

Pyrolance, LLC

== Lance L-1000 W-P, PTO, Wireless - 2013.002 11/26/13 ==

SPECIFICATIONS FOR

PTO DRIVEN

ULTRA HIGH PRESSURE PIERCING AND

FIRE FIGHTING SYSTEM

L 1000 W-P

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SPECIFICATIONS FOR FIRE FIGHTING SYSTEM **FIRE FIGHTING AND PIERCING SPECIFICATIONS**

Scope and General Design Requirements

A multi-purpose fire-fighting system which shall be provided for firefighter safety by offensively attacking fire and fire gases from a 'defensive position'. Utilizing the transitional attack fire-fighting method, ultra-high pressure piercing, and cooling the fire-fighting system shall allow the operator to attack fire from a safe exterior position without the firefighter entering a situation prone to dangers such as backdraft and/or flashover.

The nozzle shall pierce the outer structure with ultra-high pressure water and aggregate enabling an exterior attack on the involved aircraft or structure. Once the outer surface or structure is penetrated, the system shall continue to inject ultra-high pressure water into the thermal layer which cools the interior, thus dropping temperatures in a matter of seconds.

The system shall be extremely effective on compartmental areas where firefighting activities are difficult and dangerous to access. The system shall have the ability to attack the fire in its' three dimensional gaseous phase, greatly reducing the potential for flash over or back-draft conditions. The system shall also have a unique ability to pierce and cut when necessary controlled by the nozzle operator.

Components and Module Design

The fire-fighting system shall consist of:

- Hydraulic drive package (Pump, Motor, Reservoir, Cooler, Control Valve)
- Water pump: Ultra-high pressure positive displacement piston pump
- Wireless remote control system
- Electric rewind reel with high pressure attack hose
- Portable ultra-high pressure piercing nozzle with wireless control
- Abrasive vessel and injection system

The aggregate abrasive product shall not rust and shall be environmentally safe, allowing the unit to be kept loaded indefinitely and ready for use at all times.

The major components shall be assembled into an enclosed module assembly with an integral hydraulic drive system. The entire system shall be designed for installation by a professional mechanic using normal tools into a fire apparatus vehicle, with an OEM supplied PTO.

Piercing and Cutting Capability

The system shall be capable of penetration through the following material:

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- Concrete with thickness up to 2” inches (50 mm)
- Concrete block walls
- Steel surfaces with thickness up to 1/2” inch (12 mm)
- Aluminum surfaces with thickness up to 1” inch (25 mm)
- Wood material and plywood with thickness in 1/2” to 4” inches range (12 mm to 100 mm)
- Composite materials with thickness up to 4” inches (100 mm)
- Plexiglas material with thickness up to 1/4” inch (6 mm)

Performance Capabilities and Applications

a) The fire-fighting system shall be tested and proven to be highly effective in the following capabilities:

- Piercing
- Cutting
- Access
- Containment

b) The fire-fighting system shall be tested and proven to be highly effective in the following application and uses:

- ARFF
- Structural
- Transport

c) In addition, the system shall have the following attributes and operation features:

- Hydraulic drive motor for quick and dependable start-up under varying temperature and altitude conditions.
- Completely forward deployable and self-contained unit for local installation by technicians.
- Simple operator interface that requires limited training levels.
- Unit shall be capable of operation in approximately 15 seconds and penetration operations in approximately 1 minute.
- Use of abrasive material shall be non-corrosive allowing the unit to be ready for instant deployment in a pre-loaded state.

The unit shall include a fully contained automatic manifold induction system, which shall not require any valves downstream of the abrasive feed line.

ENCLOSURE MOUNTING

The fire-fighting system shall be packaged in a self-supporting framework with dimensions of 36” (915 mm) wide, 24” (610 mm) deep, and 26” (660 mm) high. The mounting assembly shall be powder coated and shall be designed to contain the specified major components of the system.

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ULTRA-HIGH PRESSURE FIRE PUMP SPECIFICATIONS

The fire-fighting system shall be equipped with a heavy duty ultra-high pressure plunger type positive displacement fire pump that is driven by a hydraulic motor.

