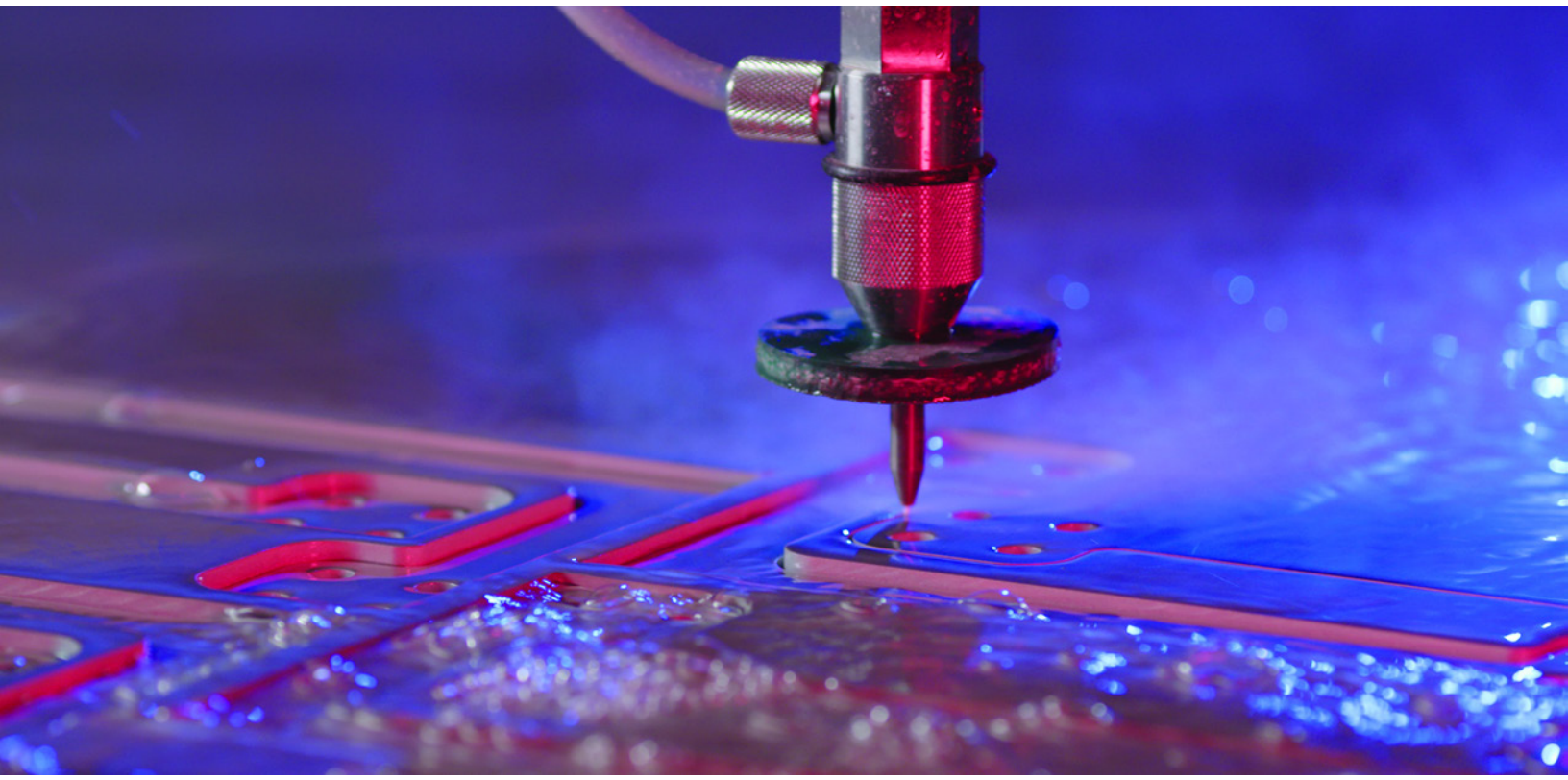
Hypertherm®

Echion™

Operator Manual



810770 – REVISION 3

ENGLISH

Environmental stewardship is one of Hypertherm's core values, and it is critical to our success and our customers' success. We are striving to reduce the environmental impact of everything we do. For more information: www.hypertherm.com/environment.

Echion

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810770
REVISION 3

ENGLISH
Original instructions

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For training and education resources, go to the Hypertherm Cutting Institute (HCI) online at www.hypertherm.com/hci.

Hypertherm products are designed and manufactured with a commitment to continuous quality control and safety. Contact a Hypertherm Technical Service Associate for information and support regarding the installation, operation, maintenance, and repair of this equipment.

Contents

Warranty

Waterjet product warranty

Product	Warranty coverage up to
Echion™ pump HyPrecision™ pump	27 months from the ship date, or 24 months from the date of proven installation, or 4,000 hours of operation, whichever occurs first
PowerDredge™ abrasive removal system EcoSift™ abrasive recycling system Reverse osmosis system Bulk abrasive pot Abrasive regulator On/off valve air actuator	15 months from the ship date, or 12 months from the date of proven installation, whichever occurs first
Diamond orifice	600 hours of operation with the use of a thimble filter and compliance with Hypertherm's water quality requirements

Hypertherm's warranty does not extend to defects, failures, damages, deficiencies, or errors that are:

- not reported to Hypertherm within the warranty period; or
- the result of modification, abuse, misuse, noncompliance with the installation or operation instructions, unauthorized repair, inadequate maintenance, neglect, accident, or the use of unapproved parts; or
- the result of normal wear; or
- the result of the system being operated contrary to Hypertherm's instructions or stated limits of rated and normal use.

For information about the manufacturer's warranty, refer to the conditions of sale provided when the product was purchased.

Consumable parts are not included in this warranty. Consumable parts include high-pressure water seals, check valves, cylinders, bleed-down valves, low-pressure seals, high-pressure tubing, and filters.

All third-party motors, pumps, and plumbing accessories are warrantied by the respective manufacturers and are not included in this warranty.

Disclaimer

All product information contained in this manual is believed to be reliable as of the date of publication. The manual could contain technical inaccuracies or typographical errors and can be changed or updated without notice.

Product stewardship

Hypertherm maintains a global regulatory management system to make sure that products comply with regulatory and environmental requirements.

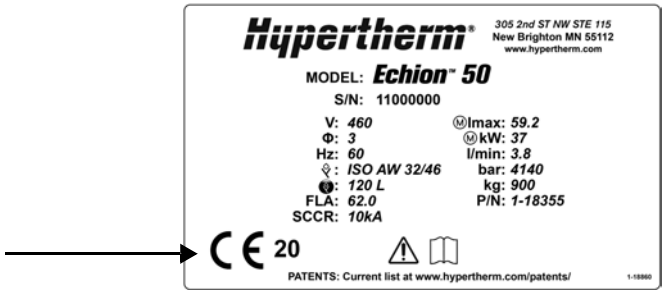
National and local safety regulations

National and local safety regulations shall take precedence over instructions supplied with the product. The product shall be imported, installed, operated, and discarded in compliance with national and local regulations applicable to the installation site.

Certification test marks

Certified products are identified by 1 or more certification test marks from accredited testing laboratories.

The certification test marks are on the pump's data plate.



Each certification test mark means that the product and its safety-critical parts conform to the national safety standards as reviewed and determined by that testing laboratory.

Hypertherm puts a certification test mark on its products only after that product is manufactured with safety-critical parts that have been approved by the accredited testing laboratory.

Once the product has left the Hypertherm factory, the certification test marks are invalid if one or more of these events occurs.

- The product is modified in a manner that causes danger or does not conform with the applicable standards.
- Safety-critical parts are replaced with unapproved spare parts.
- Assembly is unauthorized.
- An accessory that uses or generates dangerous voltage is added.
- A safety circuit or other feature that is designed into the product as part of the certification has been tampered with.

CE The Conformité Européene (CE) mark affixed to a product signifies the manufacturer's declaration of conformity to applicable European directives and standards.

Only those versions of Hypertherm products with a CE mark on or near the data plate have been tested for compliance with the applicable European directives, such as the Low Voltage Directive, the Electromagnetic Compatibility Directive, and the Machinery Directive.

If this product has a Declaration of Conformity, a copy (in English) is included. Refer to Declaration of Conformity on page 173.

Differences in national standards

Nations can apply different performance, safety, or other standards. National differences in standards include, but are not limited to:

- voltage.
- plug and cord ratings.
- language requirements.
- electromagnetic compatibility requirements.

Differences in national or other standards can make it impractical or impossible for all certification test marks to be put on the same version of a product. For example, the Canadian Standards Association (CSA) versions of Hypertherm's products do not comply with European electromagnetic compatibility requirements; therefore, they do not have a CE mark on the data plate.

Countries where the CE mark in necessary or that have compulsory electromagnetic compatibility regulations must use CE versions of Hypertherm products with the CE mark on the data plate.

These could include:

- countries in the European Union.
- Australia.
- New Zealand.
- Russia.

It is important that the product and its certification test mark be suitable for the end-use installation site. When Hypertherm products are shipped to one country for export to a different country, the product must be correctly configured and certified for the end-use installation site.

Higher-level systems

When an original equipment manufacturer (OEM) or a system integrator adds equipment such as cutting tables, motor drives, motion controllers, or robots to a Hypertherm waterjet cutting system, the system is considered a higher-level system. A higher-level system with dangerous moving parts can constitute industrial machinery or robotic equipment, in which case the OEM, system integrator, or end-use customer can be subject to more regulations and standards than those applicable to the waterjet cutting system manufactured by Hypertherm.

It is the responsibility of the end-use customer and the OEM or system integrator to do a risk assessment for the higher-level system and to provide protection against dangerous moving parts.

Unless the higher-level system is certified when the OEM or system integrator incorporates Hypertherm products into it, the installation can be subject to approval by local authorities. Get advice from legal counsel and local regulatory experts if you are not sure about compliance.

External cables connecting parts of the higher-level system must be made for exposure to contamination and movement as necessary for the end-use installation site. When the external interconnecting cables are subject to exposure to oil, dust, water, or other contamination, hard usage ratings could be necessary.

When external interconnecting cables are subject to continuous movement, constant flexing ratings can be necessary. It is the responsibility of the OEM, system integrator, or end-use customer to make sure that external connecting cables are correct for the application and obey all national, state, and local regulations.

Environmental stewardship

Hypertherm products: waste and recycling

Hypertherm waterjet cutting systems, like all products with electronics, can contain materials or parts, such as printed circuit boards, that cannot be discarded with ordinary waste. It is your responsibility to discard Hypertherm products or parts in an environmentally suitable manner and in compliance with national and local codes.

In the United States, read all national, state, and local laws. In the European Union (EU), read the EU directives, national, and local laws. In other countries, refer to national and local laws. Consult with legal or other compliance experts, when applicable. For information, go to www.hypertherm.com/customer-support/product-service/recycling.

Chemical handling and usage

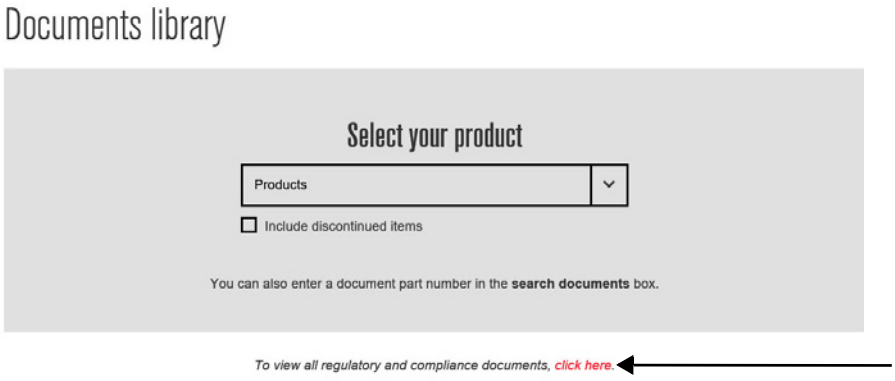
Material safety data sheets (MSDS) and safety data sheets (SDS) are part of a hazard communication plan that supplies detailed information about dangerous chemicals. The information includes the chemical's toxicity and reactivity, first aid for exposure, approved storage and disposal, recommended protective equipment, and spill-handling procedures.

The Occupational Safety and Health Administration (OSHA) has presented new dangerous chemical labeling requirements as a part of its recent revision of the Hazard Communication Standard (29 CFR 1910.1200), to align with the United Nations' Globally Harmonized System of Classification and Labelling of Chemicals (GHS). The GHS is an international system for standardizing chemical classification and labeling.

Chemical regulations in the USA, Europe, and other locations require that MSDS and SDS be made available for chemicals that are supplied with the product and chemicals used in or on the product. The list of chemicals is supplied by Hypertherm.

To see MSDS and SDS:

1. Go to www.hypertherm.com/docs.
2. Look for "To view all regulatory and compliance documents, click here" below the Select your product box.



3. Look for Safety Data Sheets. Click **+**.

These navigation instructions can change without notice.

Particle emission and waste water quality

Hypertherm does not manufacture or supply the materials that are cut and has no knowledge about the particles released from materials that are cut and if they can pose a physical danger or health risk. Get advice from your supplier or other technical advisor for guidance concerning the properties of the material you cut with a Hypertherm product.

If you are not familiar with the current applicable government regulations and legal standards for the installation site, get advice from a local expert before you purchase, install, and operate this equipment.

Safety

The end user is responsible for the safe operation of this equipment.

WARNING 	Before operating Hypertherm equipment, read the safety instructions in your product's manual.

Manuals

Copies of Hypertherm manuals can accompany the product in electronic and printed formats. Copies of the manuals are online, in all languages available for each manual.

1. Go to www.hypertherm.com/docs.
2. Under Select your product, choose **Waterjet Family** in the dropdown list.
3. Go to the **Operator and instruction manuals** section and click **+**.
4. Click on the manual for your product. You may have to click on **SHOW ALL** at the bottom of the section.

   A PDF of the manual downloads to your device.

	These navigation instructions can change without notice.

The safety precautions in this manual are general and cannot anticipate every situation. Hypertherm, Inc. acknowledges that unforeseen situations such as equipment failure, site variability, insufficient maintenance, failure of control equipment, and other events can cause equipment damage, injuries, or death. It is the user's responsibility to identify dangers and to take the steps necessary to minimize risks.

Keep these instructions near the equipment. This manual is intended to familiarize the user with the equipment and its parts, safe operation, and maintenance.

All personnel who operate or have access to this equipment must know this information:

- applicable safety standards.
- the use, limitations, and maintenance of personal protective equipment.
- the location of the written hazard communication program and safety data sheets.
- how to recognize dangerous energy sources.
- the correct methods for isolating and controlling energy, to include lock out–tag out procedures.

User qualification and training

All users must read and understand these instructions before installing, operating, or doing maintenance on this equipment.

Do not let an untrained person operate this equipment. Operators must be approved to operate and maintain this equipment.

Training should include:

- how to start and stop the equipment during operation and in an emergency situation.
- conditions and procedures that can lead to injuries to personnel and damage to the equipment.
- how to operate all controls.
- how to identify and respond to a problem with the equipment.
- how to do maintenance procedures.
- a copy of the operator manual.

This list is not all-inclusive.

Emergency medical information and treatment

WARNING	A waterjet is a cutting tool. Keep away from high-pressure streams and leaks. Pressurized fluid can cause injuries. Delayed treatment can cause injuries or death.
WARNING	Do not put ice or heat on a waterjet injury. If possible, use a support to keep injured body parts above heart level.

High-pressure equipment puts the operator and other personnel at risk of contact with high-pressure water. Possible injuries include eye damage, lacerations, infections, and amputations.

Waterjet operators should have a waterproof emergency medical tag or card that describes the recommended treatment for high-pressure water injuries. Show the tag or card to emergency responders and medical professionals.

This wallet-size card can be copied, laminated, and folded.

MEDICAL INFORMATION A high-pressure injection injury is a surgical emergency. Get medical treatment immediately for all high-pressure waterjet injuries.	The person with this card has been exposed to a waterjet of up to 4,140 bar (60,000 psi) and a velocity of 609 m/s (2,000 feet/second). Abrasive waterjets can eject water and abrasive materials that can be injected into body tissues, leading to a dangerous infection. ■ Skin can appear to be not damaged or show a small pinhole-sized puncture wound. ■ The injured area can become swollen, painful, and pale over the next 4 to 6 hours. ■ Tissue becomes ischemic and necrotic within 12 hours.
■ Do not use digital or local nerve blocks. ■ Give analgesics by mouth or injection.	■ Consult a surgical specialist immediately for decompression, removal of foreign materials, and debridement. ■ Give broad-spectrum, intravenous antibiotics for Gram-negative and Gram-positive organisms. ■ X-ray is the preferred imaging method. ■ Acute compartment syndrome is possible. ■ Leave the wound open. ■ Do not use solvents other than isotonic sodium chloride solution for irrigating the wound.

Safety information for operation, maintenance, repair, and installation

DANGER 	Before opening the electrical enclosure or doing maintenance or repairs on this equipment, turn **OFF** the electrical power and release water pressure and hydraulic pressure from the system. Use standard lock out-tag out procedures. Isolate all sources of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy with a lockable energy-isolating device that satisfies national and local requirements.
WARNING 	Make sure that all connections, fasteners, locking devices, hoses, and fittings are tight before operation.
WARNING 	Make sure that the shaft access cover and all other safety devices are correctly installed before operating this machine.
WARNING 	Do not stand in line with high-pressure fittings when operating this equipment. If a high-pressure fitting fails, it can cause a stream of water or hydraulic fluid to eject from the system with force.
WARNING 	Do not leave waterjet cutting equipment unattended while it is operating.
WARNING 	During operation, keep a restricted-access area clear that is larger than the maximum movement range of the cutting equipment's moving parts.
WARNING 	Let only approved personnel operate this machinery.
WARNING 	Release all high-pressure water before doing work on this equipment.
WARNING 	Do not touch a hot surface. Water leaking from a high-pressure fitting or the bleed-down valve can be hot.
WARNING 	Obey all safety requirements and applicable safety laws and regulations. Obey national and local codes regarding installation, repairs, and maintenance of the electrical and plumbing systems. All work that requires opening the electrical enclosure or removing covers or panels from this equipment must be done only by an approved technician. It is your responsibility to investigate and obey all local codes.

WARNING 	A person who works on deenergized machinery can be injured or killed if the machinery is energized without permission. All personnel in an area where energy-control procedures are used must receive training for energy-control procedures.
WARNING 	**DANGEROUS VOLTAGE/RISK OF SHOCK** Doing work on this equipment while it is energized is dangerous. Personnel who maintain and repair this equipment can be injured or killed if dangerous energy is not controlled. Injuries can include burns, cuts, fractures, or electrocution.
WARNING 	Before removing a lock-out device: • obey the employer's energy-control procedure. • examine machines and parts to make sure that they are operational. • make sure that all personnel are safely away from machines. After removing energy-isolation devices, make sure that all personnel in the area know that the devices are removed and that the machine is being energized.
WARNING 	To reduce the risk of injuries or death, wear approved protection and obey safety recommendations when doing work with electricity.
WARNING 	When work must be done in a small space or an area with limited access, the access must not be blocked by ventilation ducts, hoses, pipes, or other equipment.
WARNING 	Do not block or remove warnings, cautions, or instructions.
WARNING 	Personal protective equipment is recommended. If you do not use personal protective equipment, there is a risk of injury or death.
WARNING 	High-pressure water can cause eye injuries. Wear approved eye protection when operating or doing work near this equipment.
WARNING 	This waterjet equipment could make more noise than is permitted by national or local codes. When this intensifier is operating, the noise level is 75 dB(A) to 85 dB(A). Water flow rate, pipe layout, and the acoustical characteristics of the building have an effect on noise level. Long periods of exposure to noise can cause permanent hearing loss. Wear approved ear protection and control exposure time when operating or doing work near this equipment.

WARNING 	High-pressure water can cause cuts, abrasions, and punctures. Precision parts can have sharp corners or edges. Wear approved hand protection when operating or doing work near this equipment and when touching parts.
WARNING 	Some materials can cause airborne contamination or particles when cut. Wear approved respiratory protection when operating or doing work near this equipment.
CAUTION 	Examine and clean the equipment regularly. Refer to the Preventive maintenance schedule on page 60. Do repairs immediately.

Symbols and marks

Information and symbols

Some symbols in this table could apply to other products.

DANGER 	**DANGER** identifies an imminently dangerous condition or a situation that **WILL** cause serious injuries or death if ignored.
WARNING 	**WARNING** identifies a dangerous condition or a situation that **COULD** cause injuries or death if ignored.
CAUTION 	**CAUTION**, when used with the yellow warning sign, identifies a dangerous condition or a situation that **COULD** cause minor or moderate injuries or **WILL** cause damage to the equipment if ignored.
NOTICE	***NOTICE*** identifies a condition or a situation that **COULD** cause damage to the equipment if ignored.
	This symbol identifies a mandatory action.
	This symbol identifies a prohibited action.
	This symbol identifies tools or materials that are necessary or recommended for a procedure.
	This symbol identifies information that could cause the user to fail at the task if ignored.
	This symbol identifies a tip or helpful information.

Symbols and marks found on the equipment

Some symbols or marks in this table could apply to other Hypertherm products.

DANGER 	**DANGER** identifies an imminently dangerous condition or a situation that **WILL** cause serious injuries or death if ignored.
DANGER 	**ARC FLASH AND SHOCK HAZARD** Follow all requirements in NFPA 70E for safe work practices and for Personal Protective Equipment.
WARNING 	**WARNING** identifies a dangerous condition or a situation that **COULD** cause injuries or death if ignored.
WARNING 	**HAZARDOUS VOLTAGE** Disconnect power before servicing.
WARNING 	**WARNING** This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.p65warnings.ca.gov.
WARNING 	Hydraulic, water, and electrical connections can come loose during shipping and normal operation. It is recommended that all connections are checked at installation and annually.
CAUTION 	**CAUTION**, when used with the yellow warning sign, identifies a dangerous condition or a situation that **COULD** cause minor or moderate injuries or **WILL** cause damage to the equipment if ignored.
CAUTION 	Do not touch a hot surface.
	Read and fully understand operator's manual before using this machine. Failure to follow operating instructions could result in death or serious injury.
	Correct direction of motor rotation (motor rotation arrow)
S/N	Serial number
V	Volts

Φ	Number of phases in a power system
HZ	Frequency (hertz)
	Type of hydraulic fluid recommended
	Hydraulic fluid tank volume (liters)
FLA	Full-load current (amperage)
SCCR	Short-circuit current rating
Ⓜ **IMAX**	Primary motor maximum current draw (amperes)
Ⓜ **KW**	Primary motor power output (kilowatts)
L/MIN	Maximum outlet flow rate (liters/minute)
BAR	Maximum outlet water pressure (bar)
KG	Weight (kilograms)
P/N	Electrical enclosure part number
CE	The Conformité Européene (CE) mark affixed to a product signifies the manufacturer's declaration of conformity to applicable European directives and standards. Only those versions of Hypertherm products with a CE mark on or near the data plate have been tested for compliance with the applicable European directives, such as the Low Voltage Directive, the Electromagnetic Compatibility Directive, and the Machinery Directive.
	Use caution when operating this equipment. Refer to the instruction manual. Read and understand all of the safety guidelines in this manual.
	Identifies the terminal of a protective earth (ground) electrode or a terminal intended to connect to an external conductor for protection against electric shock during a fault condition
	Controls
	Remote key switch off The key switch is in the Local position.
	Remote key switch on The key switch is in the Remote position.

	**COMPRESSED AIR** The bleed-down valve uses compressed air to operate.
	**CUTTING WATER IN** This line carries low-pressure water from a water softener, a reverse osmosis system, a well, or a public utility to the pump.
	**CUTTING WATER OUT** This tubing carries high-pressure water from the intensifier to the cutting table.
	**WASTE WATER OUT** This hose carries water from the bleed-down valve to a drain.
	**COOLING IN** This line carries low-pressure water from the local utility or a chiller to the pump's cooling loop.
	**COOLING OUT** This line carries low-pressure water from the heat exchanger to the chiller or to the drain.
	Start the pump symbol
	Stop the pump symbol

1 Optional equipment

Boost pump

The pump will not operate satisfactorily if the supply water pressure is too low for the pump to get to stable pressure. A boost pump increases the water pressure to a value higher than the minimum requirement.

Modbus TCP/IP communication

All Hypertherm waterjet pumps can use Ethernet to communicate with a CNC.

Utility connection panel kit

The utility connections for the Echion pump are inside the pump, at the point of use. With this kit, utility connections are made on the outside of the pump.

Metric conversion kit

This kit includes adapter fittings for use in countries where metric connections are standard.

Pump-mounted high-pressure plumbing kit

This kit includes a bracket and a high-pressure tube to connect a high-pressure line directly to the pump.

For part numbers, refer to Optional equipment kits on page 103.

2 Operation

	This section assumes that the user is familiar with the **Safety**, **Preventive maintenance**, **Troubleshooting**, and **Specifications** sections of this manual.
	Images in this manual are for reference purposes. It is possible that your product configuration is not shown accurately.
	It is possible that not all of the information in this section applies to all pump models.

Safety

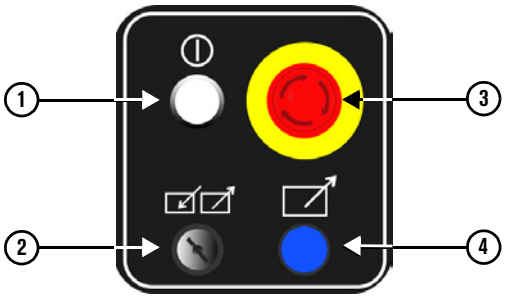
WARNING

Read and understand all of the safety guidelines in this manual.

Refer to Safety on page 21 before operating, doing maintenance on, repairing, and installing your pump.

About the controls

Operation panel



1 Controls button

Push this button to turn **ON** the control circuit in the pump. The button lights when the control circuit is on.

2 Local/Remote key switch

When the key switch is in the Local position, use the operator interface to operate the pump.

When the key switch is in the Remote position, use the remote source, such as a computer numerical control (CNC) operator console, to controls the pump.

Most functions on the operator interface are not available when the key switch is in the Remote position.

3 EMERGENCY STOP button

Push this button to turn off the control circuit. Refer to Emergency stop on page 51.

4 Remote indicator light

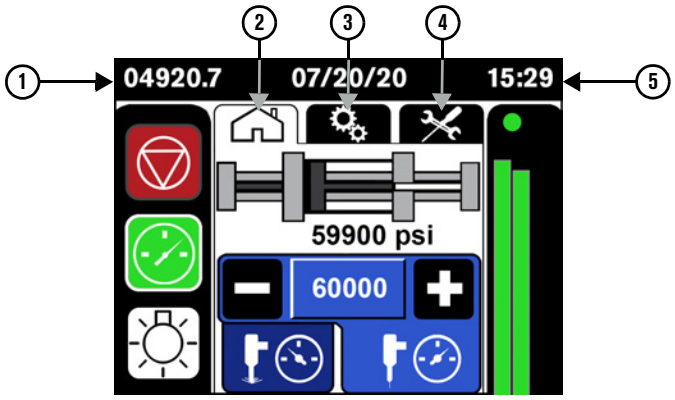
When the key switch is in the Remote position, this indicator light is on.

Operator interface

Refer to Touchscreen maps on page 175 to see all of the screens available on the controller.

Primary operation screen

These elements are on most screens.



1 Hour meter

This shows the total hours the pump motor has been in operation.

2 Primary operation screen tab

- Turn the pump on or off.
- Select the pressure mode (cut or pierce).
- Set or change the water pressure.
- Monitor the status of the intensifier.

3 Operator interface: Adjustment screens tab

- See information about your system.
- Change some display options, such as pressure units (bar or psi) or language.
- Change timer durations.
- Turn features such as Modbus mode on or off.

Refer to Operator interface: Adjustment screens on page 164.

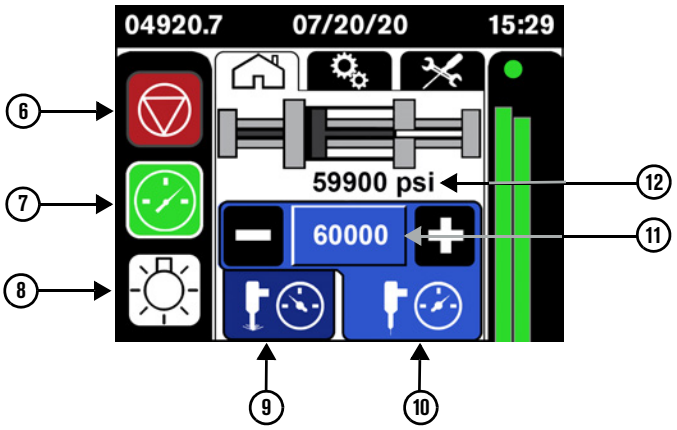
4 Operator interface: Maintenance screens tab

- Move the plunger to one end of the intensifier.
- Prepare the pump for storage.
- See the alarm log.
- See the inputs-outputs from the controller.

Refer to Operator interface: Maintenance screens on page 56.

5 Date and time

Refer to Date / Time / Language on page 169.



6 Stop

Touch this symbol to stop the pump.

7 Start

Touch this symbol to start the pump.

8 LED light on/off

Touch this symbol to turn the red LED lights **ON** or **OFF**.

