

LDS-665-03

2205 6107 01.01 Page 1 of 6 31 August 2022



Fully Automatic Switchover Manifold for Liquid Cylinders, Liquid Withdrawal - Temperature Operated (CFAM-TX Series - Laboratory Applications)

SPECIFICATION

Introduction and Manifold Description

The BeaconMedaes CFAM-TX Series manifold operates as a fully automatic switchover control system, dispensing cryogenic liquid from liquid cylinders when the downstream pipeline pressure drops below a predetermined set point. When the "IN USE" supply bank is depleted, the manifold automatically switches over to a "READY" (full) supply bank.

The CFAM-TX manifold is composed of a manifold enclosure box, a control module, a left and right valve header and liquid cylinder hoses. Within the manifold enclosure, a Micro-PLC controls the manifold, as it monitors liquid cylinder pressures and withdrawal temperatures.

The CFAM-TX manifold is primarily used to feed liquid nitrogen to cryogenic storage freezers, but liquid argon and liquid oxygen service is also available.

Visual Indicators and Audible Signal

The manifold's enclosure box is equipped with a series of lights indicating the status of each bank. A green LED illuminates when the cylinder bank is "IN USE", a yellow LED indicates when the bank is "READY", a red LED signals that the bank is "EMPTY" and a blue "COOL DOWN" LED will switch on when the Cool Down process (pressure and temperature of the bank is being monitored) is happening. The controller box also includes a white "LIQUID NITROGEN REQUIRED" LED. When this LED is illuminated, it indicates that cryogenic liquid is needed by the application.

When the cylinder bank is depleted, the buzzer sounds while the red "EMPTY" LED turns on. Pushing the silence push-button kills the buzzer without extinguishing the corresponding red light. Once the operator changes out the empty cylinder and pushes the RESET push-button, the red light extinguishes and the yellow "READY" light illuminates for that bank.

Micro-PLC

The CFAM-TX is driven by a Micro Programmable Logic Controller (PLC). The PLC receives signals from the three (3) pressure transmitters and the two (2) temperature transmitters of the CFAM-TX manifold to determine when the "IN USE" liquid cylinder bank is depleted and that it is time to switch over to the "READY" cylinder bank. Time is also a factor in the switchover process. The factor of time is important primarily due to the cool down process of the different components of the system. It is very important to understand that the switchover process takes several minutes with the CFAM-TX. If a faster and more accurate response is required for an application, a scale-actuated manifold (BeaconMedaes **CFAM-WX**) should be considered.

LCD Screen and Keypad

The Micro-PLC is equipped with an LCD Screen and Keypad, allowing the user to adjust some parameters of the switchover process to suit application requirements. The field adjustable parameters include the minimum cylinder pressure, minimum pipeline pressure and the cooldown lag time.

Ice and Water Management

Some "water management" is required with this equipment. Because air is always humid and the wetted components get extremely cold, the ambient air humidity (water vapor) will freeze up the wetted parts and ice will accumulate on them. When the equipment is not in service, the ice will melt and water will drip down. The amount of water will vary upon the relative humidity of the air and the usage of the cryogenic manifold.



LDS-665-03

2205 6107 01.01 Page 2 of 6 31 August 2022

Standard Configuration



Materials			
Enclosure	Polyester, NEMA 4X, c/w Mounting Bracket and Stainless Steel Latches		
Pipes	Brass (Some brass fittings are Silver Brazed together)		
Tubing	Stainless Steel		
Fittings	Brass, Stainless Steel		
Hoses	Stainless Steel (All Wetted Parts)		
Solenoid Valves	Bronze Body - Teflon Seat - Stainless Steel Plunger		
Relief Valves	Brass Body - Teflon Seat- Stainless Steel Spring		
Wall Mounting Frame	Aluminum Strut with Galvanized Steel Fittings		
Thermowell	Type 316 Stainless Steel		



LDS-665-03 2205 6107 01.01 Page 3 of 6

Page 3 of 6 31 August 2022

CFAM-TX Operation and Design



Initial Start-Up

For the initial start up, if both sides are connected and the pressure is adequate, the manifold will start the supply cycle from the left bank.

Cryogenic Liquid Supply Cycle

The supply cycle is controlled by the Micro-PLC. Each bank has one pressure transmitter (located inside the manifold enclosure) and one temperature transmitter (installed directly at each manifold inlet). These transmitters relay real-time temperature and pressure of the cryogen coming from each liquid cylinder bank to the Micro-PLC.

