts	Proprietary	3.2 - 4.0
Amines, C12-14-alkyl, reaction products with hexanol, phosphorus oxide (P2O5), phosphorus sulfide (P2S5) and propylene oxide	Proprietary	0.1 - 1.0

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

Composition comments * All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Inhalation Move affected person into fresh air and keep warm. If breathing is difficult, give oxygen. Get medical attention if any discomfort continues.

Skin contact Remove contaminated clothing. Wash with soap and water. Get medical attention if irritation develops and persists.

Eye contact Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention promptly if symptoms occur after washing.

Ingestion Immediately rinse mouth and drink plenty of water. Never give anything by mouth to an unconscious person. Get medical attention if any discomfort continues.

Most important symptoms/effects, acute and delayed Severe eye irritation.

Indication of immediate medical attention and special treatment needed Treat symptomatically. The effects might be delayed.

General information First aid personnel must be aware of own risk during rescue.

5. Fire-fighting measures

Suitable extinguishing media Extinguish with foam, carbon dioxide or dry powder.

Unsuitable extinguishing media Do not use water or halogenated extinguishing media.

Specific hazards arising from the chemical Thermal decomposition may produce smoke, oxides of carbon and lower molecular weight organic compounds whose composition have not been characterized.

Special protective equipment and precautions for firefighters Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus, operated in positive pressure mode and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions Use standard firefighting procedures and consider the hazards of other involved materials. Containers close to fire should be removed or cooled with water.

General fire hazards The product is not flammable.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Avoid contact with skin and eyes. Wear suitable protective clothing, gloves and eye/face protection. In case of spills, beware of slippery floors and surfaces. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up Absorb spillage with non-combustible, absorbent material. Clean contaminated area with oil-removing material.

Environmental precautions Do not contaminate water. Contact local authorities in case of spillage to drain/aquatic environment.

7. Handling and storage

Precautions for safe handling Avoid contact with skin and eyes. Always remove grease with soap and water or skin cleaning agent, never use organic solvents. Wear appropriate personal protective equipment. Be aware of potential for surfaces to become slippery. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities Keep container in a well-ventilated place. Store away from incompatible materials.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value	Form
Distillates (petroleum), hydrotreated heavy naphthenic	PEL	5 mg/m3	Mist.
Distillates (petroleum), solvent-dewaxed heavy paraffinic	PEL	5 mg/m3	Mist.
Distillates (petroleum), solvent-refined heavy naphthenic	PEL	5 mg/m3	Mist.
Residual oils (petroleum), solvent-refined	PEL	5 mg/m3	Mist.

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Distillates (petroleum), hydrotreated heavy naphthenic	TWA	5 mg/m3	Inhalable fraction.
Distillates (petroleum), solvent-dewaxed heavy paraffinic	TWA	5 mg/m3	Inhalable fraction.
Distillates (petroleum), solvent-refined heavy naphthenic	TWA	5 mg/m3	Inhalable fraction.
Residual oils (petroleum), solvent-refined	TWA	5 mg/m3	Inhalable fraction.

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value	Form
Distillates (petroleum), hydrotreated heavy naphthenic	Ceiling	1800 mg/m3	
	STEL	10 mg/m3	Mist.
	TWA	5 mg/m3	Mist.
Distillates (petroleum), solvent-dewaxed heavy paraffinic	Ceiling	1800 mg/m3	
	STEL	10 mg/m3	Mist.
	TWA	5 mg/m3	Mist.
Distillates (petroleum), solvent-refined heavy naphthenic	Ceiling	1800 mg/m3	
	STEL	10 mg/m3	Mist.
	TWA	5 mg/m3	Mist.
Residual oils (petroleum), solvent-refined	STEL	10 mg/m3	Mist.
	TWA	5 mg/m3	Mist.

Biological limit values No biological exposure limits noted for the ingredient(s).

Exposure guidelines No exposure standards allocated.