9 Pierce-pressure mode (off)

Touch this symbol to put the pump in pierce-pressure mode.

10 Cut-pressure mode (on)

Touch this symbol to put the pump in cut-pressure mode.

Cut-pressure mode is active in this image.

Refer to Select the pressure mode on page 49 for information about pressure modes.

11 Target water pressure

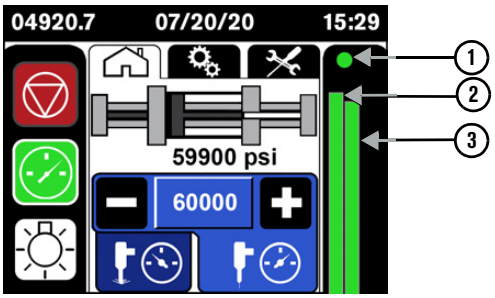
12 Output water pressure

This shows the actual water pressure when the pump is operating.

This is the target water pressure set by the user. Refer to Set the target water pressure on page 49.

Intensifier status indicator and stroke-rate bars

The stroke-rate bars show the speed of the piston moving to each side of the intensifier.



1 Intensifier status indicator

- Enabled (green)
- Not enabled (red)

2 Intensifier stroke rate to the left

3 Intensifier stroke rate to the right

- The stroke rate is within the permitted range (green).
- The stroke rate is at the limit of the permitted range (yellow).
- The intensifier is overstroking (red).

Refer to Primary operation screen on page 113 for more information.

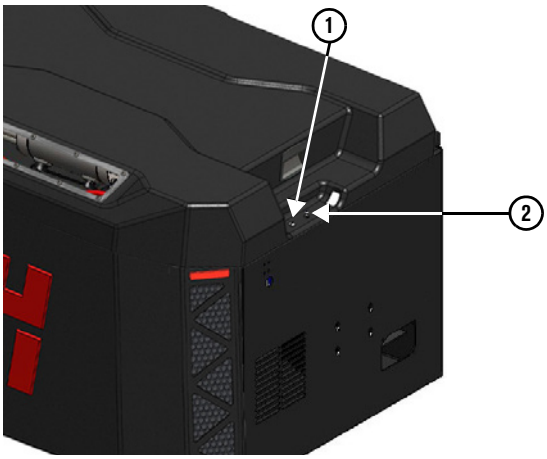
Turn on the pump: beginning of day

Follow this procedure when starting the pump for the first time each day or at the beginning of each work shift. Daily preventive maintenance tasks are included in these instructions.

Inspect the pump

Unless otherwise recommended, install the top cover and the front panel before operating the pump.

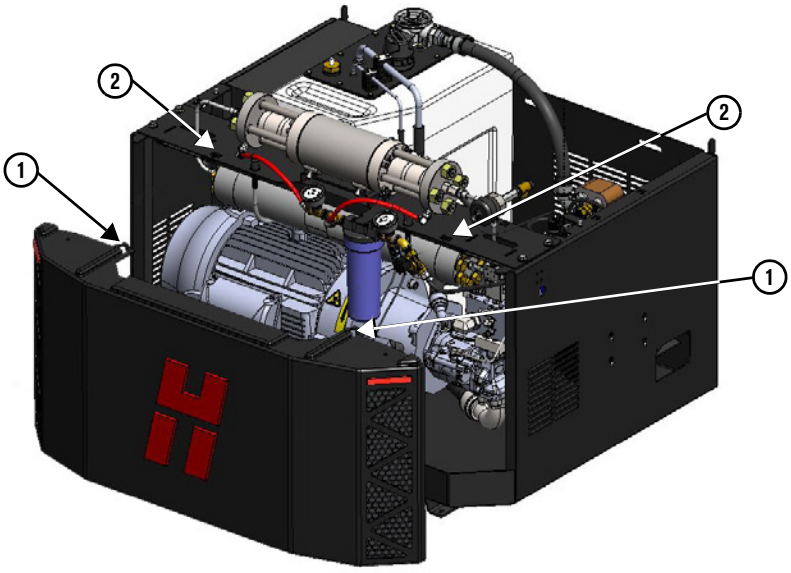
1. Remove the top cover.



   a. Use a standard screwdriver to turn the bolt ① on each end counterclockwise 1/4 turn.

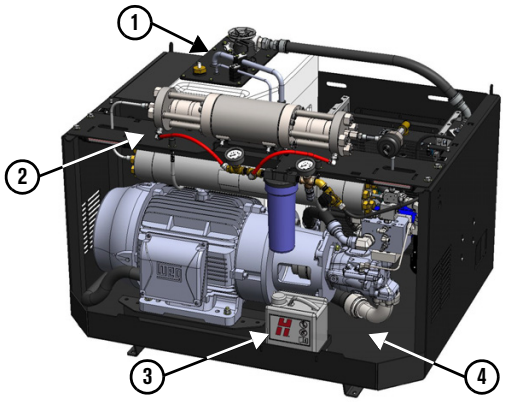
   b. Lift the cover off of the alignment pins ②.

2. Remove the front panel.



   Push down on the horizontal surface on top of the panel ① to release the retainers tabs from the frame ②.

3. Clean all debris, water, and hydraulic fluid off of the hydraulic fluid tank ①, the intensifier bridge ②, and the bottom deck ④.



4. Empty the dirty water container ③, if necessary.

	Refer to local regulations regarding waste water. Environmental rules can apply to disposal.

5. Clean the operator interface, if necessary.

	To prevent damage to the operator interface: • do not use cleaners that contain alcohol, ammonia, acetone, phosphates, or ethylene glycol. • do not push hard on the touchscreen. • do not use paper towels, abrasive cloth, or dirty rags. • do not put liquid directly onto the touchscreen.

- Gently wipe the touchscreen and keys with a clean microfiber cloth.
- Use a cleaner made for touchscreens or use a 1:1 solution of distilled water and white vinegar.

6. Examine electrical cords and cables for kinks or damage to the insulation. Examine electrical plugs and other electrical connections for corrosion or damage.

7. Look for leaks, deterioration, damage, or other conditions that can interfere with operation.

8. Make sure that all connections, fasteners, locking devices, hoses, and fittings are tight.

9. Make sure that all warning decals are visible and legible.

   Contact Hypertherm for replacement decals.

Check the hydraulic fluid

Replace the hydraulic fluid:

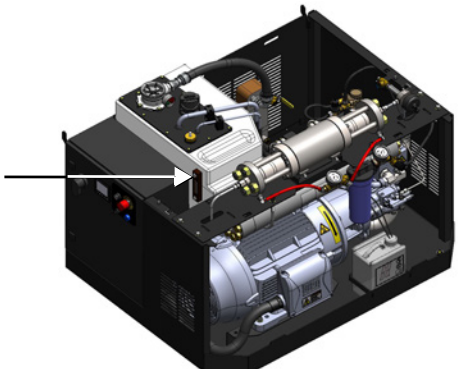
- every 3,000 hours.
- if it is dark or milky in color.
- if it has a strong odor.
- if a test laboratory finds the quality is unsatisfactory.

Refer to Replace the hydraulic fluid on page 86.

CAUTION	Heat and other conditions cause hydraulic fluid to degrade. Degraded hydraulic fluid can cause damage to hydraulic components. Collect a sample of hydraulic fluid from the hydraulic fluid tank and send it to a test laboratory for analysis. Refer to Hydraulic fluid on page 136 for recommended limits.
	Contact a hydraulic fluid supplier for a precise report about your hydraulic fluid quality.

Do this task when the pump is not operating.

1. Look through the sight gauge to see the color of the hydraulic fluid. Good hydraulic fluid is almost transparent.



2. Remove the filler cap.
3. Smell the hydraulic fluid. Good hydraulic fluid has almost no odor.
4. Install the filler cap.

Turn on the utilities

1. Turn **ON** the water to the pump.
2. Turn **ON** the compressed air source.
3. Turn **ON** the electrical main (line disconnect switch).
4. Turn the primary breaker disconnect lever on the electrical enclosure door to **ON**.

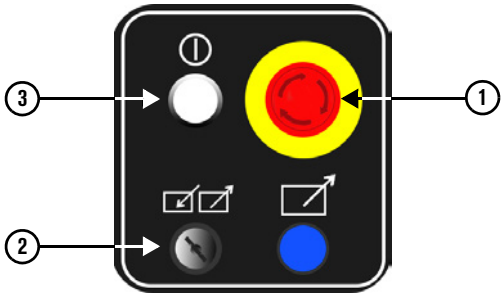
Turn on the controls

Turn on the controls remotely

> Refer to the OEM's instructions for starting the pump and for operating the pump from a remote source.

1. Make sure that the EMERGENCY STOP ① is not engaged. If the button is pushed in, turn the button clockwise until it releases.
2. Make sure that the key switch ② is set to Local ↙.
3. Push the Controls button ③.
4. Turn the key switch ② to Remote ↗. The remote indicator light is on ④.

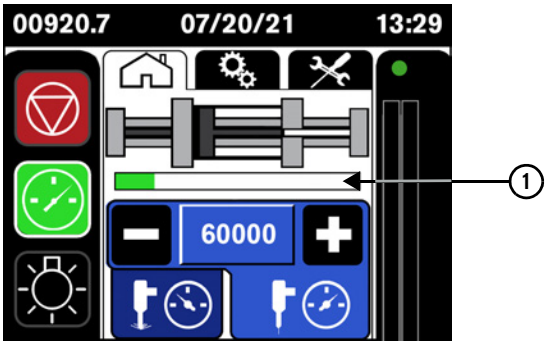
Turn on the controls locally



1. Make sure that the EMERGENCY STOP ① is not engaged. If the button is pushed in, turn the button clockwise until it releases.
2. Make sure that the key switch ② is set to Local ↙.
3. Push the Controls button ③.

Start the pump

CAUTION	Use the Postmaintenance start procedure on page 91 if maintenance or repairs have been done on: ▪ the high-pressure water system. ▪ intensifier components. ▪ the primary motor.



1. On the operator interface, touch the symbol.
   - The controller starts the pump.
   - A progress bar ① shows below the intensifier on the screen.

   The normal start sequence is fully automated. Refer to Primary operation screen on page 177 for a description of the sequence.

   Monitor for leaks.
2. When the start sequence is complete, complete the Daily preventive maintenance tasks. Refer to the Preventive maintenance schedule on page 60.

Do the preoperation maintenance checks

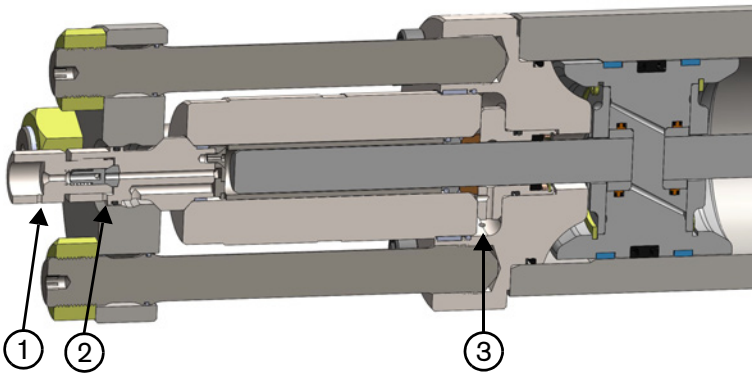
Examine the pump for leaks or damage

Do this task when the pump is operating and the system is pressurized.

1. Look for hydraulic fluid leaks. Monitor these areas.
   - Hydraulic connections
   - Valves
   - Intensifier bridge and bottom deck
2. Examine the low-pressure tubes and the hoses for leaks.
3. Examine the bleed-down valve for leaks or damage.

   A hot bleed-down valve can suggest that there is a leak.

4. Examine the weep holes in the high-pressure ends for leaks. Water leaking from a weep hole is a sign of a faulty part or a loose connection.



1 Output adapter leak

2 High-pressure seat leak

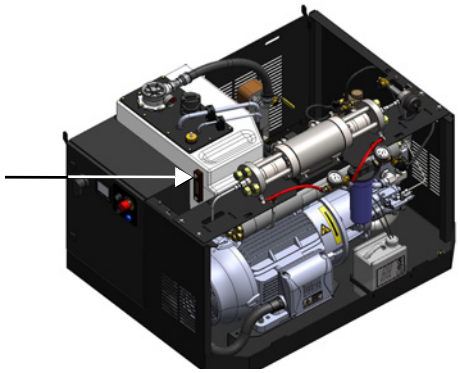
3 Dynamic seal leak

5. Examine the high-pressure tubing for leaks.
6. Look for deterioration, damage, or other problems.

Check the hydraulic fluid level

Do this task when the pump is operating.

Make sure that the hydraulic fluid level is at the top mark on the sight gauge.



Add hydraulic fluid, if necessary. Refer to Add hydraulic fluid on page 85 for instructions.

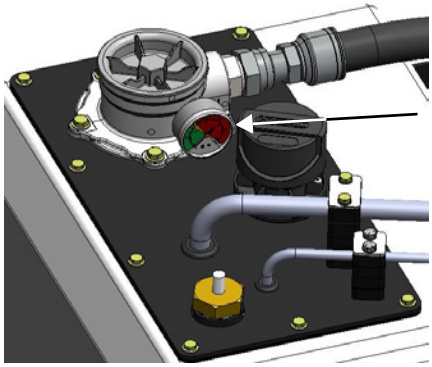
Check the hydraulic filter gauge

Replace the hydraulic filter element:

- every 1,500 hours.
- when the needle on the gauge stays in the red zone while the pump is operating.

Refer to Replace the hydraulic filter element on page 84.

Do this task when the pump is operating at a stable temperature.



Make sure that the needle on the hydraulic gauge is not in the red zone.

Check the low-pressure water pressure gauges

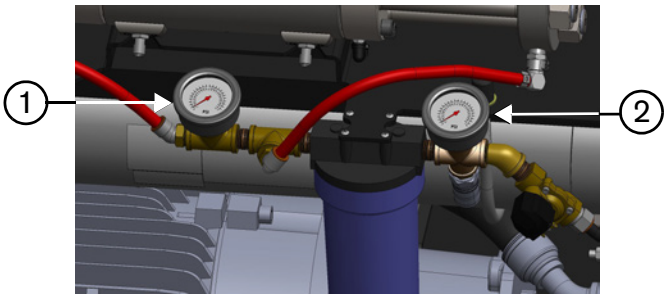
Replace the water filter:

- every 1,000 hours.
- if the difference between the values is more than 0.7 bar (70 kPa / 10 psi).

Refer to Replace the water filter on page 80.

The prefilter water-pressure gauge shows the water pressure before the water goes through the filter. The postfilter water-pressure gauge shows the water pressure after the water goes through the filter.

The usual range is 2.8 bar to 7.6 bar (280 kPa to 760 kPa / 40 psi to 110 psi).



1 Postfilter water-pressure gauge

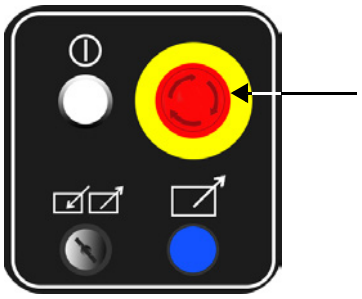
2 Prefilter water-pressure gauge

Do this task when the pump is operating.

Subtract the value shown on the postfilter water pressure from the value shown on the prefilter water pressure.

If the difference between the values is more than 0.7 bar (70 kPa / 10 psi), replace the water filter.

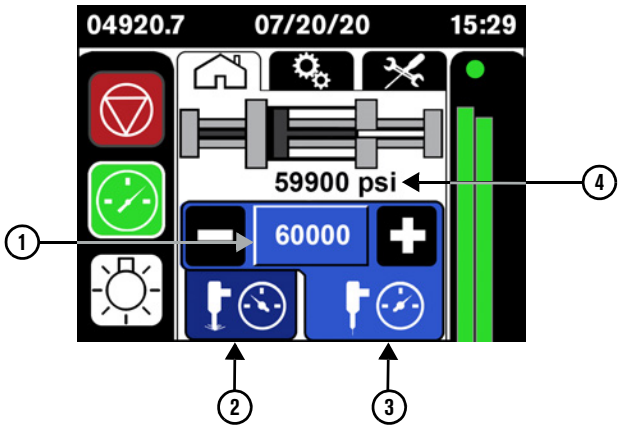
Make sure that the emergency stop operates correctly



Do this task when the pump is operating.

On the operation panel, push the EMERGENCY STOP button. Refer to Emergency stop on page 51.

Operate the pump



1 **Target water pressure**

Touch this to set the target water pressure.

2 **Pierce-pressure mode (off)**

Touch this symbol to put the pump in pierce-pressure mode.

3 **Cut-pressure mode (on)**

Touch this symbol to put the pump in cut-pressure mode.

4 **Output water pressure**

This shows the actual water pressure when the pump is operating.

Select the pressure mode

Cut-pressure mode ③ is used for most cutting jobs.

Pierce-pressure mode (low-pressure mode) ② is applicable for:

- making a hole in the material to be cut.
- decreasing the risk of cracking when cutting brittle materials, such as glass or ceramic.
- preventing composite materials like carbon fiber from delaminating.

Pierce pressure is typically less than or equal to 1,380 bar (138,000 kPa / 20,000 psi).

Set the target water pressure

There are 2 ways to change the target water pressure on the operator interface.

- Touch the ▬ symbol or the ✚ symbol to change the target water pressure in preset increments.

  To change the increments, refer to Pressure Adjustments on page 167.

- Touch the target water pressure button ① to open a numeric keypad. Type the number and then touch **Enter**.

Stop the pump

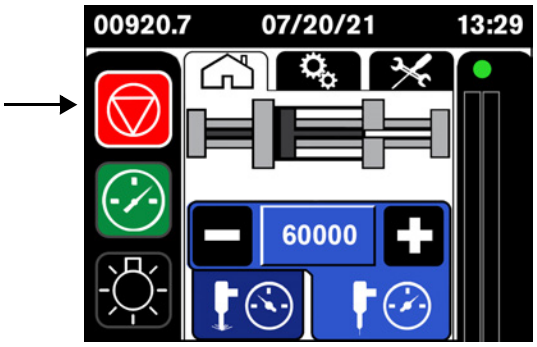
Stop the pump remotely

	You can stop the pump from the operator interface while using remote controls. On the operator interface, touch the symbol to stop the pump. Refer to Stop the pump on page 50.
	Refer to Emergency stop on page 51 for information about the EMERGENCY STOP button.

Refer to the OEM's instructions for turning the pump off.

Stop the pump locally

Use this procedure during normal operation.



On the operator interface, touch the symbol.

- The pump, the primary motor, and the intensifier turn off.
- The bleed-down valve opens to release high-pressure water from the system.
- The supply-water valve closes to stop low-pressure water from entering the system.
- No output water pressure shows.
- The control circuit stays on.

Emergency stop

WARNING

The EMERGENCY STOP button does not disconnect main electrical power from the machine.

Use the emergency stop to stop the controls immediately to prevent injury or to reduce the risk of injury to personnel, machinery, or work in progress. **This is not the preferred method of turning off the pump.**

On the operation panel, push the EMERGENCY STOP button.

- The control circuit turns off, which turns off the pump, the primary motor, and the intensifier.
- Remote controls that are wired to the pump controller turn off.
- The bleed-down valve opens to release high-pressure water from the system.
- The supply-water valve closes to stop low-pressure water from entering the system.

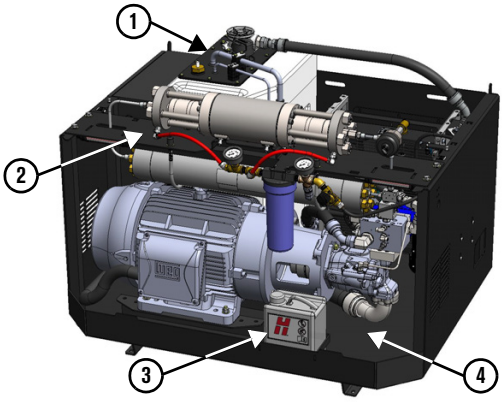
The EMERGENCY STOP button must be reset before the equipment can be turned on. Turn the button clockwise until it releases.

Turn off the pump: end of day

Do this procedure at the end of the day.

1. On the operator interface, touch the symbol to stop the pump.
2. Turn the primary breaker disconnect lever on the electrical enclosure door to **OFF**.

3. Turn **OFF** the utility water to the pump. Make sure that the water pressure gauges show 0.0 bar (0 kPa / 0 psi).
4. Turn **OFF** the compressed air source.
5. Turn **OFF** the electrical main (line disconnect switch). Use standard lock out–tag out procedures.
6. Remove the top cover and the front panel.
7. Clean all debris, water, and hydraulic fluid off of the hydraulic fluid tank ①, the intensifier bridge ②, and the bottom deck ④.



8. Empty the dirty water container ③, if necessary.

	Refer to local regulations regarding waste water. Environmental rules can apply to disposal.

3 Preventive maintenance

	This section assumes that the user is familiar with the **Safety**, **Operation**, **Troubleshooting**, and **Specifications** sections of this manual.
	Images in this manual are for reference purposes. It is possible that your product configuration is not shown accurately.
	It is possible that not all of the information in this section applies to all pump models.

Safety

WARNING 	**Read and understand all of the safety guidelines in this manual.** Refer to Safety on page 21 before operating, doing maintenance on, repairing, and installing your pump.
CAUTION 	Do not tighten a fitting too much. The fitting can fail.
CAUTION 	Hydraulic, water, and electrical connections can become loose during shipping and normal operation. Examine all connections at installation and during regular maintenance.
CAUTION 	When replacing wiring, use only the same size, type, and color as the original wiring.
CAUTION 	Before assembling high-pressure or hydraulic parts, clean the parts to remove grease and other contamination.
	Clean and examine parts that will be replaced to identify wear patterns or damage that can show other problems.
	Clean each part with a towel and isopropyl alcohol. Examine all parts for deterioration, corrosion, or damage. Do not use soap, detergent, or solvents.
	Keep the work area clean and dry. Clean fluid spills immediately. Use a pan or a tray below areas where water or hydraulic fluid can spill during maintenance or repair procedures.
	Obey local protocols for recycling or disposal of parts, materials, and fluids. National and local environmental rules can apply to disposal. Refer to Recycling and end of product life on page 96.
	Keep accurate maintenance records. Records can help with predicting and preventing maintenance problems.
	Keep spare parts and repair kits available.

Benefits of preventive maintenance

Hypertherm recommends preventive and scheduled maintenance for Echion pumps. High-quality equipment that is maintained on a schedule lasts longer than equipment that is not maintained regularly. This maintenance includes adjustments, cleaning, lubrication, repairs, and replacement of parts.

- Improves reliability
- Finds possible problems before they cause unplanned downtime and become expensive repairs
- Extends the life of equipment and decreases the frequency of replacement
- Contributes positively to reputation and profits
- Gives traceability through records

Training

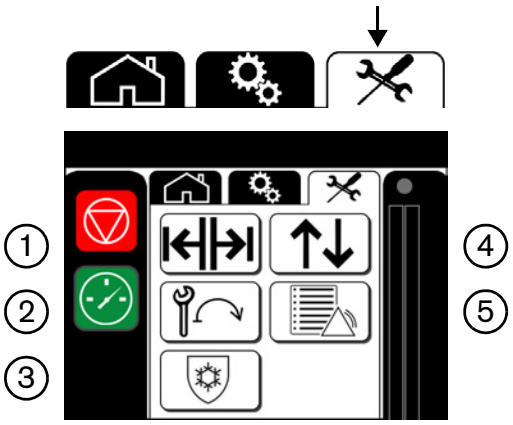
The employer must provide training for maintenance procedures. Retrain personnel when:

- there is a change in job assignment, machinery, or procedures that can present a new danger.
- energy-control procedures change.
- there is reason to believe there is a deficiency in a person's knowledge of the energy-control procedure.

Operator interface: Maintenance screens

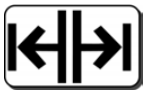
Refer to Touchscreen maps on page 177 to see all of the screens available on the controller.

On the operator interface, touch the maintenance tab to open the primary maintenance screen.

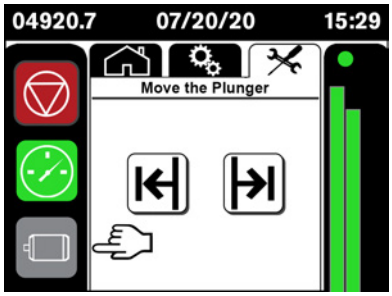


1 Move the plunger
2 Start the pump after maintenance
3 Prepare for storage
4 Inputs and outputs
5 Alarm log

Move the plunger



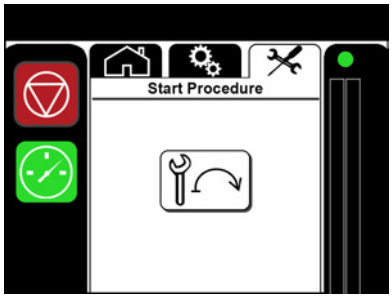
Touch this symbol to open the **Move the Plunger** screen.



Instructions for moving the plunger begin on page 61.

Start the pump after maintenance

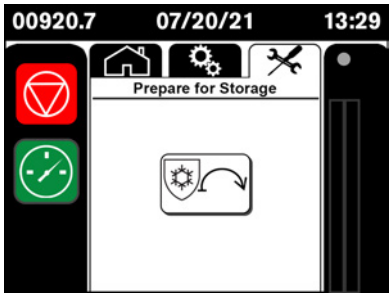
Touch this symbol to open the **Start Procedure** screen.



Refer to Postmaintenance start procedure on page 91 for more information.

Prepare for storage

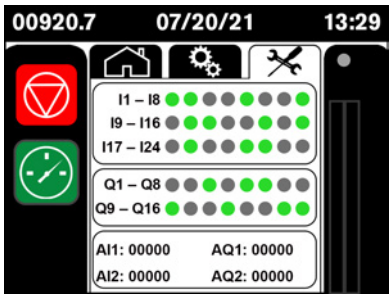
Touch this symbol to open the **Prepare for Storage** screen.



Refer to Prepare for storage on page 93 for more information.

Inputs and outputs

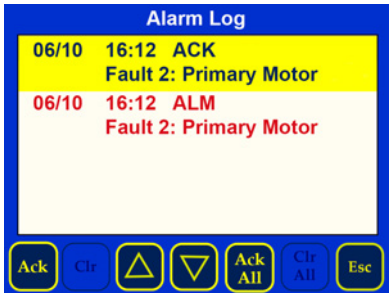
The inputs and outputs screen is useful for troubleshooting. Touch this symbol to open a screen that shows inputs and outputs for the controller.



Refer to Input/output status on page 134 for more information.

Alarm log

The alarm log is useful for troubleshooting. Touch this symbol to open the Alarm Log screen.



Refer to Alarms on page 114 for more information.

Tools

	Use the correct tools for maintenance procedures. Some tools are designed to make the procedure easier and to prevent damage to the equipment.
	Personnel who maintain and repair this equipment must know how to use standard hand tools.
	Use SAE (US standard) tools for most procedures.

Special tools are recommended or necessary for some maintenance and repair procedures.

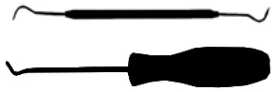
Open-ended wrench

Crowfoot wrench

Screwdriver

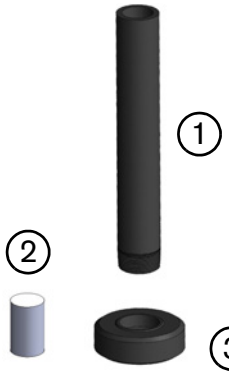
Standard

Phillips



O-ring pick

Snap ring pliers



Intensifier repair tools

1. Seal installation tool
2. Seal removal tool
3. Cylinder locator tool

Preventive maintenance schedule

These maintenance intervals are recommended guidelines. Find the procedures on the page numbers listed in the Hours columns.

	Interval						
	Daily	500	1,000	1,500	3,000	6,000	12,000
Before starting the pump							
• Clean and inspect the pump.	page 39						
• Check the hydraulic fluid.	page 41						
After starting the pump							
• Examine the pump for leaks or damage.	page 44						
• Check the hydraulic fluid level.	page 45						
• Check the hydraulic filter gauge.	page 45						
• Check the low-pressure water pressure gauges.	page 46						
• Make sure that the emergency stop operates correctly.	page 46						
Intensifier							
• Repair the high-pressure cylinders, the check valves, and the low-pressure poppets.		page 66					
• Replace the high-pressure seal cartridges.		page 69					
Intensifier							
• Replace the high-pressure poppet assemblies.			page 69				
• Replace the low-pressure poppets and seats.			page 74				
Low-pressure water system							
• Clean the air cooler.			page 78				
Bleed-down valve							
• Repair the bleed-down valve.			page 75				
Low-pressure water system							
• Replace the water filter.			page 80				
• Test the low-pressure water TDS level.			page 81				

	Interval						
	Daily	500	1,000	1,500	3,000	6,000	12,000
Hydraulic system • Replace the hydraulic filter element.				page 84			
Intensifier • Flip the high-pressure cylinder.				page 66			
Intensifier • Replace the high-pressure cylinders and the check valve assemblies.					page 66		
Bleed-down valve • Replace the bleed-down valve body.					page 75		
Hydraulic system • Replace the hydraulic fluid.					page 86		
Intensifier • Replace the output adapters. • Replace the seal housing assemblies.						page 73 page 62	
Motor • Lubricate the primary motor bearings.						page 88	
Intensifier • Replace the spacer tubes. • Repair the hydraulic center section.							page 62 page 65

Intensifier

Every 500 hours
- Repair the check valves and the low-pressure poppets.
- Repair the high-pressure cylinders.
- Replace the high-pressure seal cartridges.

