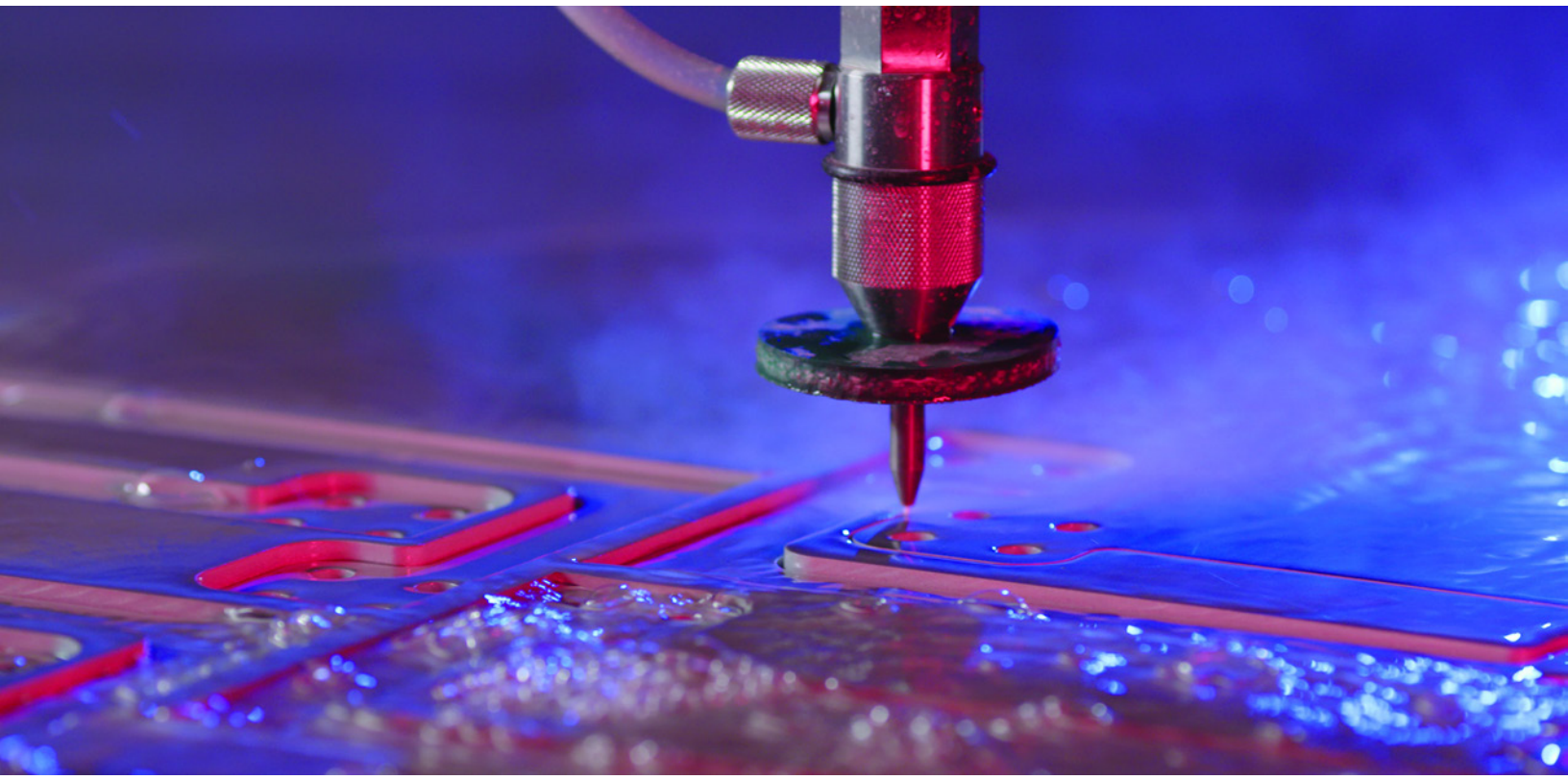
Hypertherm®

DynaMAX™ 315/330/350

Waterjet Pump

Operator Manual



811370 – REVISION 1.1

ENGLISH



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DynaMAX 315/330/350 Waterjet Pump

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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.

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Warranty

Disclaimer

All 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.

The descriptions, images, and diagrams shown in this manual are for general information. The actual equipment configuration could be different from the examples.

Waterjet product warranty

Product	Warranty coverage up to
Waterjet 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
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.

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.

The Conformité Européene (CE) mark affixed to a product signifies the manufacturer's Declaration of Incorporation 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 Incorporation, a copy (in English) is included. Refer to Declaration of Incorporation on page 181.

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 is 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.

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.

Chemical handling and usage

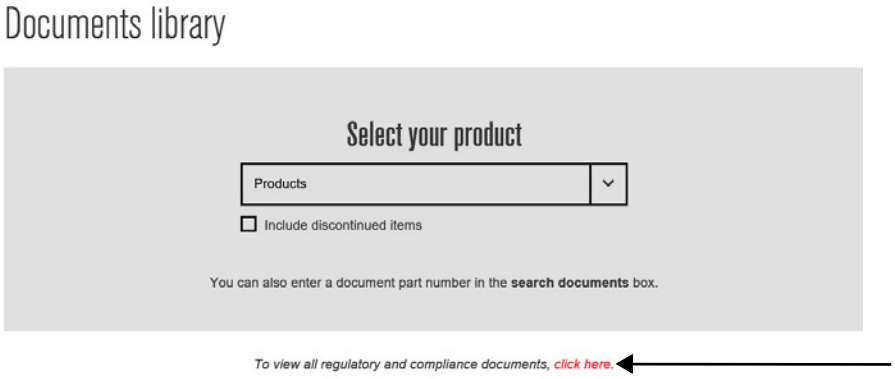
Material safety data sheets (MSDS) and safety data sheets (SDS) are part of a hazard communication plan that supplies detailed information about dangerous chemicals. The information includes the chemical's toxicity and reactivity, first aid for exposure, approved storage and disposal, recommended protective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



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



	These navigation instructions can change without notice.

Safety

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



Before operating Hypertherm equipment, read the safety instructions in the 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	**WARNING** **Pressurized fluid can cause injuries.** A waterjet is a cutting tool. Keep away from high-pressure streams and leaks. A high-pressure injection injury is a surgical emergency. Get medical treatment immediately for all high-pressure waterjet injuries. Delayed treatment can cause injuries or death. Abrasive waterjets eject a mixture of water and abrasive materials that can be injected into body tissues, leading to a dangerous infection.
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

Also refer to Symbols and marks on page 25.

WARNING	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.
NOTICE	Make sure that all connections, fasteners, locking devices, hoses, and fittings are tight before operation.
CAUTION	Make sure that the shaft access cover and all other safety devices are correctly installed before operating this machine.
CAUTION	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.
CAUTION	Do not leave waterjet cutting equipment unattended while it is operating.
CAUTION	During operation, keep a restricted-access area clear that is larger than the maximum movement range of the cutting equipment's moving parts.
CAUTION	Let only approved personnel operate this machinery.
CAUTION	Release all high-pressure water before doing work on this equipment.
CAUTION	**HOT SURFACE** Do not touch.
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.
CAUTION	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.
NOTICE	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.
	**CAUTION** **High-pressure water can cause eye injuries.** Wear approved eye protection when operating or doing work near this equipment.

	**CAUTION** **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. 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.
	**CAUTION** **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.
	**CAUTION** **Some materials can cause airborne contamination or particles when cut.** Wear approved respiratory protection when operating or doing work near this equipment.
NOTICE	Water leaking from a high-pressure fitting or the bleed-down valve can be hot.
NOTICE	Examine and clean the equipment regularly. Refer to Preventive maintenance schedule on page 53. Do repairs immediately.

Symbols and marks

Information and symbols

Some symbols in this table could apply to other products.

WARNING	**Identifies a dangerous situation that could result in death or serious injury if not avoided.**
CAUTION	**Identifies a dangerous situation that could result in minor or moderate injury if not avoided.**
NOTICE	**Identifies situations that are important but not dangerous or related to physical injury; for example, messages related to property damage.**
	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 a tip or helpful information.

Symbols and marks found on the equipment

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

 **DANGER**	**DANGEROUS VOLTAGE** **Risk of shock.**
 **DANGER**	**ARC FLASH AND SHOCK HAZARD** Follow ALL requirements in NFPA 70E for safe work practices and for Personal Protective Equipment.
 **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** **Cancer and reproductive harm.** www.p65warnings.ca.gov
	**Connections may come loose during shipping and normal operation** 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**	**HOT SURFACE** **Do not touch.**
	**RECYCLABLE** Drain and dispose of properly.
	Do not pour the contents of this container down a drain.
	Do not consume the contents of this container.
	**REFER TO THE MANUAL** Read and fully understand all of the safety guidelines in this manual.

	**WARNING** Read and fully understand the operations and maintenance manuals before servicing this machine. Failure to follow the correct procedures could result in serious injury.
	Correct direction of motor rotation (motor rotation arrow)
PN	Pump part number
SN	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)
DWG	Electrical enclosure and schematic drawing number

CE	The Conformité Européene (CE) mark affixed to a product signifies the manufacturer's Declaration of Incorporation 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 manual. Read and fully 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
	Control circuit on
	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** **Water-cooled system:** This line carries low-pressure water from the local utility or a chiller to the pump's cooling loop. **Air-cooled system:** This line carries hydraulic fluid to the system from the external heat exchanger.
	**COOLING OUT** **Water-cooled system:** This line carries low-pressure water from the heat exchanger to a drain or to a chiller. **Air-cooled system:** This line carries hydraulic fluid from the system to the external heat exchanger.

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 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.

Cooling water shutoff kit

This kit is for water-cooled systems. It includes a solenoid valve and a cable harness. The kit prevents cooling water from flowing when the pump is turned off.

2 Operation

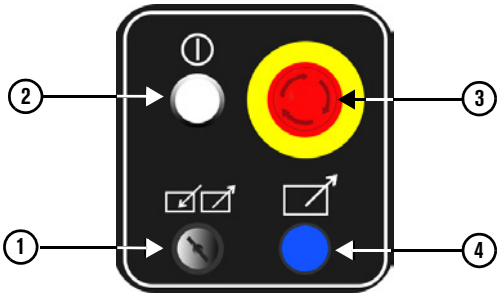
Safety

WARNING	**Read and understand all of the safety guidelines in this manual.** Refer to Safety on page 19 before operating, doing maintenance on, repairing, and installing the pump.

Use the controls

Operation panel

The operation panel turns the control circuit in the pump on and off and controls local and remote pump operation.



1 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 control the pump.
- Most of the functions on the operator interface are not available.

Refer to Operate the pump remotely on page 42.

2 CONTROLS ON button

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

3 EMERGENCY STOP button

When this button is pushed:

- The control circuit turns off, which turns off the pump, the primary motor, and the intensifier.
- The bleed-down valve opens to release high-pressure water from the system.

Refer to Emergency stop on page 44.

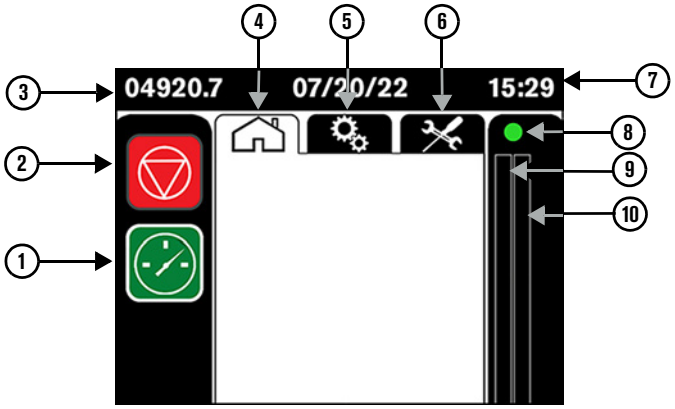
4 REMOTE indicator light

When the **LOCAL-REMOTE** key switch is in the **REMOTE** position, this indicator light is on.

Operator interface

Refer to Touchscreen maps on page 183 to see all of the available screens.

These elements are on most screens.



1 Start

Touch this symbol to start the pump.

2 Stop

Touch this symbol to stop the pump.

3 Hour meter

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

4 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.

5 Adjustments screens tab

- See information about the 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 Adjustment screens on page 187.

6 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 Maintenance screens on page 189.

7 Date and time

This shows the current date and time.

Refer to Date/Time/Language on page 177.

8 Intensifier status indicator

Enabled (green)

Not enabled (red)

9 Intensifier stroke rate bar (stroke to the left)

10 Intensifier stroke rate bar (stroke 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).

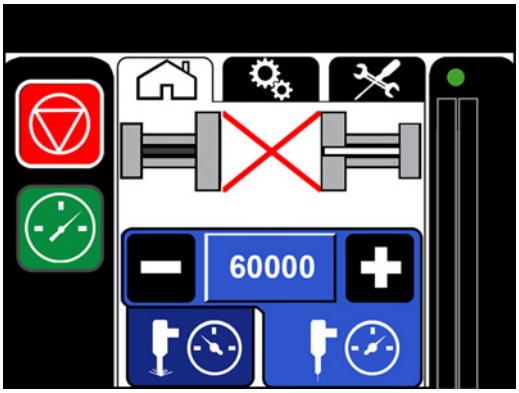
Intensifier status indicator and stroke-rate bars

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

During normal operation, the intensifier strokes smoothly to the left and to the right at the same speed. The stroke-rate bars show the speed of the piston moving to each side of the intensifier.

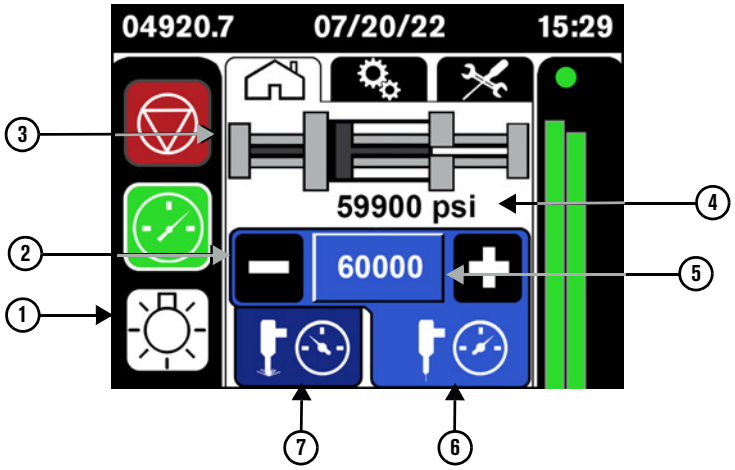
Intensifier control

When intensifier control is off, the primary screen shows a red ✕ on the intensifier symbol.



	Refer to Intensifier Control on page 178 for information about adjusting the intensifier overstroke percentage.

Primary operation screen



1 LED light on or off

Touch this symbol to turn the red LED lights on or off.

2 Decrease (minus) or increase (plus) the water pressure

3 Intensifier graphic

The intensifier graphic is animated when the pump is on and the intensifier is engaged.

4 Output water pressure

This shows the actual water pressure in the system.

5 Target water pressure

Refer to Set the target water pressure on page 43.

6 Pierce-pressure mode

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

7 Cut-pressure mode

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

Refer to Select the pressure mode on page 43 for information about pressure modes.

The intensifier animation is not related to the actual stroke rate and can be moving when the intensifier is not stroking.

Turn on the pump: beginning of day or beginning of shift

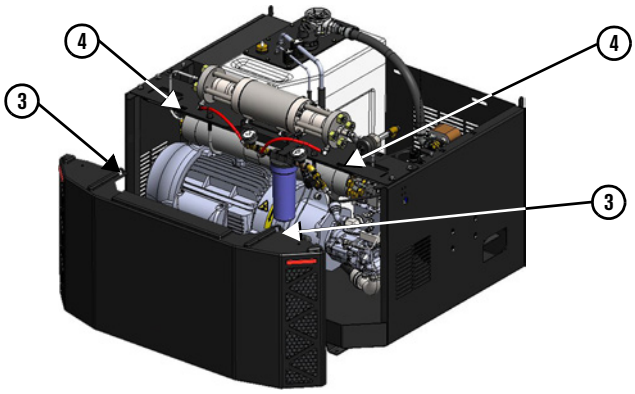
Follow these steps when starting the pump for the first time each day or at the beginning of each work shift.

	Daily preventive maintenance tasks are included in these instructions.

Clean and inspect the pump

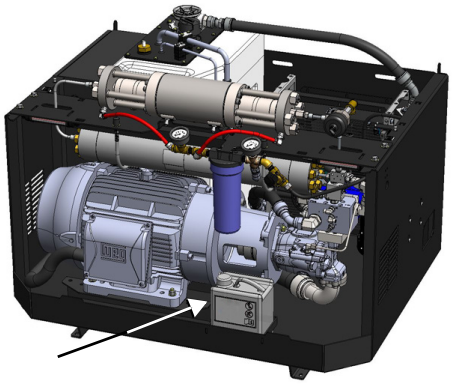
Do this task when the pump is off.

1. Remove the top cover.
   a. Use a standard screwdriver to turn the cover 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 ③ to release the retainers tabs from the frame ④.



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

4. Empty the dirty water container, if necessary.



	Refer to local regulations regarding waste water. Environmental rules can apply to disposal.
	Water in the container could have oil in it.

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. These can cause scratches. • 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 quality

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 81.

NOTICE	Heat and other conditions cause hydraulic fluid to degrade. Degraded hydraulic fluid can cause damage to hydraulic components. Refer to Hydraulic fluid on page 132 for recommended temperature limits.
	Collect a sample of hydraulic fluid from the hydraulic fluid tank and send it to a test laboratory for analysis. Contact a hydraulic fluid supplier for a precise report about the hydraulic fluid quality.

1. Look through the sight gauge to see the color of the hydraulic fluid. Good hydraulic fluid is almost transparent.
2. Remove the filler-breather cap on top of the tank.
3. Smell the hydraulic fluid. Good hydraulic fluid has almost no odor.
4. Install the filler-breather cap.

Turn on the utilities

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

1. Turn **ON** the supply water to the pump.
2. Turn **ON** the compressed air source.

   Set the air pressure between 5.2 bar and 8.3 bar (75 psi and 120 psi).

NOTICE	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 poppet 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**.

   The operator interface screen is on when the pump is energized.

Make sure that the emergency stop operates correctly

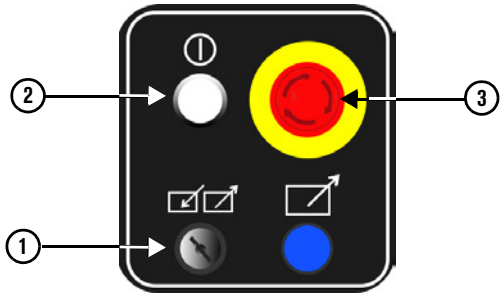
On the operation panel, push the **EMERGENCY STOP** button. Refer to Emergency stop on page 44.

Start the pump

NOTICE	Use the Post-maintenance start on page 85 if maintenance or repairs have been done on: • the high-pressure water system. • intensifier components. • the primary motor.

The pump is on when the primary motor is operating.

The primary motor drives the pump. A hydraulic pump moves hydraulic fluid to the intensifier.



1. On the operation panel:
   a. Make sure that the **EMERGENCY STOP** button ③ is not engaged. If the button is pushed in, turn the button clockwise until it releases.
   b. Make sure that the **LOCAL-REMOTE** key switch ① is set to **LOCAL**.
   c. Push the **CONTROLS ON** button ②.
2. On the operator interface, touch the **START** symbol.

   The controller starts the pump.

	The normal start sequence is fully automated. Refer to Normal start sequence on page 186 for a description of the sequence.

3. Monitor for leaks.

Examine the pump for leaks or damage

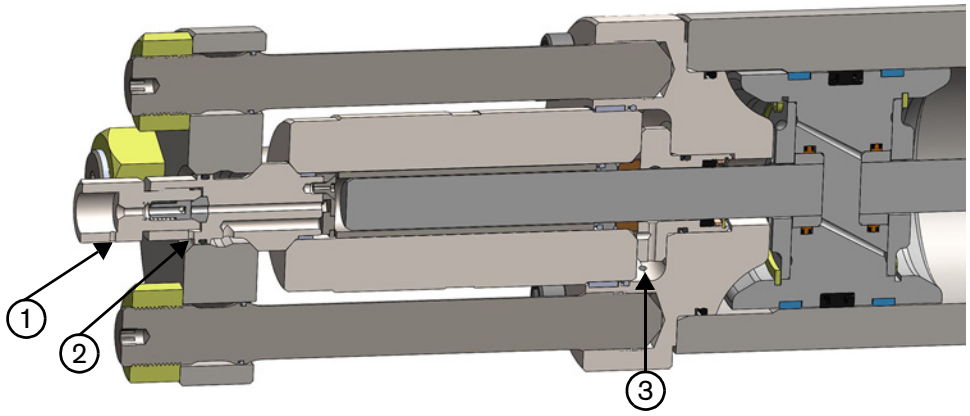
Do this task when the pump is operating and the system is pressurized.

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.

	Water leaks at a rate of more than 30 ml/minute usually indicate that a high-pressure seal has failed.



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 low-pressure water pressure gauges

Do this task every work shift.