The pump shall have the following features:

- Pump rating: 10 GPM @ 2,200 PSI (40 LPM @ 150 bar)
- System operational rating: 10 GPM @ 2,200PSI (40 LPM @ 150 bar)
- Brass Manifold
- Stainless Steel Check Valve
- Stainless Steel Plunger Rods
- Bronze Connecting Rods
- Tapered Roller Bearings
- Solid Ceramic Plungers
- Heavy Duty Flat Base
- High Pressure Seals
- Heat Treated Crankshaft

HYDRAULIC DRIVE SYSTEM SPECIFICATIONS

The hydraulically driven ultra high pressure water pump, lance, and fire fighting tool shall be controlled by a PTO (OEM supplied) that is activated via the master PTO switch. The hydraulic drive motor shall be engaged via a load sensing / pressure compensating hydraulic pump flow control switch which will activate when water flow in the fire pump circuit is sensed (OEM supplied). This allows the variable speed hydraulic drive pump to spool up to maximum flow regardless of engine RPM with high idle being the starting point.

If the water flow condition in the water circuit is stopped it will the pump will be put into standby mode until the water flow begins again. As soon as water begins to flow again through the UHP fire pump, the demand on the hydraulic drive pump will return the system to pumping the full rated hydraulic pump capacity regardless of engine RPM.

Hydraulic drive system shall consist of the following components:

- Hydraulic Motor
- 40 gallon (152 L) Hydraulic Reservoir
- Hydraulic Cooler
- Thermostat
- Variable Speed Hydraulic Pump*
- PTO*

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The PTO and Variable Speed Hydraulic Pump shall be supplied and installed by the apparatus OEM truck builder. The PTO ratio, hydraulic pump, and coupling shall be approved by PyroLance prior to the installation of the unit.

The system shall be capable of delivering full rated output at apparatus high idle rpm.

INSTRUCTIONS AND LABELING

A fire-fighting pump instruction nameplate and necessary warning labels shall be installed on the assembly. (English language)

PANEL LIGHT

The pump control panel shall be provided with an LED 12 volt light.

PUMP CONTROL PANEL

The control panel shall be ergonomically designed and operator friendly. The panel shall be labeled and installed to be easily visible from the operator's position. The following instruments and controls shall be installed:

- Emergency Stop/Master Switch (red)
- Override water "on" push button
- Override abrasive "on" push button
- Override safety control button
- Control panel light
- Two (2) UHP pressure gauges

PLUMBING

The fire-fighting system shall be plumbed with high pressure hydraulic type hose, plumbing and fittings. This shall include double wire braided high pressure hoses of various sizes, zinc plated steel hose ends, and plated steel hydraulic fittings. The threads shall be male and female NPT, JIC and SAE O-ring style in various sizes. Rigid plumbing shall be in zinc plated steel piping with pipe fittings of zinc plated steel.

BYPASS UNLOADER VALVE

The ultra-high pressure plumbing system shall include a bronze adjustable by-pass unloading valve set for the proper working pressure of the system. The valve shall unload the excess pressure to the intake side of the pump.

PRESSURE SAFETY, EASY START, THERMAL RELIEF VALVE

The ultra-high pressure plumbing system shall include the following devices:

- a.) One (1) pressure safety relief valve which shall relieve water pressure to atmosphere; set at a slightly higher pressure than the unloading valve.
- b.) One (1) thermal relief valve which shall open if water temperatures exceed 145 F (62 C) degrees; designed to protect the pump from high temperature conditions and relieve the water to atmosphere.

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c.) One (1) EZ start valve.

INTAKE FILTER

A 1-1/4" (31 mm) water filter with 32 mesh stainless steel screen shall be installed in the water supply line to the fire pump. The filter shall be accessible for cleaning the screen.

ELECTRICAL WIRING

Necessary low voltage automatic circuit breaker protection shall be provide where required. Wiring shall be stranded copper automotive type, sized for the appropriate electrical load. Exposed wiring shall be protected with convoluted split plastic loom; such looms shall be mechanically secured. Wiring shall be run in protected areas or enclosed in metal panels where subject to mechanical injury. Electrical connections and termination of wiring shall be within weather proof plastic enclosures with waterproof strain reliefs and connectors.