Every 1,000 hours
- Replace the high-pressure poppet assemblies.
- Replace the low-pressure poppets and seats.

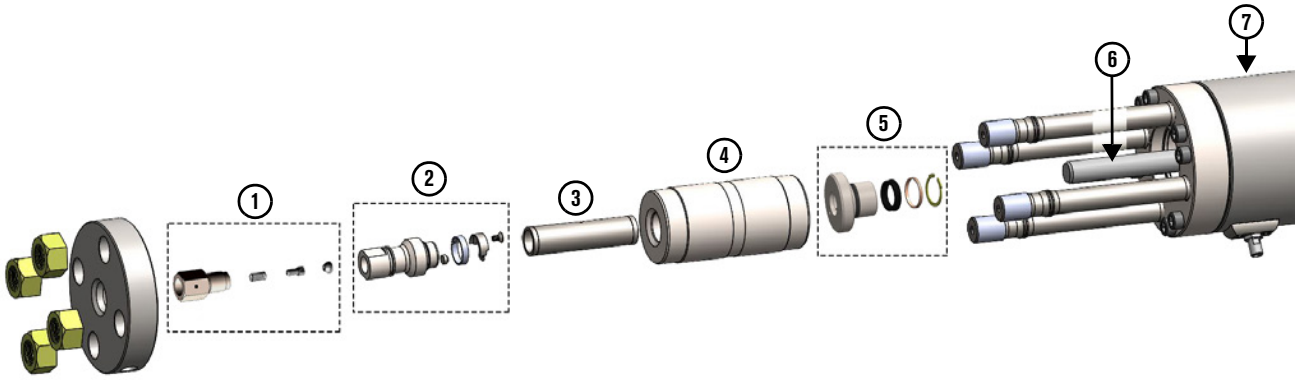
Every 1,500 hours
- Flip the high-pressure cylinders.

Every 3,000 hours
- Replace the high-pressure cylinders.
- Replace the check valve assemblies.

Every 6,000 hours
- Replace the output adapters.
- Replace the seal housing assemblies.

Every 12,000 hours
- Replace the spacer tubes.
- Repair the hydraulic center section.

CAUTION	To prevent causing damage or premature failure, use 2 wrenches when loosening or tightening a high-pressure connection. Always tighten fittings to the specified torque.
CAUTION	Do not use an adjustable wrench on high-pressure fittings.
	Use clean hands when changing high-pressure parts.
	To reduce downtime, Hypertherm recommends doing preventive maintenance on both ends of the intensifier at the same time.



1 Output adapter and high-pressure poppet assembly
2 Check valve assembly
3 Spacer tube
4 High-pressure cylinder
5 Seal housing assembly
6 Plunger
7 Hydraulic center section

Parts, tools, and materials

Intensifier repair tools

1-18770 Echion high-pressure seal repair kit

1-18771 Echion high-pressure poppet repair kit

1-18849 Echion low-pressure poppet repair kit

1-18768 Standard tool kit

13/16-inch open-ended wrench or socket

1-inch open-ended wrench

1-1/16-inch open-ended wrench

1-inch socket

Torque wrench

Rubber mallet

2 O-ring picks (or similar tool)

2 standard screwdrivers

Large snap-ring pliers

Small snap-ring pliers

Isopropyl alcohol

Antiwear (AW) mineral oil or synthetic hydraulic fluid, ISO viscosity grade (VG) 32 or 46

Clean towels

Nonstick scouring pad

Masking tape

Recommended materials

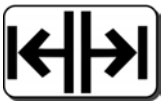
Bench vise

Refer to Intensifier high-pressure ends on page 107 for individual replacement parts.

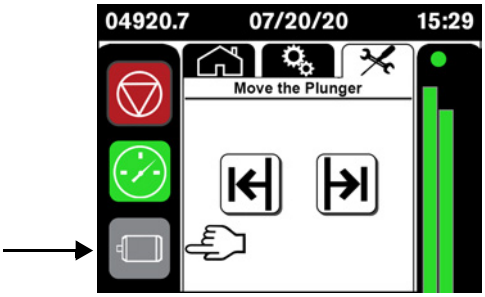
Do this task when the pump is not operating.

1. On the operator interface, touch the maintenance symbol to open the primary maintenance screen.

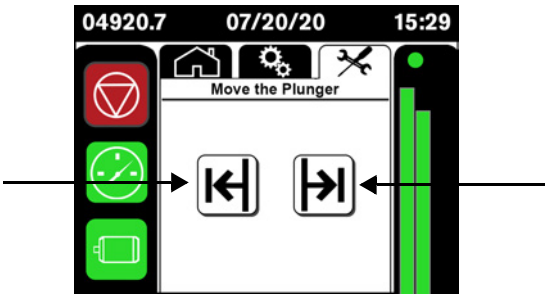
2. Touch this symbol to open the **Move the Plunger** screen.



3. Touch the motor symbol to start the motor.



4. Touch a symbol to move the intensifier plunger to the end you will be working on.



5. On the operator interface, touch the  symbol to stop the pump.

6. Turn the primary breaker disconnect lever on the electrical enclosure door to **OFF**.

7. Turn **OFF** the utility water to the pump. Make sure that the water pressure gauges show 0.0 bar (0 kPa / 0 psi).

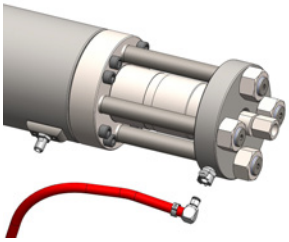
8. Turn **OFF** the compressed air source.

9. Turn **OFF** the electrical main (line disconnect switch). Use standard lock out–tag out procedures.

10. Use a 13/16-inch open-ended wrench to disconnect the high-pressure tubing from the intensifier.

11. Remove the bleed-down valve. Refer to step 5 though step 10 on page 76.

12. Push the button on the quick-disconnect fitting to remove the low-pressure water line from the intensifier.



It is possible that some water will spray from the connection when this tubing is disconnected.

13. Use the breaker bar and the 1-1/2-inch 12-point socket to remove the endcap nuts. Use a repeating cross pattern.

14. Remove the end cap.

Hydraulic fluid and water will leak during this procedure. Put towels on the intensifier bridge under the work area.

15. Pull out the check valve.

16. Pull the high-pressure cylinder off of the plunger.

Make sure that the spacer tube does not fall out. Dropping the spacer tube can cause damage to it.

17. Put the cylinder locator tool and the seal installation tool together.

18. Put the tool on the seal housing and turn it clockwise so that the threads engage. Pull the seal housing assembly off of the plunger.

A small amount of hydraulic fluid could leak from the hydraulic cylinder. This is normal.

Repair the hydraulic center section

Repair the hydraulic center section every 12,000 hours.

The hydraulic center section includes the piston, the hydraulic cylinder, the hydraulic end caps, the low-pressure seals, the plungers, the T-seals, and the proximity switches.

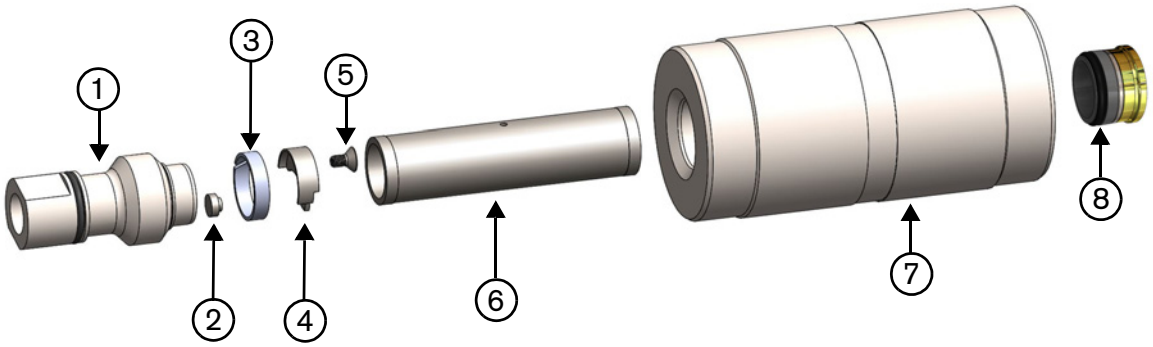
Preventive maintenance on these parts requires special tools. Contact a Hypertherm Technical Service Associate for information and support regarding the installation, operation, maintenance, and repair of this equipment.

Repair the high-pressure cylinder, the check valve, and the low-pressure poppet

- Repair the high-pressure cylinders every 500 hours.
- Repair the check valves and the low-pressure poppets every 500 hours.
- Replace the high-pressure seal cartridges every 500 hours.
- Replace the low-pressure poppets and seats every 1,000 hours.
- Replace the high-pressure cylinders every 3,000 hours or if the cylinder is chipped or cracked.
- Replace the check valve assemblies every 3,000 hours.

CAUTION	Debris in the cylinder can cause the seals or the poppets to fail.
	This procedure is for a moderately worn check valve. Replace very worn components.

1. Disassemble and examine the cylinder and the check valve.



1	Check valve body	**5**	Low-pressure poppet screw
2	Low-pressure poppet	**6**	Spacer tube
3	Check valve wear ring	**7**	High-pressure cylinder
4	Poppet retainer	**8**	High-pressure seal cartridge

2. Disassemble the cylinder locator tool and the seal installation tool.

3. Put the high-pressure cylinder on the seal locator tool. Make sure that the spacer tube is inside the cylinder.

4. Put the end of the push tool against the spacer tube inside the cylinder.

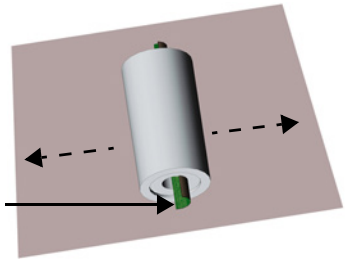
5. Tap on the end of the push tool with a rubber mallet to push the bottom seal and the hoop out of the high-pressure cylinder.

6. Take the spacer tube out of the cylinder.

7. Disassemble all of the parts.

8. Examine the cylinder. If the area around the bore is marked or pitted or has rough edges or burrs, remove the defects with a nonstick scouring pad.

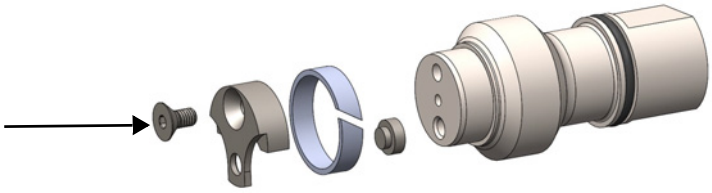
9. Cut a nonstick pad in half. Put half of the pad in the end of the cylinder. Put 1 thumb in each end of the cylinder and push down evenly on the pad while rolling the cylinder back and forth.



Nonstick scouring pad

10. Clean the inner surfaces of the cylinder with a towel and isopropyl alcohol.

11. Use a 1/8-inch hex wrench to remove the low-pressure poppet screw from the check valve.



12. Tape a sheet of lapping paper on a granite lapping block. Make sure that the paper is smooth and flat.

13. Put the check valve face or the low-pressure poppet face flat on the lapping paper and move it back and forth. Use light pressure. Do this procedure until the face is smooth and flat and has a mirrorlike finish.

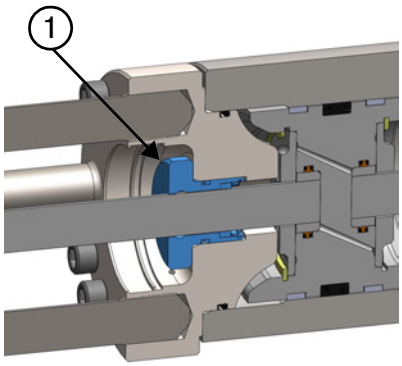
CAUTION 	Do not rock the parts or use too much pressure. Doing so can cause damage to the part faces.
CAUTION 	Keep the low-pressure poppet and the poppet retainer clean. Grease can cause the poppet to stick.
	Do not put grease or lubricant on the check valve face or in the cylinder bore. These components are designed for dry contact.

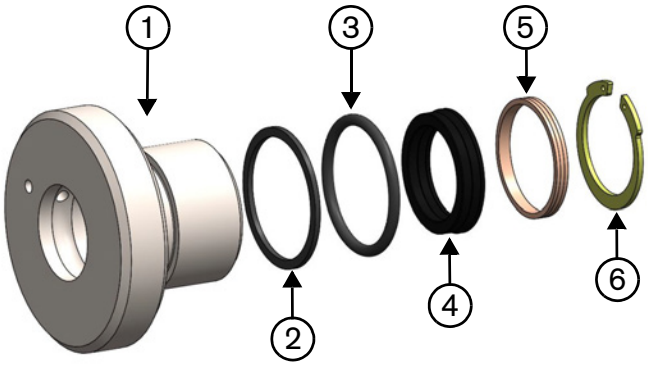
Install the high-pressure components

Replace the seal housing assemblies every 6,000 hours.

CAUTION

Water can enter the hydraulic system if the weep holes in the dynamic seal backup or the seal housing are blocked. Make sure that there is no debris in the weep holes.

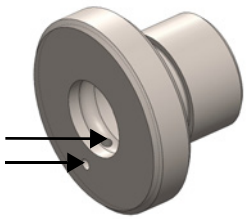




1 Seal housing
2 O-ring backup
3 O-ring
4 Energized spring seal
5 Rod seal spacer
6 Snap ring

1. Use small snap-ring pliers to remove the snap ring from the seal housing.
2. Remove the rod seal spacer.
3. Use an O-ring pick to remove the energized seal spring.
4. Remove the O-ring and the O-ring backup from the seal housing.
5. Clean all surfaces. Examine the seal housing and the high-pressure seal backup. Make sure that the inner grooves are clean.

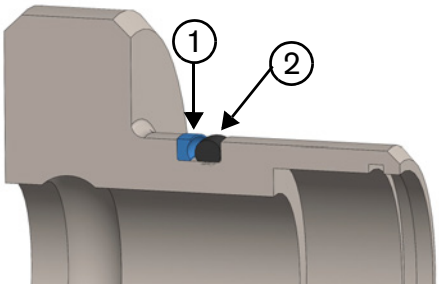
   Make sure that the weep hole is clear. If necessary, use compressed air to blow debris out.



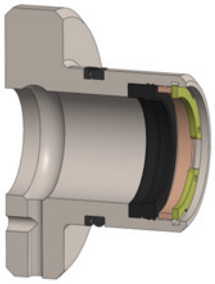
6. Put high-vacuum grease on the backup ring and the seal housing O-ring.

7. Put the seal housing O-ring backup and the seal housing O-ring on the seal housing.

   The seal housing O-ring backup ① has a flat side and a concave side. Make sure the flat side of the O-ring backup faces the wide end of the seal housing. The O-ring ② fits into the concave groove on the O-ring backup.



8. Put the new components in the seal housing, as shown.

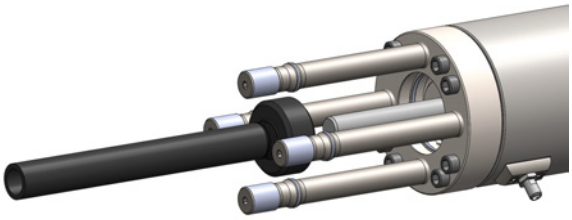


9. Use snap-ring pliers to insert the snap ring. Make sure that the snap ring is seated correctly in the groove.

10. Put the cylinder locator tool and the seal installation tool together.

11. Put the tool on the seal housing and turn it clockwise so that the threads engage.

12. Put the seal housing on the plunger with the narrow end of the seal housing toward the center of the intensifier.



13. Turn the seal housing so that the weep hole faces down.

14. Push the seal housing tightly against the hydraulic end cap. You should feel it click.

15. Remove the tool from the seal housing.

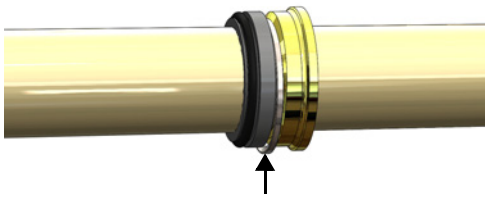
16. Put the cartridge in the seal installation tool.

17. Hold the seal installation tool with both hands and push the cartridge and the tool onto the plunger in a smooth motion. Push until the cartridge is touching the seal housing.

18. Remove the seal installation tool, leaving the cartridge on the plunger.

Part of the cartridge stays inside the seal installation tool. This is by design.

19. Make sure that the cartridge parts are tight and none of the components are hanging down on the plunger.



20. Put the spacer tube on the plunger.

21. Find the end of the high-pressure cylinder that was repaired with the nonabrasive pad. Put the high-pressure cylinder over the spacer tube with that end facing the center of the intensifier. Push the cylinder as far as possible.

Turn the high-pressure cylinder around at 1,500 hours to promote even wear.

22. Put the check valve in the end of the high-pressure cylinder. Make sure that the weep hole faces down toward the ground.

23. Put the high-pressure end cap over the check valve and onto the studs. Push the endcap until it is tight against the check valve. Make sure that the low-pressure water connection points toward the attenuator.

24. Use a clean rubber mallet to tap the exposed part of the check valve until the cylinder is fully seated in the end of the hydraulic end cap.

25. Lubricate the stud threads with antiseize bolt lubricant (white lithium grease).

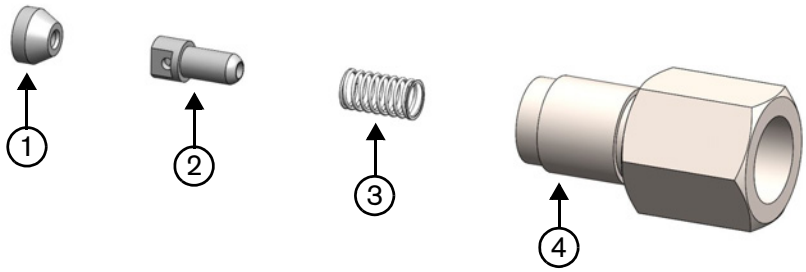
26. Put the nuts on the studs by hand. Use a torque wrench to tighten the high-pressure end cap nuts to 68 N·m (50 lbf·ft). Use a repeating cross pattern.

Tighten the nuts to 375 N·m (275 lbf·ft). Do this in 68 N·m (50 lbf·ft) increments.

Examine the output adapter and the high-pressure poppet assembly

- Replace the high-pressure poppet assemblies every 1,000 hours.
- Replace the output adapters every 6,000 hours.

CAUTION	The high-pressure poppet seat can cause cracks, erosion marks, or dents in the output adapter.
	If a poppet part is damaged, replace all 3 components.



1 High-pressure poppet seat

2 High-pressure poppet

3 High-pressure poppet spring

4 Output adapter

Use a cotton-tipped applicator to guide the high-pressure poppet seat out of the check valve.

Tap the output adapter gently on a wooden or other soft surface to eject the poppet from the output adapter.

Assemble the check valve and the low-pressure poppet

1. Use a cotton-tipped applicator to put high-pressure antiseize lubricant in the recess in the bottom of the check valve.
2. Use a cotton-tipped applicator to guide the high-pressure poppet seat into the check valve. The wide end of the poppet seat faces toward the check valve.
3. Push the high-pressure poppet seat into the high-pressure antiseize lubricant in the check valve.
4. Put high-pressure antiseize lubricant on the threads of the output adapter.
5. Put the high-pressure poppet spring and the high-pressure poppet in the output adapter.
6. Put the output adapter in the check valve and tighten it by hand. Use a torque wrench to tighten the output adapter to 115 N·m (85 lbf·ft).

CAUTION

Tightening the output adapter with the high-pressure poppet in an incorrect position can cause damage.

When the output adapter is correctly installed, the gap between the wide part of the output adapter and the check valve is 2.5 mm (3/32 inch) and no threads are visible.

If the gap is too large or if threads are visible, make sure that the poppet parts have not moved.

7. Torque the high-pressure water fitting to 68 N·m (50 lbf·ft).
8. Repeat this procedure on the other end of the intensifier.
9. Connect the high-pressure tubing.

CAUTION

Make sure that some of the threads on the high-pressure tubing are visible at the fitting. Refer to High-pressure water fittings on page 144.

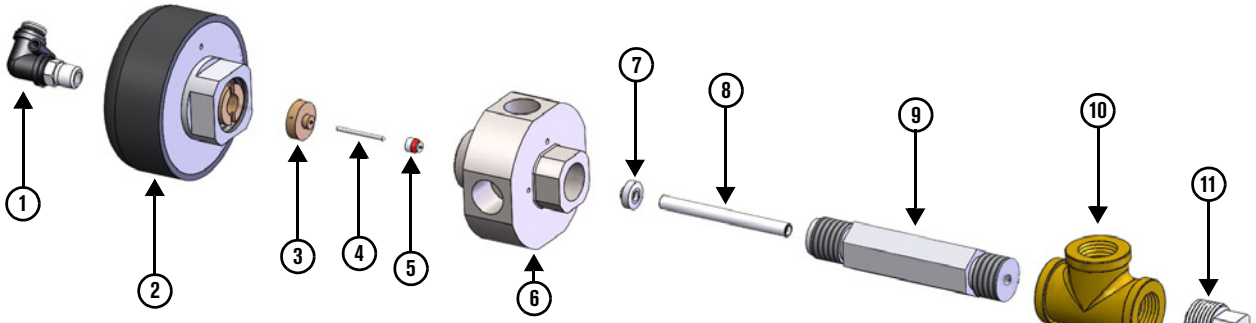
10. Connect the low-pressure water lines.

Repair the bleed-down valve

Repair the bleed-down valve:

- every 1,000 hours.
- if water leaks from the **Waste water out** connection or from the weep holes while the pump is operating.

Replace the bleed-down valve body every 3,000 hours.



1 Air fitting
2 Actuator
3 Needle guide
4 Needle
5 High-pressure valve seal
6 Bleed-down valve body
7 Bleed-down valve seat
8 Flow reducer
9 Outlet adapter
10 Tee fitting
11 Plug

Parts, tools, and materials

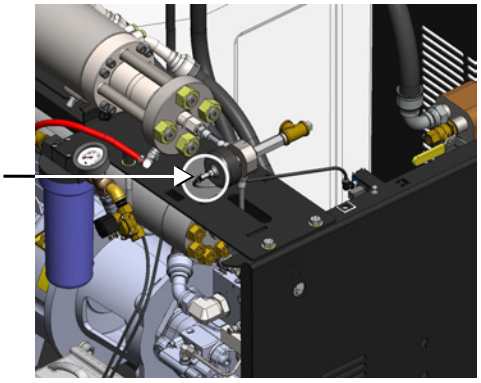
1-17434 Bleed-down valve repair kit
1-18311 Bleed-down valve body
3/4-inch open-ended wrench
5/8-inch open-ended wrench
13/16-inch open-ended wrench
1-inch open-ended wrench
1-1/8-inch open-ended wrench
13/16-inch crowfoot wrench
Torque wrench
Clean towels
Isopropyl alcohol

Do this task when the pump is not operating.

1. Turn the primary breaker disconnect lever on the electrical enclosure door to **OFF**.
2. Turn **OFF** the utility water to the pump. Make sure that the water pressure gauges show 0.0 bar (0 kPa / 0 psi).
3. Turn **OFF** the compressed air source.
4. Turn **OFF** the electrical main (line disconnect switch). Use standard lock out–tag out procedures.

5. Remove the top cover and the front panel. Refer to Inspect the pump on page 39 for instructions.

6. Disconnect the compressed air hose from the air fitting on top of the actuator.



7. Disconnect the water drain tube from the bleed-down valve.

8. Use 13/16-inch open-ended wrench to loosen the high-pressure fittings attached to the bleed-down valve body.

9. If the pump-mounted plumbing kit is installed on this machine, loosen the high-pressure fitting near the bleed-down valve.

10. Remove the bleed-down valve assembly from the pump.

11. Remove the outlet adapter from the valve body.

12. Remove the seat and the flow reducer from the outlet adapter.

13. Remove the actuator from the valve body.

14. Push a dowel through the bottom of the valve body to remove the seal, the needle guide, and the needle.

15. Put high-pressure antiseize lubricant on the seat.

16. Put the flow reducer into the outlet adapter.

17. Put the seat into the outlet adapter.

18. Install the outlet adapter in the bleed-down valve body. Use a torque wrench to tighten the adapter to 95 N·m (70 lbf·ft).

19. Put the needle through the needle guide and the valve seal. Make sure that the point of the needle faces the seal.

20. Put high-vacuum grease on the red O-ring on the valve seal. Make sure that the red O-ring on the valve seal faces away from the needle.

21. Put the needle-and-seal assembly into the valve body until the needle guide is even with the top of the bore.

22. Install the actuator on the valve body. Tighten the actuator by hand.

23. Use a torque wrench to tighten the high-pressure fittings on the valve body. Refer to High-pressure water fittings on page 144.

24. Connect the water drain tube to the bleed-down valve.

25. Connect the compressed air hose to the fitting on top of the actuator.

26. Turn **ON** the utility water to the pump.

27. Turn **ON** the compressed air source.

28. Turn **ON** the electrical main (line disconnect switch).

29. Turn the primary breaker disconnect lever on the electrical enclosure door to **ON**.

30. Make sure that the EMERGENCY STOP is not engaged. If the button is pushed in, turn the button clockwise until it releases.

31. Make sure that the key switch is set to Local  .

32. Push the Controls button.

33. On the operator interface, touch the  symbol to start the pump.

34. Monitor for leaks.

Clean the air cooler

Do this task:

- every 1,000 hours.
- if you receive a Fault 1: Hydraulic Fluid >65C alarm.

CAUTION 	Detergent can give better cleaning results. Think about the environment when selecting and using cleaning chemicals. Detergent **must** be compatible with aluminum.
CAUTION 	Protect the motor and all electronics during the cleaning procedure.

Parts, tools, and materials

Compressed air source

Pressurized-water source or a steam cleaner

Operation or equivalent oil

Recommended materials

Aluminum-compatible detergent

Ethylene perchlorate detergent

Oil carbon detergent

Do this task when the pump is off.

Remove the top cover and the front panel. Refer to Inspect the pump on page 39 for instructions.

Clean the air side of the cooler

CAUTION 	To prevent damage, the stream of water or air must be parallel to the fin. Point the water stream against the air direction.
CAUTION 	Detergent can give better cleaning results. Think about the environment when selecting and using cleaning chemicals. Detergent **must** be compatible with aluminum.

1. Refer to the label on the cooler to find the cooler's air direction.
2. Clean oil and grease off of the cooler with compressed air, pressurized water, or a steam cleaner. Direct the cleaning stream against the cooler's air direction.
3. After cleaning, dry the cooler.

Clean the hydraulic fluid side of the cooler

1. Disassemble the blast oil cooler to find the degree of contamination.

   If contamination is moderate, connect the oil side to a closed cleaning system with a pump and a filter.

   Ethylene perchlorate detergent can be used. Pump the detergent through the blast oil cooler for 10 minutes.

   If contamination is very bad, use an oil carbon detergent. Rinse cleaned surfaces for 30 minutes.

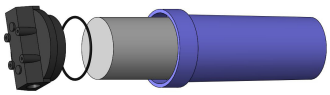
2. Use compressed air to remove remaining detergent.

3. Rinse the blast oil cooler with operation or equivalent oil.

Replace the water filter

Do this task:

- every 1,000 hours.
- if the difference between the values on the prefilter water-pressure gauge and the postfilter water-pressure gauge is more than 0.7 bar (70 kPa / 10 psi).



Parts, tools, and materials

Filter cartridge, water, 1.0 micron, 10-inch

Filter wrench (included in the standard tool kit)

Recommended materials

Bucket or pail

Do this task when the pump is off.

1. Turn **OFF** the water to the pump.
2. Remove the top cover and the front panel. Refer to Inspect the pump on page 39 for instructions.
3. Use the filter wrench to loosen the filter canister.
4. Remove the used filter cartridge from the filter canister. Discard the used filter.

   There is an O-ring in the top of the canister.

5. Pour all of the water and debris out of the canister. Rinse or wipe out the canister, if necessary.
6. Put a new filter cartridge in the canister. The filter does not have a designated top or bottom.
7. Use the filter wrench to install the filter canister.
8. Turn **ON** the water to the pump.
9. Turn **ON** the pump.
10. On the operator interface, touch the symbol start the pump.
11. Make sure that the difference between the values on the prefilter water-pressure gauge and the postfilter water-pressure gauge is less than 0.7 bar (70 kPa / 10 psi).

Test the total dissolved solids (TDS) level

Do this task every 1,000 hours.

CAUTION	The meter is not waterproof. Do not submerge the meter in water.
	Some TDS meters must be calibrated before use. For best results, calibrate the meter at 25°C (77°F). Refer to the instructions supplied with the TDS meter.

Refer to Test the water quality on page 83.

A total dissolved solids (TDS) test measures the total concentration of dissolved substances in postfilter water. Dissolved solids cause deposits that can cause damage to check valves, seals, orifices, and other consumables.