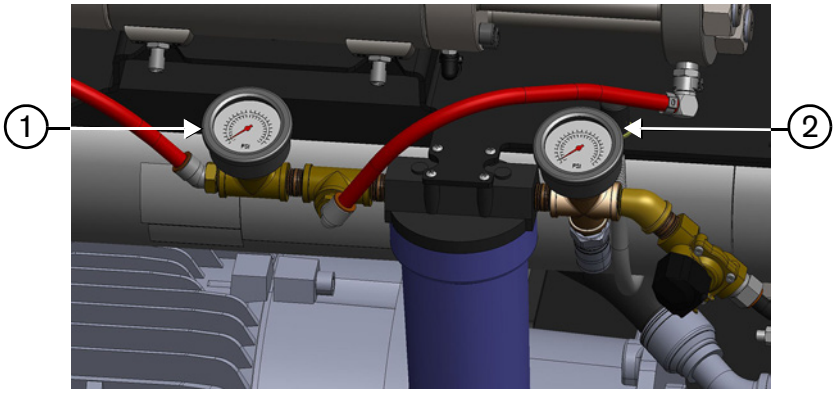
Replace the water filter:

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

Refer to Low-pressure water system on page 75.

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 (40 psi to 110 psi).



Do this task when the pump is operating.

Subtract the value shown on the postfilter water pressure gauge ① from the value shown on the prefilter water pressure gauge ②.

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

Check the hydraulic filter gauge

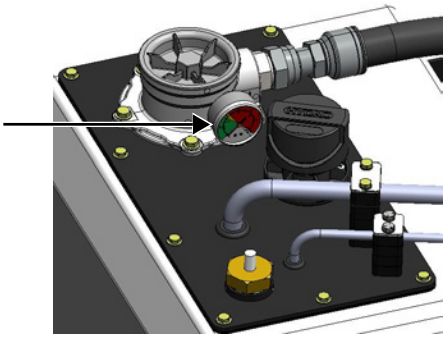
Do this task every work shift.

Replace the hydraulic filter element:

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

Refer to Hydraulic system on page 79.

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



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

Check the hydraulic fluid level

Do this task every work shift.

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 80.

Operate the pump remotely

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

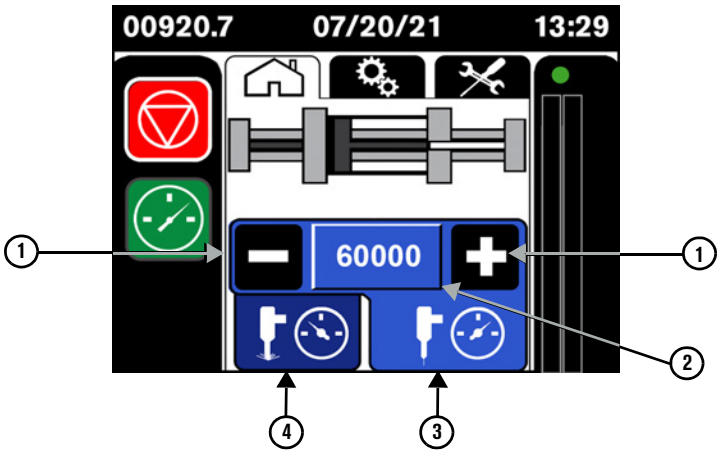
On the operation panel, turn the **LOCAL-REMOTE** key switch to **REMOTE**.

The remote indicator light is on.

Stop the pump

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

Operate the pump locally



1 Minus and plus symbols
2 Target water pressure
3 Pierce-pressure mode
4 Cut-pressure mode

Select the pressure mode

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

Cut-pressure mode is used for most cutting jobs.

Pierce-pressure mode (low-pressure mode) 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.

Set the target water pressure

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

- Touch the minus symbol or the plus symbol next to the target water pressure to change the target water pressure in preset increments.

	To change the increments, refer to Pressure Adjustments on page 173.

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

Stop the pump

Use this procedure during normal operation.

On the operator interface, touch the **STOP** symbol.

- The control circuit stays on.
- 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.

Emergency stop

WARNING	The **EMERGENCY STOP** button does not disconnect main electrical power from the machine.
NOTICE	**This is not the preferred method of turning off the pump.**

Use the **EMERGENCY STOP** button to prevent injury or to reduce the risk of injury to personnel, machinery, or work in progress.

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 or end of shift

1. On the operator interface, touch the **STOP** symbol.
2. Turn the primary breaker disconnect lever on the electrical enclosure door to **OFF**.
3. Turn **OFF** the inlet water supply to the pump. If the pump is water cooled, turn off the cooling water supply. Make sure that the water pressure gauges show 0.0 bar (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 intensifier bridge, the hydraulic fluid tank, and the bottom deck.
8. Empty the dirty water container, if necessary.

	Refer to local regulations regarding waste water. Environmental rules can apply to disposal.
	Water in the container could have oil in it.

3 Preventive maintenance

Benefits of preventive maintenance

Hypertherm recommends preventive and scheduled maintenance for all waterjet pumps. High-quality equipment that is maintained on a schedule lasts longer than equipment that is not maintained regularly. Regular maintenance that 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.

Safety

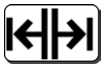
WARNING	**Read and understand all of the safety guidelines in this manual.** Refer to Safety on page 19 before operating, doing maintenance on, repairing, and installing the pump.
NOTICE	Do not tighten a fitting too much. The fitting can fail.
NOTICE	Hydraulic, water, and electrical connections can become loose during shipping and normal operation. Examine all connections at installation and during regular maintenance.
NOTICE	When replacing wiring, use only the same size, type, and color as the original wiring.
NOTICE	Before assembling high-pressure or hydraulic parts, clean the parts to remove grease and other contamination.
	Clean and examine parts that are 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 90.
	Keep accurate maintenance records. Records can help with predicting and preventing maintenance problems.
	Keep spare parts and repair kits available.

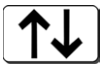
Operator interface: Maintenance screens

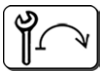
Refer to Touchscreen maps on page 183 to see all of the screens available on the operator interface.

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



 Move the plunger on page 49

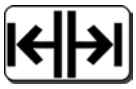
 Inputs and outputs on page 50

 Start the pump after maintenance on page 50

 Alarm log on page 51

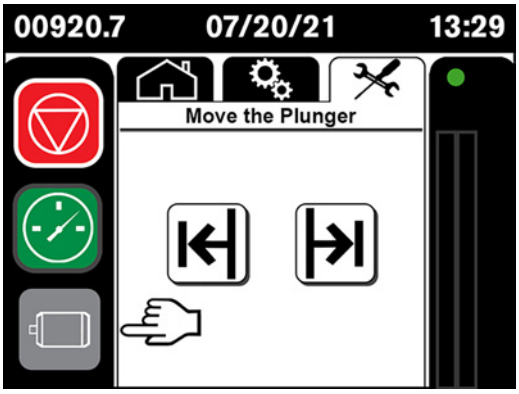
 Prepare for storage on page 51

Move the plunger

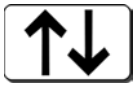


Instructions for moving the plunger begin on page 56.

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

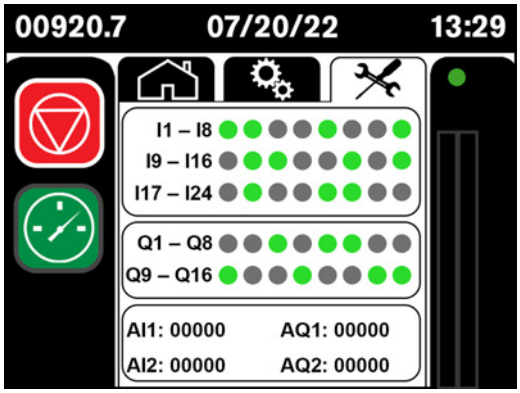


Inputs and outputs

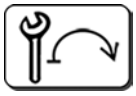


Refer to Input-output status on page 130 for more information.

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

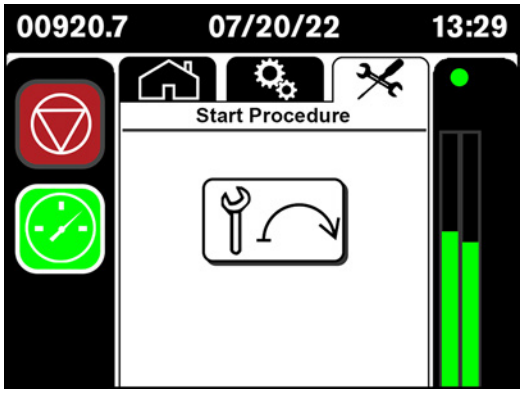


Start the pump after maintenance



Refer to Post-maintenance start on page 85 for more information.

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

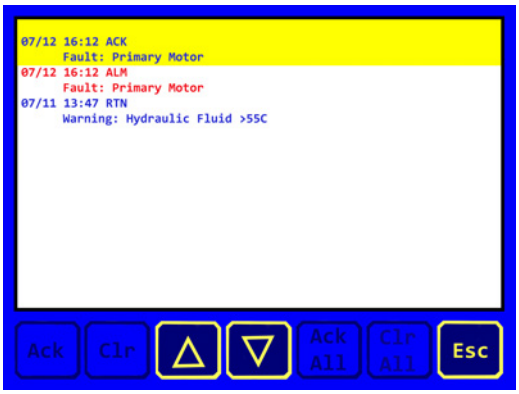


Alarm log



Refer to Alarms on page 108 for more information.

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

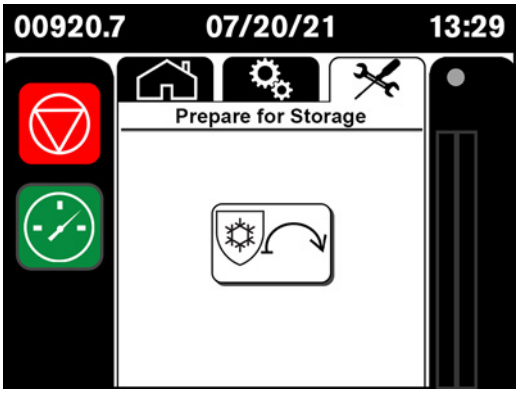


Prepare for storage



Refer to Prepare the pump for storage on page 88 for more information.

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



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



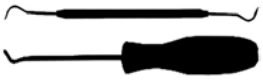
Screwdriver



Standard



Phillips



O-ring pick



Snap-ring pliers



Intensifier repair tools (Refer to Intensifier repair tools on page 93.)

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 columns.

	Interval						
	Daily	500 hours	1,000 hours	1,500 hours	3,000 hours	6,000 hours	12,000 hours
Before starting the pump							
Clean and inspect the pump.	page 36						
Check the hydraulic fluid quality.	page 38						
After starting the pump							
Make sure that the **EMERGENCY STOP** button operates correctly.	page 44						
Examine the pump for leaks or damage.	page 40						
Check the low-pressure water pressure gauges.	page 41						
Check the hydraulic filter gauge.	page 42						
Check the hydraulic fluid level.	page 42						
Intensifier							
Repair the check valve and the low-pressure poppet.		page 60					
Repair the high-pressure cylinder.		page 60					
Replace the high-pressure seal cartridge.		page 60					
Replace the high-pressure poppet assembly.			page 59				
Replace the low-pressure poppet.			page 60				
Flip the high-pressure cylinder.				page 64			
Replace the check valve assembly.					page 60		
Replace the high-pressure cylinder.					page 64		

	Interval						
	Daily	500 hours	1,000 hours	1,500 hours	3,000 hours	6,000 hours	12,000 hours
Intensifier							
Replace the seal housing assembly.						page 63	
Replace the output adapter.						page 64	
Repair the hydraulic center section.							page 59
Replace the spacer tube.							page 64
Bleed-down valve							
Repair the bleed-down valve.			page 69				
Replace the bleed-down valve body.					page 69		
Low-pressure water system							
Clean the air cooler.			page 73				
Replace the water filter.			page 75				
Test the water quality.			page 76				
Hydraulic system							
Replace the hydraulic filter element.				page 79			
Replace the hydraulic fluid.					page 81		
Motor							
Lubricate the primary motor bearings.						page 83	

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.

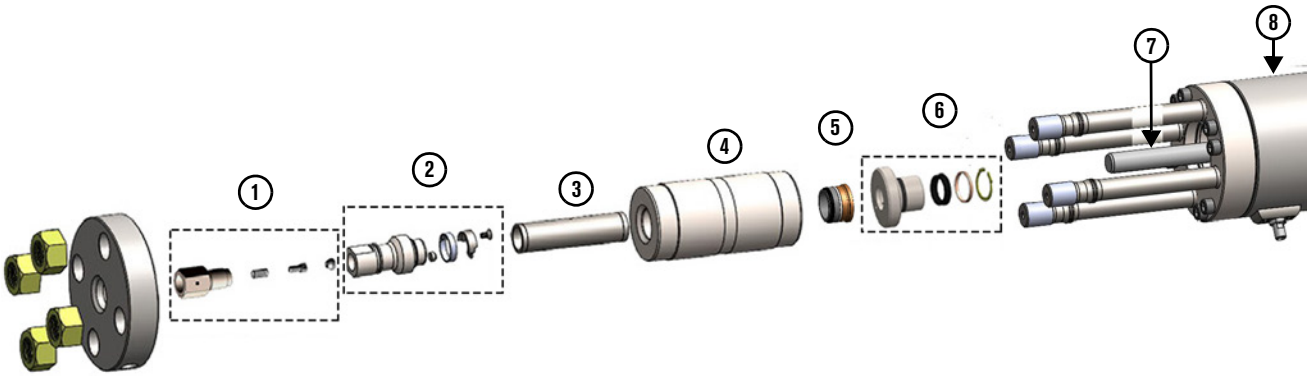
Every 1,500 hours
- Flip the high-pressure cylinders.

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.

NOTICE	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.
NOTICE	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 High-pressure seal cartridge
6 Seal housing assembly
7 Plunger
8 Hydraulic center section

Parts, tools, and materials

- Intensifier repair tools
- DynaMAX 3-series high-pressure seal repair kit
- DynaMAX 3-series high-pressure poppet repair kit
- DynaMAX 3-series low-pressure poppet repair kit
- DynaMAX 3-series 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 103 for individual replacement parts.

Do this task when the pump is not operating.

Prepare the intensifier for service

Position the intensifier plunger

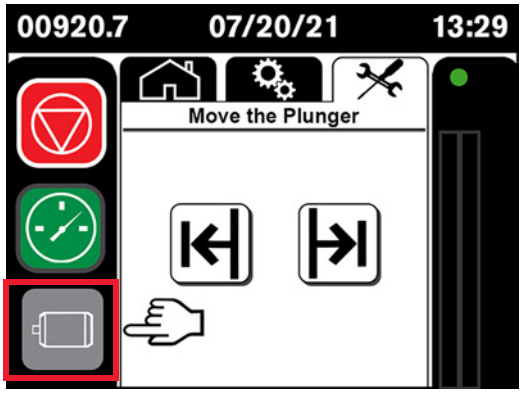
1. On the operator interface, touch the maintenance symbol to open the primary maintenance screen.



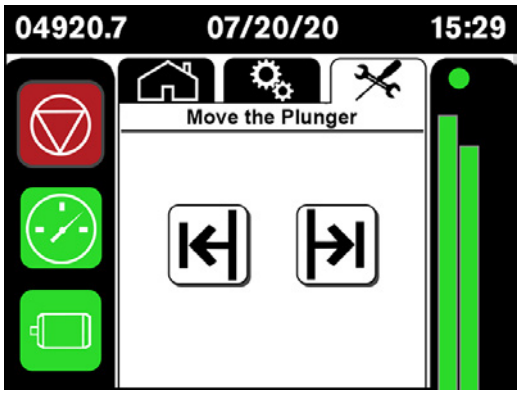
2. Touch this symbol to open the **Move the Plunger** screen.



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.

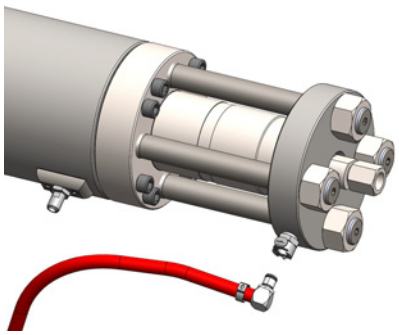


5. Touch the **STOP** symbol.

Disconnect power, water and air

1. Turn the primary breaker disconnect lever on the electrical enclosure door to **OFF**.
2. Turn **OFF** the supply water to the pump. Make sure that the water pressure gauges show 0.0 bar (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. Use a 13/16-inch open-ended wrench to disconnect the high-pressure tubing from the intensifier.
6. Remove the bleed-down valve if you are working on the right side of the pump. Refer to Repair the Bleed-down valve on page 69.

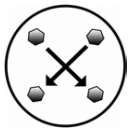
7. Push the button on the quick-disconnect fitting to remove a low-pressure water line from the intensifier.



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

Disassemble the intensifier

1. Use the breaker bar and the 1-1/2-inch 12-point socket to remove the endcap nuts.

	Use a repeating cross pattern. 

2. Remove the end cap.

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

3. Pull out the check valve.

4. 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.

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



6. 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.

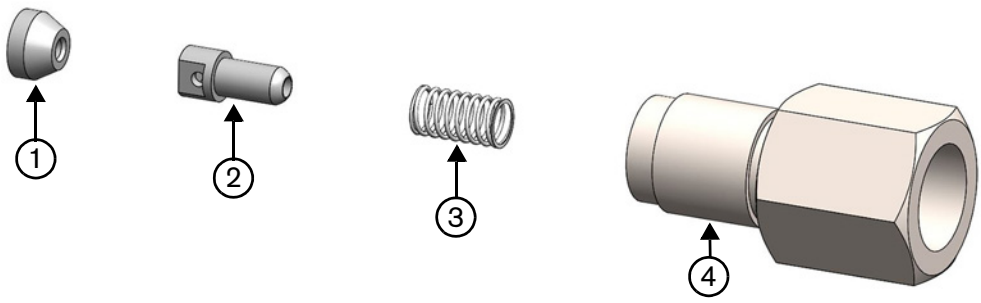
The hydraulic center section includes the piston, the hydraulic cylinder, the hydraulic end caps, the low-pressure seals, the plungers, the T-seals, and the proximity switches.

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.

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.

NOTICE	The high-pressure poppet seat can cause cracks, erosion marks, or dents in the output adapter.
	Clean and examine parts that are 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.
	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

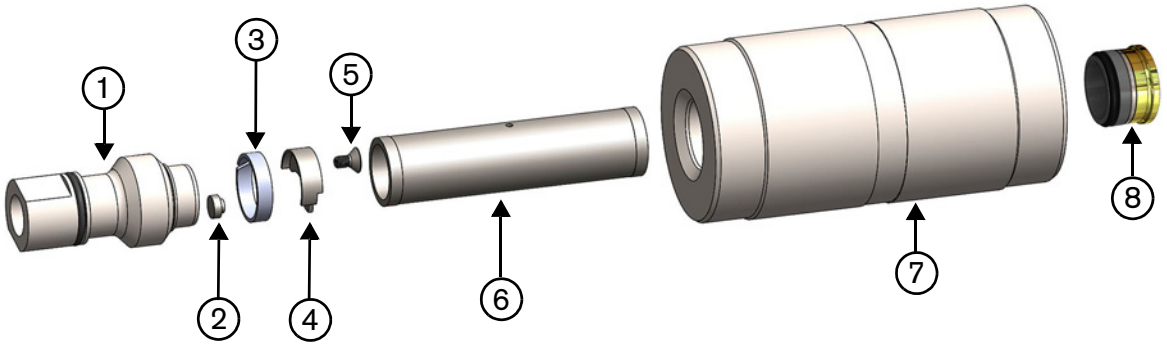
1. Use a cotton-tipped applicator to guide the high-pressure poppet seat out of the check valve.
2. Tap the output adapter gently on a wooden or other soft surface to eject the high-pressure poppet from the output adapter.
3. Disassemble, clean, and examine all of the parts.

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

- Repair the high-pressure cylinders, 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 every 1,000 hours.
- Replace the high-pressure cylinders every 3,000 hours or if a cylinder is chipped or cracked.
- Replace the check valve assemblies every 3,000 hours.

NOTICE	Debris in the cylinder can cause the seals or the poppets to fail.
NOTICE	If a low-pressure poppet screw seizes, the check valve body must be replaced.
	Clean and examine parts that are 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.
	This procedure is for a moderately worn check valve. Replace very worn components.

1. Disassemble, clean, and examine the high-pressure 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 with the seal side facing down. 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.

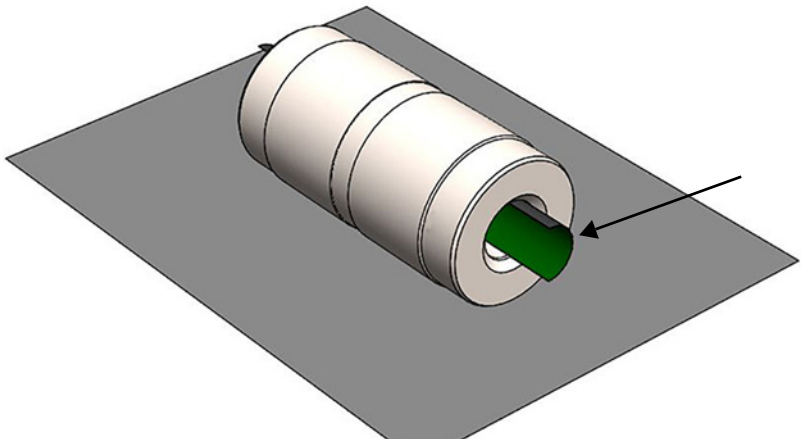
5. Tap on the end of the push tool with a rubber mallet to push the bottom seal and the hoop out of the high-pressure cylinder.

