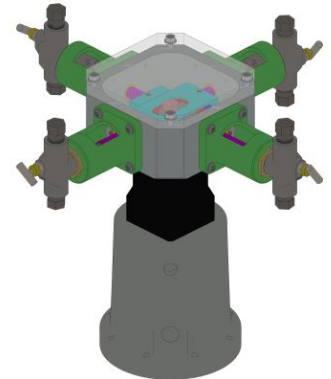




## CROSSFIRE Ultra-Low Power Chemical Injection Pump

### Introduction

The LCO Technologies *CROSSFIRE* Chemical Injection pump is an ultra-low power device that is designed to reduce chemical costs, maintenance costs and methane emissions. It is a durable, energy-efficient solution like no other that can run for weeks – not days, even in areas with limited sunlight. It can be configured with one to four fluid ends, allowing you to replace up to four pneumatic pumps with one unit.



### Features

The *CROSSFIRE* chemical injection pump includes the following key features and benefits:

- Eliminates methane venting from chemical injection
- Precise chemical injection
  - Delivers chemical proportionate to flow
  - Consistent chemical dispersion rate
  - Delivers <1L/day to 720 L/day up to 10,000 psi
- High system autonomy
  - Ultra-low power chemical injection pump that can run weeks, not days on most applications
- Standard 5100 series fluid ends for field familiarity
  - Customization available based on fluid end size, packings, and O-rings based on application
- Comes complete with a smart controller that has MODBUS communications built in as a standard
  - Option to upgrade to an advanced controller that has standalone automation capabilities
- User friendly operator and technician interface that is password protected

### Explosion Proof Motor Assembly

- Class 1, Division 1 Group CD T6 Explosion Proof Motor Assembly
- Rated input 24 Vdc, 9.9 Amps, 750 rpm, Class B, Continuous Stall Current 11A, Rated output power 190W
- Ambient Temperature: -40 C to +60 C
- Efficient, compact and powerful permanent rare earth magnet motor
- The drivetrain is specifically designed to work continuously and reliably in the extreme ambient temperature of the North

### Planetary Gearbox

- Custom design with double support mechanism for increased durability and stability to withstand tangential force up to 400 lbs
- Double stage, 20:1 ratio to deliver high torque to the pump assembly
- Closed casing to keep dust and contaminant free
- Lifetime lubrication, no maintenance required



## Smart Controller Features

- Sophisticated Field Oriented Control (FOC) scheme used to drive the 3-phase rare earth permanent magnet BLDC motor for maximum torque performance and efficiency
- Sensorless design with no Hall Effect sensor signal required for control
- Only 3 standard conductor flex armour cables are required to power the motor and cables can be a maximum of 60ft long (gauge 10)
- Built in protection schemes to protect equipment such as: ground-fault, over-voltage, over-current, under-voltage, short-circuit, reverse polarity from power supply, unbalanced loading due to broken / loose motor power lines, and fast logic to shut down and isolate motor in the event of faults
- Direction of motor rotation is reversed automatically every 20,000 revolutions to increase life span of the cam box and minimize natural wear and tear; this can be customized per application if necessary.
- Permanent record of total stroke counts, volume of chemical injected for each plunger, system status and operating conditions. Data can be accessed remotely via SCADA or with the use of the local operator interface and is time and date stamped.

Process control and programmable logics:

- Specific programmable logics and control algorithm can be developed to meet customer needs
- Built-in process control functions, such as PID, ratio and feedback controls
- Multiple digital and analog IO's to transmitters and final control elements
- Serial and Ethernet communication to a data modem, a flow computer or a HMI
- Onboard temperature sensor to indicate temperature of the controller

## Software Interface

LCO Technologies' *CROSSFIRE* Software Interface is a tool that allows for easy configuration and monitoring of the controller for the *CROSSFIRE* platform. By connecting to the controller's RS232 serial port from a Windows or Macintosh computer, both operators in the field and technicians performing more advanced setup of the controller are able to monitor and configure the device from a simple, intuitive interface.

The software's password protected separation of roles between operator and technician, allows the user to be presented only with the information and options required for their task. This eliminates distraction and reduces the chance of accidental misconfiguration.

A mobile version of the software is also available, allowing users of iOS or Android smartphones and tablets to connect to and configure the controller, using the RS232 Bluetooth LE adapter available for the controller.

