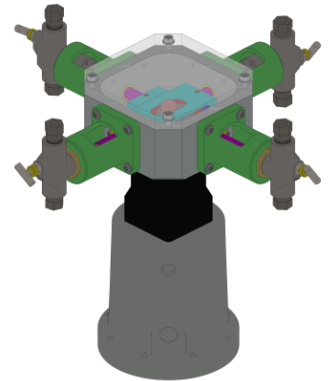




CROSSFIRE Ultra-Low Power Chemical Injection Pump

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 for 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

Planetary Gearbox

- Custom design with double support mechanism for increased durability and stability
- 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 (plus ground) standard conductor flex armour cables required to power the motor
 - Cable length: maximum 60ft long (gauge 10)
 - Longer cables are acceptable with larger gauge conductors
- 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 month to increase life span of the cam box and minimize natural wear and tear
- 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 Logic:

- Specific programmable logic and control algorithm can be developed to meet customer needs
- Built-in process control functions, such as toggle switch control, plunger lift control, timer control, PID, ratio and feedback controls
- Multiple digital and analog IO's to transmitters and final control elements
- Serial communication to a data modem, RTU or flow computer, pole top Bluetooth module, or HMI
- Supports standard MODBUS/RTU protocol for remote control and monitoring

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 computer, both operators in the field and technicians performing more advanced setup of the controller can 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 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 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

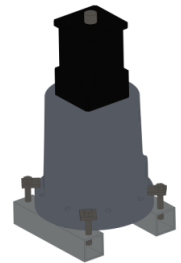
Integration with Chemical Manager

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
Fluorosilicone	-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	Fluorosilicone	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 Bluetooth pole-top module Maximum cable length: 130 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 RTU, SCADA and HMI Maximum cable length: 4000 ft. Ethernet 10/100 - Maximum cable length: 350 ft (Advanced model only)
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
--	-------	--

DI1-DI3 are discrete

DI4 is pulse count input (Advanced model only)

All Digital Outputs are discrete

Digital Inputs	Input Type	DI1-DI3: Discrete level
----------------	------------	-------------------------

DI4: Pulse count input

	Isolation	Each channel is individually isolated
--	-----------	---------------------------------------

	Voltage	10-36 Vdc
--	---------	-----------

	Scan Rate	100 ms for discrete level. 400 us interrupt for pulses
--	-----------	--

	Frequency	Maximum 10 KHz pulse input
--	-----------	----------------------------

	Loop Power	Externally sourced
--	------------	--------------------

	Input Resistance	20,000 Ohm
--	------------------	------------

Digital Outputs	Output Type	Dry contact
-----------------	-------------	-------------

	Isolation	Each channel ground is individually isolated
--	-----------	--

	Voltage	10 – 36 Vdc
--	---------	-------------

	Scan Rate	100 ms for discrete level
--	-----------	---------------------------

	Loop Power	Externally sourced
--	------------	--------------------

	Output Current	Maximum 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: 24 Vdc, however will function within 18 – 30 Vdc range

Controller 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: 10 AWG, Max 60 ft
	Motor power lines: 10 AWG, Max 60 ft
	Digital and Analog I/O: size 20 to 24 AWG

Wiring Access	Easy access from the top
---------------	--------------------------

Environmental

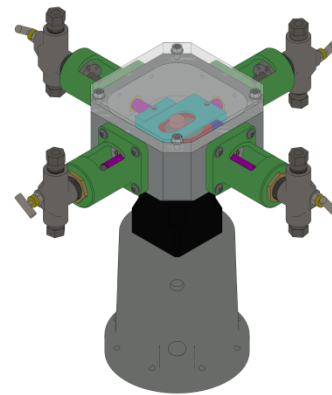
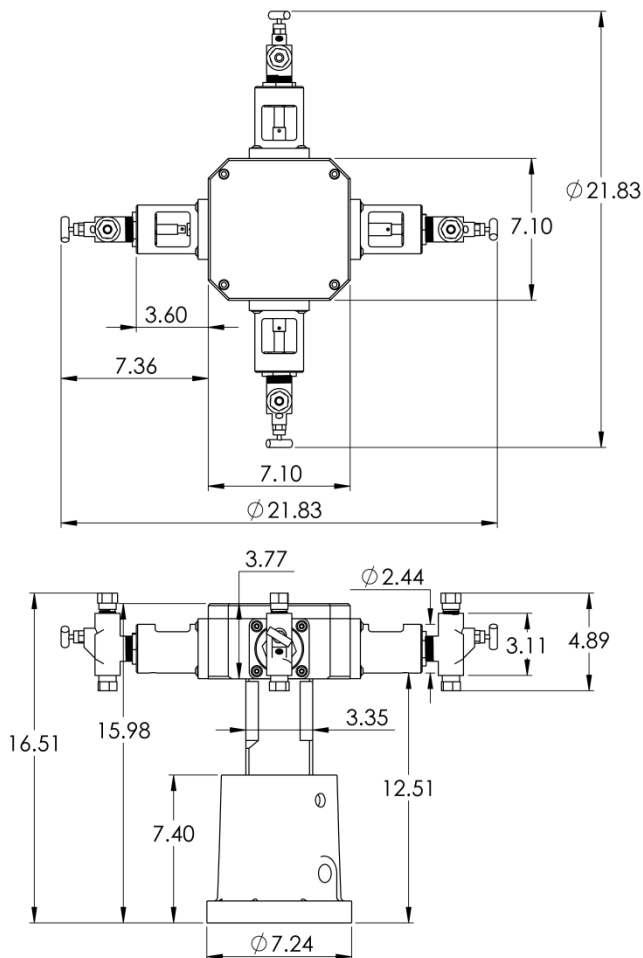
Operating Temperature: -40 C to +60 C
Storage Temperature: -50 C to +85 C
Operating Humidity: 5 to 95%, non-condensing

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