

TUNE

Multi Parameter Sensor & Closed Loop Flow Rate Controller with 0 to 3V_{DC} I/O

Oxygen ($\pm 1.5\%$), Flow Rate (± 0.1 LPM) Pressure ($\pm 0.5\%$) –45 to +70°C



Fast and miniature Oxygen concentrator Flow rate controller & sensor. Analog proportional outputs, LCD display, Usart present measurements of O₂ content, Flow rate, Inlet / outlet Pressure and gas Temperature. Digital & 0 to 3Vdc Analog Flow Controls.

Specification:

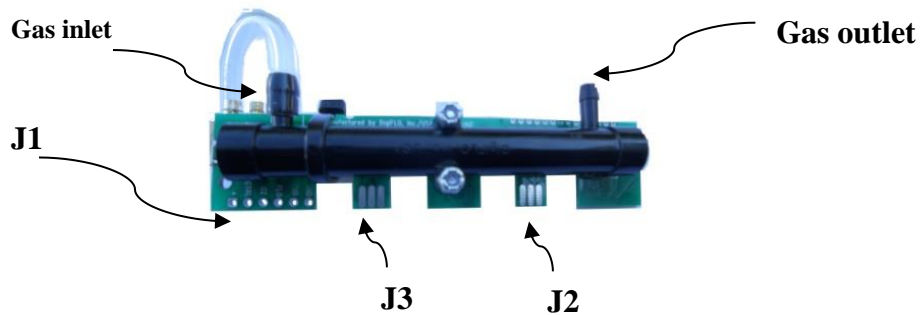
Gas type	Output from Oxygen concentrator
Size	5" x 1" x 1.5" / 82g
Analog Flow Rate control	0 to 3V _{DC} Linearly proportional to 0–10.0 LPM
Digital Flow Rate control	Via DigiDISP Mode button
Analog Flow output	0 to 3V _{DC} Linearly proportional to 0–10.0 LPM
Analog O ₂ output	0 to 3V _{DC} Linearly proportional to 0–100% O ₂
Analog Pressure output	Positive: 0.5 to 3.5V _{DC} Linearly proportional to 0–30 Psig Negative: 0 to 0.5V _{DC} Linearly proportional to -5–0 Psig
Power Supply	Unregulated 12V DC 12ma -valve fully closed; 130ma - valve fully open
Modes Switch	Positioned on DigiDISP. Toggles between O ₂ , Flow, Target Flow, Pressure, Temperature on DigiDISP
Display / RS-232	DigiDISP Connects to J3; DigiRS232 connects to J2
O ₂ Accuracy	$\pm 1.5\%$ @ -5 to +45°C; $\pm 2\%$ @ -45 to -5°C, 45 to 70°C
Flow Accuracy	± 0.1 LPM
Pressure Accuracy	$\pm 0.5\%$ FS
O ₂ Range	Concentration: 20.8% - 95.7%
Pressure Range	-5 to +30psig
Max pressure	30 psig
Operating Temperature range	-45 to +70°C
Survival Temperature range	-85 to +85°C
Thermal Gradient _{max}	50 K/ meter
Thermal response	1°C per Minute
RoHS	Compliant on request
Field Flow Calibration	4 LPM
Operating / Storage humidity	95%RH
Field Pressure Calibration	10 psig
Pressure Port	Configurable to Inlet or outlet
Flow Direction	Unidirectional
Response time	20 mili-seconds

DigiFLO, Inc., USA, <http://www.dgflo.com>, info@dgflo.com,
Tel. 206-232-2193, Fax. 206-275-0229

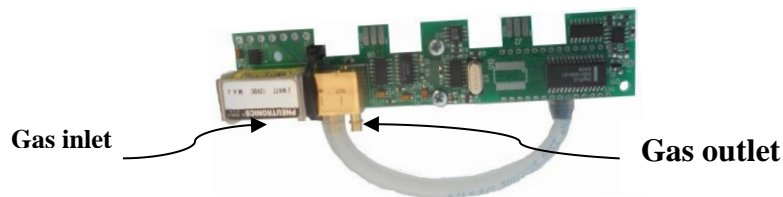
Features

- RS-232 output—TTL level. [DigiRS232](#) adapter converts to RS232 levels. Parity bit is provided
- DigiFLO RS-232 Computer Download Program is available.
- Linear Analog 0 to 3Vdc outputs; LCD display output.
- Digital & 0 to 3Vdc Analog Flow Rate Controls
- Field O2, Flow rate, Pressure calibrations.