6. Take the spacer tube out of the cylinder.

7. Disassemble, clean, and examine all of the parts.

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

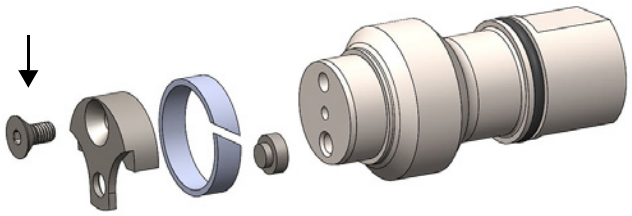
   a. Cut a nonstick pad in half. Put half of the pad in the end of the cylinder. Put 1 thumb in each end of the cylinder and push down evenly on the pad while rolling the cylinder back and forth.



Nonstick scouring pad

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

c. Use a 1/8-inch hex wrench to remove the low-pressure poppet screw from the check valve. Discard the low-pressure poppet screw. Disassemble, clean, and examine all of the parts.



If the check valve face or the low-pressure poppet face are not smooth and shiny, repair the part.

NOTICE	Do not rock the parts or use too much pressure. Doing so can cause damage to the part faces.

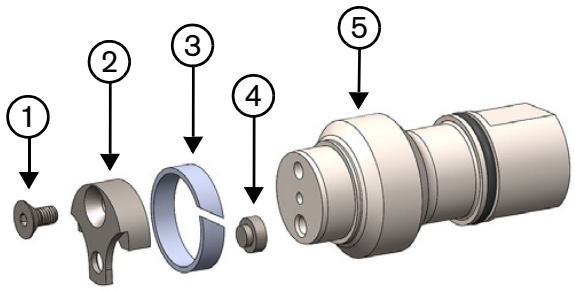
a. Tape a sheet of 1500 grit lapping paper on a granite lapping block. Make sure that the paper is smooth and flat.

b. Put the check valve face or the low-pressure poppet face flat on the lapping paper and move it back and forth several times, then rotate 45 degrees and repeat. Use light pressure.

c. Do this procedure until the face is smooth and flat and has a mirrorlike finish.

Assemble the check valve

NOTICE	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.



1 Low-pressure poppet screw
2 Poppet retainer
3 Check valve wear ring
4 Low-pressure poppet
5 Check valve body

Assemble the check valve as shown.

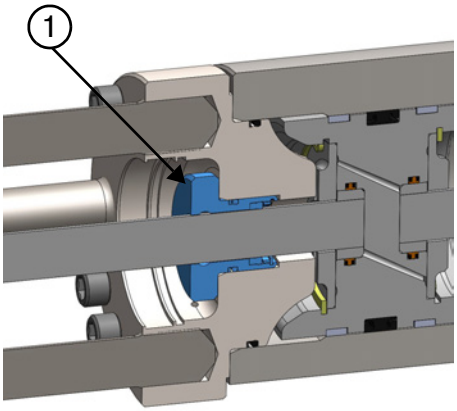
1. Use a cotton-tipped applicator to put high-pressure antiseize lubricant such as Blue Goop or PURE Goop on the threads of a new low-pressure poppet screw.

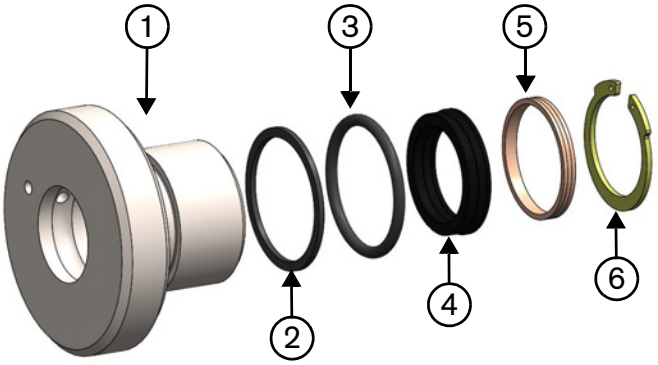
2. Use a 1/8-inch hex wrench to install the low-pressure poppet screw.
3. Use a torque tool to tighten the low-pressure poppet screw to 4.5 N·m (40 lbf·in).

Examine the high-pressure components

Replace the seal housing assemblies every 6,000 hours.

NOTICE	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.
	Clean and examine parts that are 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.

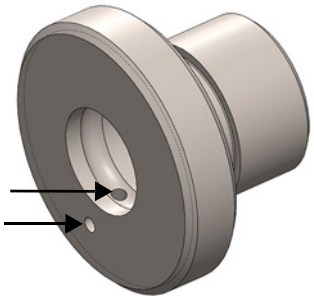




1 Seal housing
2 Seal housing O-ring backup
3 Seal housing O-ring
4 Energized spring seal
5 Rod seal spacer
6 Snap ring

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. Use an O-ring pick to remove the O-ring and the O-ring backup from the seal housing.

5. Disassemble, clean, and examine all of the parts.
6. Examine the seal housing.
   - 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.



Assemble the intensifier

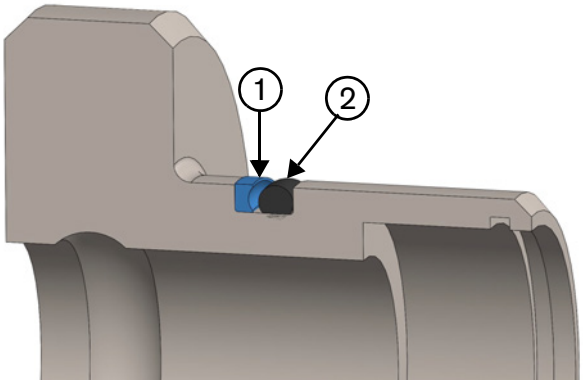
- Flip the high-pressure cylinders every 1,500 hours.
- Replace the spacer tubes every 12,000 hours.

NOTICE

Before assembling high-pressure or hydraulic parts, clean the parts to remove grease and other contamination.

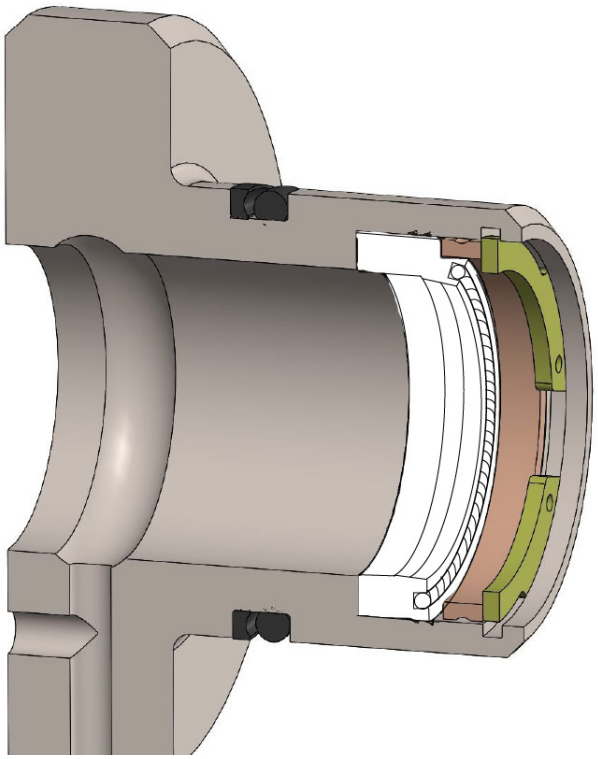
Prepare and assemble the seal housing

1. Put high-vacuum grease on the seal housing O-ring backup and the seal housing O-ring.
2. Put the seal housing O-ring backup ① and the seal housing O-ring ② 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.

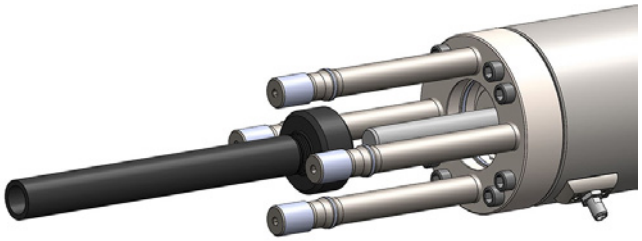
3. Put the new components in the seal housing as shown.



4. Use snap-ring pliers to install the snap ring. Make sure that the snap ring is installed correctly in the groove.

Install the seal housing onto the plunger

1. Install the seal housing in the installation tool by turning it clock-wise into the tool.
2. Put the seal housing on the plunger with the narrow end of the seal housing toward the center of the intensifier.



3. Turn the seal housing so that the weep hole faces down.
4. Push the seal housing tightly against the hydraulic end cap until it clicks.
5. Unscrew and remove the tool while leaving the seal housing in place.

Install the seal cartridge and spacer tube

1. Put the cartridge in the seal installation tool.

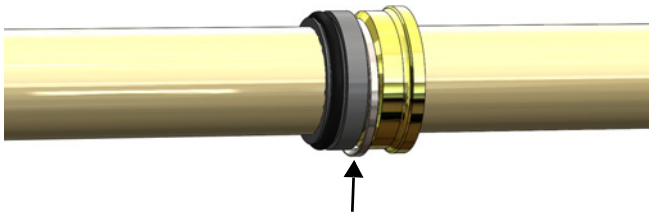


NOTICE	The O-rings in the seal cartridge assembly are lubricated at the factory. Do not use grease when installing this assembly. Using too much grease or using an incorrect type of lubricant can decrease seal life.

2. 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.
3. 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.

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



5. Put the spacer tube on the plunger.

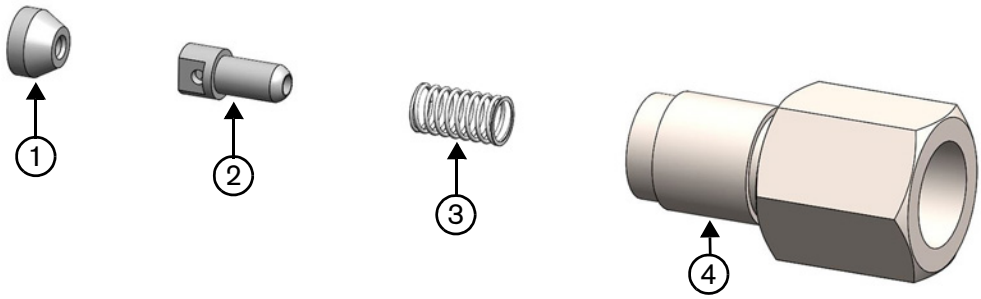
Install the high-pressure cylinder and check valve assembly

1. 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 in as far as possible.

ⓘ	Flip the high-pressure cylinder every 1,500 hours to promote even wear.

2. Use a cotton-tipped applicator to put high-pressure antiseize lubricant such as Blue Goop or PURE Goop in the recess in the bottom of the check valve.

3. 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.



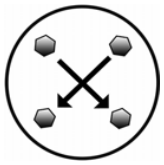
1 High-pressure poppet seat
2 High-pressure poppet
3 High-pressure poppet spring
4 Output adapter

4. Push the high-pressure poppet seat into the high-pressure antiseize lubricant in the check valve.
5. Put high-pressure antiseize lubricant on the threads of the output adapter.
6. Put the high-pressure poppet spring and the high-pressure poppet in the output adapter.
7. Put the check valve in the end of the high-pressure cylinder. Make sure that the weep hole faces down toward the ground.
8. Put the output adapter in the check valve and tighten it by hand.

Final assembly and connection

1. 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.
2. 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.
3. Lubricate the stud threads with antiseize bolt lubricant (white lithium grease).
4. Put the nuts on the studs by hand. Use a torque wrench to tighten the high-pressure end cap nuts to 375 N·m (275 lbf·ft).

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

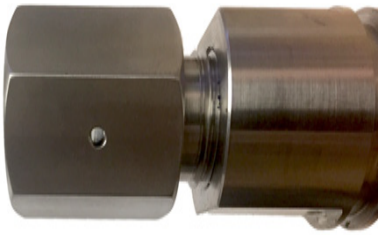


5. Use a torque wrench to tighten the output adapter to 102 N·m (75 lbf·ft).

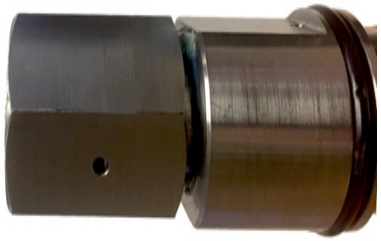
NOTICE

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.



Bad gap



Good gap

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

6. Repeat this procedure on the other end of the intensifier.

7. Connect the high-pressure tubing.

NOTICE

Make sure that some of the threads on the high-pressure tubing are visible at the fitting. Refer to Install a gland nut on page 144.

8. Torque the high-pressure water fitting to 68 N·m (50 lbf·ft).

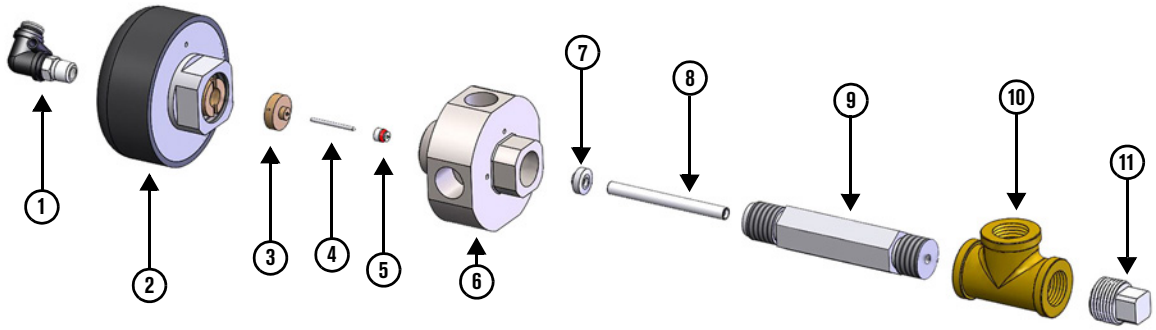
9. Connect the low-pressure water lines.

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 poppet seat
8 Flow reducer
9 Outlet adapter
10 Tee fitting
11 Plug

Parts, tools, and materials

Bleed-down valve repair kit
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

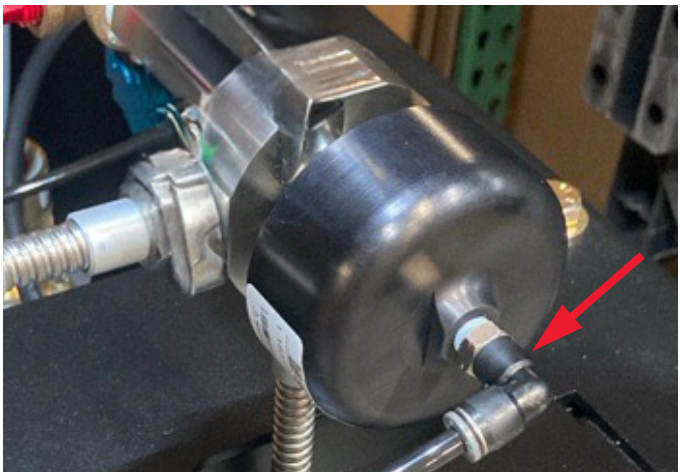
Do this task when the pump is not operating.

Disconnect the power, water, and air

1. Turn the primary breaker disconnect lever on the electrical enclosure door to **OFF**.
2. Turn **OFF** the supply water to the pump. Make sure that the water pressure gauges show 0.0 bar (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.

Remove the bleed-down valve from the pump

1. Remove the top cover and the front panel from the pump.
2. Disconnect the **COMPRESSED AIR** hose from the air fitting on top of the actuator.



3. Disconnect the water drain tube from the bleed-down valve.
4. Loosen the high-pressure fittings attached to the bleed-down valve body.
   a. Use a 1 1/16-inch open-ended wrench to support the bleed-down valve body and use a 13/16-inch open-ended wrench to loosen the high-pressure fittings.
   b. If the pump-mounted plumbing kit is installed on this machine, loosen the high-pressure fitting near the bleed-down valve.
5. Remove the bleed-down valve assembly from the pump.

Disassemble the bleed-down valve

1. Remove the outlet adapter from the valve body.
2. Remove the seat and the flow reducer from the outlet adapter.
3. Remove the actuator from the valve body.
4. Push a dowel through the bottom of the valve body to remove the seal, the needle guide, and the needle.

Assemble the bleed-down valve with new parts

1. Put high-pressure antiseize lubricant such as Blue Goop or PURE Goop on the new seat.
2. Put the flow reducer into the outlet adapter.
3. Put the new seat into the outlet adapter.
4. 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).
5. Put the needle through the needle guide and the valve seal. Make sure that the point of the needle faces the seal.
6. 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 as shown here.



7. Put the needle-and-seal assembly into the valve body until the needle guide is even with the top of the bore.
8. Install the actuator on the valve body. Tighten the actuator by hand.
9. Attach the bleed-down valve assembly to the pump.
10. Use a torque wrench to tighten the high-pressure fittings on the valve body. Refer to Fittings on page 140.

NOTICE	To prevent causing damage or premature failure, use 2 wrenches when loosening or tightening a high-pressure connection.

Reconnect the power, water, and air

1. Connect the water drain tube to the bleed-down valve.
2. Connect the **COMPRESSED AIR** hose to the fitting on top of the actuator.
3. Turn **ON** the supply water to the pump.
4. Turn **ON** the compressed air source.

Set the air pressure between 5.2 bar and 8.3 bar (75 psi and 120 psi).

NOTICE	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 poppet seat in the bleed-down valve. If the available air pressure is too high, install an air regulator (not included) to reduce the pressure.

5. Turn **ON** the electrical main (line disconnect switch).
6. Turn the primary breaker disconnect lever on the electrical enclosure door to **ON**.

   The operator interface screen is on when the pump is energized.

Start the pump

1. On the operation panel:
   a. Make sure that the **EMERGENCY STOP** button is not engaged. If the button is pushed in, turn the button clockwise until it releases.
   b. Make sure that the **LOCAL-REMOTE** key switch is set to **LOCAL**.
   c. Push the **CONTROLS ON** button.
2. On the operator interface, touch the **START** symbol.

   The controller starts the pump.

	The normal start sequence is fully automated. Refer to Normal start sequence on page 186 for a description of the sequence.

3. Monitor for leaks.

Air cooler

Clean the air cooler:

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

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

Parts, tools, and materials

Compressed air source

Pressurized-water source or a steam cleaner

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

Recommended materials

Aluminum-compatible detergent

Ethylene perchlorate detergent

Clean the air side of the cooler

NOTICE	To prevent damage, the stream of water or air must be parallel to the fin. Point the water stream against the air direction.

Do this task when the pump is off.

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

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

Do this task when the pump is not operating.

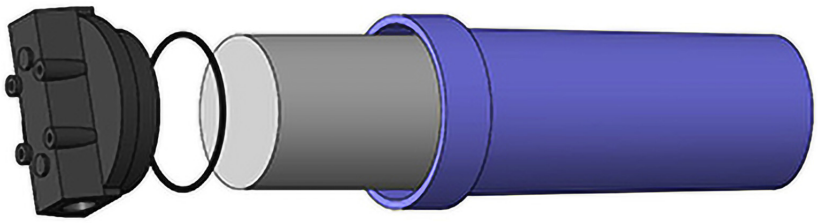
1. Disassemble the cooler to find the degree of contamination.
2. If contamination is moderate, connect the oil side to a closed cleaning system with a pump and a filter. If contamination is very bad, use an oil carbon detergent.
3. Rinse cleaned surfaces for 30 minutes.
4. Use compressed air to remove remaining detergent.
5. Rinse the cooler with hydraulic fluid.

Low-pressure water system

Replace the water filter and test the water quality:

- 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 (10 psi).

Replace the water filter



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 from the pump.
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 **START** symbol.
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 (10 psi).

Test the water quality

Total dissolved solids (TDS) cause deposits that can cause damage to check valves, seals, orifices, and other consumables.

Parts, tools, and materials

TDS meter

Container for a water sample

Clean, deionized water or filtered water

pH tester

Silica test kit

Water hardness (calcium carbonate) test kit

Recommended materials

Bucket or pail

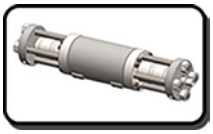
Do this task when the pump is not operating.

Take a water sample

1. Disconnect a low-pressure water line from the intensifier.
2. Disengage 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. This engages and disengages the intensifier.

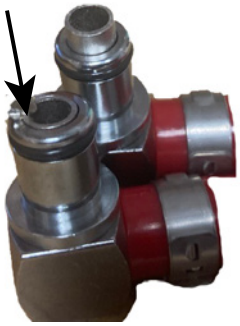


3. Set the target water pressure to 345 bar (5,000 psi).

	Refer to Set the target water pressure on page 43 for instructions.

4. Turn **ON** the pump.

5. Take a sample of the water from a low-pressure water line by pressing down on the check valve.



Test the water sample

1. Make sure that the water is clear and odorless.
2. Test the pH. The optimal pH measurement is between 6.0 and 8.0.
3. Test the silica (SiO_2) content. The silica content must be lower than 0.0015% (15 parts per million [ppm]).
4. Test the water hardness. The result must be equal to or lower than 0.006% (60 ppm/3.5 grains per gallon).

Test the total dissolved solids (TDS) concentration

NOTICE	The TDS 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.

A 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.The optimal range is 0.005% to 0.015% (50 ppm to 150 ppm).

1. 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.