The supply cycle is factory set at 90 seconds as a standard (this time is field adjustable). During that 90 second period, the solenoid valve opens and the Micro-PLC will monitor pressure and temperature fluctuations of the cryogen coming from the bank in service. At the end of the 90 seconds, the solenoid valve closes and the Micro-PLC waits 10 seconds (not adjustable) so that the temperature and pressure stabilizes (this is called the cool down cycle). At the end of the cool down cycle, and if the minimum pipeline pressure is not met, the PLC starts another supply cycle for 90 seconds from the same liquid cylinder as long as:

- a) there is enough pressure inside the liquid cylinder and
- b) the temperature inside the manifold header has dropped or if the temperature reached -150°C (-238°F).

If neither of these conditions are met, the PLC will consider the liquid cylinder is empty and will start the 90-second supply cycle process from the other "READY" bank.

Minimum Cylinder Pressure (MCP)

Each liquid cylinder bank requires a minimum cylinder pressure to be put into service (preset at 3 psi but is field adjustable). If the pressure is below 3 psi or there are no liquid cylinders connected to any of the inlet hoses, the Micro-PLC will automatically consider that cylinder bank to be empty.

Minimum Pipeline Pressure (MPP)

When the pipeline pressure falls under the minimum pipeline pressure (preset at 7 but is field adjustable), the Micro-PLC starts the supply cycle sub-program. When the supply cycle starts, the Micro-PLC checks the cylinder pressure on both cylinder banks. It will always start on the side that was last in use. If the side that was last in use is empty, it will switch to the other bank automatically.



LDS-665-03

2205 6107 01.01 Page 4 of 6 31 August 2022

Technical Specifications				
Fluid	Liquid Nitrogen (Liquid Argon and Liquid Oxygen upon request)			
Maximum Working Pressure	50 psig [3 barg]			
Operating Temperature	-325°F to 120°F [-198°C to 49°]			
Inlet Connections	CGA Fittings - CGA 295 for Nitrogen			
Relief Valve Outlet Connection	1/2" Compression (Stainless Steel)			
Header	1/2" NPS, Brass			
Solenoid Valves	Normally Closed (Power to Open)			
Power Requirements	120 VAC, Single Phase, 6 Amp.			
Audible Alarm	Standard, 85 dBa			

Remote Alarm Signal Circuitry

The remote alarm signal inside the manifold control box of the CFAM-TX Series Manifold has a dry contact available for remote alarm actuation. It is triggered each time either of the two cylinder banks are empty.



When the content inside either of the liquid cylinder banks is depleted, the dry contact switches from the Normally Closed (NC) position to Normally Open (NO) position. The electrical circuit is closed and the alarm device is actuated.





In this situation, both liquid cylinder bank pressures are satisfactory (i.e. not empty). The dry contact inside the remote alarm box is in the Normally Closed position. The electrical circuit is open and the alarm device is NOT actuated.



Ordering Information



BeaconMedaes CFAM-TX Manifold Model Number Chart				
Variable	Definition	Allowable Value	Description	
A	Fluid	CGA 295A CGA 295N CGA 440	Liquid Argon Liquid Nitrogen Liquid Oxygen	
В	No. of Cylinders	2 4 6	One (1) Liquid Cylinder per Side Two (2) Liquid Cylinders per Side* Three (3) Liquid Cylinders per Side*	
С	Hoses	SSHAG VJH	Stainless Steel Hoses with Armor Guard Vacuum Jacketed Hoses	
D	Relief Valves	50	50 PSI	
E	Installation Hard- ware	WM FS	Wall Mounted Bracket Floor Stand	

*For configurations of 2x2 and 3x3, it is recommended to use a VENT KIT (VK Series - sold separately) for the most effective operation of the liquid cylinders. The Vent Kit equalizes the vapor head space in each liquid cylinder and allows each cylinder to withdraw liquid equally and operates at maximum flow capacity.

Example: FULLY AUTOMATIC SWITCHOVER MANIFOLD FOR LIQUID CYLINDERS - TEMPERATURE OPERATED (LIQUID WITHDRAWAL), LIQUID NITROGEN SERVICE, 2 CYLINDERS PER SIDE, VACUUM JACKETED HOSES, WALL MOUNTED.

Example Model Number: CFAM-TX-295N-4-VJH-50-WM

LDS-665-03

2205 6107 01.01 Page 5 of 6 31 August 2022



Dimensions

LDS-665-03

2205 6107 01.01 Page 6 of 6 31 August 2022





1059 Paragon Way Rock Hill, SC 29730 Phone: (803) 817-5600 www.beaconmedaes.com