Parts, tools, and materials

1-13897 TDS meter

Container for a water sample

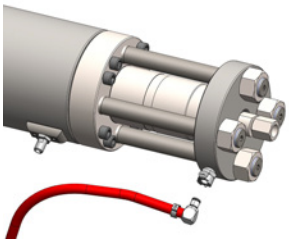
Clean, deionized water or filtered water

Recommended materials

Bucket or pail

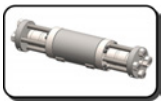
Do this task when the pump is off.

1. Push the button on a quick-disconnect fitting to remove a low-pressure water line from the intensifier.

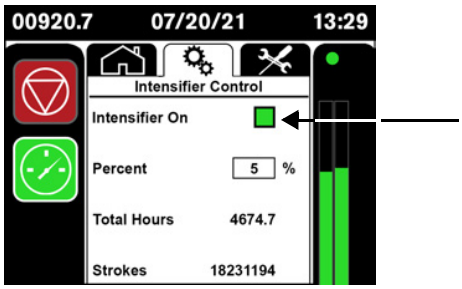


2. Disable the intensifier.
   a. On the operator interface, touch the adjustments symbol to open the primary adjustments screen.

   b. Touch this symbol to open the **Intensifier Control** screen.



c. Touch the **Intensifier On** box.



Refer to Intensifier Control on page 170.

3. Set the target water pressure to 345 bar (5,000 psi). Refer to Set the target water pressure on page 47 for instructions.

4. Turn **ON** the pump.

5. Take a sample of the water from a low-pressure water line after the water filter. Make sure that the water is clear and odorless.

6. Put the TDS meter in the water sample up to the maximum immersion level (5 cm/2 inches). Tap the meter gently to release air bubbles.

   Wait approximately 20 seconds for the reading to become stable.

   If multiple readings are taken, turn **OFF** the TDS meter between readings.

7. Compare the reading to the table.

Unsatisfactory	Optimal	Satisfactory	Unsatisfactory
Lower than 0.005% (50 ppm)	0.005% to 0.015% (50 ppm to 150 ppm)	0.015% to 0.022% (150 ppm to 220 ppm)	Higher than 0.022% (220 ppm)
Use nonmetallic or stainless-steel fittings	—	A reverse osmosis system can be used to remove TDS	Use a reverse osmosis system to remove TDS

CAUTION	A TDS level that is lower than 0.005% (50 ppm) can harm waterjet parts and requires the use of nonmetallic or stainless steel fittings. A TDS value of lower than 0.0005% (5 ppm) can damage stainless steel parts.
	Treat water with a TDS level that is higher than 0.015% (150 ppm) with reverse osmosis.

8. Rinse the meter in clean, deionized water or filtered water after use.

9. Connect the low-pressure water line.

10. Go to the **Intensifier Control** screen and enable the intensifier.

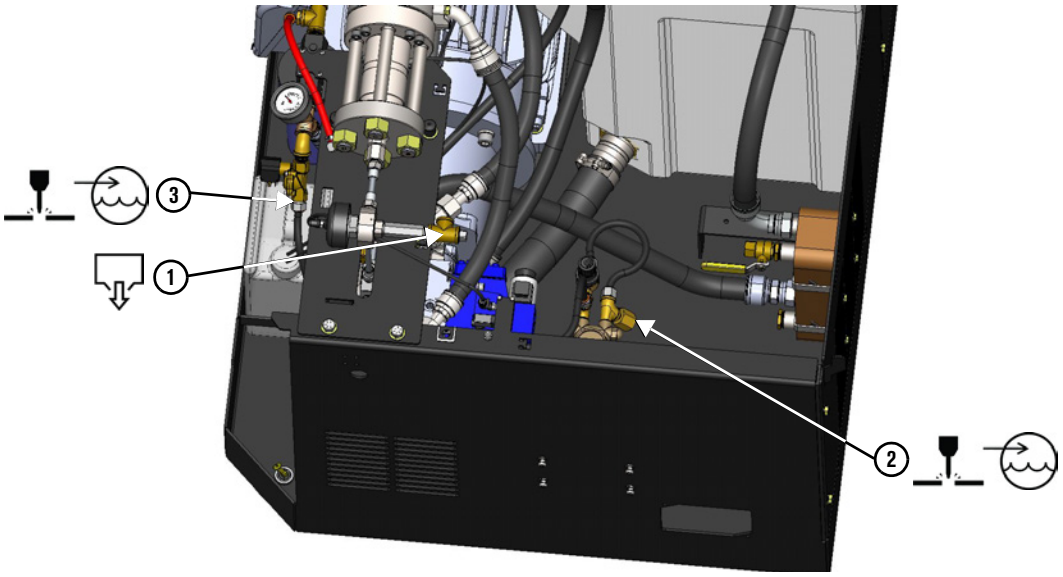
Test the water quality

Parts, tools, and materials

TDS meter	pH tester
Container for a water sample	Silica test kit
Clean, deionized water or filtered water	Water hardness (calcium carbonate) test kit

Do this task when the pump is not operating.

1. Take a sample from the **Waste water out** ① hose. If you cannot access the hose, take a sample from the boost pump ② or from the hose going to the inlet water solenoid ③ (for pumps without a boost pump).

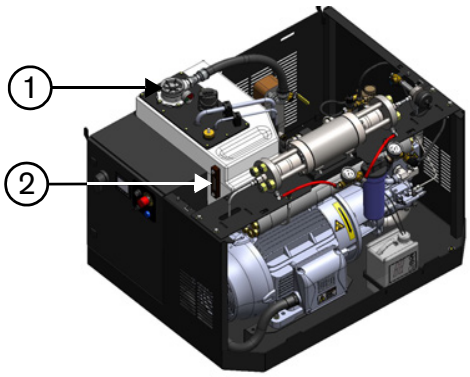


2. Make sure that the water is clear and odorless.
3. Test the pH. The optimal pH measurement is between 6.0 and 8.0.
4. Test the silica (SiO_2) content. The silica content must be lower than 0.0015% (15 parts per million [ppm]).
5. Test the water hardness. The result must be equal to or lower than 0.006% (60 ppm / 3.5 grains per gallon).
6. Test the total dissolved solids (TDS) concentration. The optimal range is 0.005% to 0.015% (50 ppm to 150 ppm). Refer to Test the total dissolved solids (TDS) level on page 81.

Replace the hydraulic filter element

Do this task:

- every 1,500 hours.
- when the needle on the hydraulic gauge is in the red zone while the pump is at stable temperature.



1 Filter head

2 Sight gauge

Parts, tools, and materials

Hydraulic filter element

Antiwear (AW) mineral oil or synthetic hydraulic fluid, ISO viscosity grade (VG) 32 or 46

Torque wrench

15/16-inch crowfoot wrench or socket

Recommended materials

Clean funnel

Clean towels

Do this task when the pump is not operating.

1. Remove the top cover and the front panel. Refer to Inspect the pump on page 39.
2. Remove the used filter element from the filter head.

   Use a 15/16-inch crowfoot wrench or a socket if the filter element is too tight to remove by hand.

3. Put clean hydraulic fluid on the gasket of the new filter element.
4. Twist the filter element into the filter head.
5. Use a torque wrench to tighten the filter to a value between 13.5 N·m (10 lbf·ft) and 16 N·m (12 lbf·ft).
6. Turn **ON** the pump in pierce-pressure mode.
7. Look at the sight gauge to check the hydraulic fluid level. Add hydraulic fluid, if necessary.

Add hydraulic fluid

	Do not put too much hydraulic fluid in the tank.

The capacity of the hydraulic fluid tank is 120 L (32 gallons).

Parts, tools, and materials

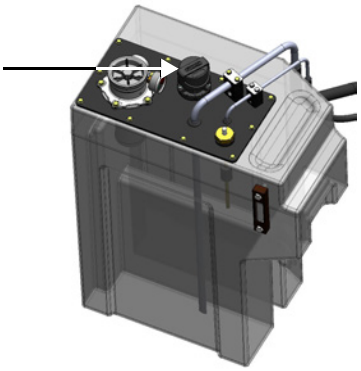
Antiwear (AW) mineral oil or synthetic hydraulic fluid, ISO viscosity grade (VG) 32 or 46

Recommended materials

Clean funnel

Do this task when the pump is not operating.

1. Remove the top cover and the front panel. Refer to Inspect the pump on page 39 for instructions.
2. Remove the filler cap.



3. Fill the tank with hydraulic fluid until the fluid is at the top mark on the sight gauge.
4. Install the filler cap.

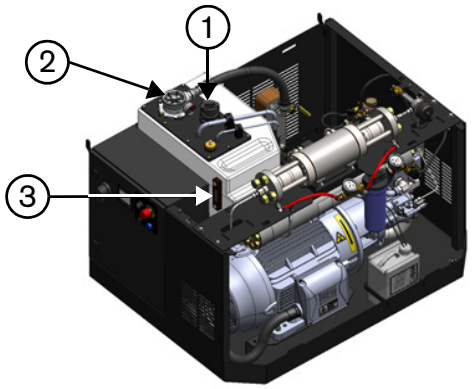
Replace the hydraulic fluid

Do this task:

- every 3,000 hours.
- if the hydraulic fluid is dark or milky in color or has a strong odor.
- if a test laboratory finds the quality is unsatisfactory.

Refer to Check the hydraulic fluid on page 41.

Do not put too much hydraulic fluid in the tank.



1 Filler cap
2 Filter head
3 Sight gauge

Parts, tools, and materials

1-18772 Hydraulic fluid replacement kit

Antiwear (AW) mineral oil or synthetic hydraulic fluid, ISO viscosity grade (VG) 32 or 46

Clean towels

Siphon or siphon pump

Torque wrench

15/16-inch crowfoot wrench or socket

Recommended materials

Clean funnel

Container for used hydraulic fluid

Isopropyl alcohol

Do this task when the pump is not operating.

1. Remove the top cover and the front panel. Refer to Inspect the pump on page 39 for instructions.
2. Remove the filler cap or the filter head.
3. Use a siphon or a siphon pump to remove the hydraulic fluid from the tank.

4. Disconnect the lower ends of the hydraulic hoses that enter the top of the tank.
5. Remove the filter element and install a new element. Refer to Replace the hydraulic filter element on page 84 for instructions.
6. Disassemble the hydraulic tank cover.
   a. Disconnect the temperature/level sensor cable.
   b. Disconnect the hydraulic hose from the filter.
   c. Remove the 2 hoses that pass through the cover.
   d. Use a 7/16-inch open-ended wrench to remove the bolts and washers (10 each) from the tank cover.
7. Clean the inner surfaces of the tank with clean towels. Make sure that no debris is left in the bottom of the tank.

CAUTION 	Remove all towels from the tank before putting hydraulic fluid in it.
CAUTION 	Do not use soap, detergent, or solvents. Isopropyl alcohol can be used to clean the tank.

8. Assemble the hydraulic tank cover.
   a. Install the tank cover bolts and washers (10 each).
   b. Install the 2 hoses that pass through the cover.
   c. Connect the hydraulic hose from the filter
   d. Connect the temperature/level sensor cable.
9. Fill the tank with hydraulic fluid until the fluid is at the top mark on the sight gauge.
10. Install a new filler cap.
11. Discard the used parts.
12. Turn **ON** the pump in pierce-pressure mode.
13. Monitor for leaks.
14. Add hydraulic fluid, if necessary. Refer to Add hydraulic fluid on page 85.
15. Operate the pump in pierce-pressure mode for 15 to 20 minutes.

If air is in the hydraulic system, the pump can be noisy during operation. Refer to The pump makes noise during operation on page 133.

Lubricate the primary motor bearings

Do this task every 3,000 hours.

CAUTION	Correct lubrication is important for motor performance. Use the correct types and amounts of grease and oil.
CAUTION	The bearing can overheat if too much or not enough grease is used to lubricate the bearing
	Most handheld pump grease guns have an output of 1.25 grams of grease per pump. Check with the manufacturer of your grease gun.

Parts, tools, and materials

Low-pressure handheld grease gun

NLGI grade 2 bearing grease

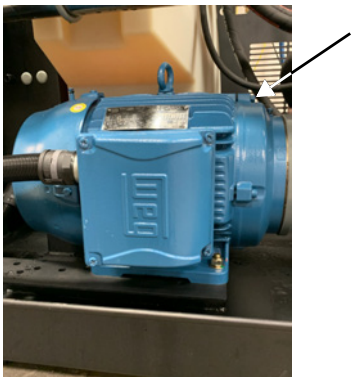
Clean towels

Recommended materials

Mobil Polyrex™ EM

Do this task when the pump is operating.

1. Remove the top cover and the front panel. Refer to Inspect the pump on page 39 for instructions.
2. Remove the grease fitting cap.



3. Remove the plastic plug on the bottom side of the motor.
4. Clean the grease fitting with a towel, if necessary.
5. Attach a grease gun coupler to the grease fitting.

6. Use a grease gun to put the specified quantity of grease in the motor.

Echion 15	Echion 30	Echion 50
13 grams	18 grams	21 grams

7. Replace the grease cap.

CAUTION

Use only the recommended volume of grease.

8. Do this procedure again on the other end of the motor.

9. Use the postmaintenance start procedure after working on the primary motor. Refer to Postmaintenance start procedure on page 91.

Start the pump after maintenance

CAUTION 	A turning motor shaft can be dangerous. Close all doors and replace all covers, including access covers.
CAUTION 	Do not try to repair a leak with pressure in the system.
CAUTION 	Remove all tools, towels, and rags from the work area before starting the equipment.
CAUTION 	Make sure that all fittings are tight after doing maintenance on or repairs to this equipment.

Start the pump normally if maintenance done on the pump was limited to: ▪ replacing the water filter. ▪ replacing the hydraulic filter element. ▪ replacing the hydraulic fluid. ▪ repairing or replacing the bleed-down valve. ▪ working on the electrical system. Refer to Start the pump on page 43 for instructions.	Use the Postmaintenance start procedure on page 91 if maintenance or repairs have been done on: ▪ the high-pressure water system. ▪ intensifier components. ▪ the primary motor.

Postmaintenance start procedure

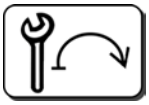
A smooth start after maintenance can give the high-pressure seal longer life.

Touch the ☒ symbol to stop the procedure and to turn **OFF** the pump.

Use this program to increase the water pressure gradually. The procedure takes approximately 6 minutes. Refer to Touchscreen maps on page 177 for details about the program.

1. Turn **ON** the utility water to the pump.
2. Turn **ON** the compressed air source.
3. Turn **ON** the electrical main (line disconnect switch).
4. Turn the primary breaker disconnect lever on the electrical enclosure door to **ON**.
5. Make sure that the EMERGENCY STOP is not engaged. If the button is pushed in, turn the button clockwise until it releases.
6. Make sure that the key switch is set to Local ↙.
7. Push the Controls button.
8. On the operator interface, touch the maintenance symbol to open the primary maintenance screen.

9. Touch this symbol to open the **Start Procedure** screen.

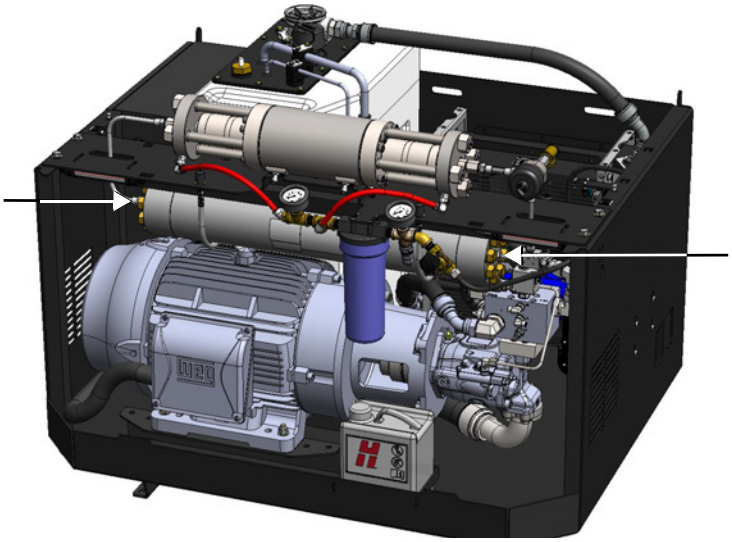


10. Touch the symbol on the screen to start the procedure.

> While the procedure continues, examine the pump for high-pressure water leaks and hydraulic fluid leaks. Monitor these areas.
>
> - Hydraulic connections
> - Valves
> - Intensifier bridge and bottom deck

11. When **Turn On the Cutting Head** flashes on the screen:
    a. Move the cutting head to a safe location on the table.
    b. Turn **ON** the cutting head.
    c. Touch the ☑ symbol to continue.

12. When **Turn Off the Cutting Head** flashes on the screen:
    a. Turn **OFF** the cutting head.
    b. Touch the ☑ symbol to continue.
13. When **Examine the Pump** flashes on the screen:
    a. Examine the pump for loose fittings or leaks.
    b. Examine the attenuator connections for leaks.



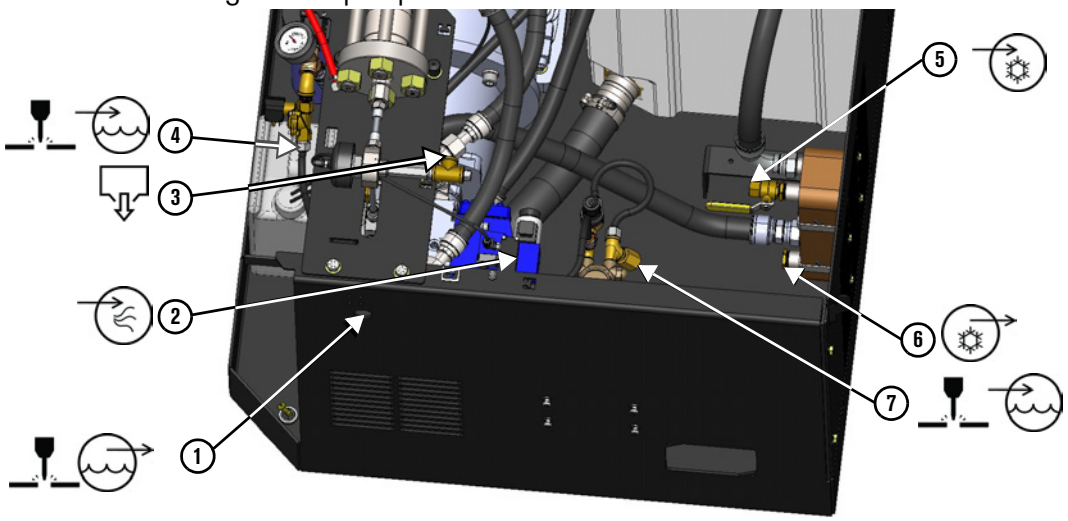
    c. Touch the ☑ symbol to continue.
        - ❑ The main motor turns off.
        - ❑ The primary operation screen opens.
14. Install the top cover and the front panel.

The pump is ready for operation.

Prepare for storage

WARNING	High-pressure water can cause eye injuries. Wear approved eye protection when operating or doing work near this equipment. Do not stand over components such as tubes or valves while drying the system.
	All low-pressure water connections use push-to-connect fittings.

Use this procedure to prepare the system for storage. Clearing the water lines prevents freezing, which can cause damage to the pump.



Cutting water in

⑦ Boost pump

④ Inlet water solenoid (for systems without a boost pump)

③ **Waste water out**

② **Compressed air**

① **Cutting water out**

Water-cooled system

⑤ **Cooling in**

⑥ **Cooling out**

Refer to Connect the water and the air on page 157 for information about the connections.

Parts, tools, and materials

1/8-inch male to 1/2-inch male adapter (compressed air to **cutting water in**)

1/8-inch male to 1-inch male adapter (compressed air to **cooling in**)

7/16-inch open-ended wrench

1-1/16-inch open-ended wrench

Filter wrench (included in the standard tool kit)

Water-cooled system

1-inch open-ended wrench

1-3/16-inch open-ended wrench

Do this task when the pump is not operating.

1. Remove the water filter from the filter canister. Refer to Replace the water filter on page 80.
2. Pour the water out of the filter canister.
3. Install the water filter canister without the filter.
4. Disconnect the compressed air from the pump. Connect the compressed air hose to the **Cutting water in** connection.

   The **compressed air** hose connection is 1/8-inch NPT male. The **Cutting water in** connection is 1/2-inch NPT female. An adapter (not included) is necessary.

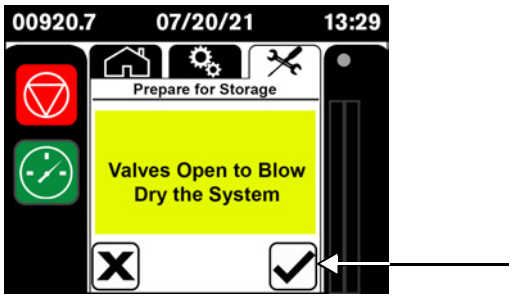
5. Use a 1-1/16-inch open-ended wrench to disconnect the **Waste water out** hose from the pump.
6. On the operator interface, touch the maintenance symbol to open the primary maintenance screen.

7. Touch this symbol to open the **Prepare for Storage** screen.

8. Touch the symbol on the screen to start the procedure.

   The supply water valve opens.

9. Turn **ON** the compressed air for a minimum of 5 minutes to dry the system.
10. Turn **OFF** the compressed air.
11. Touch the ☑ symbol to continue.



   The water valve closes.

12. Disconnect the compressed air hose from the **Cutting water in** connection.
13. Make sure that the water filter canister is empty. Water can collect in the canister when the system is cleared.

14. Install the water filter canister with the filter.

15. Do this procedure for a water-cooled system.

	Air-cooled systems do not require fluid removal.

    a. Use a 1-inch open-ended wrench to connect the compressed air hose to the **Cooling in** connection.

         The **Cooling in** connection is 1/2-inch NPT female. An adapter (not included) is necessary.

    b. Use a 1-3/16-inch open-ended wrench to disconnect the **Cooling out** line from the pump.

    c. Disconnect the compressed air hose from the **Cooling in** connection.

    d. Do step 8 through step 12 again.

16. Install the original caps and the plugs for the utility connections.

Recycling and end of product life

At the end of the life of the product or its parts, recycle or discard materials and parts. Use an environmentally satisfactory method and in accordance with local regulations. If the product contains substances that could cause damage to the environment, remove and dispose of them in accordance with current local regulations. This includes liquids such as hydraulic fluid.

Make sure that dangerous substances are disposed of safely and that the correct personal protective equipment is used. The safety specifications must be in accordance with the current local regulations at all times.

4 Parts lists

Genuine Hypertherm parts are the factory-recommended replacement parts for this pump. It is possible that the Hypertherm warranty will not cover damage caused by nongenuine Hypertherm parts.

To order parts, contact the original equipment manufacturer (OEM).

Tools

1-18768 Standard tool kit

	Part number	Description	Quantity
1	1-12091	Torque wrench, 3/4-inch drive, 80 N·m to 400 N·m (60 lbf·ft to 300 lbf·ft)	1
2	1-17490	Breaker bar, 40-inch	1
3	1-18038	White lithium grease, 44.3 ml (1.5 fluid oz)	1
4	1-13537	PURE Goop halocarbon-based antiseize lubricant, 28 g (1 oz)	1
5	1-11111	Blue Goop oil-based antiseize lubricant, 57 g (2 oz)	1
6	1-11136	High-vacuum grease, 150 g (5.3 oz)	1
7	1-13972	Water filter wrench	1
8	1-18851	Square drive adapter, 3/4-inch female to 1/2-inch male	1
9	1-18852	Hex-bit socket, 1/2-inch square drive, 3/8-inch	1
10	1-12021	12-point socket, 3/4-inch square drive, 1-1/2-inch	1
11	1-13281	Granite lapping block	1
12	1-11210-12	Lapping paper, 12 micron, 1 sheet	10

The tool case contains all of the above items except:

- The torque wrench has a separate case.
- The granite lapping block is shipped in a wooden box.
- The breaker bar is shipped in a bag.

Intensifier repair tools

	Part number	Description	Quantity
1	1-18416	Seal installation tool	1
2	1-18803	Seal removal tool	1
3	1-18848	Cylinder locator tool	1

These tools are shipped with the pump.

Maintenance and repair kits

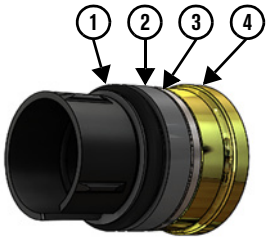
1-18769 Echion standard spare parts kit

Part number	Description	Quantity
1-18770	Repair kit, high-pressure seal, Echion	2
1-18771	Repair kit, high-pressure poppet, Echion	1
1-18849	Repair kit, low-pressure poppet, Echion	1
1-17434	Repair kit, bleed-down valve	1
1-18772	Replacement kit, hydraulic fluid	1
1-11106	Filter cartridge, water, 1.0 micron, 10-inch	1

1-18770 Echion high-pressure seal repair kit

	Description	Quantity
1	Spring, energized seal, 7/8-inch	2
2	O-ring backup, seal housing, -122	2
3	O-ring, seal housing, -122	2
4	Seal cartridge, high-pressure	2
5	Poppet screw, low-pressure	2

Each high-pressure seal cartridge includes:



1	High-pressure seal O-ring, greased, -119	**3**	High-pressure hoop
2	High-pressure seal	**4**	High-pressure seal backup, bronze

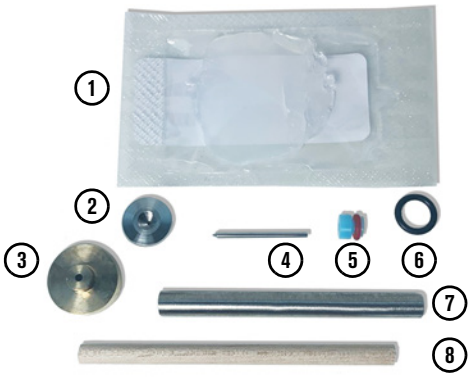
1-18771 Echion high-pressure poppet repair kit

	Description	Quantity
1	Cotton-tipped applicator	2
2	Poppet, high-pressure	2
3	Poppet spring, high-pressure	2
4	Poppet seat, high-pressure	2

1-18849 Echion low-pressure poppet repair kit

	Description	Quantity
1	Wear ring, check valve	2
2	O-ring, check valve, -120	2
3	Poppet screw, low-pressure	2
4	Poppet, low-pressure	2

1-17434 Bleed-down valve repair kit



	Description	Quantity
1	High-vacuum grease, 150 g (5.3 oz)	1
2	Poppet seat, high-pressure	1
3	Valve seal, high-pressure	1
4	Needle, bleed-down valve	1
5	Needle guide, bleed-down valve	1
6	O-ring, -011	1
7	Flow reducer insert, bleed-down valve	1
8	Wooden dowel	1

1-18772 Hydraulic fluid replacement kit

	Description	Quantity
1	Filter element, hydraulic, 5-micron	1
2	Filler cap	1

Optional equipment kits

Part number	Description
1-18603	Boost pump kit 100 gallons per hour, 208 V / 230 V
1-18576	Boost pump kit 100 gallons per hour, 400 V / 460 V
1-18551	Modbus TCP/IP communication kit
1-18552	Utility connection panel kit
1-18553	Metric conversion kit
1-18695	Pump-mounted plumbing kit

Replacement parts

Item numbers in orange are not shown in the illustration. The number shows the relative location of the part in or on the machine.

Colors (blue, green, pink, and yellow) are used in the illustrations to show where one component ends and another begins. The colors are used for contrast and do not mean anything specific.