2. Compare the reading to the table.

NOTICE	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.
	If the TDS level is higher than 0.015% (150 ppm), treat the water with reverse osmosis.

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

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

4. Connect the low-pressure water line.

5. Go to the Intensifier Control screen to engage the intensifier. Refer to Use the controls on page 32.

Hydraulic system

Replace the hydraulic filter element:

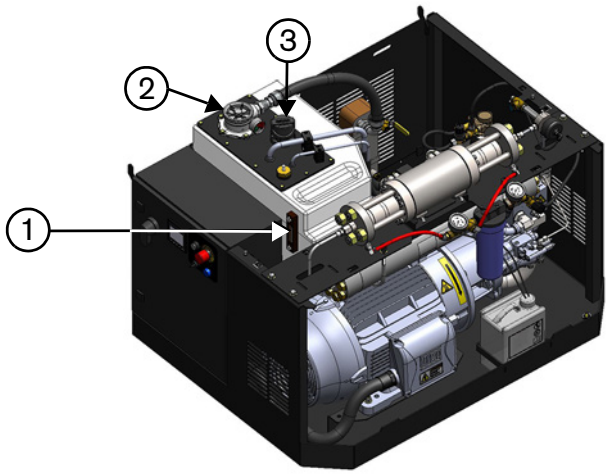
- every 1,500 hours.
- when the needle on the hydraulic gauge is in the red zone while the pump is at stable temperature.

Replace the hydraulic fluid:

- 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 quality on page 38.

Replace the hydraulic filter element



1 Sight gauge
2 Filter head
3 Filler cap

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 from the pump.
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 with a 15/16 in. socket to tighten the filter to a value between 13.5 N·m and 16 N·m (10 lbf·ft and 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

NOTICE	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

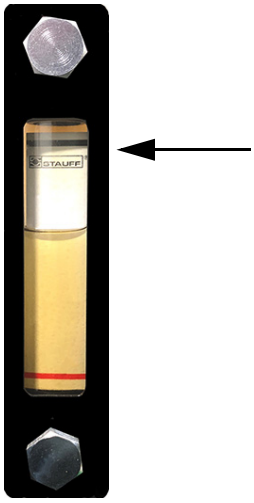
Antiwear (AW) mineral oil or synthetic hydraulic fluid, ISO viscosity grade (VG) 32 or 46

Recommended materials

Clean funnel

Do this task when the pump is not operating.

8. Remove the top cover from the pump.
9. Remove the filler-breather cap on top of the hydraulic fluid tank.
10. Fill the tank with hydraulic fluid until the fluid is at the top mark on the sight gauge.



11. Install the filler-breather cap.

Replace the hydraulic fluid

NOTICE	Do not put too much hydraulic fluid in the tank.
	If it is not practical to analyze a sample of the hydraulic fluid, Hypertherm recommends replacing the hydraulic fluid every 3,000 hours.

Parts, tools, and materials

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 from the pump.
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 Hydraulic system on page 79 for instructions.
6. Disassemble the hydraulic tank cover.
   a. Disconnect the fluid level-and-temperature 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 (13 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.

NOTICE	Remove all towels from the tank before putting hydraulic fluid in it.
	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 (13 each).
   b. Install the 2 hoses that pass through the cover.
   c. Connect the hydraulic hose from the filter
9. Connect the temperature-level sensor cable.
10. Fill the tank with hydraulic fluid until the fluid is at the top mark on the sight gauge.
11. Install a new filler cap.
12. Discard the used parts.
13. Turn **ON** the pump in pierce-pressure mode.
14. Monitor for leaks.
15. Add hydraulic fluid, if necessary. Refer to Add hydraulic fluid on page 80.
16. 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 127.

Lubricate the primary motor bearings

Do this task every 6,000 hours.

NOTICE	**Correct lubrication is important for motor performance.** Use the correct types and amounts of grease and oil.
NOTICE	The bearing can overheat if too much or not enough grease is used to lubricate the bearing.
	Do a post-maintenance start after working on the primary motor. Refer to Post-maintenance start on page 85.
	Do this procedure on both ends of the motor.
	Most handheld pump grease guns deliver 1.25 grams of grease per pump. Check with the manufacturer of the grease gun.

Parts, tools, and materials

Low-pressure handheld grease gun

Electric-motor bearing grease, NLGI grade 2

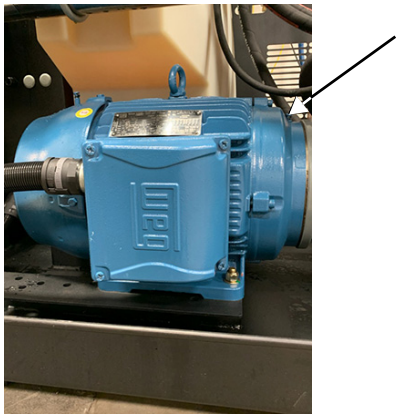
Clean towels

Recommended materials

Mobil Polyrex™ EM grease

Do this task when the pump is operating.

1. Remove the top cover and the front panel from the pump.
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.

DynaMAX 315	DynaMAX 330	DynaMAX 350
13 grams	18 grams	21 grams

NOTICE	Use only the recommended volume of grease.

7. Replace the grease cap.
8. Let the motor operate with the grease outlet open for 20 to 30 minutes.
9. Clean grease from the outside of the grease outlet and replace the relief plug.

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.
NOTICE	Remove all tools, towels, and rags from the work area before starting the equipment.
NOTICE	Make sure that all fittings are tight after doing maintenance on or repairs to this equipment.

Post-maintenance start

	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 Make sure that the emergency stop operates correctly on page 39 for instructions.
	Use this procedure if maintenance or repairs have been done on: • the high-pressure water system. • intensifier components. • the primary motor.
	A smooth start after maintenance can give the high-pressure seal longer life.
	Touch the **STOP** 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 183 for details about the program.

1. Turn **ON** the supply water to the pump.
2. Turn **ON** the compressed air source.

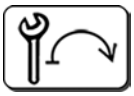
Set the air pressure between 5.2 bar and 8.3 bar (75 psi and 120 psi).

NOTICE	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 poppet 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 disconnect lever on the electrical enclosure door to **ON**.
5. On the operation panel:
   a. Make sure that the **EMERGENCY STOP** button is not engaged. If the button is pushed in, turn the button clockwise until it releases.
   b. Make sure that the **LOCAL-REMOTE** key switch is set to **LOCAL**.
   c. Push the **CONTROLS ON** button.
6. On the operator interface, touch the maintenance symbol to open the primary maintenance screen.



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



8. 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

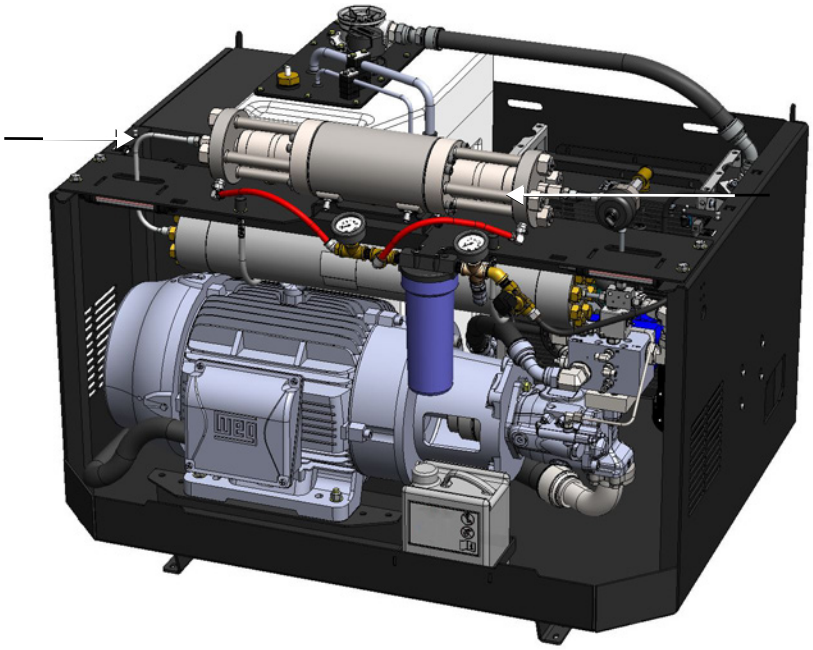
9. When **Turn On the Cutting Head** flashes on the screen:
   a. Move the cutting head to a safe location on the table.
   b. Turn **ON** the cutting head.
   c. Touch the ✓ symbol to continue.
10. When **Turn Off the Cutting Head** flashes on the screen:
   a. Turn **OFF** the cutting head.

b. Touch the ✔ symbol to continue.

11. 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 and the primary operation screen opens.

12. Install the top cover and the front panel.

The pump is prepared for operation.

Prepare the pump for storage

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

CAUTION	**Do not stand over components such as tubes or valves while drying the system.** High-pressure water can cause eye injuries. Wear approved eye protection when operating or doing work near this equipment.
	Refer to Connect the utilities to the pump on page 157 for information about the connections.
	All low-pressure water connections use push-to-connect fittings.

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 Low-pressure water system on page 75.
2. Pour the water out of the filter canister.
3. Install the water filter canister without the filter.
4. Disconnect the **COMPRESSED AIR** hose 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. 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.



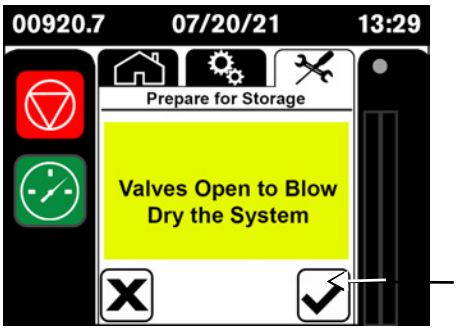
8. Touch the symbol on the screen to start the procedure.

   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.

Water-cooled system

Do these steps 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. Disconnect the **COOLING OUT** line from the pump.

c. Disconnect the **COMPRESSED AIR** hose from the **COOLING IN** connection.

d. Do steps 8 through 12 again.

15. 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 non genuine Hypertherm parts.

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

Tools

1-18768 DynaMAX 3-series 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	Wrench, water filter	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	Lapping block, granite	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	Tool, seal installation	1
2	1-18803	Tool, seal removal	1
3	1-18848	Tool, cylinder locator	1

These tools are shipped with the pump.

Maintenance and repair kits

1-18769 DynaMAX 3-series standard spare parts kit

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

1-18770 DynaMAX 3-series high-pressure seal repair kit



	Description	Quantity
1	Seal cartridge, high pressure	2
2	Seal spring, energized, 7/8-inch	2
3	O-ring backup, seal housing, -122	2
4	O-ring, seal housing, -122	2
5	O-ring, check valve, -120	2
6	Poppet screw, low pressure	2

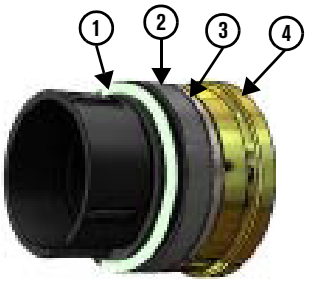
Each high-pressure seal cartridge includes:

1 O-ring, high-pressure seal, greased, -119

2 Water seal, high pressure

3 Hoop, high pressure

4 Seal backup, high pressure, bronze



1-18771 DynaMAX 3-series high-pressure poppet repair kit



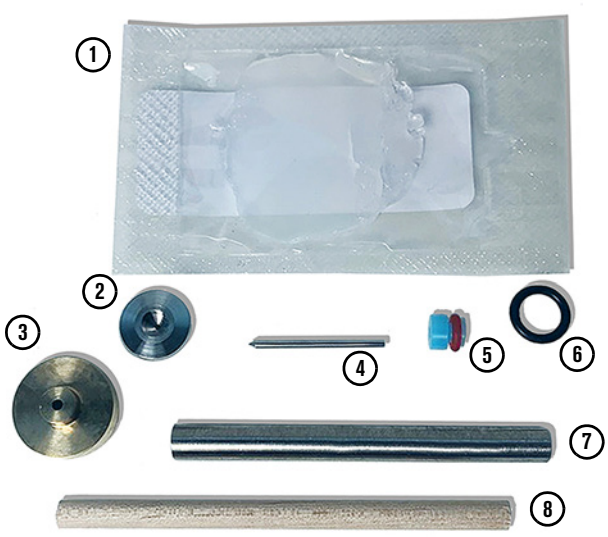
	Description	Quantity
1	Cotton-tipped applicator	2
2	Poppet, high pressure	2
3	Poppet spring, high pressure	2
4	Poppet seat, high pressure	2

1-18849 DynaMAX 3-series 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, 5 g (0.2 oz)	1
2	Poppet seat, bleed-down valve	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, air actuated	1
8	Dowel, wooden	1

1-18772 Hydraulic fluid replacement kit, DynaMAX 3-series



	Description	Quantity
1	Filter element, hydraulic, 5 micron	1
2	Cap, filler	1

Optional equipment

Part number	Description
1-18603	Boost pump kit, 378.5 L, 208 V/230 V, 100 gallons per hour
1-18576	Boost pump kit, 378.5 L, 400 V/460 V, 100 gallons per hour
1-18979	Water shutoff kit, cooling
1-19159	Utility connection panel kit, air-cooled system
1-18552	Utility connection panel kit, water-cooled system
1-18695	Plumbing kit, external, pump mounted
1-18553	Conversion kit, US standard-to-metric
1-18551	Communication kit, Modbus TCP/IP

Replacement parts

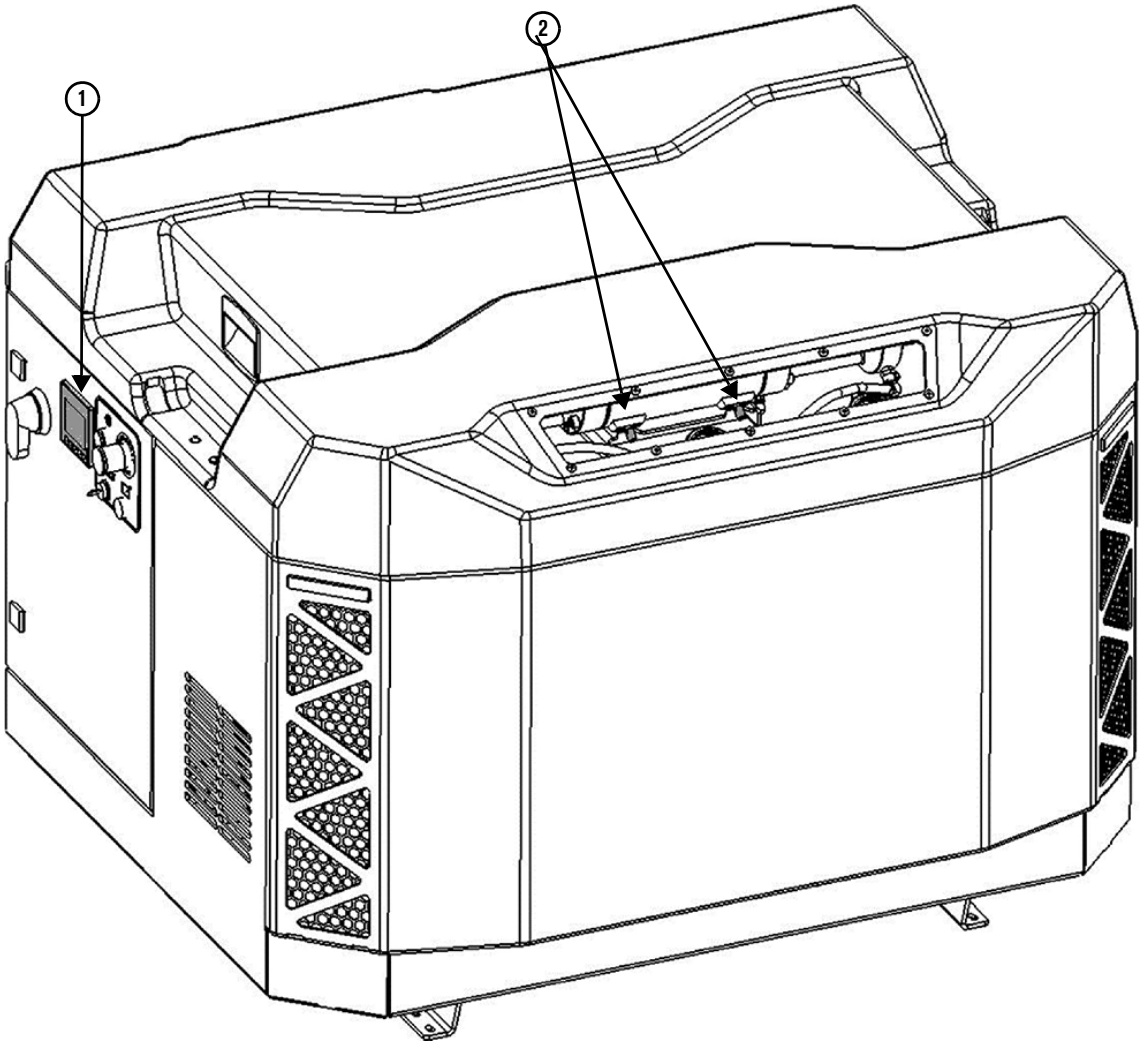
1-18938 Top cover hardware replacement kit

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

Lubricants

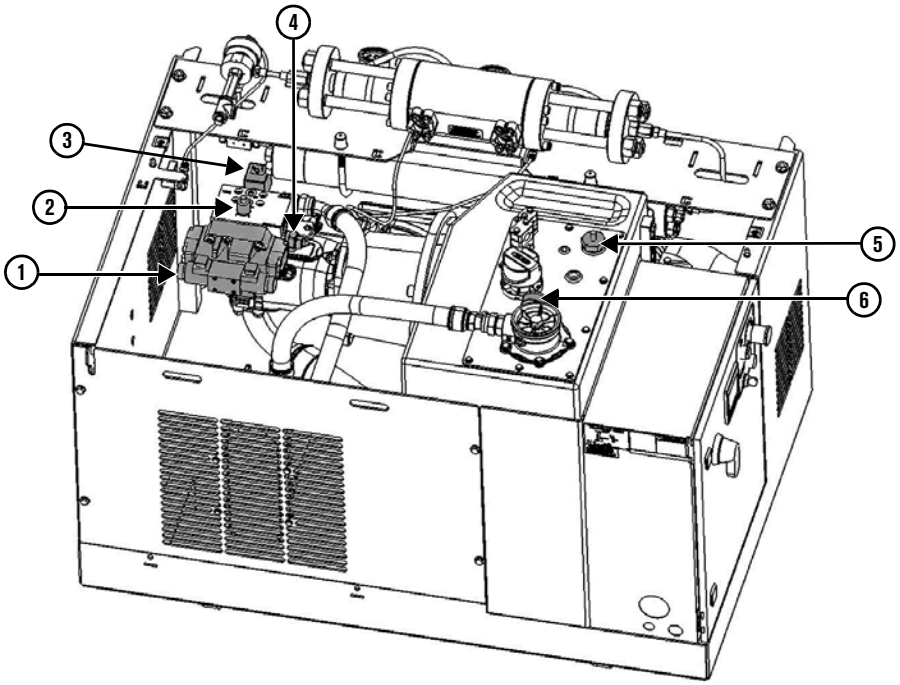
Part number	Description
1-11111	Blue Goop oil-based antiseize lubricant, 57 g (2 oz)
1-13537	PURE Goop halocarbon-based antiseize lubricant, 28 g (1 oz)
1-11136	High-vacuum grease, 150 g (5.3 oz.)
1-13969	O-ring lubricant, petroleum-based, 113 g (4 oz.)
1-13186	Antiseize bolt lubricant (white lithium grease), 411 g (14.5 oz.)