WATER TANK SUPPLY LINE

A 1.25" (31 mm) water tank to fire pump line shall be installed as follows:

- a) From the fire pump to the water filter shall be a 1.25" (31.75mm) flexible transparent hose.
- b) One (1) 1.25" (31.75mm) manually operated valve with control handle.
- c) 15' (5 meters) of 1.25" (31 mm) flexible water hose with removable connections and clamping devices to connect to a (non-drafting) water supply / source.

HIGH PRESSURE DISCHARGE GAUGES

Two (2) 2.5" (62 mm) liquid filled pressure gauges shall be installed.

THROTTLE CONTROL GOVERNOR (OEM SUPPLIED)

Once the PyroLance system is engaged the engine RPM shall be controlled by an electronic throttle control governor via the wireless remote control nozzle, which shall automatically increase engine speed to 1,450 RPM when actuated, and when released return the engine speed to idle.

The electronic throttle control governor is an engine type specific part and shall be supplied and fitted by the OEM in consultation with the specific engine/chassis manufacturer.

The electronic throttle control governor shall be interfaced with the engine electronic control module (ECM) and will be active once the PyroLance system is engaged and master/emergency stop switch is activated on the PyroLance control panel.

The system shall:

- Reduce engine RPM when the pump is in by-pass resulting in reduced engine wear.
- Prolong pump life by reducing potential heat build-up while the pump is in by-pass.
- Reduce fuel consumption because the engine is not continually running at full RPM.
- Allow the PyroLance system to be shut down in case of emergency by activating the Master/Emergency stop switch.

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- Allow the hydraulic bypass unloader valve to go into by-pass mode and drop the hydraulic system pressure to 300 PSI (20 bar) or less when the water flow control valve is closed.
- Allow rapid on/off throttle response eliminating pressure control delays when the PyroLance system is in operation.

ABRASIVE VESSEL

Piping shall be installed from the water control valve and from the abrasive vessel to a "T" connection and then to the hose reel.

The abrasive holding tank shall be automatically pressurized when the pump system is activated. When the vessel is pressurized, the abrasive shall flow to a "T" connection, where it combines with the ultra-high pressure water flow and directed to the hose reel and piercing nozzle.

The high pressure vessel shall be as follows:

- Capacity: 2.5 gallons (9 liters).
- Filler opening: Large thread high pressure filler cap assembly.
- Storage vessel: Certified ASME type 3,000 PSI (200 bar) high pressure storage vessel
- A high pressure discharge gauge on the pump panel.
- Tank design: Steel vessel with abrasive material capable of being stored over a prolonged period, yet ready for immediate use.

ABRASIVE MATERIAL

Three (3) 1 gallon (3 L) plastic containers of Pyro-Shot abrasive material shall be supplied. The abrasive material shall be inert non-metallic material that will not rust, damage the environment, or damage the operator's protective clothing.

ELECTRIC REWIND HOSE REEL – ULTRA-HIGH PRESSURE

One (1) ultra-high pressure steel hose reel shall be installed with a maximum capacity of 200' of 3/4" hose per reel. The reel shall have a leak proof ball bearing swing joint, electric 12 volt rewind provisions. The reel system shall be designed for a 2,000 PSI (135 bar) working pressure. The reel shall be painted red.

Each reel shall be equipped with a locking pin assembly.

The high pressure hose reel shall be supplied by a 1/2" (12 mm) hydraulic type wire braided flexible hose line.

One (1) push button electric rewind control shall be installed near the reel. The wiring from the hose reel electric box shall be protected with conduit or loom.

The hose reel shall be equipped with a electrical wiring junction box of plastic construction with a sealed cover assembly. The box shall house the reel solenoid, circuit breaker, and electrical wiring for the rewind control circuit and electric rewind motor power supply. The electrical supply shall be sized for the reel motor for both positive and neutral cables. The electrical supply wiring shall be supplied from the main electrical supply box for high pressure pump skid or module. The supply line to the reel shall have a quick disconnect connection at the main electrical supply box.

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One (1) stainless steel hose roller assembly shall be supplied with reel for protection of the hose during hose removal and rewind operations.