Appropriate engineering controls	Provide adequate ventilation and minimize the risk of inhalation of vapors and oil mist. Provide access to washing facilities including soap, skin cleanser and fatty cream.
Individual protection measures, such as personal protective equipment	
Eye/face protection	Wear approved safety goggles.
Skin protection	
Hand protection	Wear protective gloves. Nitrile gloves are recommended, but be aware that the liquid may penetrate the gloves. Frequent change is advisable. Suitable gloves can be recommended by the glove supplier.
Skin protection	
Other	Wear appropriate clothing to prevent repeated or prolonged skin contact.
Respiratory protection	In case of inadequate ventilation or risk of inhalation of oil mist, suitable respiratory equipment with particulate filter and organic vapor cartridges can be used. If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Use a NIOSH/MSHA approved air purifying respirator as needed to control exposure. Consult with respirator manufacturer to determine respirator selection, use, and limitations. Use positive pressure, air-supplied respirator for uncontrolled releases or when air purifying respirator limitations may be exceeded. Follow respirator protection program requirements (OSHA 1910.134 and ANSI Z88.2) for all respirator use.
Thermal hazards	When material is heated, wear gloves to protect against thermal burns.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Buttery.
Physical state	Solid.
Form	Buttery.
Color	Tan.
Odor	Mild.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	Not available.
Initial boiling point and boiling range	Not available.
Flash point	370.4 °F (188.0 °C) Setaflash Closed Cup (ISO 3679)
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Relative density	0.9 g/cm3
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.

Chemical stability	Stable at normal conditions.
Possibility of hazardous reactions	Will not occur.
Conditions to avoid	Heat, sparks, flames, elevated temperatures.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	Carbon oxides. Sulfur oxides. Phosphorus oxides. Formaldehyde. PAH (polycyclic aromatic hydrocarbons).

11. Toxicological information

Information on likely routes of exposure

Inhalation	Inhalation of oil mist or vapors formed during heating of the product will irritate the respiratory system and provoke coughing.
Skin contact	May cause skin irritation.
Eye contact	Prolonged contact causes serious eye and tissue damage.
Ingestion	Ingestion may cause irritation and malaise.
Symptoms related to the physical, chemical and toxicological characteristics	Extreme irritation of eyes and mucous membranes, including burning and tearing.

Information on toxicological effects

Acute toxicity	The harmful effects may increase when exposed to used grease. Ingestion may cause irritation and malaise.
Skin corrosion/irritation	Causes mild skin irritation.
Serious eye damage/eye irritation	Causes serious eye damage.
Respiratory or skin sensitization	
Respiratory sensitization	None known.
Skin sensitization	None known.
Germ cell mutagenicity	None known.
Carcinogenicity	Prolonged and repeated contact with used grease may cause serious skin diseases, such as dermatitis and skin cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

NTP Report on Carcinogens

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

Reproductive toxicity	None known.
Specific target organ toxicity - single exposure	None known.
Specific target organ toxicity - repeated exposure	None known.
Aspiration hazard	None known.
Chronic effects	None known.

12. Ecological information

Ecotoxicity	Harmful to aquatic life with long lasting effects.
Persistence and degradability	None known.
Bioaccumulative potential	None known.
Mobility in soil	Not available.
Mobility in general	The product contains substances, which are insoluble in water and which may spread on water surfaces.
Other adverse effects	Not available.

13. Disposal considerations

Disposal instructions	Dispose of in accordance with local regulations.

Waste from residues / unused products	Dispose in accordance with applicable federal, state, and local regulations. Dispose of in accordance with local regulations.
Contaminated packaging	Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not available.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Phosphorodithioic acid, O,O-di-C1-14-alkyl esters, zinc salts (CAS Proprietary)	Listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Not listed.

Toxic Substances Control Act (TSCA)

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical	Yes
Classified hazard categories	Serious eye damage or eye irritation

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA)	Contains component(s) regulated under the Safe Drinking Water Act.

