



# BTX-Connect

Miniature Diaphragm Pump



ENGINEERING YOUR SUCCESS.

# BTX-Connect Miniature Diaphragm Pump

Up to 11 LPM Free Flow



Parker's BTX-Connect pump product line combines best-in-class diaphragm pump design, innovative "connected" brushless motor technology, ultra-low vibration, and advanced manufacturing techniques to bring a next generation solution to next generation device needs. The BTX-Connect pump is designed to provide high performance with superior quality and reliability. The options for Motor Control, Single Head, Dual Head, Pressure only, Vacuum only, and Pressure/Vacuum configurations offer a wide range of solutions with the support of Parker's global team.

## Applications

- Point of Care Diagnostics
- Negative Pressure Wound Therapy
- Compression Therapy
- Medical Simulation
- Scent Dispersion

## Features

- "Connected" brushless motor design with digital communication control and monitoring available
- Fail-safe design with over-current, over-voltage, and over-temperature shut down
- Optimized pump balancing for ultra-low vibration
- RoHS, REACH, and CE compliant



## Product Specifications

### Physical Properties

|                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating Environment<sup>1</sup>:</b>                                                                                                                              |
| 41 to 122°F (5 to 50°C)                                                                                                                                                |
| <b>Storage Environment:</b>                                                                                                                                            |
| -4 to 212°F (-20 to 100°C)                                                                                                                                             |
| <b>Media:</b>                                                                                                                                                          |
| Air, Nitrogen, Oxygen, and other non-reacting gases                                                                                                                    |
| <b>Humidity:</b>                                                                                                                                                       |
| 0 - 80% Relative Humidity<br>Non-condensing                                                                                                                            |
| <b>Noise Level<sup>2</sup>:</b>                                                                                                                                        |
| As low as 45 dB @ 12 in (30 cm)<br><i>Muffler recommended for additional noise reduction (see accessories)</i>                                                         |
| <b>Pump Assembly Rated Life<sup>3</sup>:</b>                                                                                                                           |
| Brushless Motor up to 15,000 Hours                                                                                                                                     |
| <b>Weight:</b>                                                                                                                                                         |
| Compact BLDC Single Head 4.4 oz (125 g)<br>Compact BLDC Dual Head 5.8 oz (165 g)<br>Slotless BLDC Single Head 7.4 oz (209 g)<br>Slotless BLDC Dual Head 8.4 oz (240 g) |

### Wetted Materials

|                           |
|---------------------------|
| <b>Diaphragm:</b>         |
| Long Life - Advanced EPDM |
| <b>Valves:</b>            |
| EPDM, Advanced EPDM       |
| <b>Pump Head:</b>         |
| PBT                       |

Other materials available upon request

### Electrical

|                                            |
|--------------------------------------------|
| <b>Motor Type (DC):</b>                    |
| Brushless Slotted, Brushless Slotless      |
| <b>Nominal Motor Voltages<sup>4</sup>:</b> |
| 12 or 24 VDC                               |
| <b>Electrical Termination:</b>             |
| Mating Connector: JST PAP-06V-S            |
| Pin 1: Tachometer Speed (Blue)             |
| Pin 2: PWM or 0-5V Input (White)           |
| Pin 3: +DC Voltage Input (Red)             |
| Pin 4: -Ground (Black)                     |
| Pin 5: Digital UART Rx (Brown)             |
| Pin 6: Digital UART Tx (Purple)            |

### Pneumatic

|                                                     |
|-----------------------------------------------------|
| <b>Maximum Unrestricted Flow:</b>                   |
| Single Head: Up to 6 LPM<br>Dual Head: Up to 11 LPM |
| <b>Pressure Range:</b>                              |
| Continuous Duty:<br>Up to 15 PSIG (1 Bar)           |
| <b>Vacuum Range:</b>                                |
| Continuous Duty:<br>Up to -22 inHg (-558 mmHg)      |
| <b>Filtration:</b>                                  |
| 40 microns - recommended                            |