REEL MOUNTED ULTRA-HIGH PRESSURE HOSE

150 foot (45 m) length x 3/4" (19 mm) hose shall be installed with threaded couplings. The hose shall have a working pressure of 3,125 psi (215 bar).

The hose reel(s) shall be installed by the OEM.

WIRELESS ULTRA-HIGH PRESSURE PIERCING NOZZLE

The wireless ultra-high pressure piercing nozzle shall provide a hand operated trigger control for remote operation of water and aggregate flow. The system shall incorporate remote controlled communications using a wireless transmitter/receiver. In addition to this system, the unit shall include an 'override' system whereby both the water flow and abrasive flow can be controlled by a second operator at the pump panel utilizing "dead-man" control override switches.

For piercing operations both trigger and toggle switch shall be actuated, which shall remotely open the water valve and abrasive control valve. The nozzle shall include:

4. One (1) trigger to control the flow of water from the ultra-high pressure water pump unit. The trigger mechanism shall control the flow of water at a rate of 10 GPM (40 LPM)
5. One (1) toggle switch to control the flow of abrasive material from the storage vessel.
6. Piercing operation:
 - a. The nozzle tip shall be placed against the surface to be pierced.
 - b. Initially the operator shall activate the toggle switch and pull the trigger for combined flow of water and abrasive material flow at extremely high velocity.
 - c. The nozzle shall quickly cut a small hole through the material.
 - d. After the material is penetrated, the operator shall de-activate the abrasive switch toggle and shall continue the flow of ultra-high pressure water into the hazardous area.

Nozzle Design

The nozzle barrel shall have an internal diameter of 1" (25 mm) which shall extend through the nozzle body. The rigid hollow barrel extends between the rear inlet and nozzle tip. The overall Lance design shall be approximately 53" in length.

An ergonomically designed shoulder support shall be mounted to the rear nozzle barrel area and positioned to provide additional support to an operator. The forward nozzle barrel shall have an integral grab handle to allow the operator to safely and accurately direct the fluid flow against a surface. The nozzle shall also be equipped with a three prong offset fixture with a splash plate to protect the operator from spray-back of fluid and debris during the cutting operations.

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A replaceable nozzle tip shall be mounted at the forward end of the nozzle barrel. When the nozzle is activated the abrasive material and high pressure water shall exit the nozzle tip in a focused water jet capable of cutting through various materials.

After penetration, the ultra-high pressure water shall continue through the nozzle projecting a jet stream having water droplets of appropriate size and velocity to effectively knock-down a thermal column within a closed space.

Wireless Transmitter

The nozzle shall be equipped with an enclosed manifold area which shall house a micro-switch for each function (primary water flow trigger and abrasive material flow toggle switch).

A wireless transmitter shall send command signals back to the pump assembly micro-processor electronic control center. The nozzle wireless transmitter shall be battery powered with an operating time of no less than one day of continuous use.

The nozzle shall be also equipped with an emergency manual override system at the power unit panel with switches to activate abrasive and water flow. This shall enable use of the system should transmission be lost due to excessive RF interference or “out-of-line-of-sight” deployment of the hose line.

LANCE 2.4GHZ RADIO RECEIVER WITH BLACK ANTENNA

A 2.4GHz transmitter and receiver shall be supplied.

FACTORY TESTING PRIOR TO SHIPMENT

The entire pump and the plumbing system shall undergo a complete factory test.

CRATING

The equipment shall be properly crated, sealed, and protected for shipment. The crate shall be approximately: 54" (1372 mm) wide x 79" (2007 mm) long x 44" (1118 mm) high in size and less than 2,500 lbs. (1,134 kg) in weight.

WARRANTY

The PyroLance ultra-high pressure type firefighting system components shall be covered by a one (1) year parts and labor warranty. The installation portion of the warranty shall be covered by the final stage assembler.

TECHNICAL MANUAL

The ultra-high pressure firefighting system shall be covered by a detailed technical manual covering installation, testing, operation, maintenance, and parts. This manual shall have various levels of warnings and caution notices provided. Paper and electronic portions will be supplied with the apparatus.