US state regulations

US. Massachusetts RTK - Substance List

Distillates (petroleum), hydrotreated heavy naphthenic (CAS Proprietary)
Distillates (petroleum), solvent-dewaxed heavy paraffinic (CAS Proprietary)
Distillates (petroleum), solvent-refined heavy naphthenic (CAS Proprietary)

US. New Jersey Worker and Community Right-to-Know Act

Distillates (petroleum), hydrotreated heavy naphthenic (CAS Proprietary)
Distillates (petroleum), solvent-dewaxed heavy paraffinic (CAS Proprietary)
Distillates (petroleum), solvent-refined heavy naphthenic (CAS Proprietary)
Phosphorodithioic acid, O,O-di-C1-14-alkyl esters, zinc salts (CAS Proprietary)

US. Pennsylvania Worker and Community Right-to-Know Law

Distillates (petroleum), hydrotreated heavy naphthenic (CAS Proprietary)

Distillates (petroleum), solvent-refined heavy naphthenic (CAS Proprietary)
Phosphorodithioic acid, O,O-di-C1-14-alkyl esters, zinc salts (CAS Proprietary)

US. Rhode Island RTK

Distillates (petroleum), hydrotreated heavy naphthenic (CAS Proprietary)
Distillates (petroleum), solvent-dewaxed heavy paraffinic (CAS Proprietary)
Distillates (petroleum), solvent-refined heavy naphthenic (CAS Proprietary)

California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 2016 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins. For more information go to www.P65Warnings.ca.gov.

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

Distillates (petroleum), hydrotreated heavy naphthenic (CAS Proprietary)
Distillates (petroleum), solvent-dewaxed heavy paraffinic (CAS Proprietary)
Distillates (petroleum), solvent-refined heavy naphthenic (CAS Proprietary)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	Yes
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Chemical Substance Inventory (TCSI)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 04-September-2013
Revision date 07-May-2019
Version # 04
Further information HMIS® is a registered trade and service mark of the NPCA.
HMIS® ratings Health: 3
Flammability: 0
Physical hazard: 0
NFPA ratings



List of abbreviations
Disclaimer This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

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6.6 Spare Parts

Table 6.3 Recommended Spare Parts List (20MA)

EDP	Description
890-053-121	LINEAR GUIDE,SVR252SSCOE+230LP-II G1=15,G2=15(THK)
890-198-404	CYLINDER,CDA100X50(KOGANEI)
1030198	CYLINDER,CDA63X50(KOGANEI)
890-198-405	CYLINDER,CDA80X50(KOGANEI)
890-087-520	SOLENOID VALVE,PA24A5G-02-25-39-D4(KOGANEI)
890-087-628	SPEED VALVE,AS3301FG-03-10S(SMC),20MA
1030197	SPEED VALVE,AS3301FG-02-10S(SMC),20MA
890-117-061	AIR FILTER,20-AF30-02-A(SMC)
890-087-812	REGULATOR,RPE1000-8-07P4-FL488575(CKD)
890-202-150	BUFFER,FCK-L-3-P4(CKD)
1027936	SPRING
580-176-110	ADAPTER
1030180	CONN,CYL,63BORE,20MA
1030280	CONN,CYL,80BORE,20MA
890-087-940	SOLENOID VALVE,VZ110-5LS-M5(SMC)
890-087-629	SPEED CONTROLLER,DVL-S-10-H1010-400(CKD)
J112-146-00086	SUB ASSY, S-BEAM LOAD CELL, ANTICORROSIVE MODIFICATION
100-143-181	ENCODER 4" METRIC REV MNT MOD
102-242-963	ASSY PCBD AED/AEF CNTRL EN13849
200-099-190R	SWITCH,OPTICAL(SHARP GP1A05A)

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Chapter 7: Support

7.1 Warranty 62
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7.3 Cybersecurity Vulnerability Reporting 64

7.1 Warranty

For warranty information please reference the warranty section of Terms and Conditions found at: https://www.branson.emerson.com/en/branson-terms-conditions.

7.2 Contact Us



Our dedicated experts are here to assist you with any questions or concerns you may have, ensuring you get the help you need.

Visit https://www.emerson.com/en/corporate/contact-us to find the technical support information, documentation, and software updates you need for your Emerson products and systems.