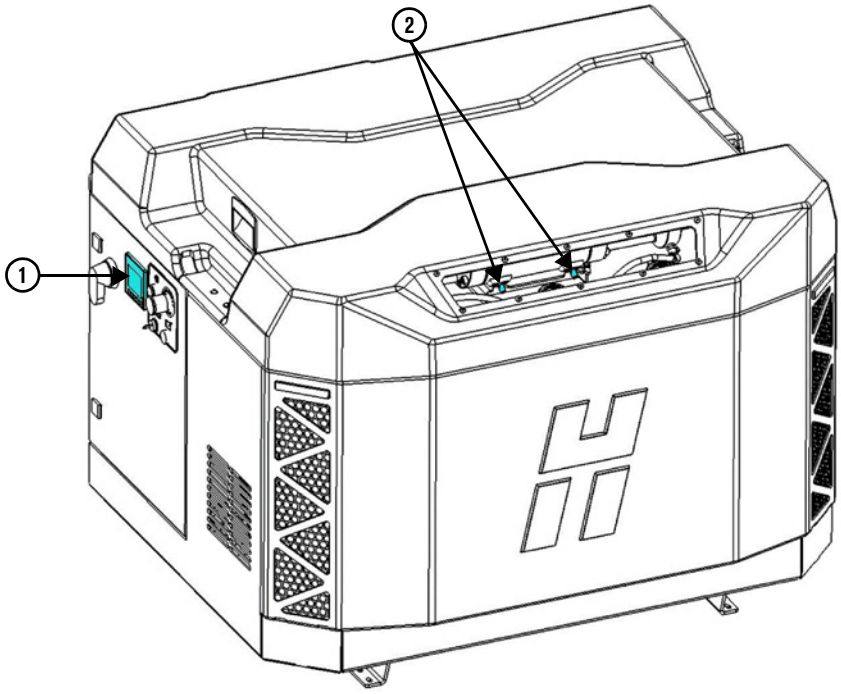
1-18938 Top-cover hardware replacement kit

Description	Quantity
Snap-in handle	2
Latch receptacle	2
Latch stud	2
Latch retainer	2
Latch spring	2

Lubricants

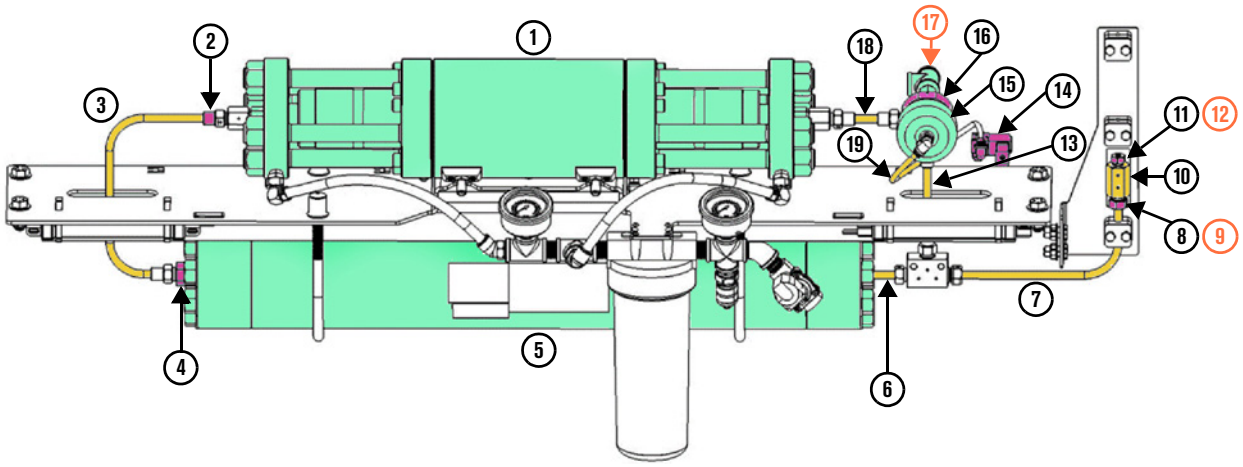
Part number	Description
1-11111	Blue Goop oil-based antiseize lubricant, 57 g (2 oz)
1-13537	PURE Goop halocarbon-based antiseize lubricant, 28 g (1 oz)
1-11136	High-vacuum grease, 150 g (5.3 oz)
1-18038	White lithium grease, 44.3 ml (1.5 fluid oz)

Electrical system



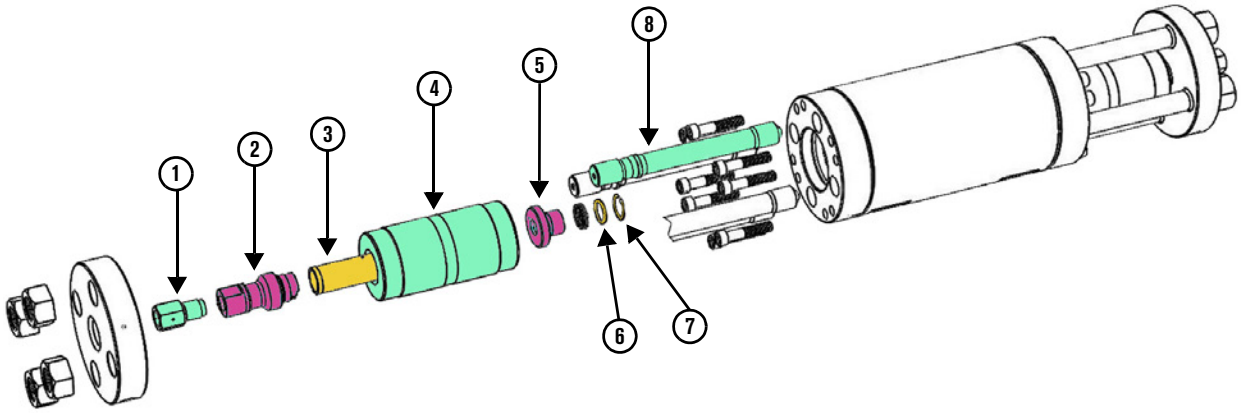
	Part number	Description
1	1-15005	PLC, Horner XL4 (requires program 1-18855)
2	1-18755	Proximity switch
—	1-17355	Memory card, SDHC MicroSD, 32GB (not shown)

High-pressure water system



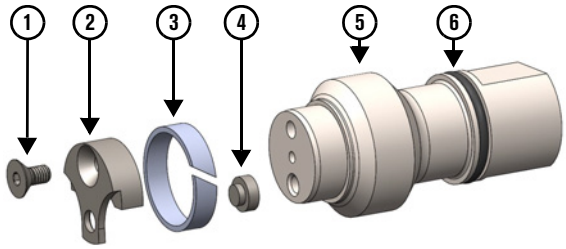
	Part number	Description
1	1-18314	Echion intensifier
2	1-14687	Sheathing end cover, high-pressure tubing, 3/8-inch
3	1-18445	Tube, high-pressure, intensifier left
4	1-12982	Inlet adapter, 3/8-inch male × 3/8-inch female
5	1-12280	Attenuator assembly, 1 liter
6	1-WJN6600375	Tube nipple, high-pressure, attenuator-to-tee
7	1-18694	Tube, high-pressure, L-shaped
8	1-13158-60-6	Gland nut, high-pressure, 3/8-inch
9	1-13157-60-6	Collar, high-pressure, 3/8-inch (not shown)
10	1-13160-60-4F6F	Reducing coupling, high-pressure, 3/8-inch female × 1/4-inch female
11	1-13158-60-4	Gland nut, high-pressure, 1/4-inch
12	1-13157-60-4	Collar, high-pressure, 1/4-inch (not shown)
13	1-WJN6600725	Tube nipple, bleed-down valve-to-tee
14	1-13949	Air solenoid, bleed-down valve
15	1-18310	Bleed-down valve assembly, air-actuated
16	1-18311	Bleed-down valve body
17	1-17130	Plug, stainless steel NPT, 1/2-inch (not shown)
18	1-WJN6600500	Tube nipple, high-pressure, intensifier right
19	1-18784	Replacement kit, bleed-down valve air tube, 1/4-inch
—	1-12580	Protective sheathing, 3/8-inch (not shown)

Intensifier high-pressure ends



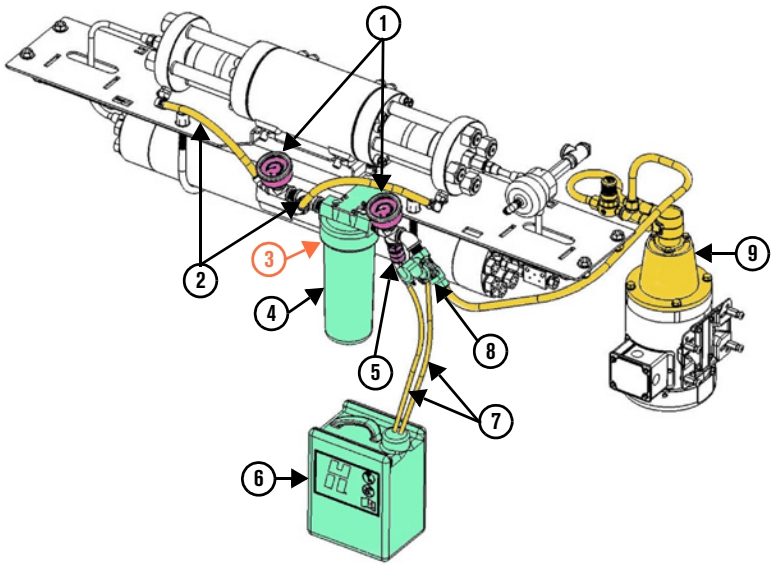
	Part number	Description
1	1-18381	Output adapter
2	1-18631	Check valve assembly
3	1-18395	Spacer tube
4	1-18386	Cylinder, high-pressure
5	1-18384	Seal housing assembly
6	1-11468	Spacer, rod seal
7	1-12370	Snap ring, rod seal
8	1-18935	Stud assembly

The check valve assembly includes:



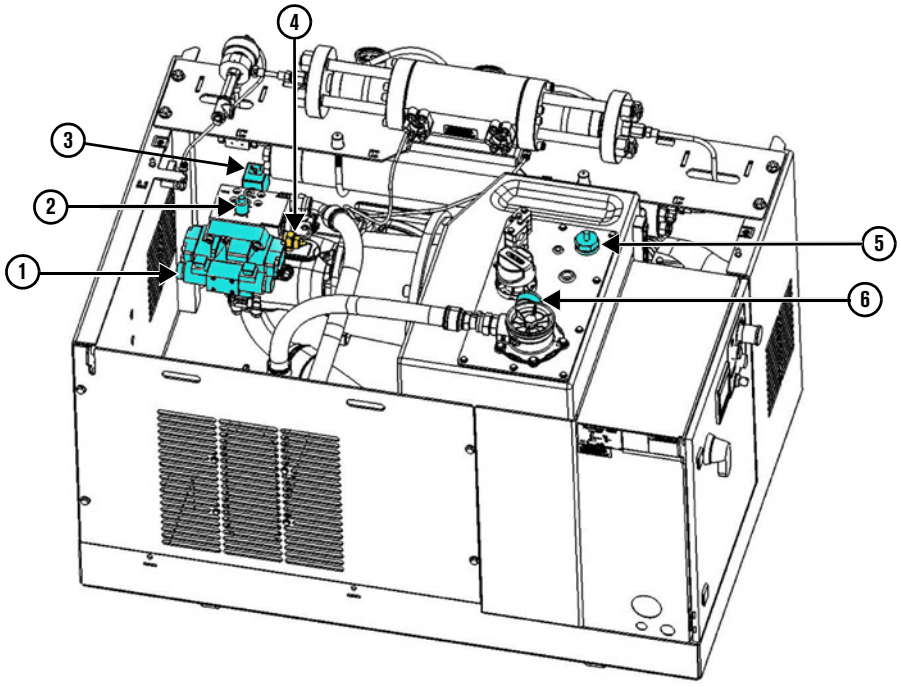
1	Low-pressure poppet screw	4	Low-pressure poppet
2	Low-pressure poppet retainer	5	Check valve body
3	Check valve guide ring	6	Check valve O-ring, -120

Low-pressure water system



	Part number	Description	Quantity
1	1-11832	Gauge, low-pressure water	1
2	1-18782	Replacement kit, intensifier inlet water tube	1
3	1-11679-237	O-ring, low-pressure, filter canister (not shown)	1
4	1-18318	Canister assembly, water filter	1
5	1-18417	Switch, low-pressure water	1
6	1-18577	Dirty water container	1
7	1-18783	Replacement kit, fluid management tube	2
8	1-12614	Solenoid valve, inlet water	1
9	1-18931	Boost pump wet end assembly	1
—	1-13897	Meter, TDS (not shown)	1

Hydraulic system



	Part number	Description
1	1-11733	Assembly, shift valve, 24 VDC
2	1-17348	Transducer, hydraulic
3	1-17347	Valve and coil, proportional cartridge
4	1-17349	Relief valve, hydraulic high-pressure, preset
5	1-12617	Switch, temperature and fluid level
6	1-18898	Gauge, hydraulic filter

5 Troubleshooting

	This section assumes that the user is familiar with the **Safety**, **Operation**, **Preventive maintenance**, and **Specifications** sections of this manual.
	Images in this manual are for reference purposes. It is possible that your product configuration is not shown accurately.
	It is possible that not all of the information in this section applies to all pump models.

Safety

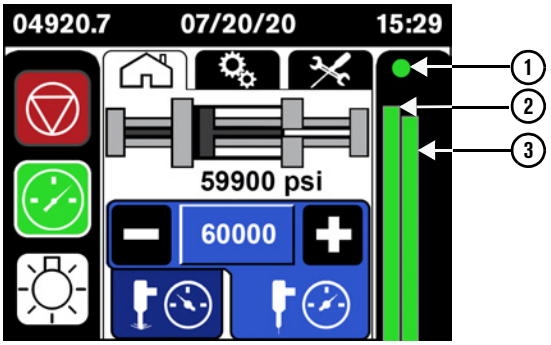
WARNING 	**Read and understand all of the safety guidelines in this manual.** Refer to Safety on page 21 before operating, doing maintenance on, repairing, and installing your pump.
	Keep the work area clean and dry. Clean fluid spills immediately. Use a pan or a tray below areas where water or hydraulic fluid can spill during maintenance or repair procedures.
	Obey local protocols for recycling or disposal of parts, materials, and fluids. National and local environmental rules can apply to disposal. Refer to Recycling and end of product life on page 96.
	Coordinate maintenance and repairs with facility and safety staff.

General

	If the problem is not found in this section, contact a Hypertherm Technical Service Associate for information and support.
	Keep accurate maintenance records. Records can help with predicting and preventing maintenance problems.
	Use SAE (US standard) tools for most procedures.

Primary operation screen

Intensifier stroke-rate bars and status indicator



1 Intensifier status indicator

- Enabled (green)
- Not enabled (red)

2 Intensifier stroke rate to the left

3 Intensifier stroke rate to the right

- The stroke rate is within the permitted range (green).
- The stroke rate is at the limit of the permitted range (yellow).
- The intensifier is overstroking (red).

During normal operation, the intensifier strokes smoothly to the left and to the right at the same speed.

It is normal for the intensifier to stroke faster during the start sequence and when changing from pierce pressure to cut pressure.

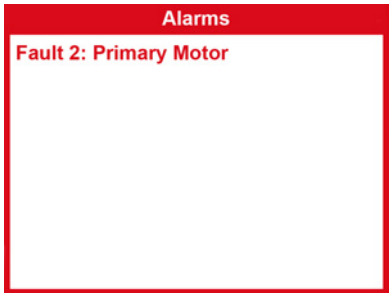
The stroke-rate bars show the speed of the piston and the plunger moving to each side of the intensifier (if you are facing the front of the pump.)

The height of the bars in relation to each other show if the piston is stroking evenly from side to side or if one side is stroking faster than the other (overstroking). This information is useful during troubleshooting. Uneven bars can mean that poppet maintenance required.

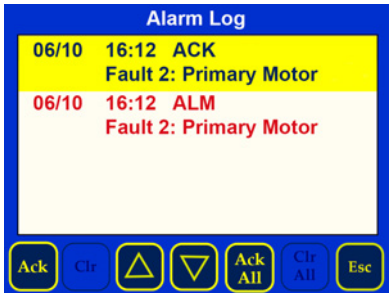
If a bar is red, then an overstroke has caused an alarm condition on that side.

Alarms

The controller monitors the pump while the pump is operating. When the controller senses a problem that is likely to cause damage to the equipment, the operator interface shows the **Alarms** screen.



To acknowledge an alarm, touch the screen. The **Alarm Log** screen opens.



Touch **Ack** (acknowledge) or **Ack All** (acknowledge all) on the screen.

The alarm screen closes.

Types of alarms

	The intensifier is...	The primary motor is...	Cause of alarm
Warning	Enabled	On	The controller senses a condition that can cause a problem or a failure.
Fault 1	Off	Off	The controller senses a condition that will cause a problem or a failure.
Fault 2	Off	Off	The controller senses a failure condition.

Warnings

Alarm	Cause	Solution
Warning: Battery Error	The controller battery is not operating correctly.	Contact a Hypertherm Technical Service Associate for information and support.
Warning: Boost Motor **Warning: Fan Motor**	The boost motor or the fan motor did not start because the thermal overload relay has tripped.	Reset the relay. ▪ Find the thermal overload relay on the motor starter. ▪ Turn the knob clockwise to the **ON** position (**I**). ▪ Release the knob. It snaps counterclockwise to the **OFF** position (**O**). ▪ Turn the knob clockwise to the **ON** position (**I**) again.
 **On**	 **Tripped**	 **Off**
Warning: Start Procedure Hydraulics	An error occurred during stage 3 of the start sequence. ▪ The cutting head is on. ▪ The bleed-down valve is leaking. ▪ The bleed-down valve is not receiving air. ▪ The Hydraulics timer setting is too short.	▪ Make sure that the cutting head is off. ▪ Repair or replace the bleed-down valve. ▪ Make sure that the compressed air supply is on. ▪ Adjust the timer on the Start-procedure Timers screen. Refer to Start Procedure Timers on page 166
Warning: Start Procedure Ramp to Pierce Pressure	An error occurred during stage 4 of the start sequence.	
Warning: Start Procedure Ramp to Cut Pressure	An error occurred during stage 5 of the start sequence.	
Warning: Too Many Motor Starts in 15 Minutes	Starting and stopping the motor rapidly can cause damage to the motor.	Wait longer between stopping and starting the motor.

Faults

Fault conditions cause the pump to turn off.

Alarm	Cause	Solution
Fault 1: Hydraulic Fluid >65C The hydraulic fluid temperature is higher than 65°C (149°F).	The system is not cooling sufficiently.	Refer to Temperature on page 124.
Fault 1: Intensifier Overstroke to Left **Fault 1: Intensifier Overstroke to Right** An overstroke fault occurs when the hydraulic piston travels faster than the pump can sustain.	A poppet (high-pressure or low-pressure) is stuck or is leaking.	Check the low-pressure poppet on the same side as the overstroke. Check the high-pressure poppet on the opposite end from the overstroke. Refer to Overstroke on page 121.
Fault 1: Low Inlet Water Pressure	The supply-water pressure is lower than 2.8 bar (280 kPa / 40 psi).	Increase the supply pressure.
	Pressure is lost because of a leak.	Identify the source of a leak and correct the problem.
	The supply water is off.	Turn **ON** the supply water.
Fault 2: Hydraulic Fluid 45C Sensor	The temperature sensor in the hydraulic fluid tank has failed.	Replace the sensor.
Fault 2: Hydraulic Fluid Level is Low The float switch in the hydraulic fluid tank monitors the fluid level.	A hydraulic fitting or a hydraulic hose is leaking.	Fix the leak. Refer to Hydraulic fluid on page 123.
	The sensor is faulty.	If the tank is full, replace the sensor.
	A poppet (high-pressure or low-pressure) is stuck or leaking.	Check the low-pressure poppet.
Fault 2: Input to Primary Motor Not Received	The controller did not receive a signal from the starter when the pump was turned on.	Contact a Hypertherm Technical Service Associate for information and support.
Fault 2: Water Pressure Control Error	The pump did not get to the target water pressure within the expected time. ▪ The hydraulic pressure transducer on the pump manifold has failed. ▪ The proportional valve has failed. ▪ The proportional valve coil has failed. ▪ The hydraulic pump has failed.	Replace the component.
	The orifice has failed.	Check the condition of the orifice. Replace it, if necessary.
	A component inside the hydraulic center section has failed.	Contact a Hypertherm Technical Service Associate for information and support.

Alarm	Cause	Solution
Fault 2: Primary Motor The primary motor did not start.	The thermal overload relay has tripped.	Reset the relay. Refer to Warning: Boost Motor on page 115. The relay can take several minutes to cool before resetting.
	The motor is too hot.	Refer to Primary motor on page 117.
	The soft starter sensed a fault.	1. Turn the primary breaker disconnect lever on the electrical enclosure door to **OFF**. The pump is not energized. 2. Turn the primary breaker disconnect lever on the electrical enclosure door to **ON**. The pump is energized. It can take several minutes for the system to reboot.
	A fuse in the electrical enclosure has blown.	Replace the blown fuse.

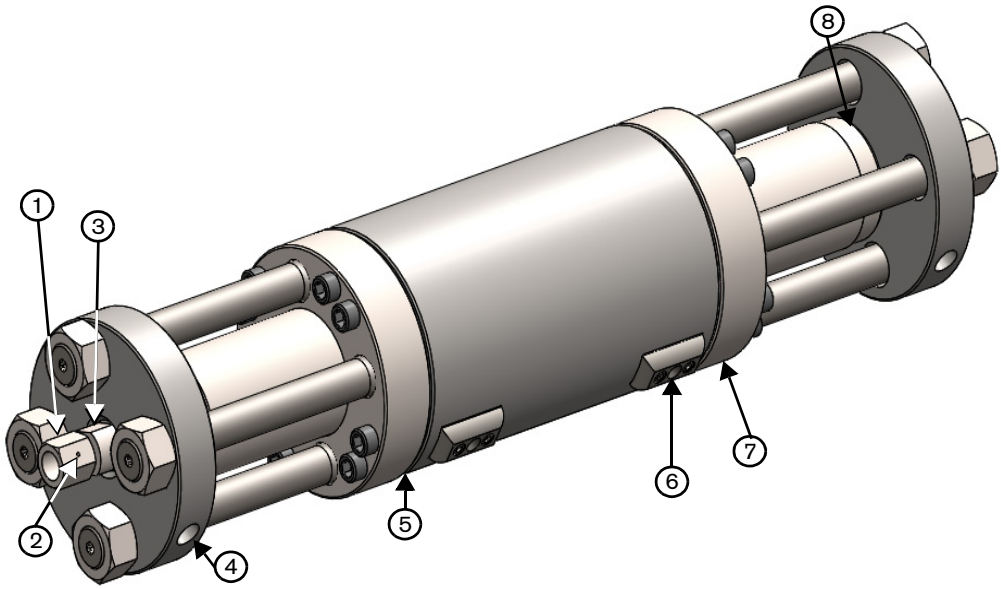
Primary motor

Problem	Cause	Solution
The motor is too hot.	The motor is not cooling sufficiently.	Clean the air inlet.
		Clean the outlet and the cooling fins.
		Reduce the ambient air temperature, if possible.
	The motor is being started too frequently.	Wait longer between stopping and starting the motor.
	The motor bearing is too hot.	Lubricate the bearing. Refer to Lubricate the primary motor bearings on page 88.

Intensifier

Leaks

CAUTION	If a high-pressure poppet part is damaged, replace the assembly (high-pressure poppet, spring, and seat).
	Fluid leaking from a weep hole is a sign of a defective part or a loose connection.



Numbers pointing to items in the illustration correspond with numbers in the table.

	Symptom	Cause	Solution
1	**The fitting or the output adapter is hot**	The high-pressure poppet is leaking.	▪ Disassemble the parts and look for flaws, deterioration, erosion marks, or cracks. ▪ Make sure that the mating surfaces are smooth and clean. ▪ If damage is found, replace the component.
2	**Water leaks from the weep hole**	A high-pressure tubing connection is loose or damaged.	▪ Examine the connection. ▪ Make sure that the fitting is tightened correctly and to the correct torque value. Refer to High-pressure water fittings on page 144.
		The output adapter has failed.	Replace the component.
3	**Hot water is leaking.**	The output adapter is loose.	Make sure that the adapter is tightened to the correct torque value. Refer to High-pressure water fittings on page 144.
		The high-pressure seat has failed.	▪ Disassemble the parts and look for flaws, deterioration, erosion marks, or cracks. ▪ Make sure that the mating surfaces are smooth and clean. ▪ If damage is found, replace the component.
		The face of the check valve is cracked.	Replace the check valve.
	Cold water is leaking.	The O-ring on the check valve body has failed.	Replace the O-ring.
4	**Cold water leaks from the weep hole.**	A fitting connection is bad.	Make sure that the fitting is tightened to the correct torque value. Refer to High-pressure water fittings on page 144.
	The fitting is warm or the low-pressure water line is pulsing.	The low-pressure poppet is leaking.	Repair or replace the poppet.
			The check valve is cracked. Replace the check valve.

	Symptom	Cause	Solution
5	**Hydraulic fluid is leaking from between a high-pressure end cap and a high-pressure cylinder.**	The hydraulic end cap bolts are not tightened.	Make sure that the end cap bolts are tightened to the correct torque value. Refer to Fittings on page 144.
		An O-ring has failed.	Examine and replace the O-ring.
		A high-pressure seal is damaged or has failed.	▪ Disassemble the parts and look for flaws, deterioration, erosion marks, or cracks. ▪ Make sure that the mating surfaces are smooth and clean. ▪ If damage is found, replace the component.
6	**Hydraulic fluid is leaking.**	The O-ring on the proximity switch has failed.	Replace the O-ring or the sensor.
7	**Water leaks at a rate of more than 30 ml/minute.**	The high-pressure seal has failed.	Replace the seal.
	Hydraulic fluid leaks at a rate of more than 30 ml/minute.	The hydraulic seal has failed.	Replace the seal.
8	**Water is leaking.**	The high-pressure cylinder has failed.	Replace the cylinder.
		The check valve body has failed.	Replace the check valve body.

Overstroke

Alarm

If an overstroke alarm shows on the operator interface:

1. Turn **OFF** the cutting head.
2. Acknowledge the alarm.
3. Turn the pump on in cut-pressure mode. The intensifier begins stroking.
4. Turn on the cutting head.
5. Monitor the intensifier stroke rate indicator on the operator interface.

   If 1 side of the intensifier is stroking too fast, is there a leak from a weep hole on the intensifier?

Yes		Inspect the high-pressure seal.
	Check valve weep hole	Check the output adapter torque.
		Check the high-pressure fitting torque.
	High-pressure endcap and high-pressure cylinder	Check the torque.
		The check valve or the high-pressure cylinder is cracked
		Inspect the check valve O-ring.
No	Is the output temperature hot?	
	Yes	Inspect the high-pressure poppet.
	No	Inspect the low-pressure poppet. ▪ Examine the low-pressure poppet and the check valve body. ▪ Make sure that the mating surfaces are clean and smooth with a mirrorlike finish. ▪ Repair or replace the low-pressure poppet. ▪ Repair or replace the poppet retainer. ▪ Make sure that the low-pressure poppet fits in the poppet retainer without sticking. Shake the assembly and listen for the poppet moving inside.
	If the overstroke is to the left	A poppet is sticking, worn, or damaged. ▪ Check the low-pressure poppet on the left side of the intensifier. ▪ Check the high-pressure poppet on the right side of the intensifier.
	If the overstroke is to the right	A poppet is sticking, worn, or damaged. ▪ Check the low-pressure poppet on the right side of the intensifier. ▪ Check the high-pressure poppet on the left side of the intensifier.

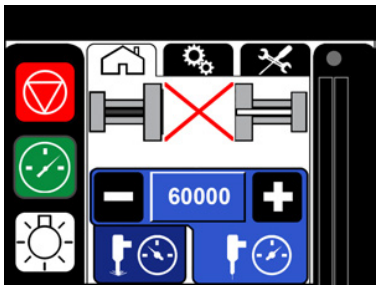
If both sides of the intensifier are stroking too fast, is a leak visible?

Yes	The high-pressure tubing or a fitting is leaking.	Identify the source of a leak and correct the problem.
	A high-pressure water seal is worn or damaged.	▪ Disassemble the intensifier. ▪ Examine the parts. Look for flaws, deterioration, erosion marks, corrosion, or cracks. ▪ Make sure that the mating surfaces are smooth and clean. ▪ If damage is found, replace the component.
	The bleed-down valve is leaking or has failed.	Repair or replace the bleed-down valve.
	The needle and the seat in the cutting head are leaking. The on/off valve has failed. The cutting head has failed.	▪ Examine the parts. Look for flaws, deterioration, erosion marks, corrosion, or cracks. ▪ Make sure that the mating surfaces are smooth and clean. ▪ If damage is found, replace the component.
No	The orifice is worn, has failed, or is incorrectly installed. A worn or damaged orifice can increase the demand for high-pressure water from the intensifier.	Replace the orifice.
	The orifice is the wrong size.	

Is the bleed-down valve hot?

Yes	The bleed-down valve has failed.	Repair or replace the bleed-down valve.
	The bleed-down valve is not getting air.	▪ Make sure that the compressed air source is on. ▪ Make sure that the compressed air hose is not damaged. ▪ Make sure that the compressed air hose is connected correctly.
No	The postfilter water-pressure gauge shows that the low-pressure water is lower than 2.8 bar (280 kPa / 40 psi).	Replace the water filter if the difference between the values on the prefilter water-pressure gauge and the postfilter water-pressure gauge is lower than 0.7 bar (70 kPa / 10 psi).
	The prefilter water-pressure gauge shows that the low-pressure water is lower than 2.8 bar (280 kPa / 40 psi). Low water pressure can cause an overstroke without triggering the low-pressure alarm for the low-pressure water.	▪ Make sure that the water to the pump is on. ▪ Make sure that the low-pressure water line is connected to the intensifier. ▪ If the pump has a boost pump, examine the water filter. If the filter is black, the boost pump has failed and must be replaced. Contact a Hypertherm Technical Service Associate for information and support.

Hydraulic fluid

Problem	Cause	Solution
The intensifier does not stroke.	Intensifier control is off. When intensifier control is off, the primary screen shows a red × on the intensifier symbol. 	Turn intensifier control on. Refer to Intensifier Control on page 170.
	The cutting head is off.	Turn on the cutting head.
	A proximity switch has failed.	Replace the switch. Contact a Hypertherm Technical Service Associate for information and support.
High-pressure water seal life is short.	A component is damaged or has failed.	▪ Do preventive maintenance according to the recommended schedule. Refer to Preventive maintenance schedule on page 60. ▪ Examine the high-pressure cylinder, the plunger, and the high-pressure water seal. ▪ Look for flaws, deterioration, erosion marks, corrosion, or cracks. ▪ Make sure that the mating surfaces are smooth and clean. If damage is found, replace the component.
	The supply-water flow or pressure is too low.	Make sure that the supply-water flow and pressure are sufficient. Refer to Specifications on page 135.
	The proportional control valve is not operating correctly.	Contact a Hypertherm Technical Service Associate for information and support.
	The water quality is not sufficient.	Make sure that the water quality is within satisfactory range. Refer to Test the water quality on page 83.