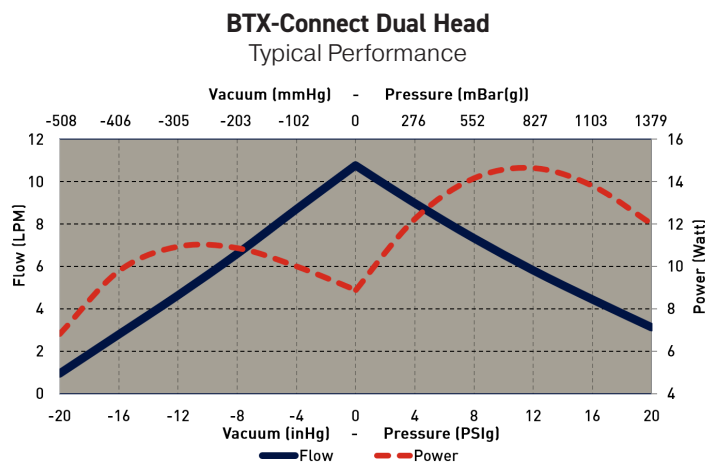
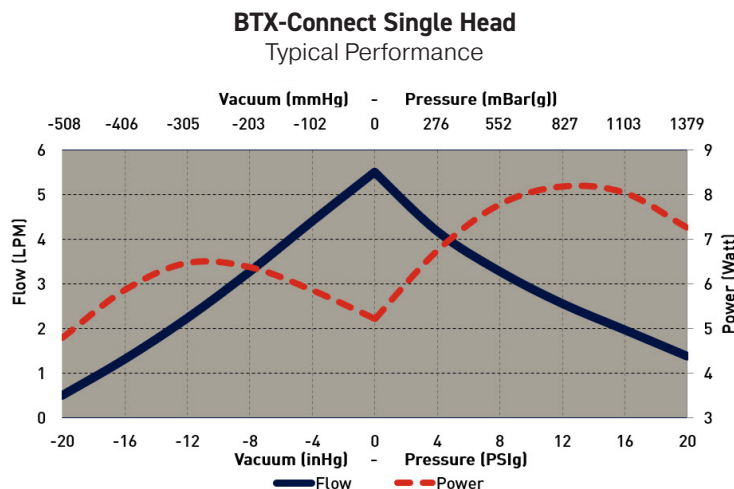
### Connect Features

|                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Speed Control Options:</b>                                                                                                                                                                                               |
| On/Off Control, Factory Set Speed<br>PWM<br>0-5V Analog<br>Serial UART                                                                                                                                                      |
| <i>On/Off only, PWM input, and 0-5 VDC are factory set, see ordering table.</i><br><i>Standard on/off configuration only requires DC power and Ground</i>                                                                   |
| <b>Current Limit Shut Down:</b>                                                                                                                                                                                             |
| Compact BLDC 12V - 1 Amp<br>Compact BLDC 24V - 0.5 Amp<br>Slotless BLDC 12V - 2 Amp<br>Slotless BLDC 24V - 1 Amp                                                                                                            |
| <b>Temperature Limit Shut Down:</b>                                                                                                                                                                                         |
| Compact BLDC: 90°C<br>Slotless BLDC: 90°C<br>Time before shut down: < 1 second<br><i>Temp and current limits are factory adjustable</i>                                                                                     |
| <b>UART Reported Values:</b>                                                                                                                                                                                                |
| Pump Speed: 1 RPM Resolution, <60 RPM reported as 0<br>Motor Temperature: 1°C Resolution, Max = 100°C, Accuracy= +/- 5°C<br>Hysteresis = 5°C<br>Motor Current: 1mA Resolution, Accuracy= +/- 50mA or 5% whichever is higher |



## BTX-Connect Miniature Diaphragm Pump

### Typical Flow Curve



- Dual head performance shown with B2H configuration and pump heads connected in parallel
- Curve shows maximum flow capability with a 0.090" pump offset, which are vacuum or pressure only. Pumps capable of alternating pressure and vacuum are available with 0.050" pump offset or less. See ordering table below for a list of available standard options
- Detailed performance specification sheets are available for each part number

The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety, and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker, its subsidiaries, and authorized distributors.