Specs/software requirements:

- A computer with either Windows XP/7/8.1/10 or MacOS 10.10 or later
- 512 MB RAM
- 50 MB hard drive space



### Hazardous Area Certifications

The CROSSFIRE has the following hazardous certifications:

- The Explosion Proof Motor Assembly (**Model LCOM-1000**)
  - CSA certified to Class 1 Division 1 Groups CD T6  
Rated input 24 VDC, 9.9 Amps, 750 rpm maximum, Class B, Continuous Stall Current 11 A, Rated Output Power 190W  
Ambient Temperature -40°C to +60°C
- The Smart Controller (Model **LCOC-1000-A** and **Model LCOC-1000-B**)
  - CSA certified to Class 1, Division 2, Groups CD T4  
Rated Input 24 VDC, Vac, 9.9 Amps  
Rated Output 24 VDC, 9.9 Amps  
Ambient Temperature: -40°C to +60°C

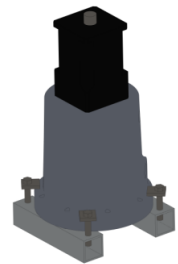
### Integration with Chemical Manager

The versatility of the CROSSFIRE controller facilitates use between the controller and several Emerson RTU based smart applications such as Chemical Manager & Local Display Manager. Modbus communications between the RTU and the controller have been pre-mapped and this out of the box solution requires very little configuration. Several advantages of coupling the CROSSFIRE & Chemical Manager have been listed below:

- Improved operation visibility of current chemical status and demand outlook
- Detailed tank inventory data (Fill info, chemical expiration, live values, and alarming)
- Built in and user defined inhibits

### Mounting Bracket

The CROSSFIRE mounting bracket is light weight, low-cost and simple. When clamped on to the CROSSFIRE, it brings the unit 1.5” out of the drip tray and has the same bolt pattern as the Texsteam 5100 pneumatic pumps for easy field integration.



### Vee Packing Temperature Rating

Material	Minimum Temperature	Maximum Temperature
Buna N	-40 °C	+120 °C
Viton	-26 °C	+204 °C
Teflon	-268 °C	+232 °C
Flurosilicone	-56 °C	+204 °C
Rockhard	-40 °C	+120 °C



Maximum Operating Conditions

Fluid End Size	Maximum Pressure Rating (psi)						Injection Range* (L/day)
	Zebra Buna/PTFE	Buna	Teflon	Viton	Flurosilicone	RockHard	
1/2"	2500	2500	3000	2500	3000	3000	4.6 L/day - 171.4 L/day
3/8"	4000	3000	3000	3000	3000	6000	2.6 L/day - 96.4 L/day
1/4"	6000	3000	3000	3000	3000	6000	1.2 L/day - 42.9 L/day
3/16"	6000	3000	3000	3000	3000	6000	0.7 L/day - 24.1 L/day

\*Note: The pumping volumetric efficiency of the fluid end will decrease with an increase in discharge pressure. Values listed are theoretical and based on one fluid end.

LCOC-PUMP Specifications

CPU Module	
Processor	NXP 1769 microcontroller with ARM Cortex M3 processor
Memory	SRAM – 64 KB Flash: 512 KB Onboard flash: 64MB (Advanced Model only)
Clock	Crystal oscillator: 120 MHz Battery backed Real-Time clock Watchdog timer
Communications	
Ports	COM 1 3-wire RS232 for data modem or HMI. Maximum cable length: 25 ft.
	COM 2 RS232 DB9 connector Supports operator interface via a serial cable or with a Bluetooth dongle Maximum cable length: 25 ft. Maximum Bluetooth range: 50 ft.
	Modbus COM 2 or 3-wire RS485 for FB107/SCADA, Maximum cable length: 4000 ft. Ethernet 10/100. Maximum cable length: 350 ft.
Protocols	Serial Modbus/RTU slave support on the RS485 port Serial communication in ASCII on COM1 and COM2
LED	
Advanced	16 LED's to indicate system status, digital IO's and COM port traffic
Basic	12 LED's to indicate system status, digital IO's and COM port traffic
Reset Button	
1 reset button to reboot controller. Press with a pin	