Electrical system



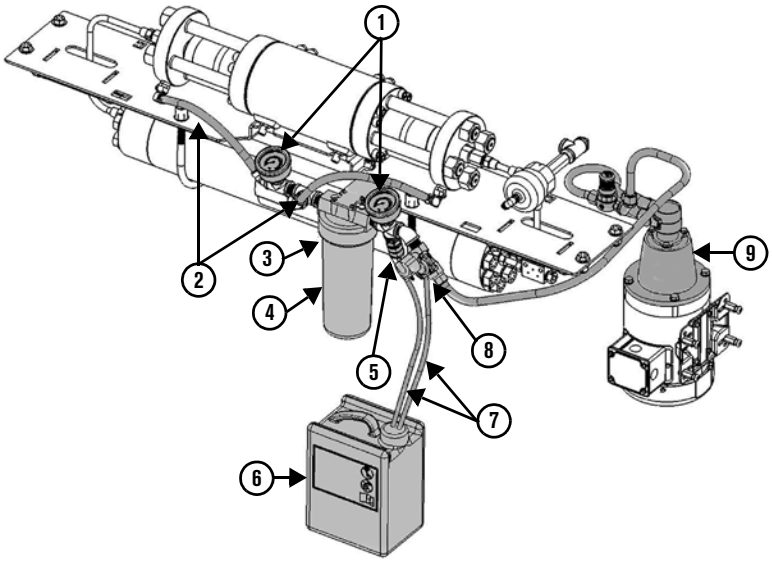
	Part number	Description
1	10081441	PLC, Horner XL4 (requires program 10081530)
2	1-18755	Switch, proximity
—	1-17355	Memory card, SDHC MicroSD, 32GB (not shown)

Hydraulic system



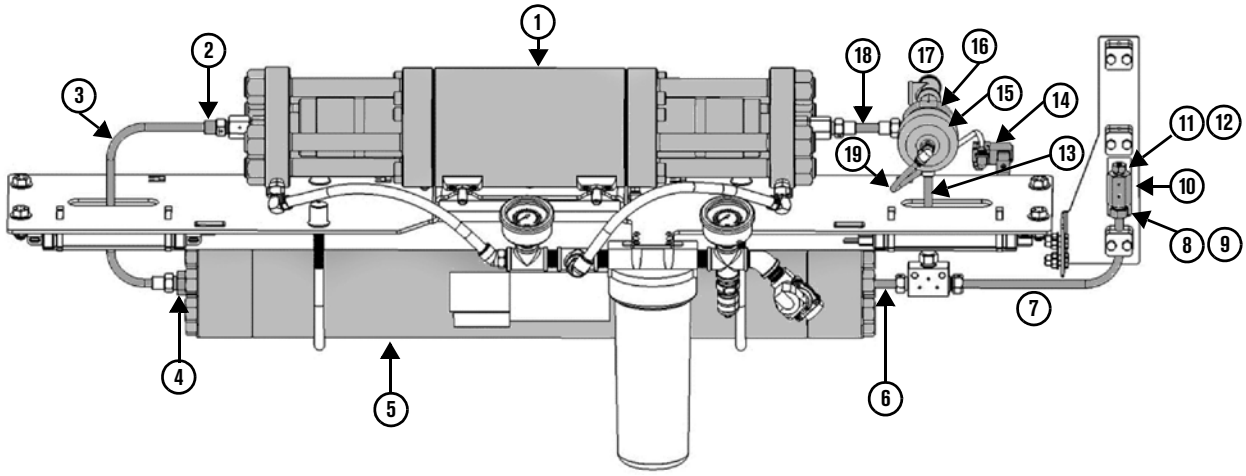
	Part number	Description
1	1-11733	Shift valve and pilot assembly, 24 VDC
2	1-17348	Transducer, hydraulic
3	1-17347	Valve and coil, proportional cartridge
4	1-17349	Relief valve, hydraulic high-pressure, preset
5	1-12617	Switch, temperature and fluid level
6	1-18898	Gauge, hydraulic filter

Low-pressure water system



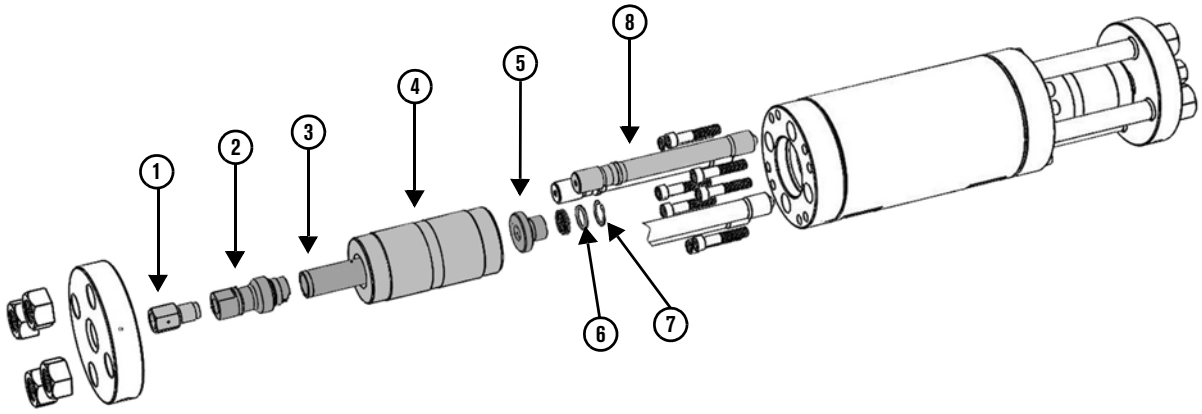
	Part number	Description	Quantity
1	1-11832	Gauge, low-pressure water	1
2	1-18782	Replacement kit, water tube, intensifier inlet	1
3	1-11679-237	O-ring, water filter canister	1
4	1-18318	Canister, water filter	1
—	1-11106	Water filter cartridge, 1.0 micron, 10 inch (not shown)	1
5	10082194	Switch, low-pressure water	1
6	1-18577	Dirty water container	1
7	1-18783	Replacement kit, fluid management tube	2
8	1-12614	Solenoid valve, cooling, 1/2-inch NPT, 24 VDC, brass	1
9	1-18931	Boost pump assembly, wet end	1
—	1-13897	Meter, TDS (not shown)	1

High-pressure water system



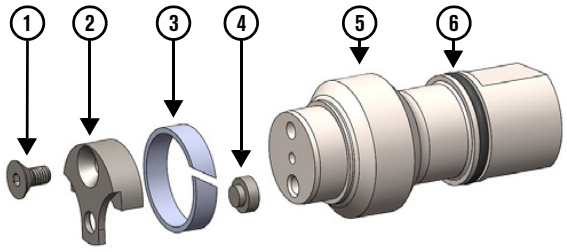
	Part number	Description
1	1-18314	Intensifier, DynaMAX 3-series
2	1-14687	End cover, high-pressure tubing sheath, 3/8 inch
3	1-18445	Tube, high-pressure, intensifier left
—	1-12580	High-pressure tubing sheath, 3/8 inch (not shown)
4	1-12982	Inlet adapter, 3/8-inch male × 3/8-inch female
5	1-12280	Attenuator 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

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 Poppet screw, low pressure

2 Poppet retainer, low pressure

3 Guide ring, check valve

4 Poppet, low-pressure

5 Check valve body

6 O-ring, check valve, -120

5 Troubleshooting

Safety

WARNING	**Read and understand all of the safety guidelines in this manual.** Refer to Safety on page 19 before operating, doing maintenance on, repairing, and installing the 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 90.
	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.

Normal status

Pump starting

Refer to Make sure that the emergency stop operates correctly on page 39 for information about the start sequence.

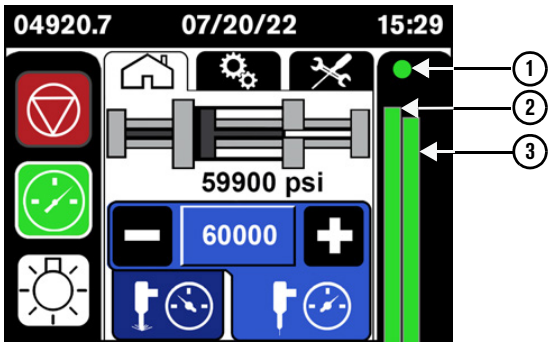
Operator interface	Intensifier	Primary motor
Primary operation screen with the start sequence progress bar	Engaged	On

Pump on

Operator interface	Intensifier	Primary motor
Primary operation screen	Engaged	On

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.

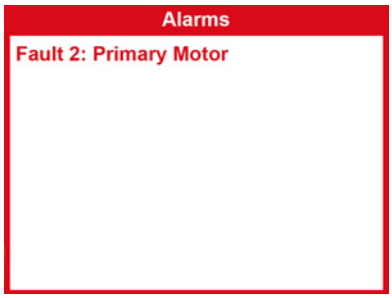
The stroke-rate bars show the speed of the piston and the plunger moving to each side of the intensifier (if you are facing the front of the pump.)

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.

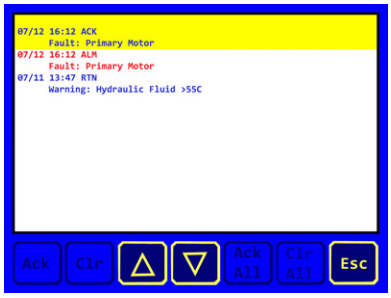
If a bar is red, then an overstroke has caused an alarm condition on that side.

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

	Intensifier	Primary motor	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.
Fault 3	Off	Off	The controller senses a failure condition.

Warnings

Alarm	Cause	Solution
Warning: Boost Motor **Warning: Fan Motor**  On	The boost motor or the fan motor did not start because the thermal overload relay has tripped.  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.  Off
Warning: Start Procedure Hydraulics **Warning: Start Procedure Ramp to Pierce Pressure** **Warning: Start Procedure Ramp to Cut Pressure**	An error occurred during 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 172.
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

Static seal: The high-pressure seal at the output end of the high-pressure cylinder

Dynamic seal: The high-pressure seal that is nearest the hydraulic center section

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 The pump makes noise during operation on page 127.
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 115.
Fault 1: Low Inlet Water Pressure The water pressure at the manifold is lower than the minimum setting.	The supply-water pressure is lower than 2.8 bar (40 psi).	Increase the supply water 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.
	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.

Alarm	Cause	Solution
Fault 2: Primary Motor The primary motor did not start.	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 83.
	A fuse in the electrical enclosure has blown.	Replace the fuse.
	The thermal overload relay has tripped.	Reset the relay. Refer to Warning: Boost Motor on page 109. The relay can take several minutes to cool before resetting.
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.

A warning or a fault occurs during the start sequence

The start sequence timers are adjustable. Refer to Start Procedure Timers on page 172 for information.

Refer to Make sure that the emergency stop operates correctly on page 39 for a description of the start sequence and problems that can occur.

Primary motor

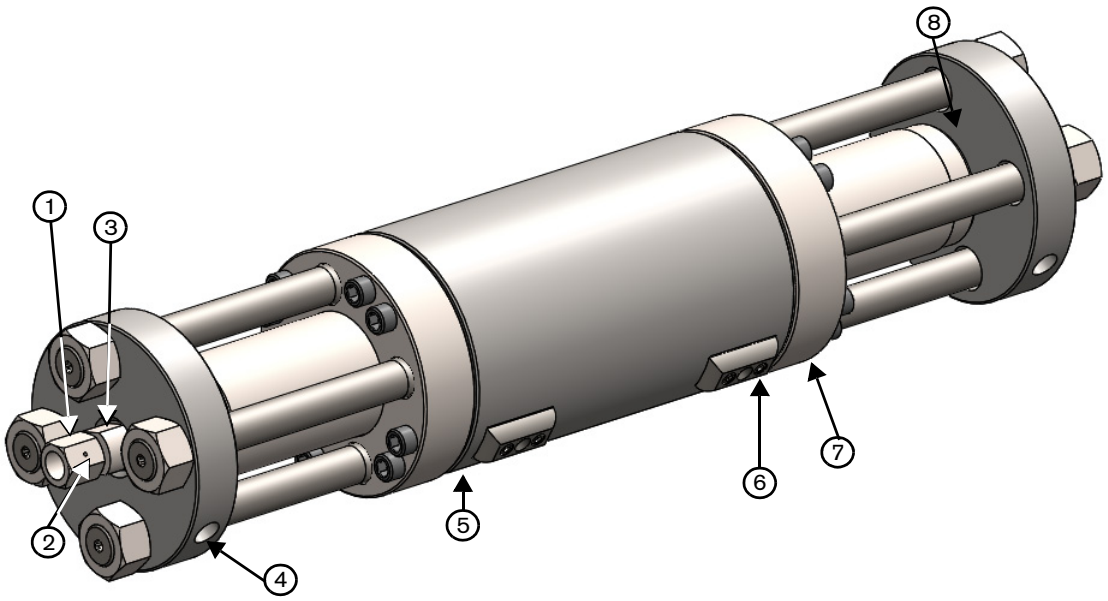
Problem	Cause	Solution
The motor is too hot.	The motor is not cooling sufficiently.	Clean the air inlet.
		Clean the outlet and the cooling fins.
		Reduce the ambient air temperature, if possible.
	The motor is being started too frequently.	Wait longer between stopping and starting the motor.
	The motor bearing is too hot.	Lubricate the bearing. Refer to Lubricate the primary motor bearings on page 83.

Intensifier

Leaks

NOTICE	If a high-pressure poppet part is damaged, replace the assembly (high-pressure poppet, spring, and seat).
	Identify the source of a leak and correct the problem. A leak can cause damage to the water fittings.
	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.
	Blocked weep holes in the dynamic seal backup or the seal housing cause water to go into the hydraulic system. Make sure that the weep holes are clean.
	Weep holes throughout the high-pressure water system let water or hydraulic fluid escape from leaking parts. Fluid leaking from a weep hole is a sign of a defective part or a loose connection.
	The SMI monitors the rate of fluid drops from the static seal and the dynamic seal.

Damage to the high-pressure water seals and the hoops is the most common cause of water leaking from the intensifier. Water dripping from the high-pressure cylinder shows that seal replacement will soon be necessary.



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 output adapter 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 143.
		The output adapter has failed.	Replace the component.

	Symptom	Cause	Solution
3	**Hot water leaks from the high-pressure seat weep hole.**	The output adapter is loose.	Make sure that the adapter is tightened to the correct torque value. Refer to Fittings on page 140.
		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 leaking from the system.	The O-ring on the check valve body has failed.	Replace the O-ring.
4	**Cold water leaks from the static seal 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 143.
	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.
5	**Hydraulic fluid leaks 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 140.
		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.  If the high-pressure seal is removed from the plunger when you disassemble the intensifier, replace the seal.
6	**Hydraulic fluid leaks from the system.**	The O-ring on the proximity switch has failed.	Replace the O-ring or the sensor.

	Symptom	Cause	Solution
7	**Water leaks at a rate of more than 30 ml/minute.**	The high-pressure seal has failed.	Replace the seal. If the high-pressure seal is removed from the plunger when you disassemble the intensifier, 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 leaks from the system.**	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. If the high-pressure seal is removed from the plunger when you disassemble the intensifier, replace the seal.
	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.	
	The low-pressure water relief valve is venting water to the drain.	Remove the 3/8-inch tube from the valve at the outlet fitting and monitor for leaks.

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 difference between the values on the prefilter water-pressure gauge and the postfilter water-pressure gauge is lower than 0.7 bar (10 psi).	Replace the water filter.
	The prefilter water-pressure gauge shows that the low-pressure water is lower than 2.8 bar (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. ▪ While the pump is operating, make sure that the LED on the low-pressure water solenoid is on.

The intensifier does not stroke to either side

Cause	Solution
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 34.
The cutting head is off.	Turn on the cutting head.
A proximity switch or the proximity switch cord has failed.	Replace the component. Contact a Hypertherm Technical Service Associate for information and support.

The intensifier strokes to one side and stops

Cause	Solution
A proximity switch has failed.	▪ Interchange the proximity switches (but not the wires). If the intensifier stalls on the opposite end, replace the proximity switches.

The intensifier strokes and there is not enough pressure at the cutting head or the pump doesn't get to the target water pressure

A pressure transducer in the water manifold senses the supply water pressure. If the pressure decreases to a value that is lower than the setpoint, the monitoring circuit opens and causes a fault.

Cause	Solution
The thimble filter on the on/off valve is defective.	Repair 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.
An orifice has failed.	Replace the orifice.
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.
The thimble filter on the on-off valve is clogged.	Clean or replace the thimble filter.
A hydraulic piston seal is worn or damaged.	Contact a Hypertherm Technical Service Associate for information and support. The shift pin is found at the ends of the coil on the pilot valve.
There is a leak in the system.	Identify the source of a leak and correct the problem. If the intensifier strokes when it is in cut-pressure mode with the cutting head turned off, check the bleed-down valve and the high-pressure tubing for leaks.
A low-pressure poppet is sticking, worn, or damaged.	▪ Examine the face of the poppet and the mating face on the check valve. Make sure that the faces are smooth and flat and have an almost mirrored finish. Refer to Repair the high-pressure cylinder, the check valve, and the low-pressure poppet on page 60. ▪ Repair or replace the low-pressure poppet. ▪ Make sure that the low-pressure poppet fits in the poppet basket without sticking. ▪ Repair or replace the check valve.
A high-pressure poppet is sticking, worn, or damaged.	Replace the high-pressure poppet, the spring, and the seat.

A component in the high-pressure end has failed.	▪ Check the temperature of the high-pressure cylinders. If 1 is hot, disassemble it and look for flaws, deterioration, erosion marks, or cracks in the parts, including the check valve and piston seal. ▪ Disassemble the check valve 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 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.
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.

High-pressure water seal life is short

	If the high-pressure seal backups have a short life, make sure that the plunger bearing is not worn.

Cause	Solution
A component is damaged or has failed.	▪ Do preventive maintenance according to the recommended schedule. Refer to Preventive maintenance schedule on page 53. ▪ Examine the high-pressure cylinder, the plunger, and the high-pressure water seals and hoops. ▪ Look for flaws, deterioration, erosion marks, corrosion, or cracks. ▪ Make sure that the mating surfaces are smooth and clean. If damage is found, repair or 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 the Specification section in this manual.
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 76.
Hydraulic fluid leaks from anywhere on the intensifier	An O-ring has failed. Replace the component.

Hydraulic fluid

Problem	Cause	Solution
The cooling water temperature is too high.		
Water-cooled system	The cooling water is not turned on.	Turn **ON** the cooling water.
	The cooling water is too warm.	If the cooling water or the supply water temperature is higher than 24.0°C (75°F), cool the water before use
Air-cooled system	The ambient temperature is too high.	Consider supplemental cooling.
	The fan is not generating enough airflow.	▪ Make sure that the fan motor breaker is not tripped. ▪ Make sure that the heat exchanger fins are not dirty or clogged.
	The thermal overload relay turned off the fan motor.	Refer to Warning: Fan Motor on page 109.
The sensor is not sensing the correct temperature.		
	The cord for the hydraulic fluid temperature/level sensor is unplugged or damaged.	▪ Plug in the sensor. ▪ Replace the cord.
	The temperature sensor is faulty or damaged.	Replace the sensor.
The hydraulic fluid pressure is too low.		
	There is a leak in the system.	Examine the pump for hydraulic fluid leaks. Monitor these areas: ▪ Hydraulic fluid tank access cover ▪ Hydraulic connections ▪ Valves ▪ Top and bottom decks
	The hydraulic fluid level is too low.	Make sure that the hydraulic fluid level is at the top mark on the sight gauge. Add hydraulic fluid, if necessary.
	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.

Problem	Cause	Solution
The hydraulic fluid level is too low.		
A float switch in the hydraulic fluid tank causes an alarm when 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.
Water leaks into the hydraulic fluid.		
	In water-cooled systems, water can enter the hydraulic system through the heat exchanger.	Contact a Hypertherm Technical Service Associate for information and support.
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 and into the hydraulic fluid. Contaminated hydraulic fluid can cause damage to the hydraulic pump.	Replace the hydraulic fluid. Refer to Replace the hydraulic fluid on page 81.
	Water-cooled system The heat exchanger has failed.	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. It could be necessary to drain and flush other areas such as the shift valve, the hydraulic manifold, and the hydraulic pump.

Temperature

	A sensor monitors the hydraulic fluid temperature in the tank. Increased temperature can mean that there is a problem with the cooling system. 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.
	Hydraulic fluid that is too cool is thick and causes increased friction and poor lubrication.
	High altitude and ambient air temperatures can have an effect on the temperature of hydraulic fluid.

Hydraulic fluid temperature alarms

When the hydraulic fluid temperature is 55°C (131°F):	▪ At 45°C (113°F), a switch closes to start the cooling fan.
	▪ The operator interface shows **WARNING: HYDRAULIC FLUID >55C.**
	▪ The beacon light flashes amber.
	▪ The fan operates for 10 minutes.
	  ▪ If the hydraulic fluid temperature is lower than 55°C (131°F) after 10 minutes, the fan turns off.
	  ▪ If the hydraulic fluid temperature is higher than 45°C (113°F) after 10 minutes, the fan continues operating.

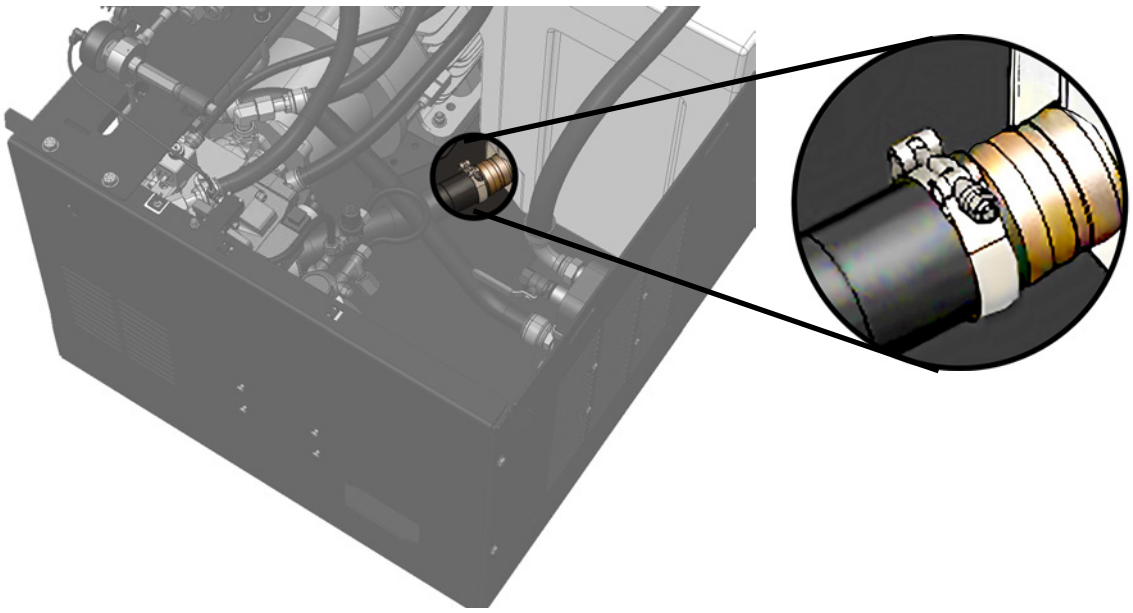
When the hydraulic fluid temperature is 65°C (149°F):	▪ The operator interface shows **FAULT 1: HYDRAULIC FLUID >65C.** ▪ The beacon light flashes red. ▪ The intensifier turns off. ▪ The pump operates in cooling mode for 3 minutes.
If the temperature remains at or higher than 65°C (149°F):	▪ The operator interface shows **FAULT 2: HYDRAULIC FLUID >65C FOR >3 MINUTES.** ▪ The primary motor turns off.