7.3 Cybersecurity Vulnerability Reporting

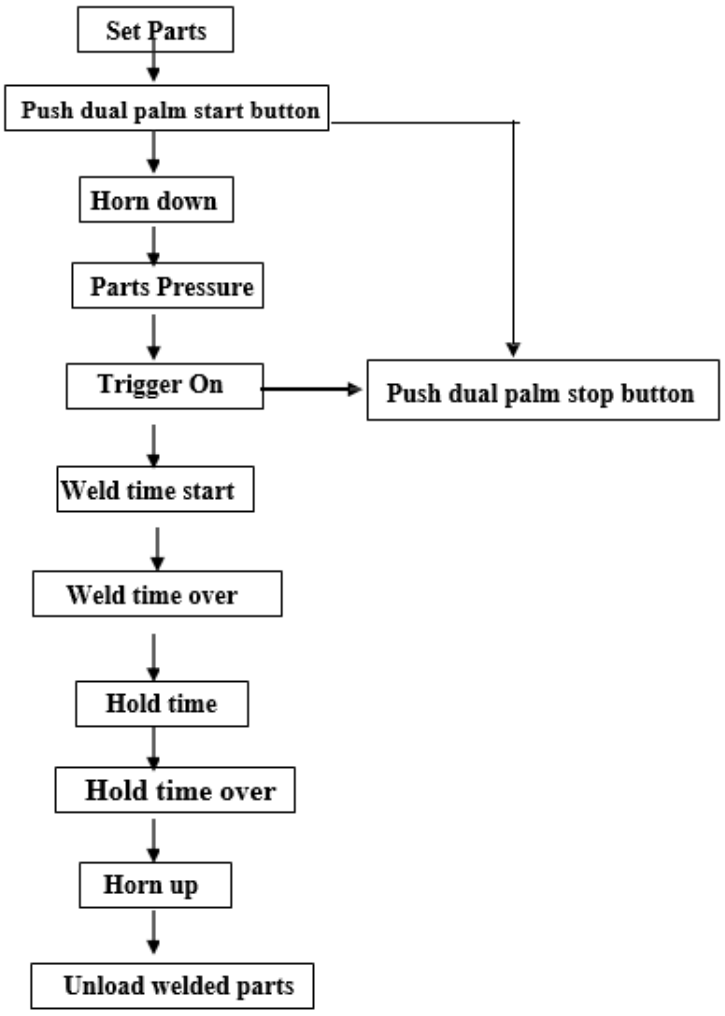
If you discover a potential vulnerability, please report it to us using the dedicated contact channel: Branson.PSIRT@emerson.com or via the reporting form available at https://emerson.com/reportvulnerability.