Temperature

Hydraulic fluid that is too cool is thick, which can cause increased friction and insufficient lubrication.

Hydraulic fluid that is too hot is thin, which can accelerate wear on the parts, increase the formation of sludge, degrade the fluid, and decrease its lubrication and protective qualities.

A sensor monitors the hydraulic fluid temperature in the tank. Increased temperature can mean that there is a problem with the cooling system.

High altitude and ambient air temperatures can have an effect on the temperature of hydraulic fluid.

The hydraulic pump has failed.

Contact a Hypertherm Technical Service Associate.

A relief valve has failed.

Contact a Hypertherm Technical Service Associate.

There is a problem in the hydraulic center section of the intensifier.

Contact a Hypertherm Technical Service Associate.

The cooling water supply or the chiller is turned off.

Turn **ON** the water supply or the chiller.

Water-cooled system

The cooling water is not turned on.

Turn **ON** the cooling water.

The cooling water is too warm.

Water that is too warm is not good for cooling and can shorten high-pressure seal life.

If the cooling water or the supply-water temperature is higher than 24°C (75°F), cool the water before use.

Make sure that the heat exchanger fins are not dirty or clogged. Flush the heat exchanger.

Air-cooled system

Do not adjust the setting on the thermal overload relay unless instructed to do so by a Hypertherm Technical Service Associate.

The ambient air temperature is too high.

Ambient air temperature can affect cooling. If a pump that is installed in a small space or in a high-temperature location, consider adding a chiller to the system for supplemental cooling.

The fan is not generating enough airflow.

Make sure that the fan motor breaker is not tripped.

Clean the air cooler. Refer to Clean the air cooler on page 78.

The thermal overload relay turned off the fan motor.

Reset the relay. Refer to Warning: Boost Motor on page 115.

The sensor is not sensing the correct temperature.

Plug in the sensor.

Replace the cord.

The temperature sensor is faulty or damaged.

Replace the sensor.

Pressure

The hydraulic fluid pressure is too low.

The cut pressure is not set correctly.

Make sure that the cut pressure is set correctly.

The pump is in pierce-pressure mode.

Make sure that the pump is in cut-pressure mode.

The relief valve on the hydraulic manifold has failed.

Contact a Hypertherm Technical Service Associate for information and support.

Level

A float switch in the hydraulic fluid tank causes an alarm when the hydraulic fluid level is too low.

The hydraulic fluid level is too low.

Make sure that the hydraulic fluid level is at the top mark on the sight gauge.

A hydraulic fitting or a hydraulic hose is leaking.

Fix the leak.

Tighten the fitting to the correct torque value.

Replace the hose.

Replace the O-ring.

Hydraulic fluid was lost during maintenance.

Add hydraulic fluid. Refer to Add hydraulic fluid on page 85.

Hydraulic fluid leaks from the intensifier.

An O-ring or an energized seal spring has failed.

Disassemble the intensifier.

Disassemble the parts and look for flaws, deterioration, erosion marks, or cracks.

Make sure that the mating surfaces are smooth and clean.

If damage is found, replace the component.

Appearance

The hydraulic fluid in the tank has a milky appearance.

A leaking high-pressure seal in the intensifier can push water past the energized seal spring energized seal spring and into the hydraulic fluid. Contaminated hydraulic fluid can cause damage to the hydraulic pump.

Water has leaked into the heat exchanger.

Water-cooled system: The heat exchanger has failed.

1. Replace the hydraulic fluid. Refer to Replace the hydraulic fluid on page 86.

   It could be necessary to drain and flush other areas such as the shift valve, the hydraulic manifold, and the hydraulic pump.

2. Examine the parts, including the inner surfaces of the hydraulic fluid tank, the hydraulic hoses, and the seals. Look for flaws, deterioration, erosion marks, corrosion, or cracks.

   If damage is found, replace the component.

Water

Low-pressure water

The supply-water pressure is too low.

A pressure switch before the water filter senses the supply-water pressure. If the value on the prefilter water-pressure gauge is lower than 2.8 bar (280 kPa / 40 psi), the water pressure to the intensifier is too low. This causes a fault.

The supply-water pressure or flow is not sufficient.

Make sure that the supply water meets requirements found in Specifications on page 135.

The supply-water pressure is too high.

If the value on the prefilter water-pressure gauge is higher than 7.6 bar (760 kPa / 110 psi), the water pressure is too high.

The boost pump is not needed.

The low-pressure water parts are rated for a maximum pressure of 8.6 bar (860 kPa / 125 psi).

In environments with high supply-water pressure, the boost pump can increase the water pressure to higher than the maximum. This can cause damage to the water filter and other parts.

If the value on the prefilter water–pressure gauge is higher than 4.8 bar (480 kPa / 70 psi):

- In the electrical enclosure, turn the switch on the boost pump motor contactor to **0**.
- On the operator interface, turn **OFF** boost pump monitoring. Refer to Pump Fault Behavior on page 168.

The boost pump bypass relief valve is not adjusted correctly.

Refer to Adjust the boost pump pressure on page 162 for instructions for adjusting the valve.

High-pressure water

The pump cannot get to the target water pressure.

The orifice is defective.

Replace the orifice.

There is a leak.

If the intensifier strokes when it is in cut-pressure mode with the cutting head turned off, check the on/off valve at the cutting head, the bleed-down valve, and the high-pressure tubing for leaks.

Refer to Leaks on page 118.

A check valve is damaged.

Disassemble the parts and look for flaws, deterioration, erosion marks, or cracks.

Make sure that the mating surfaces are smooth and clean with a mirrorlike finish.

If damage is found, replace the component.

The pump is in pierce-pressure mode or is set incorrectly.

Put the pump in cut-pressure mode.

Make sure that the cut pressure is set correctly.

The supply water is not turned on.

Turn on the supply water.

A water filter is clogged.

Replace the water filter.

The boost pump has failed.

Examine the water filter. If the filter is black, the boost pump has failed and must be replaced.

Contact a Hypertherm Technical Service Associate for information and support.

A poppet is sticking, worn, or damaged.

Disassemble the parts and look for flaws, deterioration, erosion marks, or cracks.

Make sure that the mating surfaces are smooth and clean with a mirrorlike finish.

If damage is found, replace the component.

Pressure at the cutting head is too low.

The thimble filter on the on/off valve is clogged.

Clean or replace the thimble filter.

There is a blockage in the high-pressure tubing or at the orifice.

Remove the blockage from the high-pressure tubing.

Clean or replace the orifice.

The high-pressure poppet has failed.

CAUTION	If a high-pressure poppet part is damaged, replace the full assembly (high-pressure poppet, spring, and seat).

If an output adapter feels hot:

Disassemble the parts and look for flaws, deterioration, erosion marks, or cracks.

Make sure that the mating surfaces are smooth and clean.

If damage is found, replace the component.

A component in the high-pressure end has failed.

Replace the high-pressure seal.

If a high-pressure cylinder feels hot:

Disassemble the parts and look for flaws, deterioration, erosion marks, or cracks.

Make sure that the mating surfaces are smooth and clean.

If damage is found, replace the component.

If the high-pressure seal is removed from the plunger when you disassemble the intensifier, replace the seal.

The orifice is not the correct size or too many are being used at the same time.

Make sure that the number of orifices and their sizes are sufficient for the pump's output.

An orifice has failed.

Replace the orifice.

The bleed-down valve has failed.

If the bleed-down valve feels hot or if water comes out of the drain hose, repair or replace the bleed-down valve.

Leaks

Water leaks from the intensifier.

Refer to Leaks on page 118.

Water leaks through the intensifier drain tubes.

A high-pressure water seal is damaged.

A damaged high-pressure water seal is the most common cause of water leaking from the intensifier.

Replace the high-pressure seal.

If a high-pressure cylinder feels hot:

Disassemble the parts and look for flaws, deterioration, erosion marks, or cracks.

Make sure that the mating surfaces are smooth and clean.

If damage is found, replace the component.

If the high-pressure seal is removed from the plunger when you disassemble the intensifier, replace the seal.

A fitting is leaking.

A low-pressure water line is not seated fully in the fitting.

Make sure that the low-pressure water line is pushed all the way into the fitting.

Make sure that the O-ring is not damaged or missing. Replace, if necessary.

The collar on a high-pressure water fitting is not correctly installed.

Refer to High-pressure water fittings on page 144.

A fitting on the high-pressure tubing is not tight enough.

Tighten the fitting to the maximum torque value.

Disassemble the parts and look for flaws, deterioration, erosion marks, or cracks.

Make sure that the mating surfaces are smooth and clean.

If damage is found, replace the component.

A tubing end is cracked or damaged.

Replace the tubing.

The end cap nuts are not correctly tightened.

Loosen all of the end cap nuts and then torque them to 373 N·m (275 lbf·ft) in 68 N·m (50 lbf·ft) increments. Use a repeating cross pattern.

Water leaks onto the floor or into the pump frame

The dirty water container is full.

Empty the container.

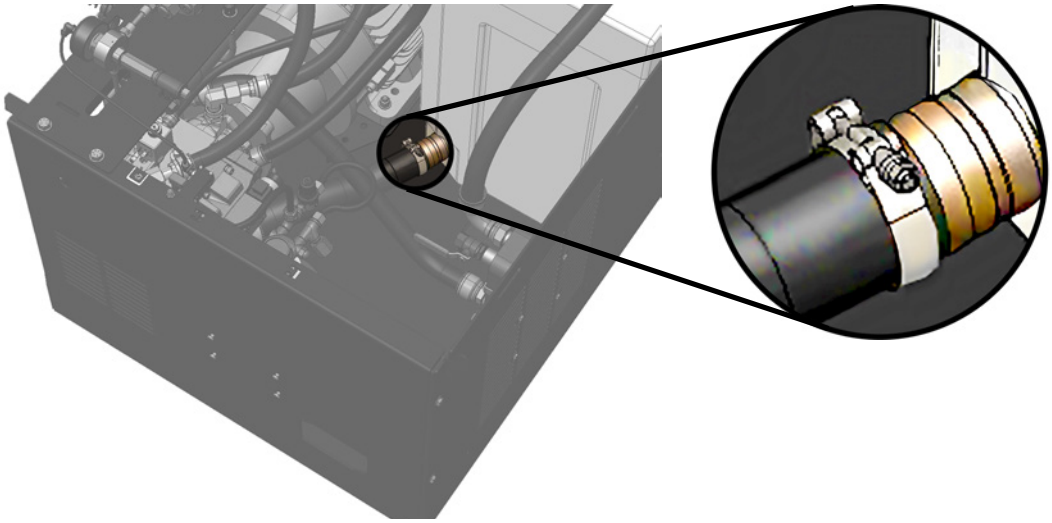
The dirty water container is misaligned.

Move the container.

The pump makes noise during operation

The pump can make unusual noise during operation if air is in the hydraulic system.

1. Use a 10-mm socket or an open-ended wrench to tighten the hose clamp on the suction hose that goes from the hydraulic fluid tank to the hydraulic pump.



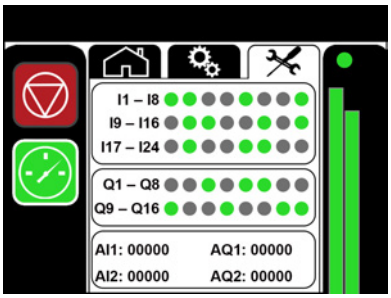
2. Torque the hose clamp to a maximum of 16 N·m (12 lbf·ft).

If the pump continues to make noise after the hose clamp is tightened, contact a Hypertherm Technical Service Associate for information and support.

Controller errors

Input/output status

This screen shows the status of inputs to and outputs from the controller.



Status: = enabled = not enabled

This table describes the assigned inputs and outputs. These can be helpful for troubleshooting.

I1	Not used
I2	Not used
I3	Hydraulic fluid temperature is higher than 65°C (149°F)
I4	Hydraulic fluid temperature is higher than 45°C (113°F)
I5	Low inlet pressure switch
I6	Front intensifier left proximity switch
I7	Front intensifier right proximity switch
I8	Not used
I9	Not used
I10	Not used
I11	Not used
I12	Not used
I13	Not used
I14	Not used
I15	Controls on
I16	Remote mode on
I17	Remote pump on
I18	Remote pump off
I19	Not used
I20	Remote pierce-pressure on
I21	Primary motor fault
I22	Primary motor on
I23	Boost pump on
I24	Heat exchanger fan on

Q1	Low-pressure on
Q2	Proportional control output
Q3	Not used
Q4	Pump on
Q5	Fan motor on
Q6	Enable bleed-down valve
Q7	Front-left shift-valve solenoid
Q8	Front-right shift-valve solenoid
Q9	Not used
Q10	Not used
Q11	Not used
Q12	Primary motor on
Q13	Boost pump motor on
Q14	Remote fault light
Q15	Left frame light (red)
Q16	Right frame light (red)

AI1	Hydraulic pressure
AI2	Remote pressure control
AQ1	Not used
AQ2	Not used

6 Specifications

When applicable, measurements are presented in metric units, followed by International System of Units (SI) units and US Customary units in parentheses.

1 bar (100 kPa / 15 psi) *10 mm (3/8 inch)* *115 N·m (85 lbf·ft)*

This equipment is manufactured in the US, so a metric equivalent is not always available because of inexact conversion.

All Echion-model pumps

Environmental conditions

Glycol can be added to the cooling circuit to prevent freezing, but glycol is less efficient for cooling than water.

Hypertherm recommends using a solution of not more than 25% glycol in chillers for this system.

Ambient air temperature	4°C to 35°C (40°F to 95°F)
Relative humidity Noncondensing	95%
Storage temperature Water not drained	2°C to 55°C (35°F to 131°F)

Hydraulic fluid

Domestic pumps ship from the factory with AW 32 hydraulic fluid.

Type	Antiwear (AW) mineral oil or synthetic hydraulic fluid, ISO viscosity grade (VG) 32 or 46
Hydraulic fluid tank capacity	120 L (32 gallons)
Maximum pressure Set at the factory	217 bar (21,700 kPa / 3,150 psi)
Operation temperature	46°C to 54°C (115°F to 130°F)

A laboratory analysis of hydraulic fluid can tell you if replacement is recommended.

The maximum contamination from particulates that is permitted is 19/17/14 when tested according to ISO 4406. The maximum recommended contamination from water is 300 ppm when tested according to ASTM D6304c-04. If it is not practical to analyze a sample of your hydraulic fluid, Hypertherm recommends replacing it every 3,000 hours.

Refer to Replace the hydraulic fluid on page 86.

Utilities

Electrical power

The motor size determines the full load amperes, the overload settings, and the wire sizes. Refer to your pump model (beginning on page 138 in this section) or to the electrical drawings.

The electrical drawings are shipped in an envelope that is found inside the electrical cabinet.

The pump uses 3-phase alternating current (AC) electricity. Some parts, such as valve solenoids and sensors, use 24-volt direct current (VDC) electricity from a power supply in the electrical enclosure.

Supply water

Do not use deionized water unless the system has stainless steel water fittings.

Deionized water can cause the plumbing parts to fail.

Softened water is necessary for most systems. Get advice from a specialist for recommendations for choosing a water treatment system. Reverse osmosis systems are available from Hypertherm.

If the cooling water or the supply water temperature is higher than 24°C (75°F), cool the water before use. Water that is too warm can shorten high-pressure seal life.

Cooling

Pump model	kW (minimum)	Refrigeration tons (minimum tons)	Heat removal requirement (minimum Btu/hour)
Echion 15	3	0.85	10,000
Echion 30	6	1.70	20,000
Echion 50	9	2.70	32,000

Compressed air

	Minimum	Maximum
Pressure	4.8 bar (70 psi)	5.5 bar (80 psi)

Echion 15

Dimensions and weights

Length	135 cm (53 in.)
Width	109 cm (43 in.)
Height	101 cm (40 in.)

Shipping weight	850 kg (1,850 lb)
Operating weight	775 kg (1,700 lb)

The shipping weight is for the pump, the pallet, and the packaging. Exact weights are measured at shipment. Operating weight is for an unpackaged pump with hydraulic fluid.

Electrical

11.2 kW, 15hp	50 Hz	60 Hz	
Voltage	400 V	208 V to 230 V	460 V
Full-load current	23 A	45 A to 41 A	21 A
Primary circuit breaker rating	30 A	60 A	30 A

Water

	Minimum	Maximum
Cutting water in		
Flow	3.8 L/minute (1.0 gallon/minute)	—
Pressure	2.8 bar (280 kPa / 40 psi)	7.6 bar (760 kPa / 110 psi)
Cutting water out		
Flow	—	1.1 L/minute (0.3 gallon/minute)
Pressure	345 bar (34,500 kPa / 5,000 psi)	4,140 bar (414,000 kPa / 60,000 psi)
Cut-pressure factory setpoint	—	4,140 bar (414,000 kPa / 60,000 psi)
Pierce-pressure factory setpoint	1,380 bar (138,000 kPa / 20,000 psi)	—
Cooling in and Cooling out		
Flow	11.4 L/minute (3 gallons/minute)	—
Pressure	2.8 bar (280 kPa / 40 psi)	7.6 bar (760 kPa / 110 psi)

Echion 30

Dimensions and weights

Length	135 cm (53 in.)
Width	109 cm (43 in.)
Height	101 cm (40 in.)

Shipping weight	900 kg (2,000 lb)
Operating weight	825 kg (1,850 lb)

The shipping weight is for the pump, the pallet, and the packaging. Exact weights are measured at shipment. Operating weight is for an unpackaged pump with hydraulic fluid.

Electrical

22.4 kW, 30 hp	50 Hz	60 Hz	
Voltage	400 V	208 V to 230 V	460 V
Full-load current	44 A	82 A to 76 A	38 A
Primary circuit breaker rating	60 A	100 A	60 A

Water

	Minimum	Maximum
Cutting water in		
Flow	4.5 L/minute (1.2 gallons/minute)	—
Pressure	2.8 bar (280 kPa / 40 psi)	7.6 bar (760 kPa / 110 psi)
Cutting water out		
Flow	—	2.3 L/minute (0.6 gallon/minute)
Pressure	345 bar (34,500 kPa / 5,000 psi)	4,140 bar (414,000 kPa / 60,000 psi)
Cut-pressure factory setpoint	—	4,140 bar (414,000 kPa / 60,000 psi)
Pierce-pressure factory setpoint	1,380 bar (138,000 kPa / 20,000 psi)	—
Cooling in and Cooling out		
Flow	11.4 L/minute (3 gallons/minute)	—
Pressure	2.8 bar (280 kPa / 40 psi)	7.6 bar (760 kPa / 110 psi)

Echion 50

Dimensions and weights

Length	135 cm (53 in.)
Width	109 cm (43 in.)
Height	101 cm (40 in.)

Shipping weight	1,000 kg (2,200 lb)
Operating weight	925 kg (2,050 lb)

The shipping weight is for the pump, the pallet, and the packaging. Exact weights are measured at shipment. Operating weight is for an unpackaged pump with hydraulic fluid.

Electrical

37.3 kW, 50 hp	50 Hz	60 Hz	
Voltage	400 V	208 V to 230 V	460 V
Full-load current	74 A	136 A to 124 A	62 A
Primary circuit breaker rating	100 A	200 A	100 A

Water

	Minimum	Maximum
Cutting water in		
Flow	7.6 L/minute (2 gallon/minute)	—
Pressure	2.8 bar (280 kPa / 40 psi)	7.6 bar (760 kPa / 110 psi)
Cutting water out		
Flow	—	3.8 L/minute (1 gallon/minute)
Pressure	345 bar (34,500 kPa / 5,000 psi)	4,140 bar (414,000 kPa / 60,000 psi)
Cut-pressure factory setpoint	—	4,140 bar (414,000 kPa / 60,000 psi)
Pierce-pressure factory setpoint	1,380 bar (138,000 kPa / 20,000 psi)	—
Cooling in and Cooling out		
Flow	11.4 L/minute (3 gallons/minute)	—
Pressure	2.8 bar (280 kPa / 40 psi)	7.6 bar (760 kPa / 110 psi)

Orifices

US Customary (inches)

Number of orifices	Echion 15	Echion 30	Echion50
1	0.007	0.011	0.014
2	0.005	0.007	0.010
3	0.004	0.006	0.008
4	—	0.005	0.007
5	—	0.004	0.006
6	—	—	0.005

Stroke rate

The maximum intensifier stroke rate is calculated using the motor wattage and the size of the hydraulic pump.

Echion pump model	Maximum strokes/minute
Echion 15	40
Echion 30	79
Echion 50	107

Default overstroke percentage = 5%

Maximum overstroke percentage = 20%

Torque values

Fasteners

WARNING

Do not use more torque than the values specified in these tables for load-carrying fasteners.

End cap fasteners

These torque values are for bolts that are coated with antiseize bolt lubricant (white lithium grease).

	Torque value		Wrench size
	N·m	lbf·ft	
High-pressure end cap nut	373	275	1-1/2-inch socket
Hydraulic end cap screw	88	65	3/8-inch hex

Tighten each end cap nut in 68 N▪m (50 lbf▪ft) increments. Use a repeating cross pattern.

SAE J518 flange bolts

These torque values are for bolts that are coated in antiseize bolt lubricant (white lithium grease).

1/16-inch dash size	Code 61 grade 8 (low pressure)			Code 62 grade 8 (high pressure)		
	Bolt size (inch)	N·m	lbf·ft	Bolt size (inch)	N·m	lbf·ft
-08	5/16-18	24	18	5/16-18	24	18
-12	3/8-16	43	32	3/8-16	43	32
-16	3/8-16	43	32	7/16-14	70	52
-20	7/16-14	70	52	1/2-13	108	80
-24	1/2-13	108	80	5/8-11	217	160

Install a flange

Parts, tools, and materials

Hydraulic fluid

Antiseize bolt lubricant (white lithium grease)

Open-ended wrench (refer to Wrench size in the table on page 142)

Torque wrench

1. Examine the parts. Look for flaws, deterioration, erosion marks, corrosion, or cracks. Make sure that the mating surfaces are smooth and clean.

   If damage is found, replace the component.

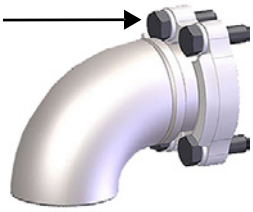
2. Put the O-ring in the flange groove.

	Lubricate the O-ring with hydraulic fluid before installing it.

3. Put the flange halves together.

	To make a good seal, the sealing face must be parallel to the mating surface and the bolt tension must be even. Align the flange face with the mating surface.

4. Lubricate the bolt threads with antiseize bolt lubricant.
5. Put the lock washers on the bolts.
6. Install the bolts.



7. Tighten the bolts by hand.
8. Use a torque wrench to tighten the bolts to the specified value.

	Tighten each bolt in small increments. Use a repeating cross pattern. 

Fittings

WARNING 	Do not tighten a fitting too much. The fitting can fail.

High-pressure water fittings

WARNING 	High-pressure water fittings are designed to make a tight seal. If a fitting is installed incorrectly, it can fail.
CAUTION 	To prevent causing damage or premature failure, use 2 wrenches when loosening or tightening a high-pressure connection. Always tighten fittings to the specified torque.
CAUTION 	Do not use an adjustable wrench on high-pressure fittings.
	Use a high-pressure antiseize lubricant such as Blue Goop or PURE Goop on high-pressure water fittings.
	Use only enough torque to make a sufficient seal. Torque values can vary depending on thread condition. A sufficient seal can be made at values much lower than the maximum values shown in the table.
	If a fitting leaks after tightening it to the maximum torque value, disassemble the parts. Repair or replace parts that show deterioration, corrosion, or damage.

	Torque value		Wrench size
	N·m	lbf·ft	
Output adapter	102	75	1 inch
High-pressure water fitting (gland nut)			
1/4 inch	34	25	5/8 inch
3/8 inch	68	50	13/16 inch
9/16 inch	150	110	1-3/16 inch

	This table shows maximum values. The torque necessary to make a sufficient seal depends on the condition of the tube threads and can be much lower than the maximum.

Install a gland nut

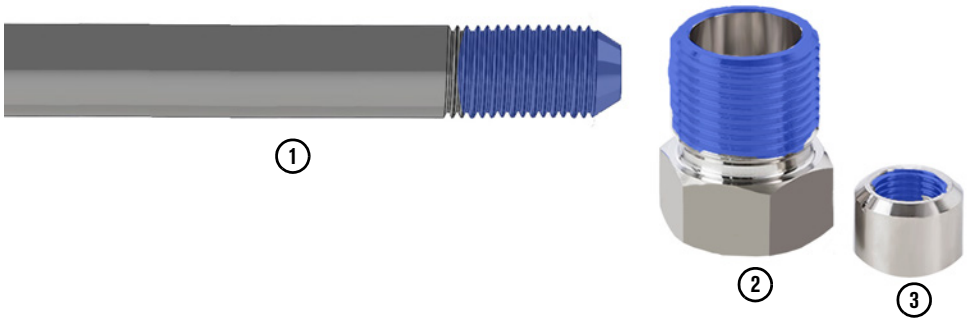
Parts, tools, and materials

Open-ended wrench (refer to the **Torque value** table on page 144)

Torque wrench

High-pressure antiseize lubricant such as Blue Goop or PURE Goop

1. Put high-pressure antiseize lubricant on the gland nut threads, the threads inside the collar, and on the cone and the threads on the high-pressure tube.

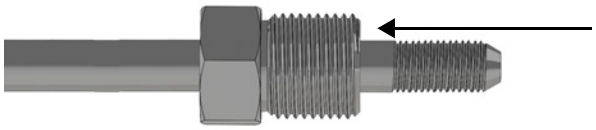


1 High-pressure tube

2 Gland nut

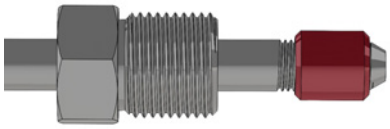
3 Collar

2. Put the gland nut on the high-pressure tube.

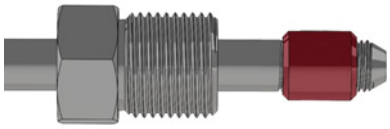


3. Put the collar on the high-pressure tube.

   Make sure that some of the threads on the high-pressure tubing are visible at the fitting.



Incorrectly installed collar: The collar interferes with the seal surface.



Correctly installed collar: The seal surface is showing.

4. Push the high-pressure tube fully into the fitting.

5. Tighten the gland nut by hand.

6. Use a torque wrench to tighten the gland nut to the specified value.

Low-pressure water fittings

Do not use lubricants on low-pressure water fittings.

All low-pressure water connections use push-to-connect fittings.

7 Installation

	This section assumes that the user is familiar with the **Safety**, **Operation**, **Preventive maintenance**, **Troubleshooting**, and **Specifications** sections of this manual.
	Images in this manual are for reference purposes. It is possible that your product configuration is not shown accurately.
	It is possible that not all of the information in this section applies to all pump models.

Safety

WARNING 	**Read and understand all of the safety guidelines in this manual.** Refer to Safety on page 21 before operating, doing maintenance on, repairing, and installing your pump.

Buyer responsibilities

WARNING 	This pump can supply water pressure of up to 4,140 bar (414,000 kPa / 60,000 psi). Only use tubing that is rated for this pressure.
WARNING 	Use supports for plumbing to prevent damage to plumbing from bending stress and fatigue from vibration.

The buyer is responsible for these obligations.

- Cooperate with Hypertherm and the Hypertherm original equipment manufacturer (OEM) regarding the installation of the equipment.
- Obey all setup and first-time start up instructions in this manual.
- Research and obey all local codes, including requirements for waste water disposal.
- Install high-pressure tubing.
- Install water-treatment equipment before the pump is installed.
- Make sure that all utilities are available during installation.
- The site must have sufficient electrical power, air, water, and drain access.
- Make all connections to the pump.
- Fill the hydraulic fluid tank.
- Perform user qualification and training. Refer to User qualification and training on page 23.

Requirements

Location

WARNING 	Some locations can be dangerous if the atmosphere contains explosive gas, vapors, or dust. Refer to requirements from the National Electric Code (NEC), the International Electrotechnical Commission (IEC), the Occupational Safety and Health Administration (OSHA), and other national and local codes for information about environmental criteria.
	Make sure that there is a minimum clearance of 91 cm (36 inches) on all sides of the equipment. This lets air movement help cool the machine and keeps space available for doing maintenance and repairs.
	Do not install this equipment in an area where the temperature is below freezing. Freezing can cause damage to the pump.

Install the pump on a solid, flat surface that can hold the weight of the equipment and is thick enough to resist vibration.

Make sure that there is sufficient space for auxiliary equipment such as a water softener, a reverse osmosis system, or a chiller.

High altitude or ambient conditions can have an effect on the temperature of hydraulic fluid. Fluid that is too cool is thick, which causes increased friction and poor lubrication. Fluid that is too hot is thin, which can accelerate wear on the parts, increase the formation of sludge, degrade the fluid, and decrease its lubrication and protective qualities.