## IO Specs

Controller	Advanced	4 Digital Inputs, 4 Digital Outputs, 3 Analog Inputs and 1 Analog Output
	Basic	2 Digital Inputs, 2 Digital Outputs, 3 Analog Inputs
All Digital Inputs can be discrete or pulse counter inputs.		
All Digital Outputs can be discrete, pulse or PWM outputs, depends on software selection.		
Digital Inputs	Input Type	Discrete level or pulse train, software selectable
	Isolation	Each channel is individually isolated
	Voltage	10-36 Vdc
	Scan Rate	100 ms for discrete level. 400 us interrupt for pulses
	Frequency	Maximum 2.5 KHz pulse input
	Loop Power	Externally sourced
	Input Current	7.5 mA at 24 Vdc
Digital Outputs	Output Type	Dry contact, pulse train, PWM, software selectable
	Isolation	Each channel is individually isolated
	Voltage	10 – 36 Vdc
	Scan Rate	100 ms for discrete level
	Frequency	Maximum 10 KHz pulse output. 1.5 KHz, 10-90% duty cycle PWM
	Loop Power	Externally sourced
	Output Current	1.0 A at 24 Vdc
Analog Inputs	Input Type	4-20 mA on 250 Ohm resistor or 0 - 5 V direct, software selectable
	Isolation	All analog channels share the same ground
	Scan Rate	100 ms
	Loop Power	Externally sourced
Analog Outputs	Output Type	0 – 5 V
	Isolation	All channels share the same ground isolated
	Scan Rate	100 ms
	Loop Power	Internally sourced

## Power

External DC Power Supply: 18 – 30 Vdc  
Power consumption: 35 mA @ 24 Vdc  
Real-Time Clock battery: 3V Lithium button type CR2032

## Physical

Controller	Construction	Fibre glass base plate and top cover
	Mounting	Bolt down to panel backplane with 4 screws or mount with 2 DIN-rail clips
	Dimensions	145 mm W by 240 mm L by 27.6 mm
	Weight	470 g
	Wiring	24 Vdc power supply: size 10 to 12 AWG Motor power lines: size 10 to 14 AWG Digital and Analog I/O: size 24 to 14 AWG



Wiring Access Easy access from the top

Environmental

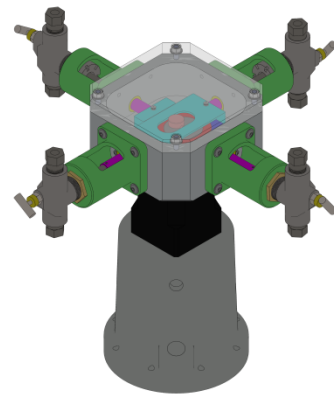
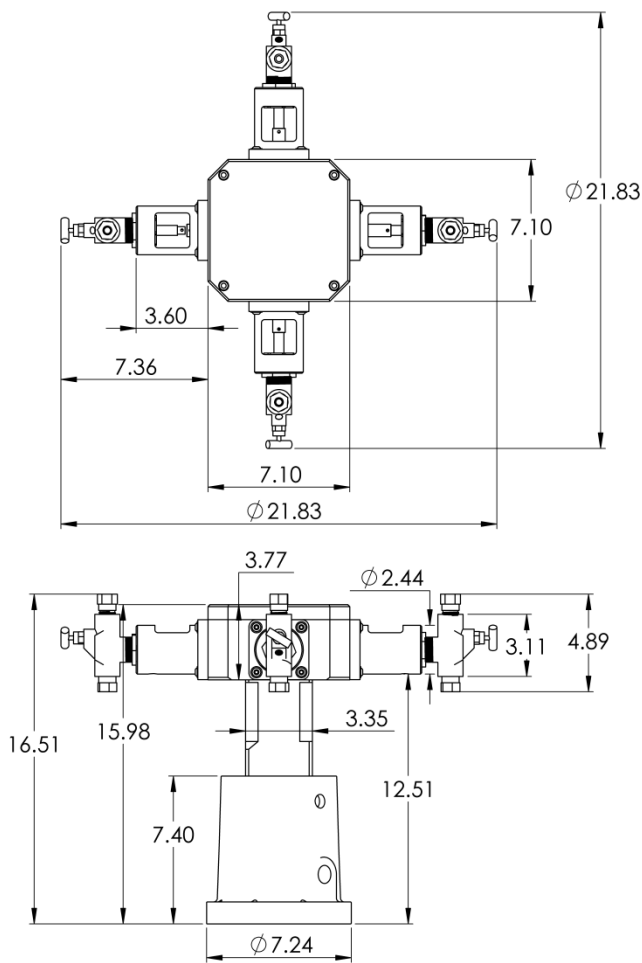
Operating Temperature: -40 C to +60 C
Storage Temperature: -50 C to +85 C
Operating Humidity: 5 to 95%, non-condensing

Regulatory Approvals for Hazardous Locations

CSA Certification

Controller Class 1, Division 2, Groups CD T4
Motor Assembly Class 1, Division 1, Groups CD T6

Dimensional Drawing:



Overall Dimensions:
H: 16.51 in
W: 21.83 in
L: 21.83 in