Problem	Cause	Solution
The operator interface shows a hydraulic fluid temperature alarm.		
Water-cooled system	The cooling water supply or the chiller is turned off.	Turn **ON** the water supply or the chiller.
	The cooling water is too warm.	If the cooling water or the supply-water temperature is higher than 24°C (75°F), cool the water before use.
	The heat exchanger is not operating correctly.	▪ Flush the heat exchanger.
Air-cooled system	The ambient air temperature is too high.	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.
	The thermal overload relay turned off the fan motor.	Reset the relay.
	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.

The pump makes noise during operation

If air is in the hydraulic system, the pump can be noisy during operation.

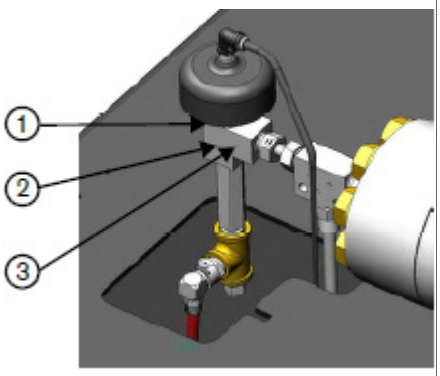
1. Use a 10-mm socket or an open-ended wrench to tighten the hose clamp on the suction hose that goes from the hydraulic fluid tank to the hydraulic pump.



2. Use a torque wrench to tighten the hose clamp to a maximum of 16 N·m (12 lbf·ft).

If the pump is still noisy after tightening the hose clamps, contact a Hypertherm Technical Service Associate for information and support.

Low-pressure water

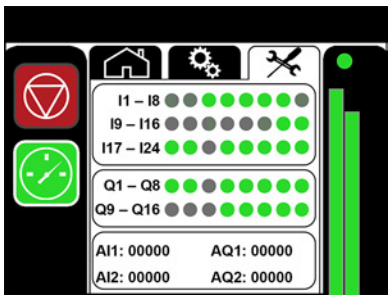
Problem	Cause	Solution
The supply water pressure is too low.		
A pressure transducer in the water manifold senses the supply water pressure. If the value on the prefilter water-pressure gauge is lower than 2.8 bar (40 psi), the water pressure going to the intensifier is too low. When the pressure is at a value that is lower than the setpoint, the monitoring circuit opens and causes a fault.	The orifice is defective.	Replace the orifice.
	There is a leak in the system.  	Make sure that the intensifier does not stroke when it is in cut-pressure mode with the cutting head turned off. If it does stroke, check the bleed-down valve and the high-pressure tubing for leaks. **1.** A leak from here can mean a problem with the seal in the bleed-down valve. **2.** A leak from here can mean an unsatisfactory connection between the bleed-down valve and the high-pressure tubing. **3.** A leak from here can mean a problem with the bleed-down valve needle and poppet seat.
	A check valve is damaged.	Examine the check valves. Repair or replace them, if necessary.
	The supply water is not turned on.	Turn **ON** the supply water.
	A water filter is clogged.	Replace the water filter.
	The relief valve on the pump manifold has failed.	Contact a Hypertherm Technical Service Associate for information and support.
	The supply-water pressure or flow is not sufficient.	Make sure that the supply water meets the requirements found in the **Specifications** section of this manual.

Problem	Cause	Solution
The supply-water pressure is too high.		
If the value on the prefilter water-pressure gauge is higher than 7.6 bar (110 psi), the water pressure is too high.	A water filter is clogged.	Replace the water filter.
	The boost pump bypass relief valve is not adjusted correctly.	Contact a Hypertherm Technical Service Associate for information and support.
	The boost pump is not needed.	The low-pressure water parts are rated for a maximum pressure of 8.6 bar (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 (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 176.

Controller errors

Input-output status

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



Status: = On = Off

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

I1	Oil level
I2	Oil temp greater than 55C
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	Remote cooling on
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	Bleed-down valve enabled
Q7	Front-left shift-valve solenoid
Q8	Front-right shift-valve solenoid
Q9	Left and right frame lights
Q10	Not used
Q11	Remote reset
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 given in metric units or International System of Units (SI) units followed by US Customary units in parentheses.

1 bar (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 DynaMAX 3-series pumps

Environmental conditions

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

Type	Antiwear (AW) mineral oil or synthetic hydraulic fluid, ISO viscosity grade (VG) 32 or 46
Hydraulic fluid tank capacity	120 L (32 gallons) If the pump is air cooled, increase the hydraulic fluid volume to fill the hoses and the heat exchanger.
Maximum pressure Set at the factory	224 bar (3.250 psi)
Normal operation temperature	46°C to 54°C (115°F to 130°F)

If it is not practical to analyze a sample of the hydraulic fluid, Hypertherm recommends replacing the hydraulic fluid every 3,000 hours. Refer to Replace the hydraulic fluid on page 81.

Utilities

Electrical power

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

The motor size determines the full load amperes, the overload settings, and the wire sizes. Refer to the specific pump model in this section of the manual or to the system schematic drawing.

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

Supply water

The quality of the water supplied to the intensifier has a direct effect on the life of the intensifier and the consumables. Bad water quality increases operating costs by causing unnecessary wear on pump parts and shortening maintenance intervals. Mineral deposits can clog the cooling fins in the heat exchanger.

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.

Water quality

Test	Optimal range
pH	6.0 to 8.0
Silica (SiO_2)	Lower than 0.0015% (15 ppm)
Water hardness	Equal to or lower than 0.006% (60 ppm/3.5 grains per gallon)
Total dissolved solids (TDS)	0.005% to 0.015% (50 ppm to 150 ppm)

Refer to Test the water quality on page 76.

Water temperature

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.

Refer to Cooling on page 150 for additional information.

Compressed air

	Minimum	Maximum
Pressure	5.17 bar (75 psi)	8.27 bar (120 psi)

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.

DynaMAX 315

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, 15 hp	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 (40 psi)	7.6 bar (110 psi)
CUTTING WATER OUT		
Flow	—	1.1 L/minute (0.3 gallons/minute)
Pressure	345 bar (5,000 psi)	4,140 bar (60,000 psi)
Cut-pressure factory setpoint	—	4,140 bar (60,000 psi)
Pierce-pressure factory setpoint	1,380 bar (20,000 psi)	—
COOLING IN and COOLING OUT		
Flow	11.4 L/minute (3.0 gallons/minute)	—
Pressure	2.8 bar (40 psi)	7.6 bar (110 psi)

DynaMAX 330

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 (40 psi)	7.6 bar (110 psi)
CUTTING WATER OUT		
Flow	—	2.3 L/minute (0.6 gallons/minute)
Pressure	345 bar (5,000 psi)	4,140 bar (60,000 psi)
Cut-pressure factory setpoint	—	4,140 bar (60,000 psi)
Pierce-pressure factory setpoint	1,380 bar (20,000 psi)	—
COOLING IN and COOLING OUT		
Flow	11.4 L/minute (3.0 gallons/minute)	—
Pressure	2.8 bar (40 psi)	7.6 bar (110 psi)

DynaMAX 350

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 (2.0 gallons/minute)	—
Pressure	2.8 bar (40 psi)	7.6 bar (110 psi)
CUTTING WATER OUT		
Flow	—	3.8 L/minute (1.0 gallon/minute)
Pressure	345 bar (5,000 psi)	4,140 bar (60,000 psi)
Cut-pressure factory setpoint	—	4,140 bar (60,000 psi)
Pierce-pressure factory setpoint	1,380 bar (20,000 psi)	—
COOLING IN and COOLING OUT		
Flow	11.4 L/minute (3.0 gallons/minute)	—
Pressure	2.8 bar (40 psi)	7.6 bar (110 psi)

Orifices

US Customary (inches)

Number of orifices	DynaMAX 315	DynaMAX 330	DynaMAX 350
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

Torque values

	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 fastener or a fitting leaks after tightening it to the maximum torque value, disassemble the parts. Repair or replace parts that show deterioration, corrosion, or damage.

Fasteners

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

Because of high pressure in the intensifier, all fasteners used on hydraulic and high-pressure water parts are grade 8. Lock washers are necessary for fasteners that are used for cyclic loading.

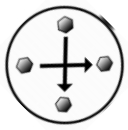
Special fasteners

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

	N·m	lbf·ft	Wrench size
Hydraulic end cap screw	88	65	3/8-inch hex
Hydraulic fluid tank access cover	16[1]	12[1]	7/16 inch
High-pressure end cap nut	375	276	1-1/4-inch socket

1. The torque value is an estimate. The bolt must be tightened until the gasket compresses.

Tighten each end cap nut in 41 N·m (30 lbf·ft) increments and finishing at 375 N·m (276 lbf ft). Use a repeating cross pattern when tightening the nuts.



SAE J518 flange bolts

Lubricate O-rings with hydraulic fluid or O-ring lubricant before installing them.

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

Install a flange

Parts, tools, and materials

Hydraulic fluid or O-ring lubricant

Antiseize bolt lubricant (white lithium grease)

Open-ended wrench (refer to the table on page 138)

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.

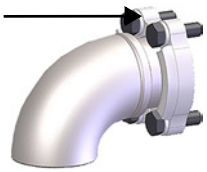
2. Put the O-ring in the flange groove.

3. Put the flange halves together.

4. Lubricate the bolt threads with antiseize bolt lubricant.

5. Put the lock washers on the bolts.

6. Install the bolts. Tighten the bolts by hand.



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

7. Use a torque wrench to tighten the bolts to the specified value.

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



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

Fittings

NOTICE	Do not tighten a fitting too much. The fitting can fail.
ⓘ	Some torque specifications are found on the technical drawings.

Hydraulic fittings

NPT

ⓘ	Hypertherm recommends thread sealant for all NPT fittings.
ⓘ	This table shows maximum values. The torque necessary to make a sufficient seal depends on the condition of the pipe threads and can be much lower than the maximum.



Size (inch)	Maximum torque value					
	Standard		With thread sealant (75% of standard maximum)		For a male tapered pipe thread with a female straight or parallel pipe thread (50% of standard maximum)	
	N·m	lbf·ft	N·m	lbf·ft	N·m	lbf·ft
1/4	34	25	26	19	18	13
3/8	47	35	35	26	24	18
1/2	61	45	46	34	31	23
3/4	75	55	56	41	38	28
1	88	65	66	49	45	33
1-1/4	108	80	81	60	54	40
1-1/2	129	95	96	71	65	48

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

Steel JIC 37°

	Lubricate the threads of steel JIC fittings with hydraulic fluid.
	This table shows maximum values. The torque necessary to make a sufficient seal depends on the condition of the pipe threads and can be much lower than the maximum.



1/16-inch dash size	Minimum		Maximum	
	N·m	lbf·ft	N·m	lbf·ft
-04	14	10	15	11
-06	23	17	26	19
-08	46	34	52	38
-10	68	50	76	56
-12	95	70	106	78
-16	127	94	141	104
-20	168	124	187	138
-24	212	156	235	173

SAE O-ring boss

	Do not use thread sealant on SAE hydraulic fittings.
	Lubricate O-rings with hydraulic fluid or O-ring lubricant before assembly.



1/16-inch dash size	Minimum		Maximum	
	N·m	lbf·ft	N·m	lbf·ft
-04	14	10	16	12
-06	24	18	27	20
-08	43	32	47	35
-10	62	46	68	50
-12	88	65	95	70
-16	125	92	136	100
-20	169	125	190	140
-24	203	150	224	165

High-pressure water fittings

NOTICE	High-pressure water fittings are designed to make a tight seal. If a fitting is installed incorrectly, it can fail. To prevent causing damage or premature failure, use 2 wrenches when loosening or tightening a high-pressure connection.
	Do not use an adjustable wrench on high-pressure 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.
	Use a high-pressure antiseize lubricant such as Blue Goop or PURE Goop on high-pressure water fittings.

	N·m	lbf·ft	Wrench size
Output adapter	115	85	1 inch
High-pressure water fittings (gland nuts)			
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

Install a gland nut

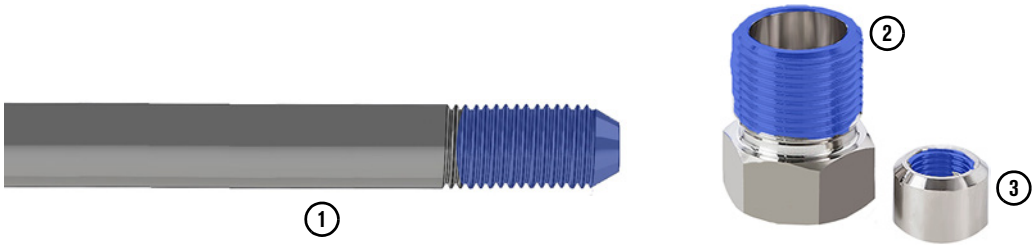
Parts, tools, and materials

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

Open-ended wrench

Torque wrench

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.

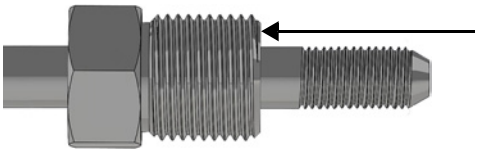


1 High-pressure tube

2 Gland nut

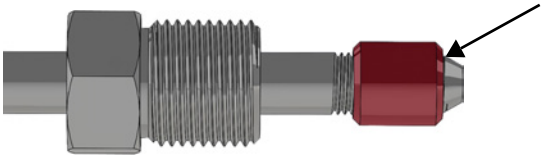
3 Collar

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

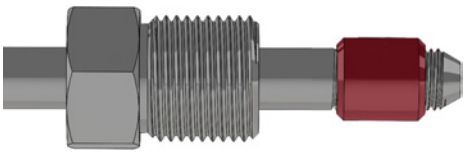


3. Put the collar on the high-pressure tube.

	Make sure that three of the threads on the high-pressure tube are visible at the fitting.



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



Correctly installed collar: The sealing 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

Safety

WARNING	**Read and understand all of the safety guidelines in this manual.** Refer to Safety on page 19 before operating, doing maintenance on, repairing, and installing this pump.
WARNING	Permit only approved personnel to operate, maintain, and repair this machinery.
CAUTION	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.
	Some materials can cause airborne contamination or particles when cut. Wear approved respiratory protection when operating or doing work near this equipment.
	All installation, repairs, and maintenance of the electrical and plumbing systems must obey national and local codes. This work should be done only by an approved technician. It is the buyer's responsibility to investigate and obey all local codes.
	Obey all safety requirements and applicable safety laws and regulations.

	Use SAE tools for most procedures.
	Keep the work area clean and dry. Clean fluid spills immediately. Use catch basins under areas where water or hydraulic fluid can spill during maintenance or repair procedures.

Buyer responsibilities

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

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 20.

Requirements

Location

CAUTION	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.
	Do not install this equipment in an area where the temperature is below freezing. Freezing can cause damage to the pump.
	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.
	Hypertherm recommends installing the 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 on a solid, flat surface that can hold the weight of the equipment and is thick enough to resist vibration. The feet on the frame can be adjusted to level the pump with two 1-1/8-inch open-ended wrenches.

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

Cooling

	**Do not use a glycol solution in a chiller at a concentration higher than 25%.** Glycol can be added to the cooling circuit to prevent freezing, but glycol is less efficient for cooling than water. Using a chiller with a water-glycol solution can have an effect on the performance of the heat exchanger.
	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.

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.

Use this table to calculate the cooling load.

DynaMAX pump model	kW (minimum)	Refrigeration tons (minimum tons)	Heat removal requirement (minimum Btu/hour)
315	3	0.85	10,000
330	6	1.70	20,000
350	9	2.70	32,000

Hydraulic fluid

 Hypertherm does not always ship the pump with hydraulic fluid in the tank. Domestic pumps usually 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) If the pump is air cooled, increase the hydraulic fluid volume to fill the hoses and the heat exchanger.

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.

Utilities

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

The motor size determines the full load amperes, the overload settings, and the wire sizes. Refer to the specific pump model in the Specifications section of this manual or to the system schematic drawing.

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

Compressed air

	Minimum	Maximum
Pressure	5.17 bar (75 psi)	8.27 bar (120 psi)

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.

Supply water

	Do not use deionized water unless the system has stainless steel water fittings. Deionized water can cause the plumbing parts to fail.
	Local codes can require a backflow prevention valve to separate the pump from the facility's potable water.

Water quality

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

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 quality of the supply water. Refer to Test the water quality on page 76 for instructions.

Softened water is necessary for most systems. Get advice from a specialist for recommendations for choosing a water treatment system.

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 the pump information in 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
   - These items are usually shipped inside the electrical enclosure:
     - Key for the **LOCAL-REMOTE** key switch
     - System schematic drawings
   - Optional items
     - Standard tool kit
     - Spare parts kit
     - Optional equipment kits

Install the pump

NOTICE	Hydraulic, water, and electrical connections can become loose during shipping and normal operation. Examine all connections at installation and during regular maintenance. Make sure that all connections, fasteners, locking devices, hoses, and fittings are tight before starting the pump.
	To connect the pump directly to an external control device, such as a CNC, refer to the CNC manual.
	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 the specific pump model in the Specifications section of this manual.

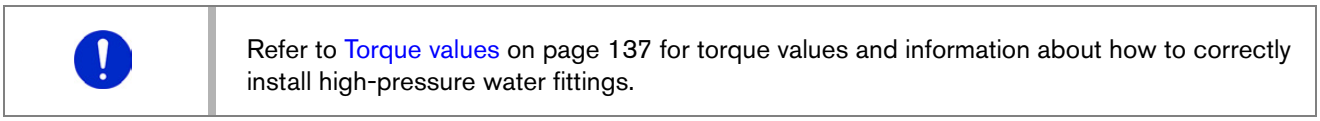
Parts, tools, and materials

Two 1-1/8-inch open-ended wrenches

Level

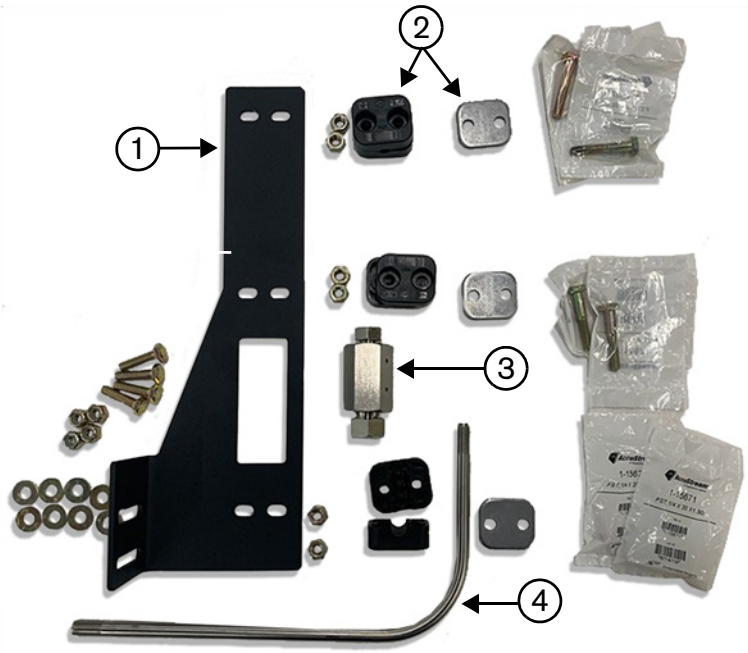
When the unit is in position, use adjustable wrenches to level the unit. There are 2 nuts on each leveling foot on the corners of the frame. Use the lower nut to set the height. The upper nut tightens against the pump frame to keep the leveling foot from moving.

Install the pump-mounted plumbing kit (optional)



Refer to Torque values on page 137 for torque values and information about how to correctly install high-pressure water fittings.

The plumbing kit is designed to make installing high-pressure tubing from the pump to the cutting table easier. A whip bracket reduces stress on the tubing and the necessity for 90° bends.



1 Tubing bracket

2 Clamp

3 Reducing adapter, 3/8-inch to 1/4-inch

4 L-shaped tubing

Parts, tools, and materials

Pump-mounted plumbing kit

Two 7/16-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

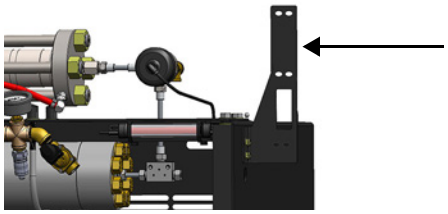
Torque wrench

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

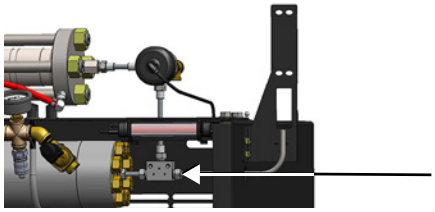
1. Find the mounting holes for the plumbing kit on the rear of the pump.