Refer to Environmental conditions on page 136 for air temperature and humidity specifications.

Cooling

	If this pump is installed in a small space or in a high-temperature location, consider adding a chiller to the system for supplemental cooling. Use the Cooling table on page 149 to calculate the cooling load.

If the cooling water or the supply water temperature is higher than 24°C (75°F), cool the water before use. Water that is too warm can shorten high-pressure seal life.

Hydraulic fluid

	Hypertherm does not ship all pumps with hydraulic fluid in the tank.

Refer to Hydraulic fluid on page 136 for specifications.

Utilities

	Refer to Utilities on page 137 for system specifications.

Electrical power

WARNING 	A line disconnect switch for incoming electrical power must be installed near the power supply. This is a supply-voltage disconnecting device or an energy-isolating device.
CAUTION 	The primary feed circuit breaker or fuse must be the correct size to control inrush and steady-state current. Use a motor-start circuit breaker or an equivalent if time-delay high-inrush fuses are not permitted by national or local codes.

Compressed air

The bleed-down valve uses compressed air to operate.

Supply water

	Local codes can require a backflow prevention valve to separate the pump from the facility's potable water.

Water quality

The quality of the water supplied to the intensifier has a direct effect on the life of the intensifier and consumables.

Bad water quality increases operating costs by causing unnecessary wear on pump parts and shortening maintenance intervals.

Before installing this equipment, test the supply water.

Water quality reports that show pH, silica, and hardness levels are frequently available for no charge from public utility water suppliers.

Receive and unpack the equipment

WARNING 	Lifting must be done by a trained operator. Obey all work site safety requirements, the safety instructions for the lifting equipment, and the safety information in this manual.
	For easy reference, write your pump information on the Pump information page at the back of this manual.
	Boxes and parts are frequently packed in the pump, or in crates, boxes, and packaging. Look for accessories and spare parts before discarding the packaging.

1. Examine containers, crates, and pallets for damage.
2. Remove the equipment from the shipping crates and pallets.
3. Examine the equipment to make sure that it was not damaged during shipping. If the equipment is damaged, a claim must be filed with the carrier.
4. Make sure that the delivery and shipping documents match the equipment that was ordered and what was received. Report shortages or damages to the OEM or to Hypertherm Waterjet within 10 days of receipt of the equipment.
5. Make sure that these items are included with the pump.
   - Dirty water container
   - Intensifier repair tools, refer to page 99
   - These items are shipped inside the electrical enclosure:
     - key for the Local/Remote key switch
     - MicroSD card adapter
     - electrical drawings
   - Optional items
     - 1-18768 Standard tool kit, refer to page 98
     - 1-18769 Echion standard spare parts kit, refer to page 100
     - Optional equipment kits, refer to page 103

Install the pump

CAUTION 	Hydraulic, water, and electrical connections can become loose during shipping and normal operation. Examine all connections at installation and during regular maintenance.
	To connect the pump directly to an external control device, such as a CNC, refer to the CNC manual and contact your OEM or a Hypertherm Technical Service Associate for information and support.
	These instructions are for a typical installation. It could be necessary to install the components in a different order.

Install the pump in a location that agrees with the requirements and recommendations for this equipment. Refer to Specifications, which begins on page 135.

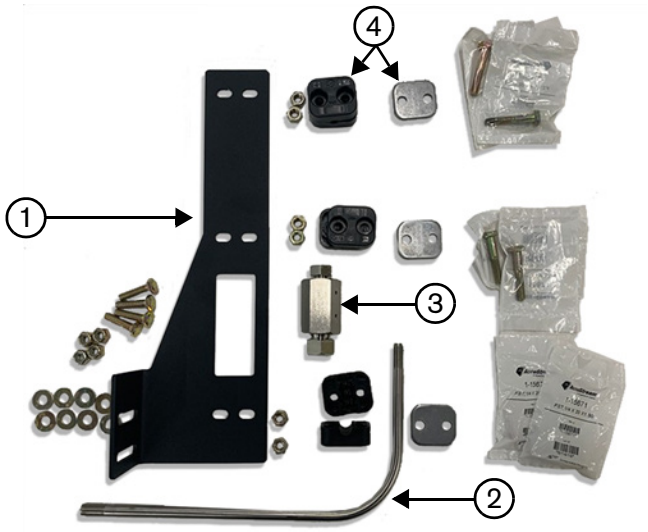
Hypertherm recommends installing the Echion pump on a level surface with a difference in height of no more than 8 cm (1/4 inch) between opposite ends.

Install the pump-mounted plumbing kit (optional)

Refer to Fittings on page 144 for torque values and information about how to correctly install high-pressure water fittings.

The plumbing kit makes installing high-pressure tubing from the pump to the cutting table easier.

The reducing adapter for this kit changes the 3/8-inch high-pressure connection to 1/4 inch.



1 Tubing bracket
2 L-shaped tubing
3 Reducing adapter, 3/8-inch to 1/4-inch
4 Clamp

Parts, tools, and materials

1-18695 Pump-mounted plumbing kit

Two 1/16-inch open-ended wrenches

5/8-inch open-ended wrench

1-1/16-inch open-ended wrench

13/16-inch open-ended wrench

5/8-inch crowfoot wrench

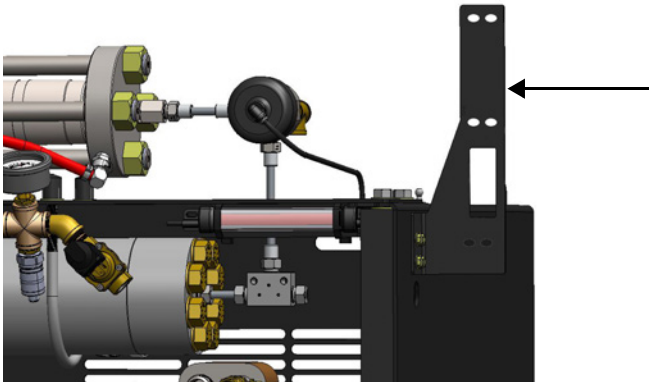
13/16-inch crowfoot wrench

Torque wrench

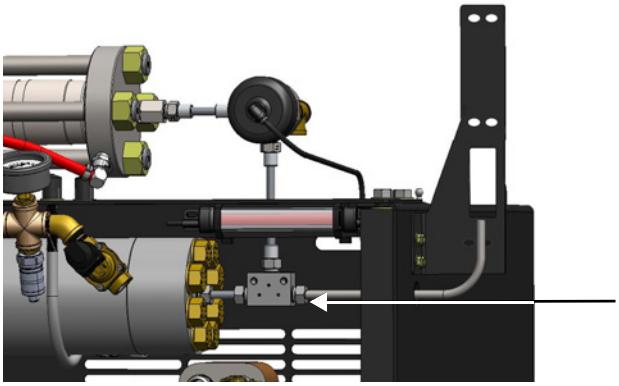
High-pressure antiseize lubricant such as Blue Goop or PURE Goop

1. Find the mounting holes for the plumbing kit on the right side of the pump.

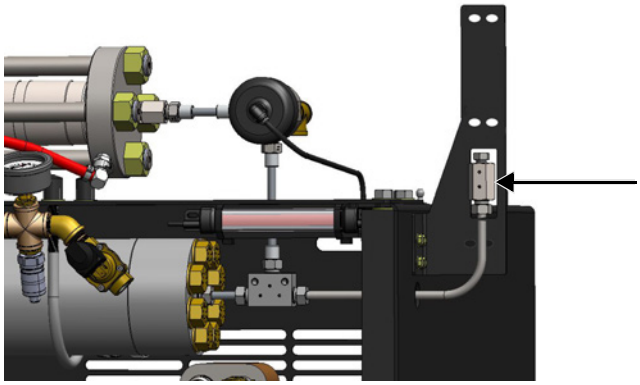
2. Use two 7/16-inch open-ended wrenches and hardware from the kit to install the tubing bracket on the pump frame.



3. Use a 1-1/16-inch open-ended wrench to hold the high-pressure tee on the attenuator. Use a 13/16-inch open-ended wrench to install the long end of the L-shaped tubing into the fitting.

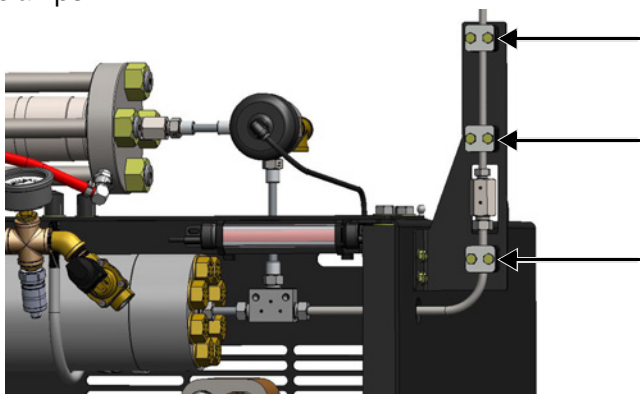


4. Use a 13/16-inch open-ended wrench to install the reducing adapter on the short end of the L-shaped tubing. Use a torque wrench to tighten the fitting to 68 N·m (50 lbf·ft).



5. Use a 5/8-inch open-ended wrench to install your 1/4-inch high-pressure tubing from the cutting head into the top of the reducing adapter. Use a torque wrench to tighten the fitting to 34 N·m (25 lbf·ft).

6. Use two 7/16-inch open-ended wrenches and hardware from the kit to attach the tubing to the tubing bracket with the clamps.



Connect the utilities to the pump

CAUTION	Compressed air is an energy source that can eject with force. Be careful when connecting to and disconnecting from this energy source.
CAUTION	**WATER-COOLED SYSTEM** Do not connect the **Waste water out** hose and the **Cooling out** line together. Connecting these hoses can cause cooling water to back up into the system, which can cause damage to the bleed-down valve and intensifier parts.
CAUTION	To prevent dirty water from entering the bleed-down valve, install the **Waste water out** hose so that it is below the bleed-down valve.
	Refer to Fittings on page 144 for torque values and information about how to correctly install high-pressure water fittings.

The utility connections are identified with hang tags. The tags have symbols on them that correspond with the table on page 157.

Parts, tools, and materials

- 9/16-inch open-ended wrench
- 13/16-inch open-ended wrench
- 1-1/16-inch open-ended wrench
- Torque wrench
- High-pressure antiseize lubricant such as Blue Goop or PURE Goop
- 1/8-inch NPT male fitting
- 3/8-inch high-pressure male fitting
- Two 1/2-inch NPT male fittings

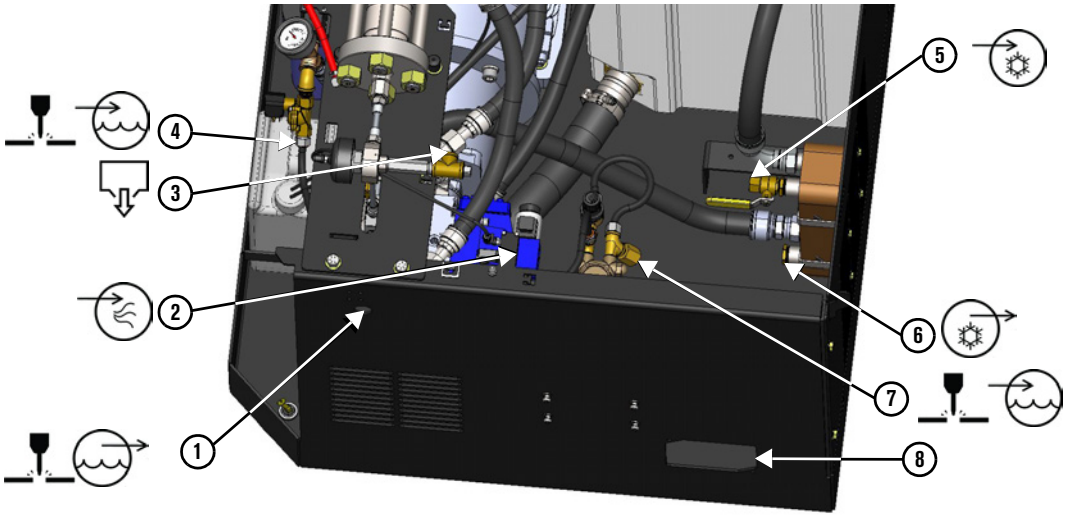
Water-cooled system

- 1-inch open-ended wrench
- 1-3/16-inch open-ended wrench
- Two 1/2-inch NPT male fittings

1. Remove the top cover and the front panel. Refer to Inspect the pump on page 41 for instructions.
2. Remove the caps from the fittings and the plugs from the utility connections.

	Keep the caps and the plugs to use if the pump is stored or shipped.

Connect the water and the air



Name of connection and symbol (on the tag) ● Factory-installed connection	● Fitting required (not included)
Cutting water out This tubing carries high-pressure water from the intensifier to the cutting table. ● 3/8-inch high-pressure female	Connect 1 end of the high-pressure tubing to the cutting head. Put the other end of the tubing through the hose access hole ① on the side of the pump. Connect the tubing to the high-pressure tee inside the pump frame. ● 3/8-inch high-pressure male
Put the other utility hoses and lines into the pump through the larger cutout ⑧.	
Cutting water in This line carries low-pressure water from a water softener, a reverse osmosis system, a well, or a public utility to the pump. ● 1/2-inch NPT female	Connect 1 end of this line to the supply water. Connect the other end to the inlet-water solenoid ④ or to the boost pump ⑦, if equipped. All low-pressure water connections use push-to-connect fittings. ● 1/2-inch NPT male
Waste water out This hose carries water from the bleed-down valve to a drain. ● 1/2-inch NPT female	Connect 1 end of this hose to the drain. Connect the other end to the brass tee ③ on the bleed-down valve assembly. To make maintenance of the bleed-down valve easier, make this connection easy to remove. ● 1/2-inch NPT male
Compressed air The bleed-down valve uses compressed air to operate. ● 1/8-inch NPT female	Connect a compressed air hose to the solenoid valve ② mounted to the frame near the bleed-down valve. ● 1/8-inch NPT male

Water-cooled system

 **Cooling in** This line carries low-pressure water from the local utility or a chiller to the pump's cooling loop. • 1/2-inch NPT female	Connect 1 end of this line to the supply water or to the chiller. Connect the other end to the ball valve at the heat exchanger inlet ⑤. • 1/2-inch NPT male
 **Cooling out** This line carries low-pressure water from the heat exchanger to the chiller or to the drain. • 1/2-inch NPT female	Connect 1 end of this line to the to the chiller or to the drain. Connect the other end to the heat exchanger outlet ⑥. • 1/2-inch NPT male

Connect the electrical power

CAUTION 	This waterjet pump can leak up to 160 mA. To reduce the effects of a high leakage current, connect the pump to a dedicated supply transformer that has separate windings.
	Use electrical parts that are certified by national or local electrical codes.
	Hydraulic, water, and electrical connections can become loose during shipping and normal operation. Examine all connections at installation and during regular maintenance.

1. Attach a ground leg to the grounding lug in the electrical enclosure.

   Use this table to find the minimum cross-sectional area of the external copper ground leg.

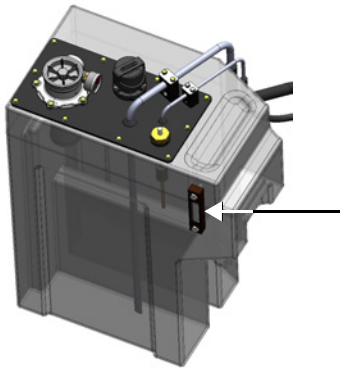
If the cross-sectional area (S mm²) of the copper phase conductors supplying the equipment is	The minimum cross-sectional area (Sp mm²) is
equal to or higher than 16	equal to S
higher than 16 and lower than or equal to 35	16
higher than 35	S/2

2. Connect electrical power to the primary circuit breaker. The breaker is labeled on the technical drawing and in the electrical enclosure as CB-1.

Check the hydraulic fluid

CAUTION	Make sure that hydraulic fluid is available during installation and for the first start.

Look at the sight gauge to check the hydraulic fluid level. Add hydraulic fluid, if necessary. Refer to Add hydraulic fluid on page 85 for instructions.



Do the first start

CAUTION	If a water line, a fitting, or a valve could be frozen, do not operate the pump. Thaw the equipment until water moves easily through the system. Examine the parts for damage. Replace parts, if necessary.
CAUTION	This procedure could cause damage to the orifice. Do not do the first start with a diamond orifice installed. Hypertherm recommends using a ruby orifice during the first 40 hours of operation.

Use this procedure:

- at installation.
- when putting the equipment into operation after storage or shipping.
- after maintenance or repairs are done on the intensifier, the high-pressure water system, or the low-pressure water system.

Do a preoperation inspection

WARNING	Make sure that all connections, fasteners, locking devices, hoses, and fittings are tight.

- Look for leaks, deterioration, damage, or other conditions that can interfere with operation.
- Look at the sight gauge on the hydraulic fluid tank. Add hydraulic fluid, if necessary.
- Make sure that all warning decals are visible and legible.

Turn on the utilities

CAUTION	A leak can cause damage to the water fittings. Monitor for leaks during this procedure. Identify the source of a leak and correct the problem.

1. Turn **ON** the utility water to the pump.
2. Turn **ON** the compressed air source. Set the air pressure between 4.8 bar and 5.5 bar (70 psi and 80 psi).

CAUTION	Air pressure that is too low can prevent the bleed-down valve from closing and can cause the intensifier to overstroke. Air pressure that is too high can cause damage to the needle and the seat in the bleed-down valve. If the available air pressure is too high, install an air regulator (not included) to reduce the pressure.

3. Turn **ON** the electrical main (line disconnect switch).
4. Turn the primary breaker disconnect lever on the electrical enclosure door to **ON**.
5. Make sure that the EMERGENCY STOP is not engaged. If the button is pushed in, turn the button clockwise until it releases.

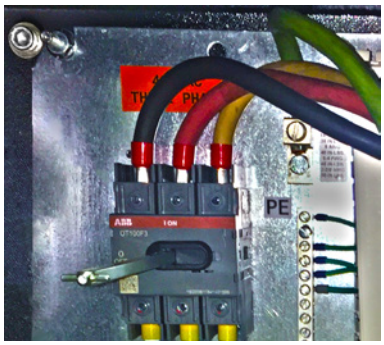
Make sure that the primary motor turns in the correct direction

WARNING	It is necessary to have access to a turning shaft for this procedure. Do not put an object or a body part near the shaft while the access cover is off.
CAUTION	Make sure that the primary motor turns in the correct direction before starting the pump. If the motor turns in the opposite direction, the impeller could turn and loosen. This can cause damage to the hydraulic pump.

1. Make sure that the key switch is set to Local .
2. Remove the shaft access cover.
3. Push the Controls button to turn on the control circuit in the pump.
4. Touch the symbol to turn **ON** the pump momentarily. Make sure that the primary motor turns in the direction shown by the rotation arrow.
5. Touch the symbol to turn **OFF** the pump.

   If the pump motor turned in the wrong direction:

   a. Turn the primary breaker disconnect lever on the electrical enclosure door to **OFF**.
   b. Turn **OFF** the electrical main (line disconnect switch). Use standard lock out–tag out procedures.
   c. Inside the electrical enclosure, interchange 2 cables on the top of the primary circuit breaker.



   d. Turn **ON** the electrical main (line disconnect switch).
   e. Turn the primary breaker disconnect lever on the electrical enclosure door to **ON**.
   f. Do step 3 through step 4 again. Make sure that the primary motor turns in the direction shown by the rotation arrow.

6. Install the shaft access cover.

Turn on the pump

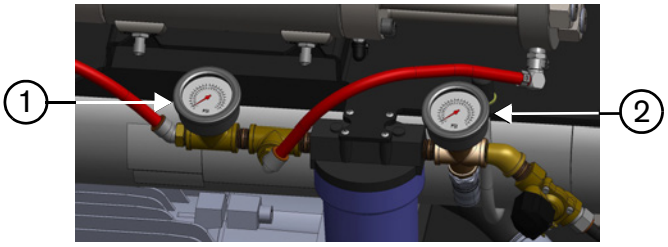
CAUTION	A leak can cause damage to the water fittings. Identify the source of a leak and correct the problem.

1. Set the pressure to 345 bar (5,000 psi).
2. On the operator interface, touch the symbol to start the pump.
3. Let the pump operate for 2 to 3 minutes.
4. Monitor for leaks.

Adjust the boost pump pressure

CAUTION	Do not set the boost pump pressure higher than 7.6 bar (760 kPa / 110 psi). The components are rated for a maximum of 8.6 bar (860 kPa / 125 psi). Pressure that is too high can cause damage to the components.
	If the supply water is from a reverse osmosis system, contact a Hypertherm Technical Service Associate for information and support.

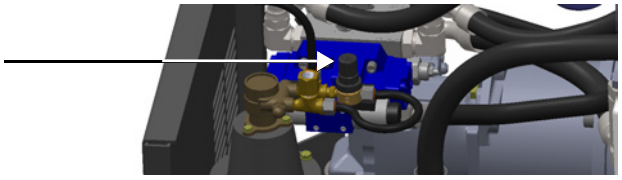
1. Make sure that the value on the prefilter water-pressure gauge is between 6.9 bar and 7.6 bar (690 kPa and 760 kPa / 100 psi and 110 psi).



1 Postfilter water-pressure gauge **2** Prefilter water-pressure gauge

If the pressure is not in range:

a. Pull the boost pump adjustment knob out.



b. Turn the knob clockwise to increase the pressure. Turn the knob counterclockwise to decrease the pressure.

c. Push the knob in to lock it.

2. Close all doors and replace all panels and covers, including the top cover.

Flush the pump and the high-pressure tubing

CAUTION 	This procedure can cause damage to the on/off valve needle and the seat and to the orifice. Keep spare parts and orifices available.
	If this pump was purchased through an OEM, the OEM could recommend a different procedure to flush out the high-pressure tubing.

It is common for small pieces of metal and debris to be present in newly installed high-pressure tubing. Flush the system to prevent damage to orifices, on/off valve parts, and other components of the high-pressure system.

1. Remove the cutting head and the orifice.
2. Make sure that the on/off valve is closed.
3. Turn **ON** the pump.
4. Set the pressure to 345 bar (5,000 psi).
5. On the operator interface, touch the  symbol to start the pump.
6. Make a program that turns the valve **ON** and **OFF** in 1-second increments. Operate the program in a loop for 15 minutes.

   If a program is not available, turn the cutting head **ON** and **OFF** in 1-second intervals for 15 minutes. This loosens debris in the high-pressure tubing.
7. Turn **OFF** the pump.
8. Install a ruby orifice in the cutting head. For orifice sizes, refer to Orifices on page 141.
9. Turn **ON** the pump.
10. On the operator interface, touch the  symbol to start the pump.
11. Increase the pressure to 2,760 bar (40,000 psi). Operate the program in a loop for 15 minutes.
12. Increase the pressure to 4,140 bar (60,000 psi). Operate the program in a loop for 15 minutes.

    If the on/off valve leaks, examine the needle, the seat, the seals, and the orifice for damage. Replace parts, if necessary.

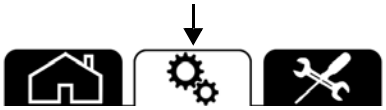
The pump is ready for normal operation.

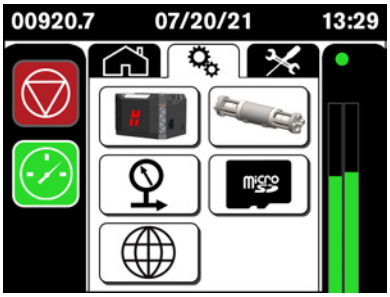
Operator interface: Adjustment screens

	Not all screens are used when installing the pump.
	Touch the current screen symbol to go back 1 screen.
	Refer to Touchscreen maps on page 175 to see all of the screens available on the controller.

The adjustment screens on the operator interface let the user change the system configuration.

On the operator interface, touch the adjustments tab to open the primary adjustments screen.

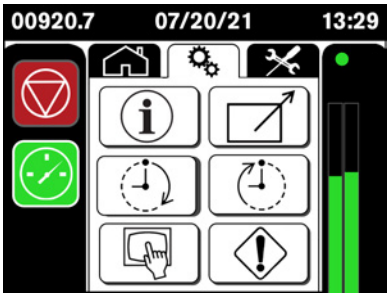




Pump Adjustments
Pressure
Date / Time / Language

Intensifier Control
SD Card

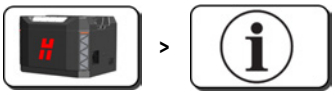
Pump Adjustments

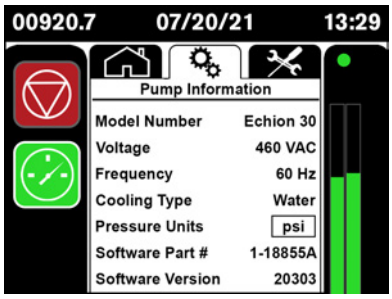


Pump Information
Start Procedure Timers
Pressure Adjustments

Remote Configuration
Stop Procedure Timers
Pump Fault Behavior

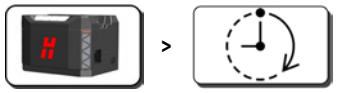
Pump Information



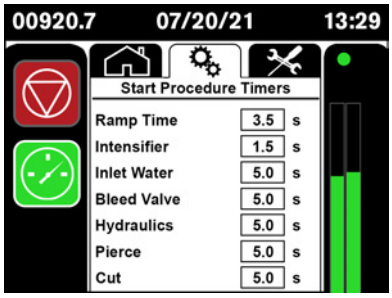


Model Number	This is the model number of the pump.
Voltage	This is the line voltage of the pump
Frequency	This is the line voltage frequency of the pump.
Cooling Type	This the type of heat exchanger the pump uses (water or air).
Pressure Units	▪ Touch this field to open a numeric keypad. ▪ Touch the up or down arrows to select the units (bar or psi) that show on the operator interface screens.
Software Part #	This is the Hypertherm part number and the revision version for the software installed on the controller.
Software Version	This is the version of the software on the controller.

Start Procedure Timers

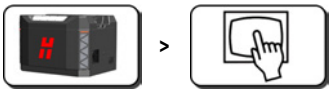


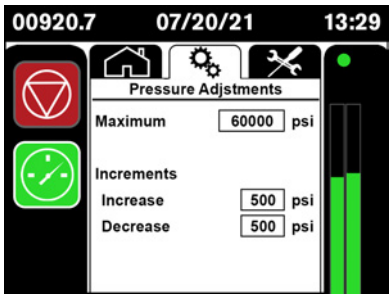
All time is in seconds. Refer to page 179 for information about the start procedure.



Ramp Time	This is the time that the system takes to increase the high-pressure water pressure from 0 to the target water pressure. Increase the value to slow the process. The timer default is between 3 seconds and 8 seconds, based on the pump model.
Intensifier	The system goes to the next stage when the time between intensifier strokes is longer than this value. The timer default is 1.5 seconds.
Inlet Water	Stage 1 After the system gets to the target water pressure, the Inlet Water timer starts. The timer default is 5 seconds.
Bleed Valve	Stage 2 The intensifier strokes and has this much time to push air that is in the system out through the open bleed-down valve. The timer default is 5 seconds.
Hydraulics	Stage 3 After the bleed-down valve closes, the system has this much time to get to the minimum hydraulic pressure. The timer default is 5 seconds. The hydraulic pressure setpoint default is 17 bar (250 psi). Refer to Hydraulic fluid on page 136 in the Specifications section.
Pierce	Stage 4 The system has this much time to get to the pierce-pressure setpoint. The timer default is 5 seconds. Refer to the Water table for your pump model in the Specifications section.
Cut	Stage 5 If the pump is in cut-pressure mode, the system has this much time to get to the cut-pressure setpoint. The timer default is 5 seconds. Refer to the Water table for your pump model in the Specifications section.

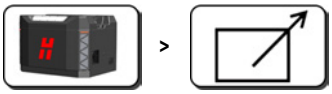
Pressure Adjustments

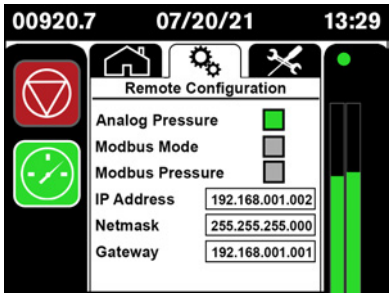




Maximum	This is the maximum pressure that the system can be adjusted to. The default is 4,140 bar (60,000 psi).
Increments	
Increase	This is how much the target water pressure increases each time you touch the ✚ symbol on the primary operation screen. The default is 34 bar (500 psi). The smallest increment is 10 bar (100 psi).
Decrease	This is how much that the target water pressure decreases each time you touch the ▬ symbol on the primary operation screen. The default is 34 bar (500 psi).

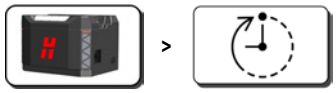
Remote Configuration



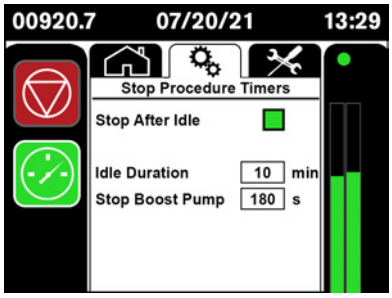


Analog Pressure	This turns the remote analog pressure input on or off.
Modbus Mode	This turns Modbus mode on or off. When this mode is on, the pump is controlled by Modbus TCP over Ethernet.
Modbus Pressure	This turns Modbus control of the pump pressure on or off.
IP Address	Enter a static IP address.
Netmask	Enter the netmask.
Gateway	Enter the gateway.