PRESSURE SENSOR @ INLET / OUTLET CONFIGURATION



Inlet Flow rate control – Pressure sensor measures outlet pressure



Outlet Flow rate Control - Pressure sensor measures inlet pressure

CONNECTORS

J1– Through Hole

Pin

1. (Square pad) 12V Unregulated DC Power Supply (+)
2. Flow Rate control (0 to 3V_{DC} Linearly proportional to 0-10.0 LPM)
3. Oxygen % Analog Out. (0 to 3V_{DC} Linearly proportional to 0- 100%)
4. Flow Rate Analog Out. (0 to 3V_{DC} Linearly proportional to 0- 10.0 LPM)
5. Pressure Analog Out. Positive: 0.5 to 3.5V_{DC} Linearly proportional to 0–30 Psig
 Negative: 0 to 0.5V_{DC} Linearly proportional to -5–0 Psig
6. USART TTL level TXD. Provides O₂ concentration, Flow Rate, Pressure and gas temperature.
7. 12V Unregulated DC Power Supply (-)

J2 (RS232) – RS-232 I/O - Board Edge

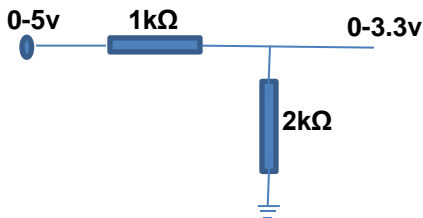
Connects to [DigiRS232](#)

1. +5V Regulated DC
2. USART TTL – TXD
3. USART TTL - RXD – Digital flow rate control.
4. NA
5. 12V_{DC} Unregulated DC Power Supply (+)
6. 12V_{DC} Unregulated DC Power Supply (-)

Connecting to a 3.3v Microcontroller

0 to 5v UART and / or Proportional analog outputs need to be reduced to a 0 to 3.3v range.

Circuit:



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J3 (DISPLAY)–Board Edge

Connect to DigiDISP

Pin

1. + 5V Regulated DC
2. External modes toggle push button input
3. Serial Clock
4. Serial Data
5. Serial Strobe
6. 5V Regulated DC Power Supply (-)

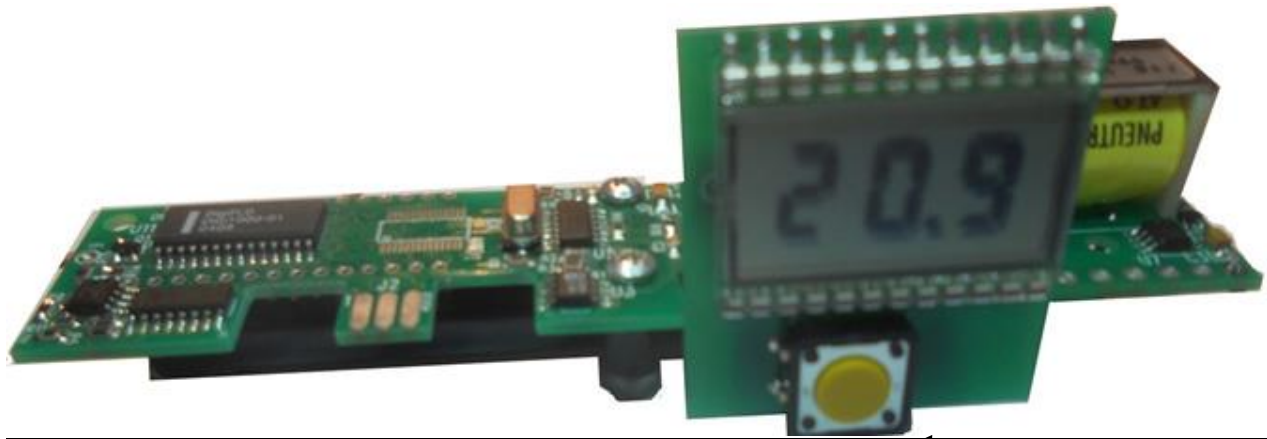
LCD Display

DigiDISP LCD display adapter connects to J3 to provide TUNE parameters' display. Toggle between the 4 display modes: O2, FLO, FGo, PSI, °C is accomplished via push button switch located on DigiDISP.