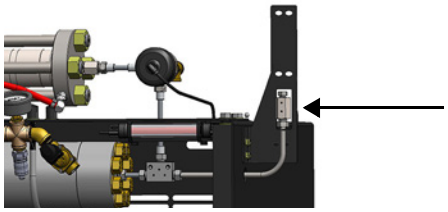
2. Use two 7/16-inch open-ended wrenches and hardware from the kit to install the tubing bracket on the pump frame.



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.

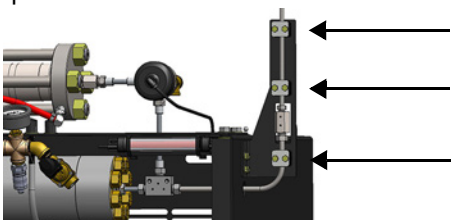


4. Use a 13/16-inch open-ended wrench to install the reducing adapter on the short end of the L-shaped tubing. Use a torque wrench to tighten the fitting to 68 N·m (50 lbf·ft).



5. Use a 5/8-inch open-ended wrench to install the 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.
NOTICE	**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.
NOTICE	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 fitting.
	Refer to Torque values on page 137 for information about how to correctly install high-pressure water fittings.
	Hydraulic, water, and electrical connections can become loose during shipping and normal operation. Examine all connections at installation and during regular maintenance.
	COOLING IN and **COOLING OUT** are sometimes referred to as the cooling loop. The cooling loop keeps the hydraulic fluid in the pump at its optimal temperature.
	The utility connections are identified with hang tags.

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 female 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-inch NPT male fittings

This pump is available with an optional utility connection panel.



Pump with a utility connection panel

Refer to page 159.



Pump without a utility connection panel

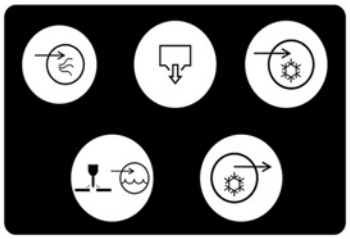
Refer to page 161.

Pump with a utility connection panel

	This configuration requires the optional pump-mounted high-pressure plumbing kit.
	The utility connections are identified with hang tags.

Remove the caps from the fittings and the plugs from the utility connections.

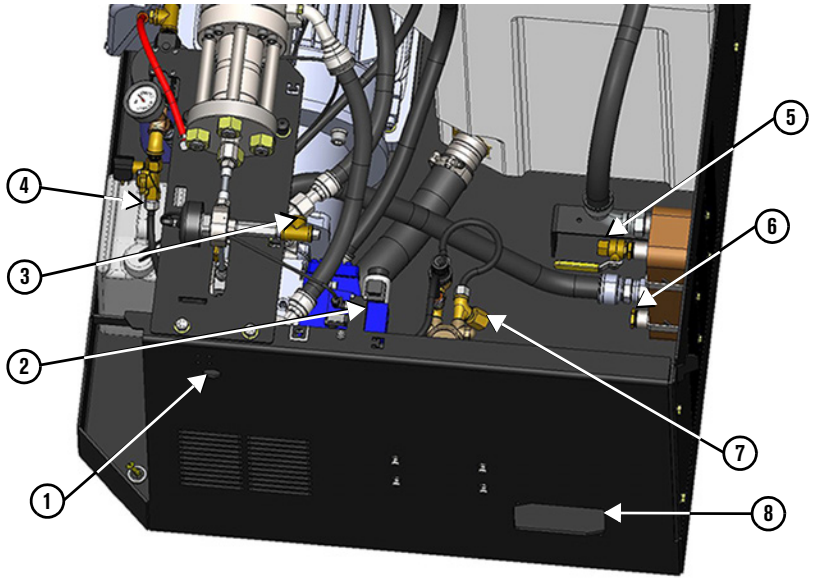
	Keep the caps and the plugs to use if the pump is stored or shipped.



	CUTTING WATER OUT This tubing carries high-pressure water from the intensifier to the cutting table.	▪ Connect 1 end of this high-pressure tubing to the cutting head. ▪ Put the other end of the tubing through the hose access hole on the side of the pump. (Refer to ① on page 161.) ▪ Connect the tubing to the high-pressure tee inside the pump frame.
	COMPRESSED AIR The bleed-down valve uses compressed air to operate.	Connect a compressed air hose to the fitting on the utility panel.
	WASTE WATER OUT This hose carries water from the bleed-down valve to a drain.	▪ Connect 1 end of this hose to the drain. ▪ Connect the other end to the fitting on the utility panel.
	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.	▪ Connect 1 end of this line to the supply water ▪ Connect the other end to the fitting on the utility panel.
	All low-pressure water connections use push-to-connect fittings.	

	**COOLING IN (not used for air-cooled systems)** This line carries low-pressure supply water from the local utility or a chiller to the pump's cooling loop. ▪ Connect 1 end of this line to the supply water or to the chiller. ▪ Connect the other end to the fitting on the utility panel.
	**COOLING OUT (not used for air-cooled systems)** This line carries low-pressure water from the heat exchanger to the chiller or to the drain. ▪ Connect 1 end of this line to the chiller or to the drain. ▪ Connect the other end to the fitting on the utility panel.

Pump without a utility connection panel



CUTTING WATER OUT

This tubing carries high-pressure water from the intensifier to the cutting table.

- 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.

- Factory-installed connection: 3/8-inch high-pressure female
- 3/8-inch high-pressure male fitting not included

Put the other hoses and lines into the pump through the cutout ⑧.

COMPRESSED AIR

The bleed-down valve uses compressed air to operate.

Connect a compressed air hose to the solenoid valve ② mounted to the frame near the bleed-down valve.

- Factory-installed fitting: 1/8-inch NPT female
- 1/8-inch NPT male fitting not included

WASTE WATER OUT

This hose carries water from the bleed-down valve to a drain.

- 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.

- Factory-installed connection: 1/2-inch NPT female
- 1/2-inch NPT male fittings (not included)



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.

- 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.

- Factory-installed connection: 1/2-inch NPT female
- 1/2-inch NPT male fittings (not included)



COOLING IN

Water-cooled system

This line carries low-pressure supply water from the local utility or a chiller to the pump's cooling loop.

- 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.

Air-cooled system

This hose carries hydraulic fluid from the external heat exchanger to the hydraulic fluid tank.

- Connect 1 end of this line to the fitting marked **OUTLET** on the external heat exchanger.
- Connect the other end to the ball valve at the heat exchanger inlet ⑤.

- Factory-installed connection: 1/2-inch NPT female
- 1/2-inch NPT male fittings (not included)



COOLING OUT

Water-cooled system

This line carries low-pressure water from the heat exchanger to the chiller or to the drain.

- Connect 1 end of this line to the chiller or to the drain.
- Connect the other end to the heat exchanger outlet ⑥.

Air-cooled system

This hose carries hydraulic fluid from the hydraulic fluid tank to an external heat exchanger.

- Connect 1 end of this line to the fitting marked **INLET** on the external heat exchanger.
- Connect the other end to the heat exchanger outlet ⑥.

- Factory-installed connection: 1/2-inch NPT female
- 1/2-inch NPT male fittings (not included)

Connect the electrical power

NOTICE	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.

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.

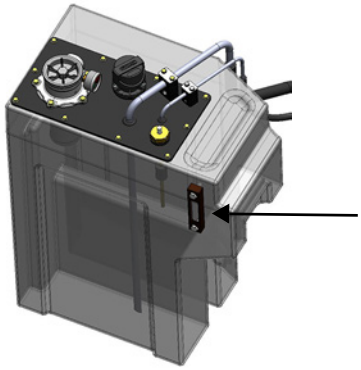
If the cross-sectional area (S mm²) of the copper phase conductors supplying the equipment is	The minimum cross-sectional area (Sp mm²) is
equal to or higher than 16	equal to S
higher than 16 and lower than or equal to 35	16
higher than 35	S/2

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

Check the hydraulic fluid

NOTICE	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 Check the hydraulic fluid on page 163.

Do the first start

NOTICE	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.
NOTICE	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

NOTICE	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. Refer to Check the hydraulic fluid on page 163.
- Make sure that all warning decals are visible and legible.

Turn on the utilities

NOTICE	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 supply water to the pump.
2. Turn **ON** the compressed air source.

   Set the air pressure between 5.2 bar and 8.3 bar (75 psi and 120 psi).

NOTICE	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 poppet seat in the bleed-down valve. If the available air pressure is too high, install an air regulator (not included) to reduce the pressure.

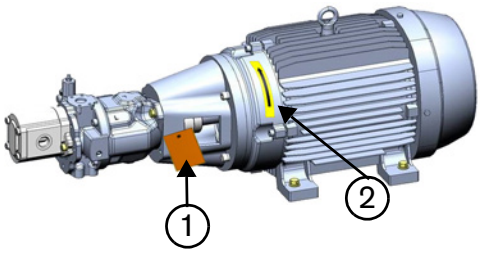
3. Turn **ON** the electrical main (line disconnect switch).
4. Turn the primary breaker disconnect lever on the electrical enclosure door to **ON**.
5. On the operation panel:
   a. Make sure that the **EMERGENCY STOP** button is not engaged. If the button is pushed in, turn the button clockwise until it releases.
   b. Make sure that the **LOCAL-REMOTE** key switch is set to **LOCAL**.

Make sure that the primary motor turns in the correct direction

CAUTION	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.
NOTICE	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.

Do this task to see the direction the motor turns without fully starting the pump.

1. Remove the shaft access cover.



1 Shaft access cover **2** Rotation arrow

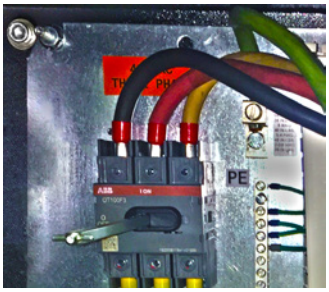
2. On the operation panel, push the **CONTROLS ON** button to turn **ON** the control circuit in the pump.
3. On the operator interface, touch the **START** symbol to turn **ON** the pump momentarily. Then touch the **STOP** symbol. Make sure that the primary motor turns in the direction shown by the rotation arrow.

   If the pump motor turns 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).

CAUTION	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**.

4. Install the shaft access cover.

Turn on the pump

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

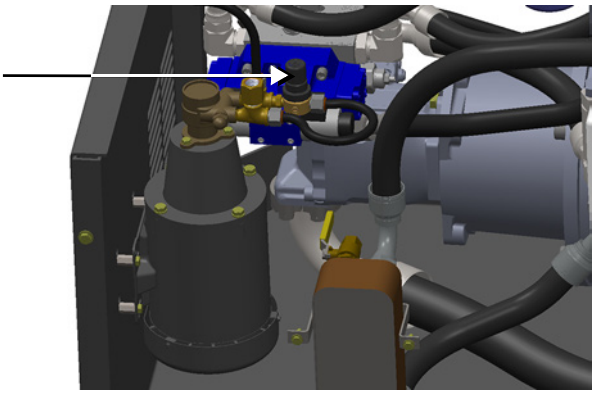
1. Set the pressure to 345 bar (5,000 psi).
2. On the operator interface, touch the **START** symbol to turn **ON** the pump.
3. Let the pump operate for 2 to 3 minutes.
4. Monitor for leaks.

Adjust the boost pump pressure

NOTICE	Do not set the boost pump pressure higher than 7.6 bar (110 psi). The supply water components are rated for a maximum of 8.6 bar (125 psi). High pressure 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.

Do this task when the pump is operating.

1. Remove the rear cover of the pump.
2. Pull out the boost pump pressure regulator knob on the water manifold. Turn it clockwise to increase the pressure or counterclockwise to decrease pressure.



3. Make sure that the pressure on the prefilter water-pressure gauge is between 6.9 bar and 7.6 bar (100 psi and 110 psi).

Flush the pump and the high-pressure tubing

NOTICE	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 **START** symbol.
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.
9. Turn **ON** the pump.
10. On the operator interface, touch the **START** symbol.
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.

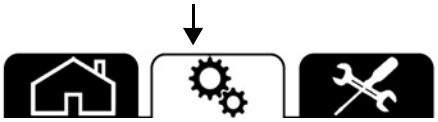
The pump is prepared for operation.

Operator interface: Adjustment screens

	Not all screens are used when installing the pump.

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 on page 170



Intensifier Control on page 178

Pressure on page 176



SD Card on page 179

Date/Time/Language on page 177



Pump Adjustments



Pump Information on page 171



Remote Configuration on page 174

Start Procedure Timers on page 172



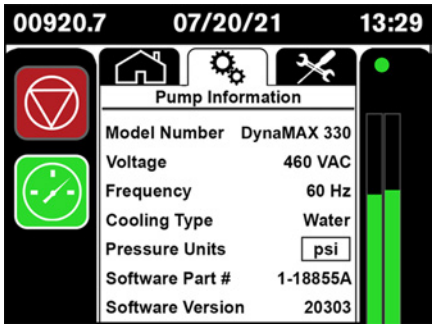
Stop Procedure Timers on page 175

Pressure Adjustments on page 173



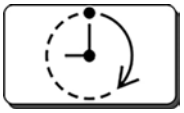
Pump Fault Behavior on page 176

Pump Information

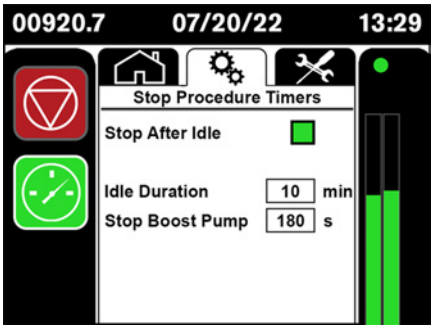


Model Number	This is the model number of the pump.
Voltage	This is the line voltage of the pump
Frequency	This is the line voltage frequency of the pump.
Cooling Type	This the type of heat exchanger the pump uses. ▪ Water: A standard pump has an internal water-cooling system. ▪ Air: An air-cooled pump has an external heat exchanger.
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 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.

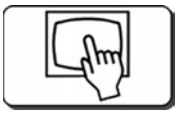


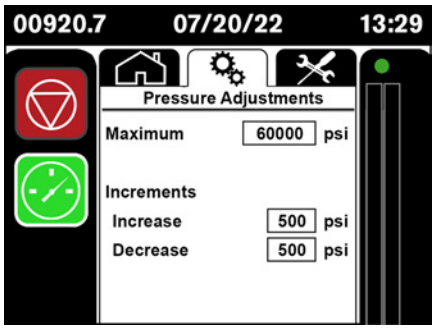
Touch a number field to change the value.

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. The value cannot be lower than the default.
Intensifier	The system goes to the next stage when the time between intensifier strokes is this value. The timer default is 1.5 seconds.
Inlet Water	Stage 1 After the system gets to the minimum water manifold pressure, the inlet water timer starts. The timer default is 5 seconds.
Bleed Valve	Stage 2 This is the time it takes for the intensifier to push air in the system out through the 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).

Pierce	Stage 4 The system has this much time to get to the pierce-pressure setpoint. The timer default is 5 seconds.
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.

Pressure Adjustments

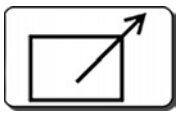


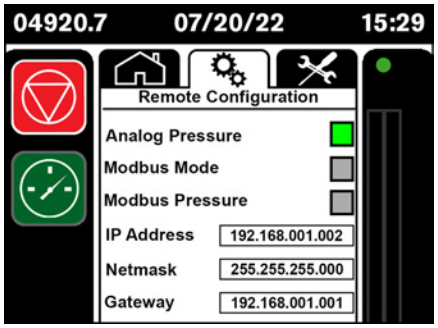


	Touch a number field to change the value.

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 that the target pressure increases each time the + symbol on the primary operation screen is touched. The default is 34 bar (500 psi). The smallest increment is 10 bar (100 psi).
Decrease	This is how much that the target pressure decreases each time the – symbol on the primary operation screen is touched. The default is 34 bar (500 psi).

Remote Configuration

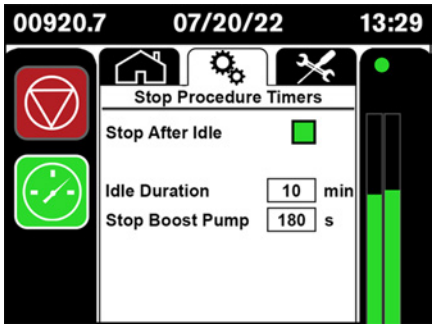




- Touch a box to turn the feature on or off. The feature is active when the box is green. The feature is inactive when the box is gray.
- Touch a number field to change the value.

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: ▪ a Modbus symbol shows on the primary operation screen. ▪ 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.

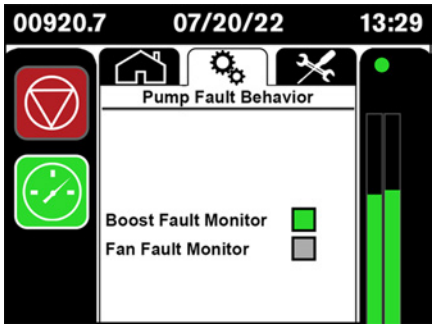
Stop Procedure Timers



- Touch the box to turn the feature on or off. The feature is active when the box is green. The feature is inactive when the box is gray.
- Touch a number field to change the value.

Stop After Idle	The pump is idle when the intensifier stops stroking. 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 or goes into cooling mode. 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.

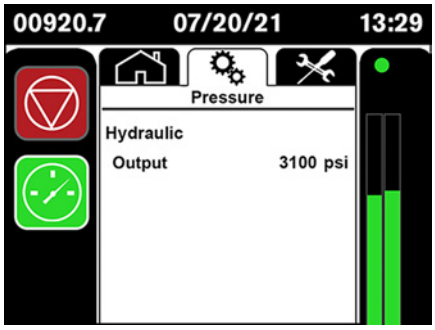
Pump Fault Behavior



	Touch a box to turn the feature on or off. The feature is active when the box is green. The feature is inactive when the box is gray.

Boost Fault Monitor	The system can monitor a boost pump for fault conditions.
Fan Fault Monitor	The system can monitor a heat exchanger for fault conditions.

Pressure

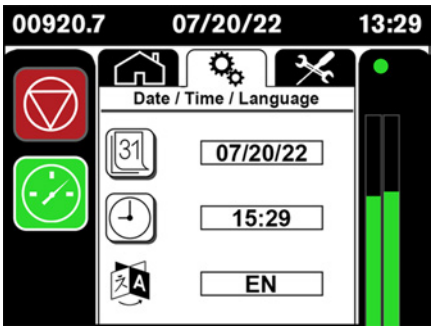


Hydraulic Output	This shows the hydraulic pressure in the system.

Date / Time / Language

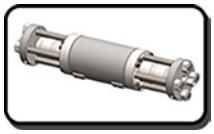


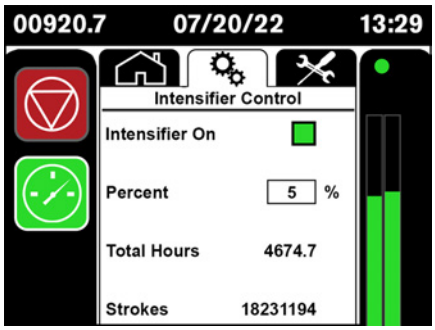
Change how the date and the time show on the operator interface. Change the language used on the screens.



	**Date symbol and field** Touch the 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 change the date.
	**Time symbol and field** Touch the 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 change the time.
	**Language symbol** Touch the field next to the symbol to open a numeric keypad. Use the keypad to change the language.

Intensifier Control





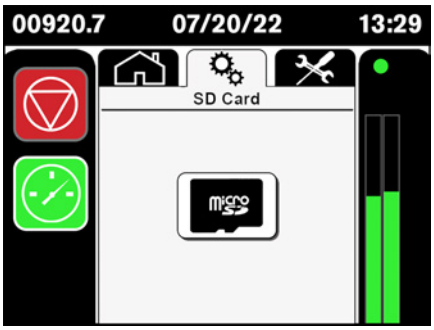
- Touch the box to turn the feature on or off. The feature is active when the box is green. The feature is inactive when the box is gray.
- Touch the number field to change the value.

Intensifier On	Use this screen to engage and disengage the intensifier. When intensifier control is off, 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. The rate can be adjusted to compensate for variations in plumbing configurations and flow rates. Touch the field to open a keypad. Enter the maximum overstroke percentage permitted before a fault occurs. **Maximum strokes/minute** **DynaMAX 315**: 40 **DynaMAX 330**: 79 **DynaMAX 350**: 107 Default overstroke: 5% Maximum overstroke: 20%
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, and the alarm log files. 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**.

Remote operation

To connect the pump directly to an external control device, such as a CNC, refer to the CNC manual and contact a Hypertherm Technical Service Associate for information and support.

Storage

Refer to Prepare the pump for storage on page 88 for information about storing this equipment.

8 Declaration of Incorporation

To see the Declaration of Incorporation 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 Incorporation for your product.
   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 13.

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

Hypertherm®

DECLARATION OF INCORPORATION

DATE OF ISSUE: 2021-05-05

PRODUCT: Waterjet Pump

MODEL: DynaMAX 315 DynaMAX 330 DynaMAX 350
Echion 15 Echion 30 Echion 50

The referenced product meets essential requirements of the following Directives and the relevant sections of harmonised standards:

Directive 2006/42/EC (Machinery)
Annex I: 1.1.2-1.1.7, 1.2.2-1.2.4.3, 1.2.5-1.3.4, 1.3.6-1.7.2, 1.7.4-1.7.4.3
Directive 2104/30/EU (EMC)
EN ISO 12100:2010
EN 60204-1:2018
EN1829-1:2010
EN 61000-6-2:2005/AC:2005
EN 61000-6-4:2007/A1:2011

The technical documentation is compiled in accordance with Annex VII, Part B of Directive 2006/42/EC. In response to a reasoned request, relevant information on the referenced product may be provided electronically. The referenced product is partly completed machinery and must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of Directive 2006/42/EC.