Appendix A: Diagrams and Drawings

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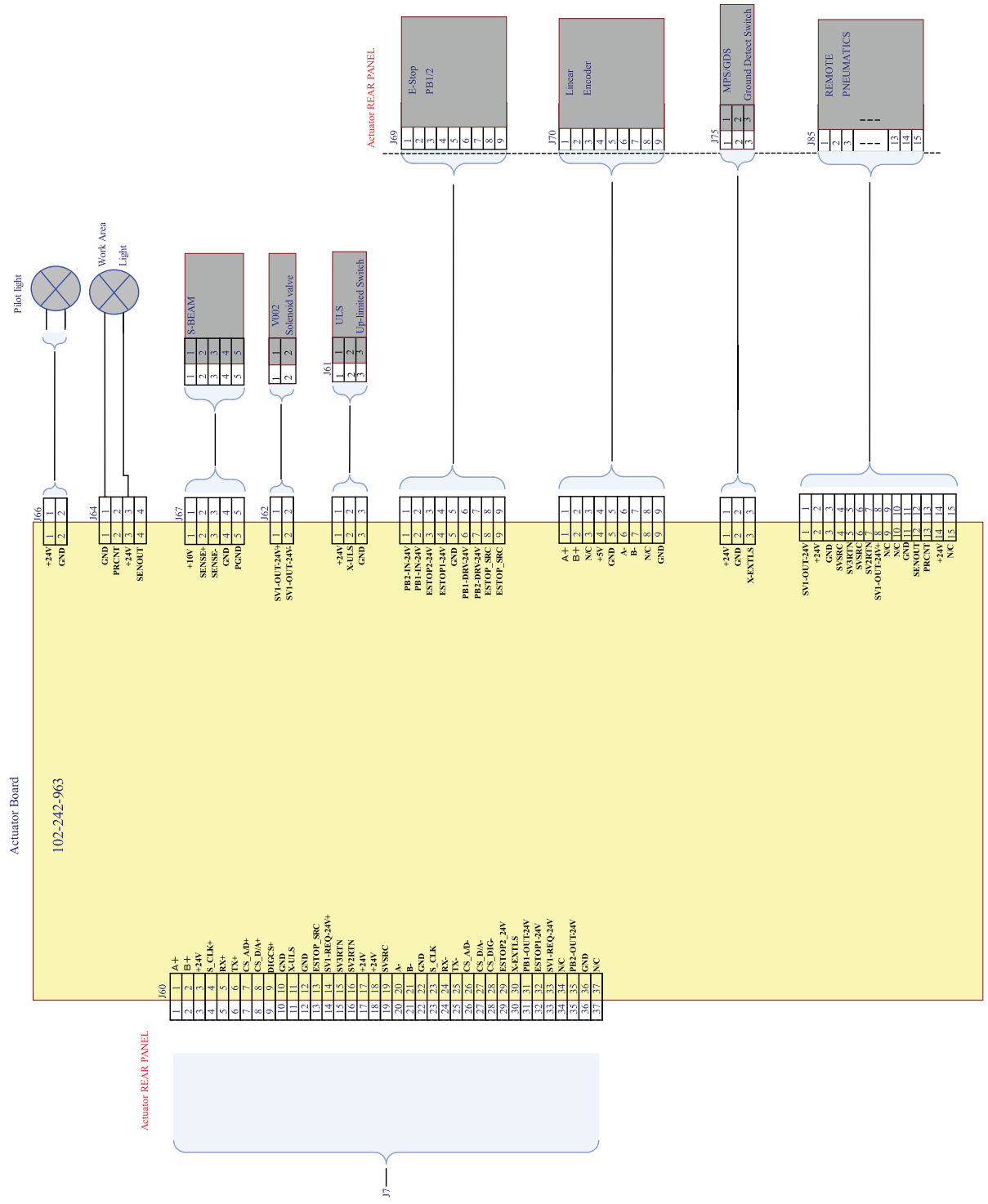
A.1 Operation Flow Chart