Display Modes

- O2 - O2 concentration [%].
- FLO – Flow Rate [LPM].
- FGo – Target desired TUNE Flow Rate [LPM]
- PSI – Pressure [PSI]
- °C – Gas temperature [Degrees C]

TUNE in conjunction with DigiDISP



Display Modes

- O2 – Oxygen concentration [%].
- FLO – Flow rate [LPM]
- FGo – Target Flow [LPM]
- PSI – Pressure [PSIG]
- °C – Temperature [°C]

Mode button toggles Display Modes and Digitally adjusts Flow Rate

Digital Target Flow setting procedure

- Toggle to FGo mode.
- Continue holding button till Target Flow appears.
- Release button. Target Flow is saved.

To return to Analog 0 to 3V input target flow control, adjust target Flow to 0, or perform Field Flow rate magnitude calibration.

Field Calibrations

Field calibrations are only intended for savvy users, who prefer to overwrite TUNE factory calibrations.

Field Oxygen, Flow Rate, Pressure Re-Zero

1. Connect a push button switch between TP1 & GND.
2. Attach DigiDISP to TUNE.
3. Purge tune of all gas with Air.
4. Remove Air source.
5. Push & release button repeatedly until TUNE changes its display to O2.
6. Continue holding the button in until TUNE displays CAL.
7. Release button.
8. TUNE has now re-zero'd it O2 & Flow rate, Pressure measurements, such that O2 reading is 20.8% and Flow reading is 0 LPM and Pressure is 0 psig.

Field Flow rate magnitude calibration

1. Connect a push button switch between TP1 & GND.
2. Attach DigiDISP to TUNE.
3. Connect gas Flow source to TUNE inlet
4. Connect a reference Flow sensor to TUNE outlet.
5. Push & release button repeatedly until TUNE changes its display to FLO.
6. Continue holding the button until TUNE displays RdY. Tune will now fully open its valve.
7. Release button.
8. Adjust Flow Rate to 4 LPM.
9. Press & release button again. TUNE will display CAL and then FLO, and then will display 4.0.

Field Pressure magnitude calibration

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1. Connect a push button switch between TP1 & GND.
2. Attach DigiDISP to TUNE.
3. Connect gas Pressure source to TUNE inlet
4. Connect a reference Pressure sensor to TUNE outlet.
5. Push & release button repeatedly until TUNE changes its display to PSI.
6. Continue holding the button until TUNE displays RdY. Tune will now fully open its valve.
7. Release button.
8. Adjust source pressure to 10 psi.
9. Press & release button. TUNE will display CAL and then PSI, and then will display 10.0.

Connecting TUNE to a computer via a COM port

Via [DigiRS232](#) TUNE can be connected to a computer COM port, such that its measured parameters can be stored in a file. DigiFLO program is available.

Serial Asynchronous RS-232 output (J2) Bit Stream

Baud Rate: 19.2K

Parity: Even – each byte contains an Even number of “1”s

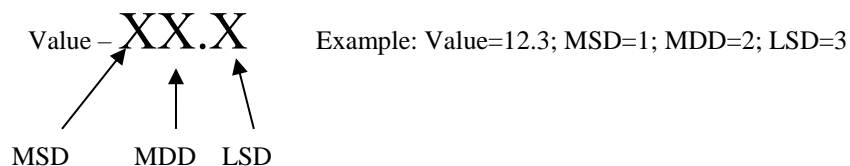
Bits 8

Stop bits 1.

Frame rate: 4 / second

Definitions:

Number	8 bits: MSB – complementing to Even Parity bit + 7 bits
0	0b0000 0000
1	0b1000 0001
2	0b1000 0010
3	0b0000 0011
4	0b1000 0100
5	0b0000 0101
6	0b0000 0110
7	0b1000 0111
8	0b1000 1000
9	0b0000 1001
0x2A	0b1010 1010



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Frame:

Byte 1: Flow Rate[LPM]) – LSD
Byte 2: Flow Rate[LPM]) – MDD
Byte 3: Flow Rate[LPM]) – MSD
Byte 4: Oxygen[%]) – LSD
Byte 5: Oxygen[%]) – MDD
Byte 6: Oxygen[%]) – MSD
Byte 7: Temperature, Pressure sign:
0 - If Temperature positive & pressure positive
1 – If Temperature negative & Pressure positive
2 - If Temperature positive & Pressure Negative
3 - If Temperature Negative & Pressure Negative

Byte 8: Temperature[oC] – LSD
Byte 9: temperature[oC] – MDD
Byte 10: temperature[oC] – MSD
Byte 11: Pressure[Psi] – LSD
Byte 12: Pressure[Psi] – MDD
Byte 13: Pressure[Psi] – MSD

Byte 14: 0x0A (burst delimiter)