AUTHORISED REPRESENTATIVE: Koen van den Bemd
European Customer Service
Hypertherm Europe B.V.
Vaartveld 9
4704 SE Roosendaal
The Netherlands

SIGNED: Gordon Rice

Gordon Rice
Executive Vice President - Waterjet

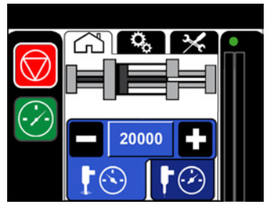
9 Touchscreen maps

Use these pages to navigate the screens on the operator interface.

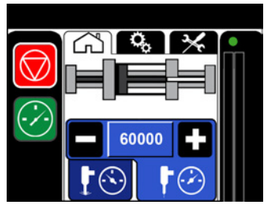
	Hypertherm recommends printing these pages on A3-, tabloid-, or ledger-size paper.

Primary operation screen

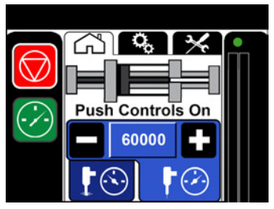
Refer to Operator interface on page 33 for more information about these screens.



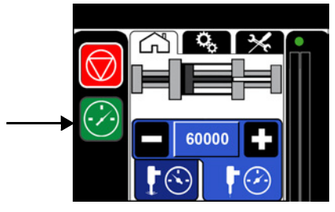
Pierce-pressure mode



Cut-pressure mode

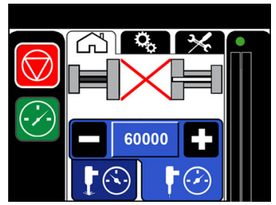


Push the **CONTROLS ON** button on the operator panel to turn on the pump.



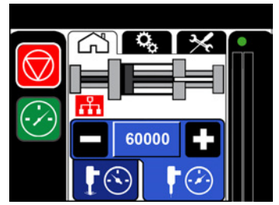
Touch the **START** symbol to turn on the pump.

Go to page 186.



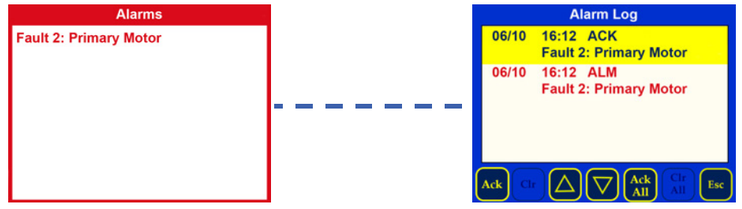
The intensifier is disengaged.

Refer to Intensifier Control on page 178.



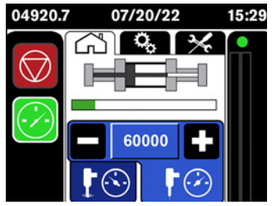
Modbus mode is on.

Refer to Remote Configuration on page 174.



Refer to Alarms on page 108.

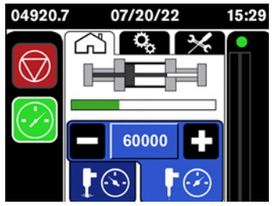
Normal start sequence



Stage 1

The supply water pressure increases.

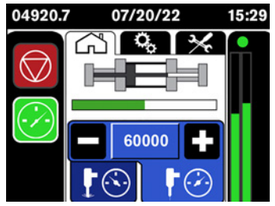
- The primary motor starts.
- The hydraulic pump operates at minimum pressure until stage 4.
- After the system gets to the target water pressure, the Inlet Water timer starts.



Stage 2

Air is removed from the system.

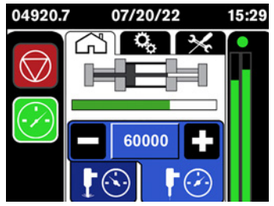
- The intensifier begins stroking.
- The Bleed Valve timer starts.



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.

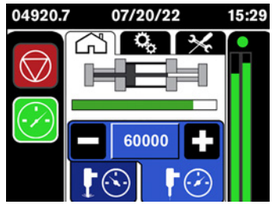


Stage 4

The pressure increases to the pierce-pressure setpoint.

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

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



Stage 5

The pressure increases to the cut-pressure setpoint.

- Water pressure in the system increases to the cut-pressure setpoint.
- The Cut timer starts.

The start procedure is complete.

The pump is at operating pressure and is prepared for operation.

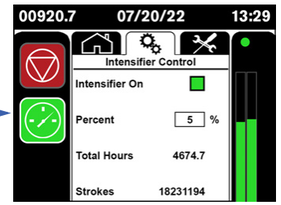
The start procedure timers are adjustable.

Refer to Stop Procedure Timers on page 175 for instructions.

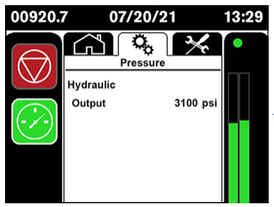
The timers are set at the factory to 5 seconds.

Adjustment screens

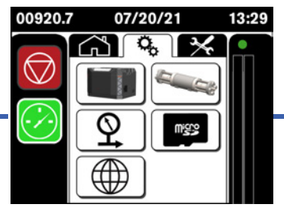
Refer to Operator interface: Adjustment screens on page 170 for more information about these screens.



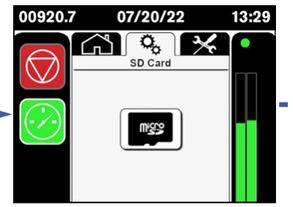
Refer to Intensifier Control on page 178.



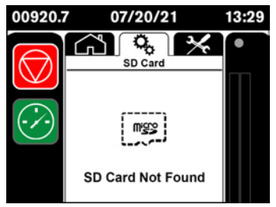
Refer to Intensifier Control on page 178.



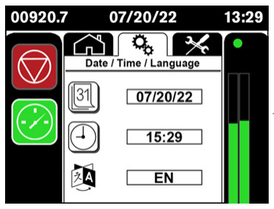
Primary Adjustments screen



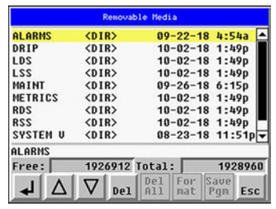
Refer to SD Card on page 179.



SD Card Not Found

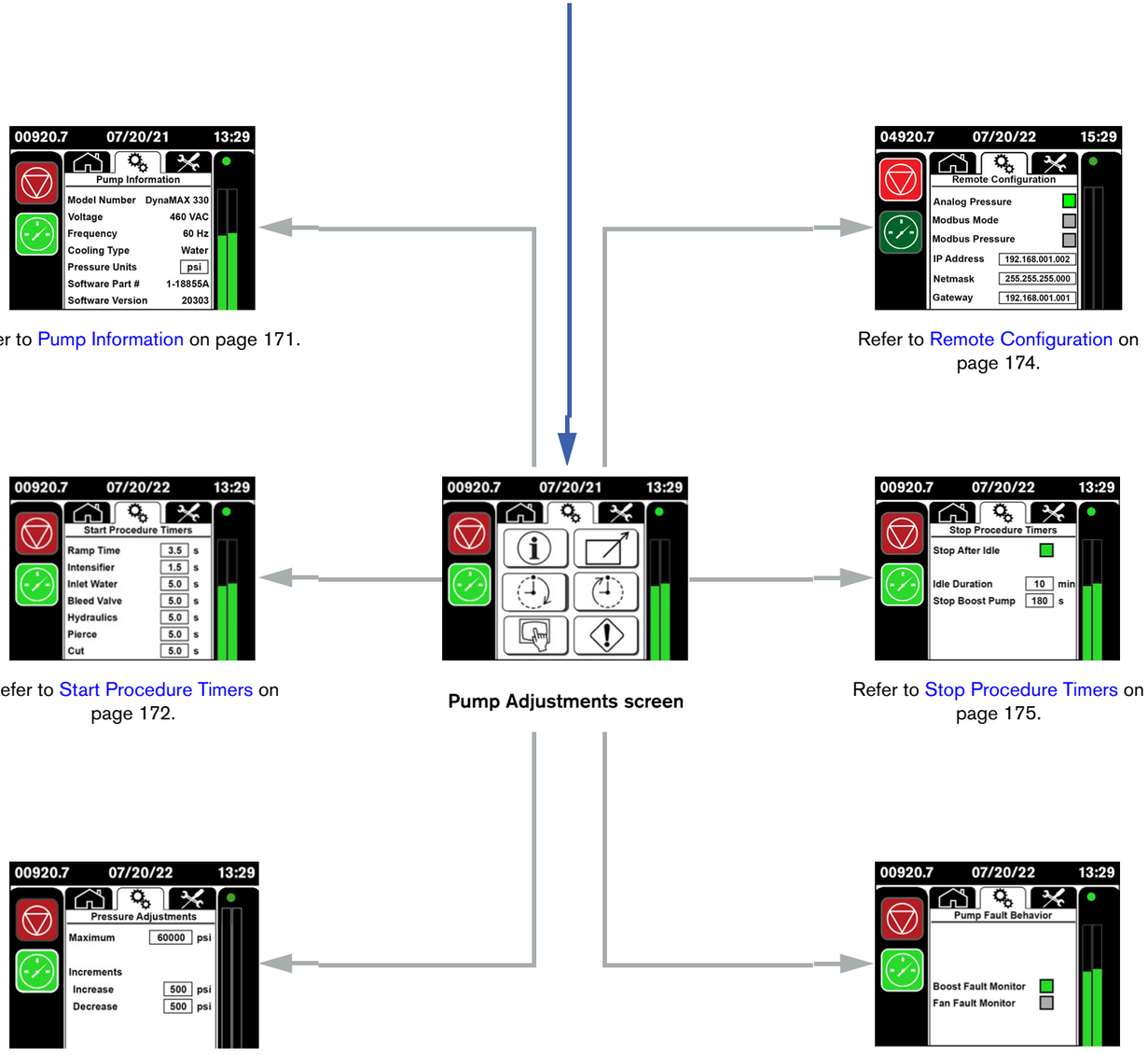


Refer to Date/Time/Language on page 177.



SD Card Files

Go to page 188.



Refer to Pump Information on page 171.

Refer to Remote Configuration on page 174.

Refer to Start Procedure Timers on page 172.

Pump Adjustments screen

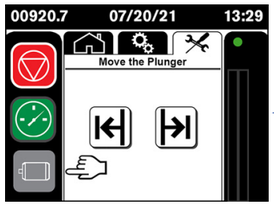
Refer to Stop Procedure Timers on page 175.

Refer to Pressure Adjustments on page 173.

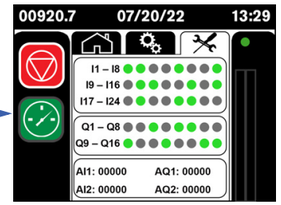
Refer to Pump Fault Behavior on page 176.

Maintenance screens

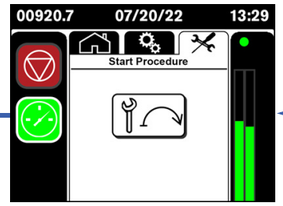
> Refer to Operator interface: Maintenance screens on page 49 for more information about these screens.



Refer to Move the plunger on page 49.

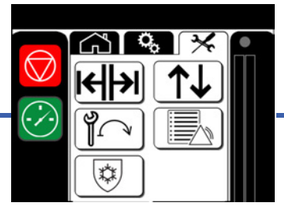


Refer to Inputs and outputs on page 50.

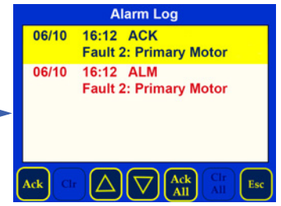


Postmaintenance Start Procedure

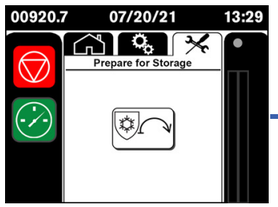
Refer to Post-maintenance start on page 85.



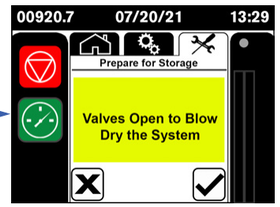
Primary Maintenance screen



Alarm log



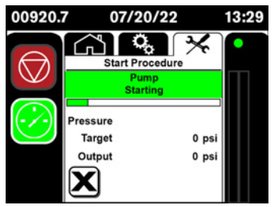
Refer to Prepare the pump for storage on page 88.



Valves Open to Blow Dry the System

Go to page 190.

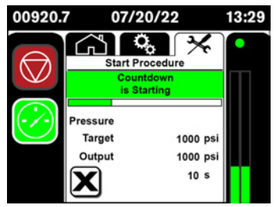
Postmaintenance start procedure



Stage 1
Pump Starting

Air is removed from the system.

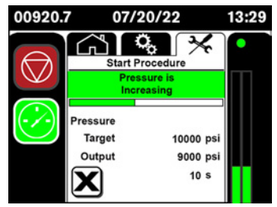
- The intensifier begins stroking.
- The bleed-down valve is open.



Stage 2
Countdown is Starting

The supply water pressure increases.

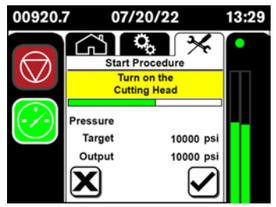
- The primary motor starts.
- If the system has a boost pump, it turns on.
- The hydraulic pump operates at minimum pressure.
- The supply water pressure increases until the it gets to the target water pressure.



Stage 3
Pressure is Increasing

The system fills with water.

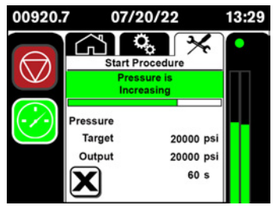
- The bleed-down valve closes.
- Water pressure in the system increases to 690 bar (10,000 psi).



Stage 4
Turn On the Cutting Head

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

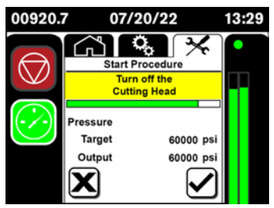
1. Move the cutting head to a safe location on the table.
2. Turn **ON** the cutting head.
3. Touch the ✔ symbol to continue.



Stage 5
Pressure is Increasing

The pressure increases.

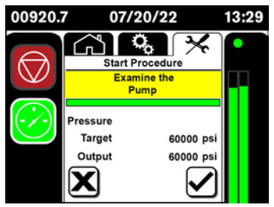
The water pressure increases in 690 bar (10,000 psi) increments until the pump is at 4,140 bar (60,000 psi).



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.

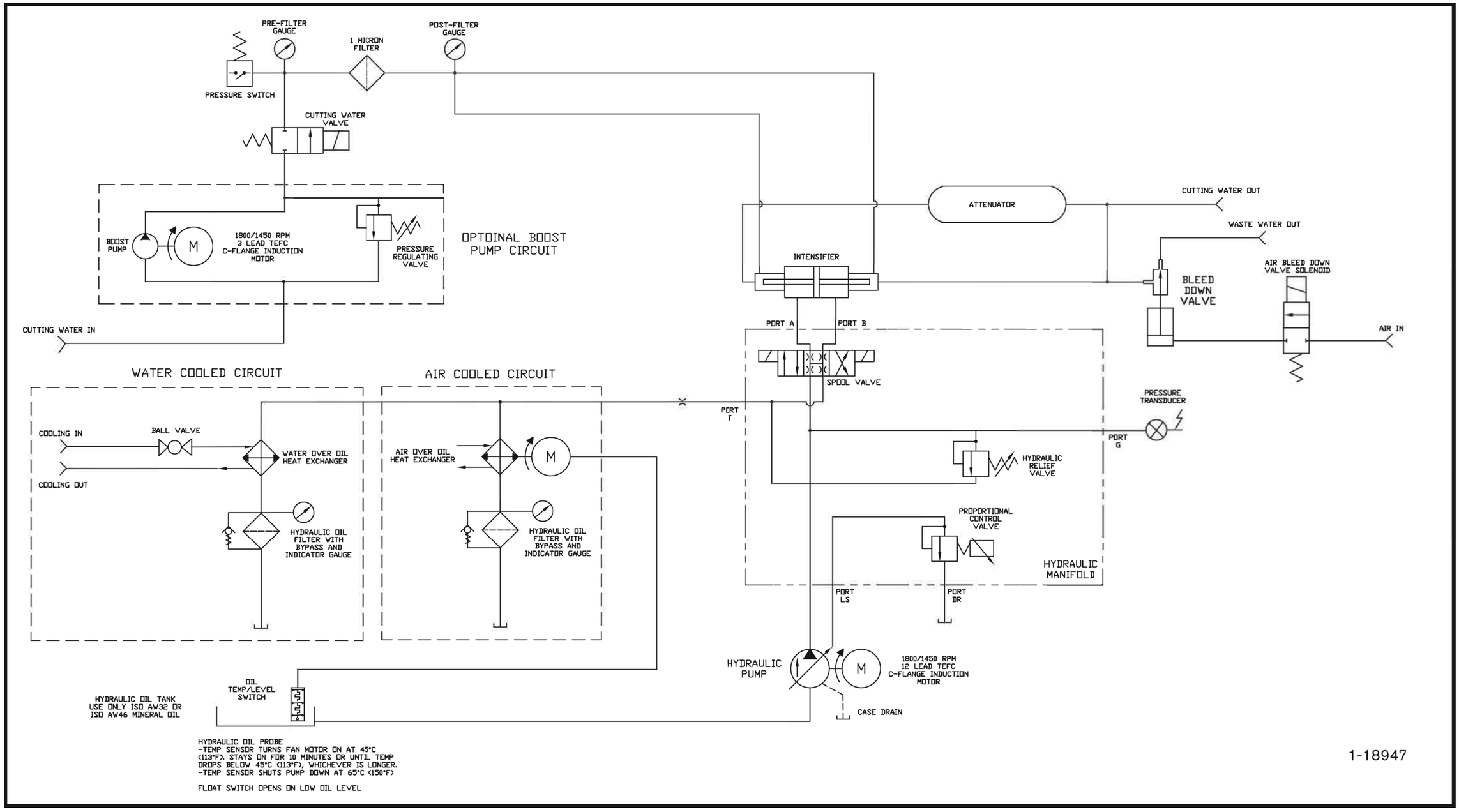
The minimum setpoint is 2.76 bar (40 psi).

Touch the **X** symbol to stop the procedure and turn off the pump.

10 Technical drawings

The hydraulic and water system drawing is in this section.

	The electrical drawings are shipped in an envelope that is found inside the electrical cabinet.
	Hypertherm recommends printing these pages on A3-, tabloid-, or ledger-size paper.


PRE-FILTER GAUGE
1 MICRON FILTER
POST-FILTER GAUGE
PRESSURE SWITCH
CUTTING WATER VALVE
BOOST PUMP
M
1800/1450 RPM 3 LEAD TEFC C-FLANGE INDUCTION MOTOR
PRESSURE REGULATING VALVE
OPTOINAL BOOST PUMP CIRCUIT
CUTTING WATER IN
ATTENUATOR
CUTTING WATER OUT
WASTE WATER OUT
INTENSIFIER
BLEED DOWN VALVE
AIR BLEED DOWN VALVE SOLENOID
AIR IN
PORT A
PORT B
SPOOL VALVE
WATER COOLED CIRCUIT
AIR COOLED CIRCUIT
PORT T
PRESSURE TRANSDUCER
PORT G
COOLING IN
BALL VALVE
WATER OVER OIL HEAT EXCHANGER
COOLING OUT
AIR OVER OIL HEAT EXCHANGER
HYDRAULIC RELIEF VALVE
HYDRAULIC OIL FILTER WITH BYPASS AND INDICATOR GAUGE
HYDRAULIC OIL FILTER WITH BYPASS AND INDICATOR GAUGE
PROPORTIONAL CONTROL VALVE
HYDRAULIC MANIFOLD
PORT LS
PORT DR
HYDRAULIC PUMP
M
1800/1450 RPM 12 LEAD TEFC C-FLANGE INDUCTION MOTOR
CASE DRAIN
OIL TEMP/LEVEL SWITCH
HYDRAULIC OIL TANK
USE ONLY ISO AW32 OR ISO AW46 MINERAL OIL
HYDRAULIC OIL PROBE
-TEMP SENSOR TURNS FAN MOTOR ON AT 45°C (113°F). STAYS ON FOR 10 MINUTES OR UNTIL TEMP DROPS BELOW 45°C (113°F), WHICHEVER IS LONGER.
-TEMP SENSOR SHUTS PUMP DOWN AT 65°C (150°F)
FLOAT SWITCH OPENS ON LOW OIL LEVEL
1-18947

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.

Distributor _____

Purchase date _____

Installation date _____

Installed by _____

Thank you

We appreciate hearing from you and receiving your feedback.

Recommend changes for the next update to this manual.

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.

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

- DynaMAX 315/330/350 Waterjet Pump Operator Manual 811370, revision 0
- Include page numbers, if applicable.
- Tell us the problem or make a suggestion.

Thank you for helping us improve our products.