Figure A.1 Common example of manual operation



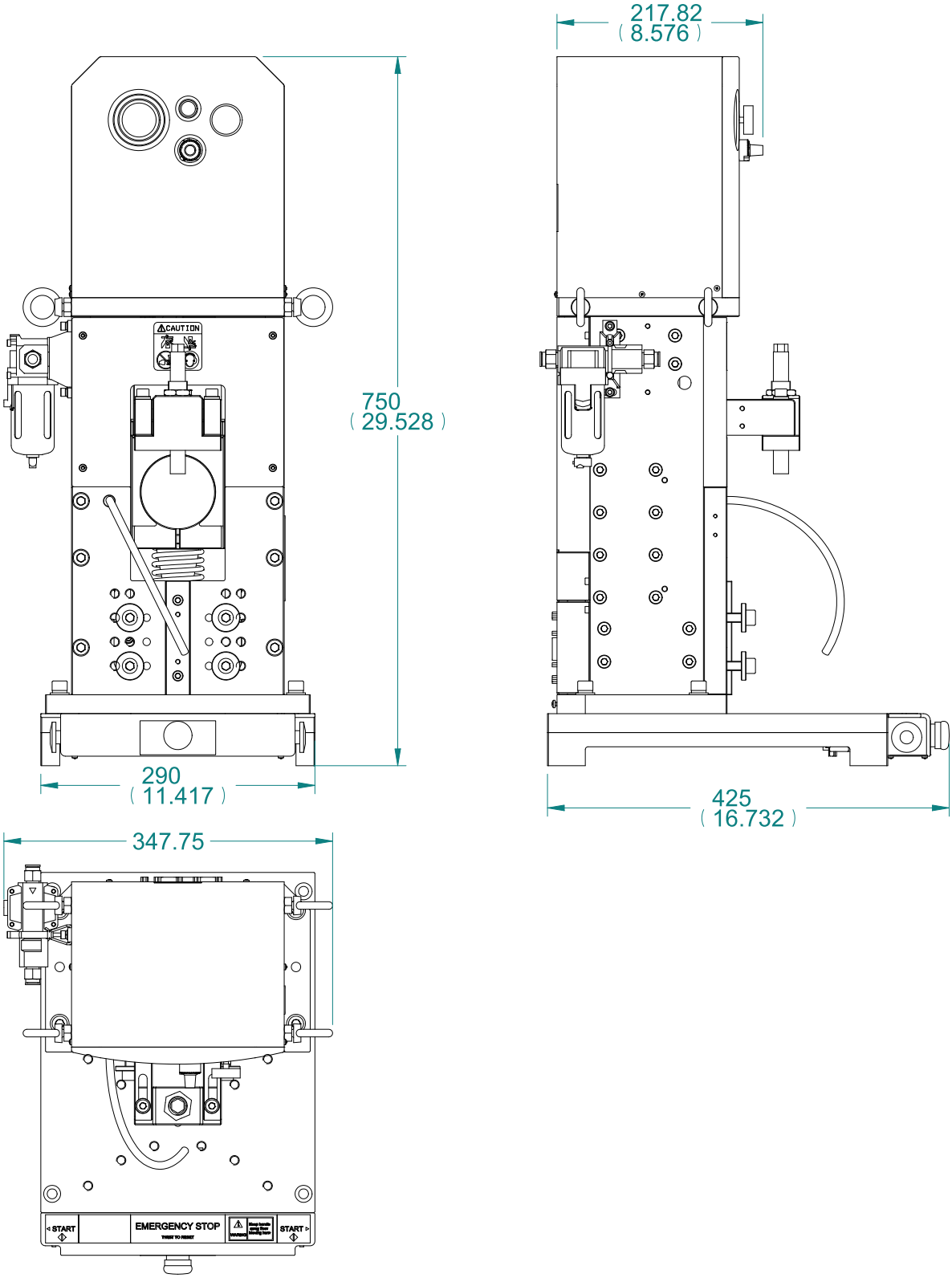
A.2 Electrical Diagram (Interface Board)