Stop Procedure Timers

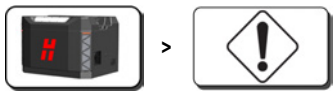


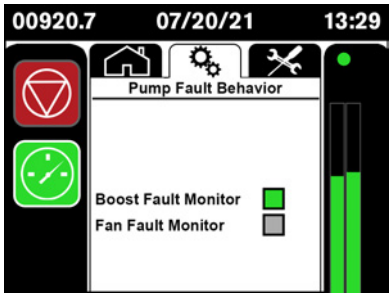
The pump is idle when the intensifier stops stroking.



Stop After Idle	When this feature is on, the pump turns off after the idle duration timer expires.
Idle Duration	This timer determines how long the pump is idle before it turns off. The default is 10 minutes.
Stop Boost Pump	This timer determines how long the pump is idle before the boost pump turns off. The default is 180 seconds.

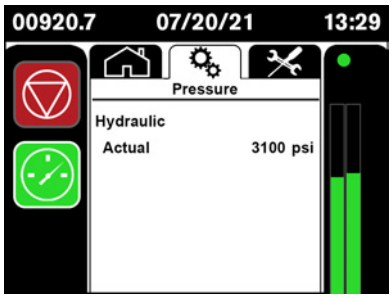
Pump Fault Behavior





Boost Fault Monitor	The system can monitor a boost pump for fault conditions. This turns monitoring on or off.
Fan Fault Monitor	The system can monitor a heat exchanger for fault conditions. This turns monitoring on or off.

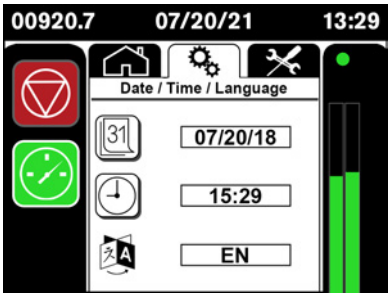
Pressure



Hydraulic	
Actual	This shows the hydraulic pressure in the system.

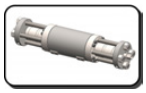
Date / Time / Language

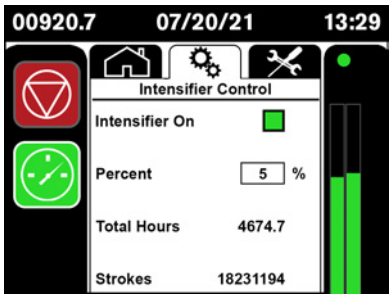
Change the time, and language that shows on the operator interface.

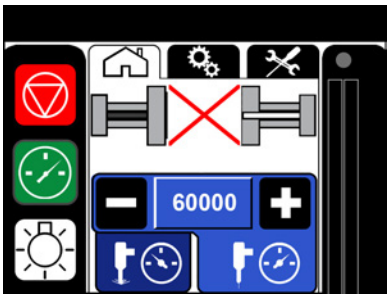


	Date symbol and field Touch this symbol to change the date format. Options are DD-MM-YY or MM/DD/YY. Touch the field next to the symbol to open a numeric keypad. Use the keypad to adjust the date.
	Time symbol and field Touch this symbol to change the time format. Options are a 12-hour clock or a 24-hour clock. Touch the field next to the symbol to open a numeric keypad. Use the keypad to adjust the time.
	Language field Touch the field next to this symbol to open a numeric keypad. Use the keypad to change the language.

Intensifier Control

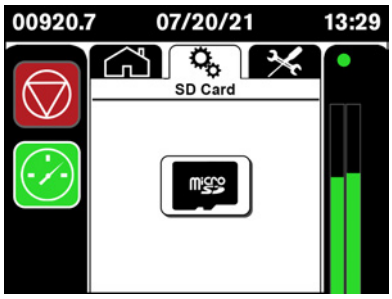




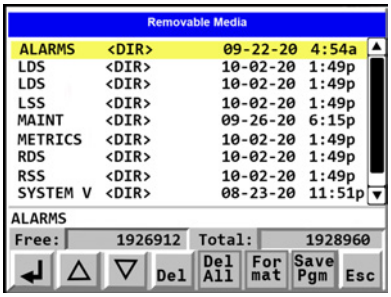
Intensifier On	This enables and disables the intensifier. When intensifier control is off: ▪ the **Intensifier On** box is gray. ▪ the primary screen shows a red × on the intensifier symbol. 
Percent	Overstroke percent is the increased stroke rate that is permitted before an overstroke fault condition occurs. The maximum intensifier stroke rate is calculated using the motor wattage and the size of the hydraulic pump. Refer to Stroke rate on page 141. The rate can be adjusted to compensate for variations in plumbing configurations and flow rates. **1.** Touch this field to open a numeric keypad. **2.** Use the keypad to enter the maximum overstroke percentage permitted before a fault occurs. The default is 5%. The maximum is 20%. **3.** Touch **Enter**.
Total Hours	This shows the total hours that the intensifier has been in operation.
Strokes	This shows the total number of strokes on the intensifier. A stroke is counted each time a proximity switch is activated.

SD Card

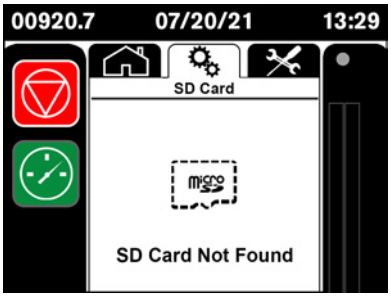
The microSD card stores the current program, the alarm log files, and the maintenance log.



Touch the microSD card symbol to see the contents of the card.



If the microSD card is missing or damaged, the screen shows **SD Card Not Found**.



8 Declaration of Conformity

To see the Declaration of Conformity in English and other languages:

1. Go to www.hypertherm.com/docs.
2. Under Select your product, choose **Waterjet Family** in the dropdown list.
3. Go to the **Regulatory information section** and click the **+**.
4. Click on the Declaration of Conformity for your product.

   You might have to click on **SHOW ALL** at the bottom of the section.

   A PDF of the document downloads to your device.

These navigation instructions can change without notice.

For information about this document, refer to Certification test marks on page 14.

Hypertherm Waterjet
305 2nd St NW STE 115
New Brighton, MN 55112 USA
www.hypertherm.com

Hypertherm®

MANUFACTURER'S DECLARATION OF CONFORMITY

Declaration of conformity (DOC) applies to the following Echion Waterjet Pump Models based on testing performed on model Echion™ 50:

Echion 15 **Echion 30** **Echion 50**

Date of first fixing of CE marking (DOC issued): 06-MAR-2020

Date of this DOC: 06-MAR-2020

The undersigned official of the company hereby declares, on behalf of Hypertherm Waterjet Business Team, that model units with CE Marking on the data plate meet the essential requirements of the following EU Directives:

2006/42/EC Machinery Directive

2014/30/EU Electromagnetic Compatibility Directive

Using the relevant sections of the following EU standards and other normative documents:

2014/30/EU:

EN 61000-6-2: 2005/AC: 2005

EN 55011:2009+A1:2010, Group 1 Class A Limit

2006/42/EC

EN/IEC 60204-1:2018+A1:2009

ANSI / ISO 12100:2012

EN 1829-1:2010

Sara Mancell, Business Team Leader – Waterjet

Note 1: The Technical Construction File including the test reports and other information required by these EU Directives is maintained at the above address.

Note 2: This DOC is not valid on units without CE Marking on the data plate.

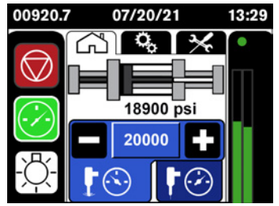
Note 3: For European customer inquiries, contact Arne van der Boon, European Customer Service Hypertherm Europe B.V. Vaartveld 9 4704 SE, Roosendaal, The Netherlands Telephone +31(0)165 596907

9 Touchscreen maps

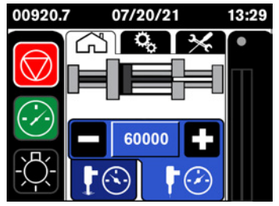
In this section

These pages can help you navigate through all of the screens that are on the operator interface.

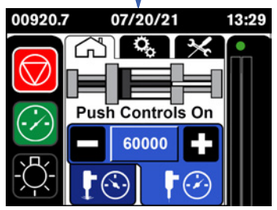
Primary operation screen



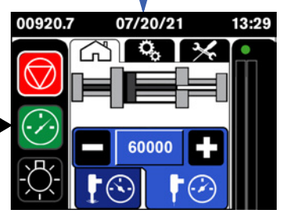
Pierce-pressure mode



Cut-pressure mode

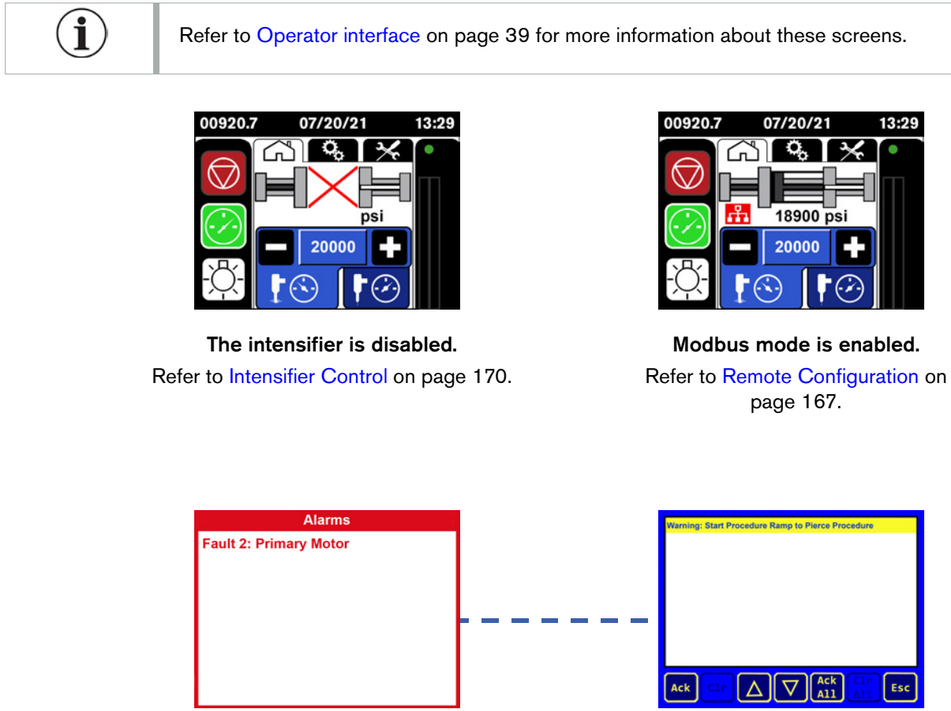


Push the Controls button
on the operator panel to turn on the pump.



Touch the Start symbol to
turn on the pump.

Go to page 179.



Refer to Operator interface on page 39 for more information about these screens.

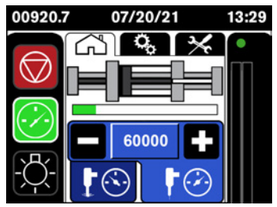
The intensifier is disabled.

Refer to Intensifier Control on page 170.

Modbus mode is enabled.

Refer to Remote Configuration on page 167.

Refer to Alarms on page 114.

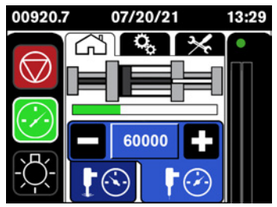


Stage 1

The supply water pressure increases.

- The primary motor starts.
- The hydraulic pump operates at minimum pressure until stage 4.
- After the system gets to the target water pressure, the Inlet Water timer starts.

  The timer default is 5 seconds.

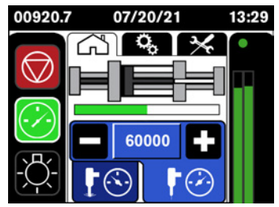


Stage 2

Air is removed from the system.

- The intensifier begins stroking.
- The Bleed Valve timer starts.

  The timer default is 5 seconds.

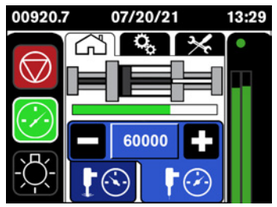


Stage 3

The system fills with water.

- The bleed-down valve closes.
- Pressure in the system increases to the hydraulic pressure setpoint.
- The Hydraulics timer starts.

  The timer default is 5 seconds.



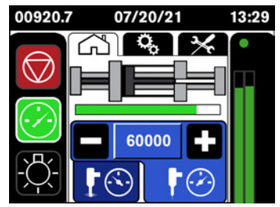
Stage 4

The pressure increases to the pierce-pressure setpoint.

- Water pressure in the system increases to the pierce-pressure setpoint.
- The Pierce timer starts.

  The timer default is 5 seconds.

If the pump is in pierce-pressure mode, the start procedure is complete.



Stage 5

The pressure increases to the cut-pressure setpoint.

- If the pump is in cut-pressure mode, water pressure in the system increases to the cut-pressure setpoint.
- The Cut timer starts.

  The timer default is 5 seconds.

The start procedure is complete.

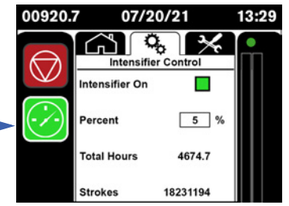
The pump is at operating pressure and is ready to use.

The start procedure timers are adjustable.

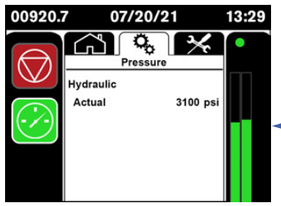
Refer to Start Procedure Timers on page 166 for instructions.

Adjustment screens

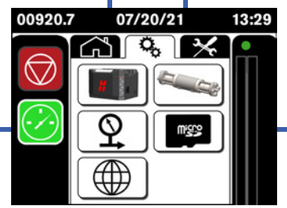
Refer to Operator interface: Adjustment screens on page 164 for more information about these screens.



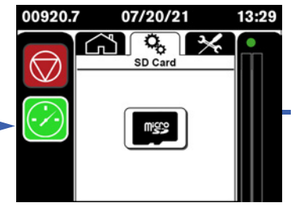
Refer to Intensifier Control on page 170.



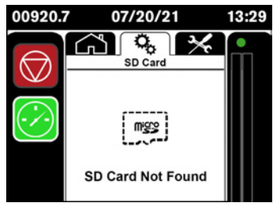
Refer to Pressure on page 169.



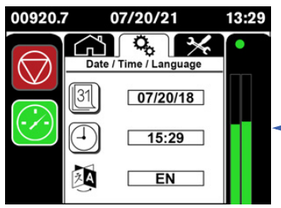
Primary Adjustments screen



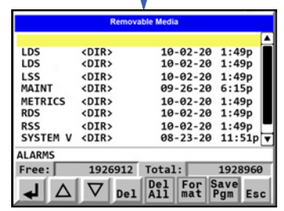
Refer to SD Card on page 171.



SD Card Not Found

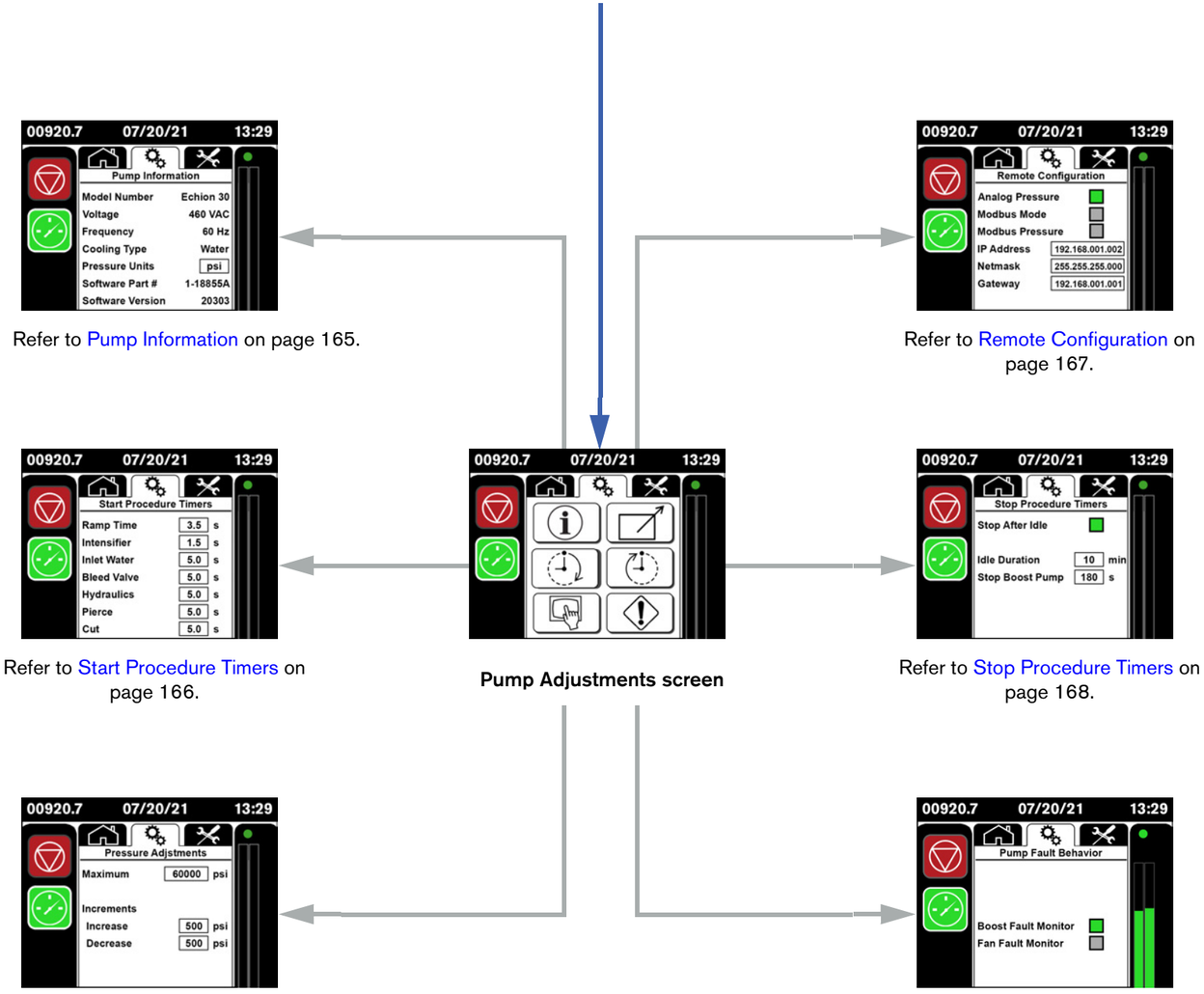


Refer to Date / Time / Language on page 169.



SD Card Files

Go to page 183.



Refer to Pump Information on page 165.

Refer to Remote Configuration on page 167.

Refer to Start Procedure Timers on page 166.

Pump Adjustments screen

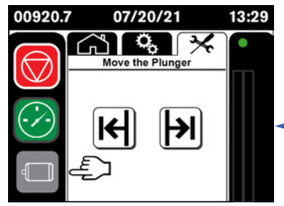
Refer to Stop Procedure Timers on page 168.

Refer to Pressure Adjustments on page 167.

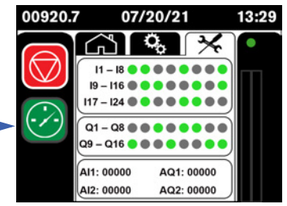
Refer to Pump Fault Behavior on page 168.

Maintenance screens

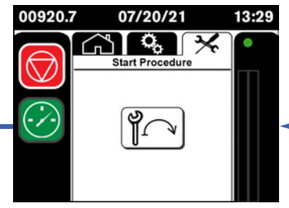
Refer to Intensifier on page 62 for more information about these screens.



Refer to Move the plunger on page 56.

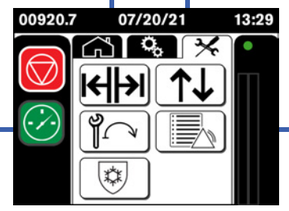


Refer to Inputs and outputs on page 58.



Postmaintenance Start Procedure

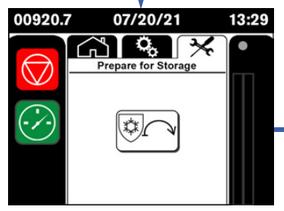
Refer to Start the pump after maintenance on page 90.



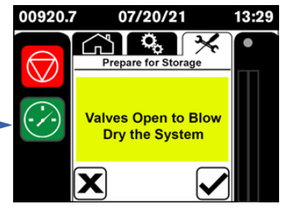
Primary Maintenance screen

Alarm Log

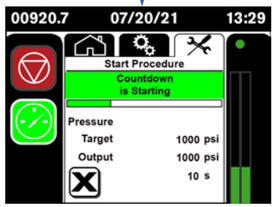
Refer to Leaks on page 118.



Refer to Prepare for storage on page 93.



Go to page 187.



Stage 1

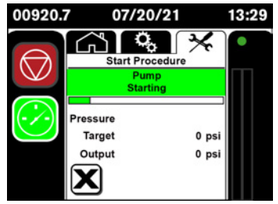
Countdown is Starting

The supply water pressure increases.

- The primary motor starts.
- If the system has a boost pump, it turns on.
- The hydraulic pump operates at minimum pressure.
- The supply water pressure increases until the it gets to the target water pressure.

  The minimum setpoint is 2.76 bar (40 psi).

Touch the ☒ symbol to stop the procedure and turn off the pump.

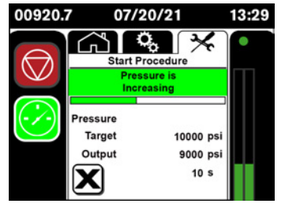


Stage 2

Pump Starting

Air is removed from the system.

- The intensifier begins stroking.
- The bleed-down valve is open.

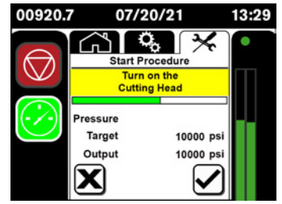


Stage 3

Pressure is Increasing

The system fills with water.

- The bleed-down valve closes.
- Water pressure in the system increases to 690 bar (10,000 psi).

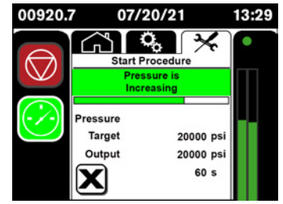


Stage 4

Turn On the Cutting Head

The system waits for you to turn on the cutting head.

1. Move the cutting head to a safe location on the table.
2. Turn **ON** the cutting head.
3. Touch the ☑ symbol to continue.

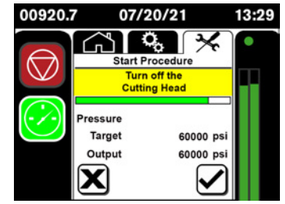


Stage 5

Pressure is Increasing

The pressure increases.

The water pressure increases in 690 bar (10,000 psi) increments until the pump is at 4,140 bar (60,000 psi).

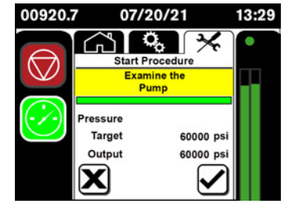


Stage 6

Turn Off the Cutting Head

The system waits for you to turn off the cutting head.

1. Turn **OFF** the cutting head.
2. Touch the ☑ symbol to continue.



Stage 7

Examine the Pump

The system waits for you to examine the pump.

1. Examine the pump for loose fittings or leaks.
2. Examine the attenuator connections for leaks.
3. Touch the ☑ symbol to continue.

   The main motor turns off.

   The primary operation screen opens.

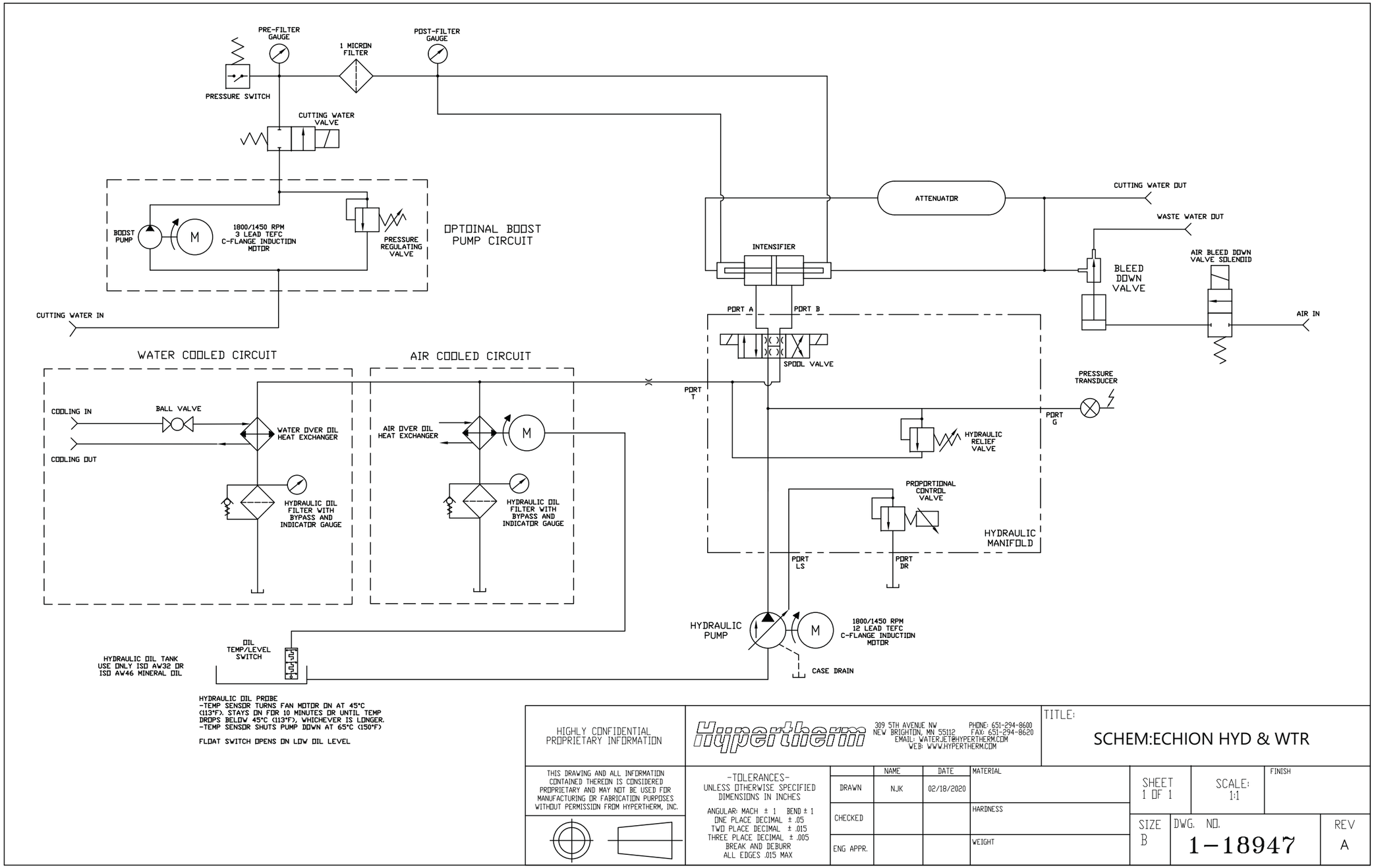
The start procedure is complete.

10 Technical drawings

In this section

1-18947 Hydraulic and water system drawing

The electrical drawings are shipped in an envelope that is found inside the electrical cabinet.



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-TOLERANCES-
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES
ANGULAR: MACH ± 1 BEND ± 1
ONE PLACE DECIMAL ± .05
TWO PLACE DECIMAL ± .015
THREE PLACE DECIMAL ± .005
BREAK AND DEBURR
ALL EDGES .015 MAX

	NAME	DATE	MATERIAL
DRAWN	NJK	02/18/2020	
CHECKED			HARDNESS
ENG APPR.			WEIGHT

SHEET 1 OF 1 | SCALE: 1:1 | FINISH

SIZE B | DWG. NO. 1-18947 | REV A

Your pump information

Model _____

Serial number _____

The serial number is on the data plate, which is found on the back of the pump.

Electrical drawing number _____

The electrical drawing number is found inside the electrical enclosure door on a green label.

Purchase date _____

Distributor _____

Installation date _____

Installed by _____

Thank you

We appreciate hearing from you and receiving your feedback

We review your comments and ideas regularly and use them when planning changes. We promise to consider every suggestion. Your satisfaction is our highest priority.

Recommend changes for the next update to this manual.

Send this information with your comments to Technical.Service@hypertherm.com.

- Echion Operator Manual 810770 Revision 3
- Include page numbers, if applicable.
- Tell us the problem or make a suggestion.

Thank you for helping us improve our products.