Figure A.2 Electrical Diagram (Interface Board) (EDP 1034417)



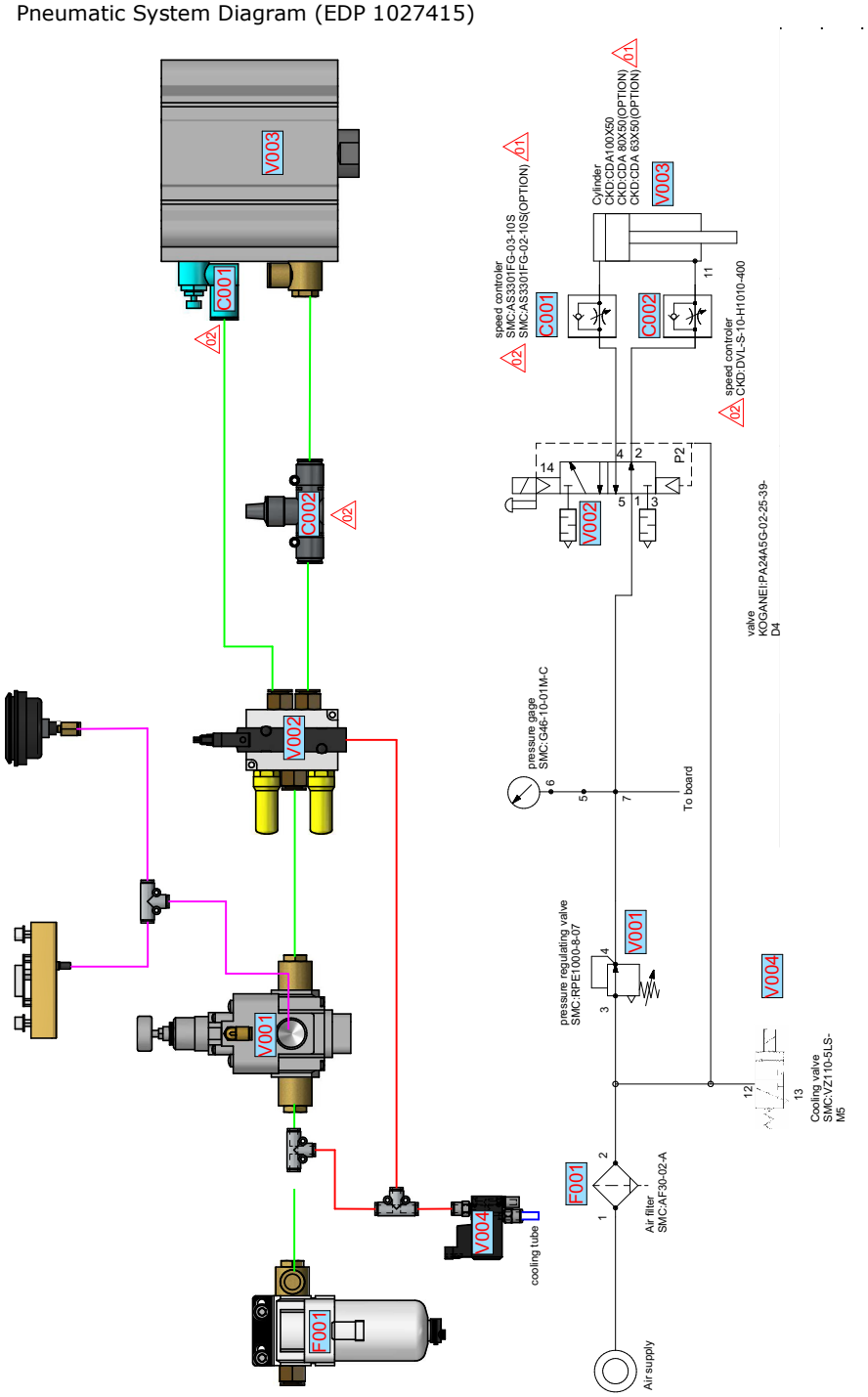
A.3 External View of 20MA

Figure A.3 External View of 20MA



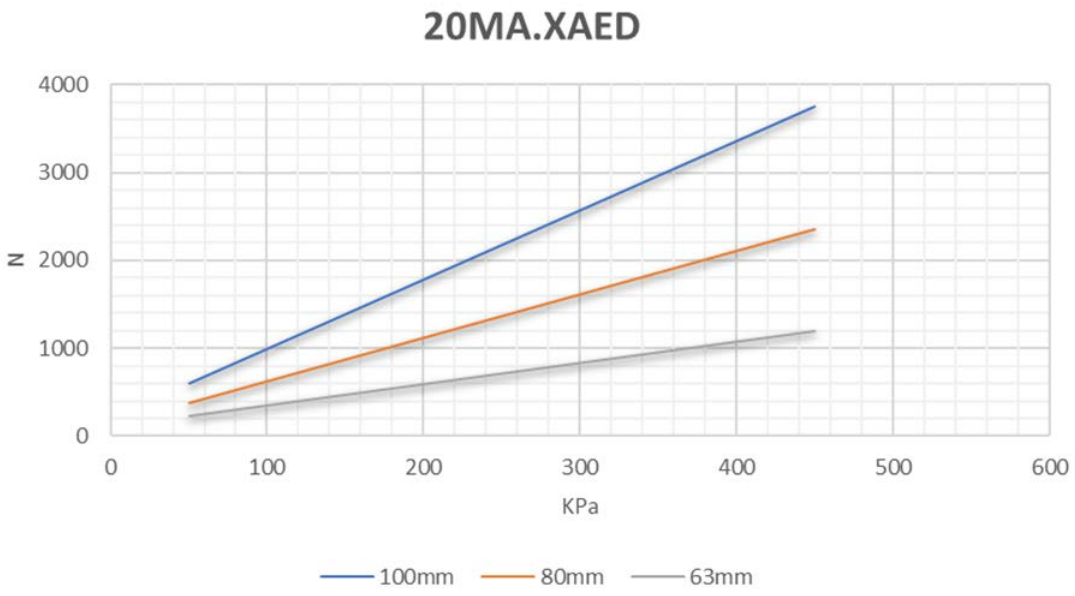
A.4 Pneumatic System Diagram

Figure A.4 Pneumatic System Diagram (EDP 1027415)



A.5 Force Characteristic Graph

Figure A.5 Force Characteristic Graph



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Original Instructions
4000391 - REV. 03



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