The above graphs represent an example of performance for the pump series handling air at 800 feet (244 m) above sea level at 75°F (24°C). Performance will vary depending on barometric pressure and media temperature. A variety of configurations can be accommodated to meet application requirements.

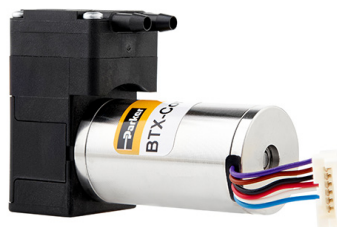
Curves are representative of standard pump configurations. Pump configurations could be customized for higher or lower flows depending on specific customer requirements.

Please contact Parker Precision Fluidics Applications Engineering for other considerations.

## BTX-Connect Miniature Diaphragm Pump Sizing and Selection



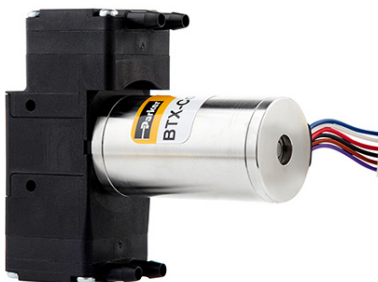
BTX-Connect Single Head  
Compact BLDC Motor  
**B1C**



BTX-Connect Single Head  
Slotless BLDC Motor  
**B1S**



BTX-Connect Dual Head  
Compact BLDC Motor  
**B2C**



BTX-Connect Dual Head  
Slotless BLDC Motor  
**B2S**



BTX-Connect Dual Head  
High Performance Slotless  
BLDC Motor  
**B2H**

|                   |                                 |                                 |                                 |
|-------------------|---------------------------------|---------------------------------|---------------------------------|
| <b>Efficiency</b> | Better                          | Best                            | Best                            |
| <b>Flow Rate</b>  | Good                            | Better                          | Best                            |
| <b>Control</b>    | On/Off, Digital, PWM, 0-5V      | On/Off, Digital, PWM, 0-5V      | On/Off, Digital, PWM, 0-5V      |
| <b>Protection</b> | Reverse Polarity, Temp, Current | Reverse Polarity, Temp, Current | Reverse Polarity, Temp, Current |
| <b>Cost</b>       | Better                          | Good                            | Good                            |

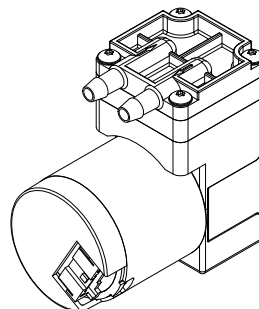
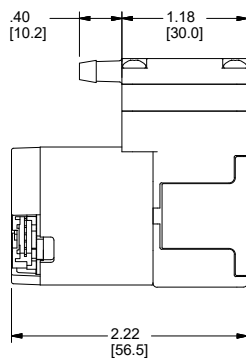
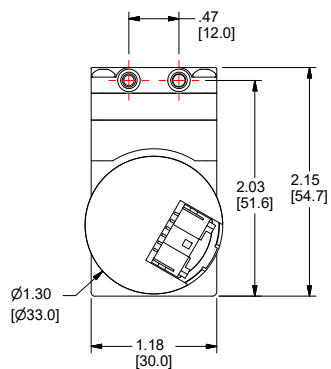
### Mounting Guidelines:

- Bracket options available for mounting consideration (See *EZ Mount catalog pages*).
- Mounting holes are drilled for #6-20 self-tapping screws with 1/4" (6 mm) thread engagement torque to 4 in-lbs (0.45 N-m).

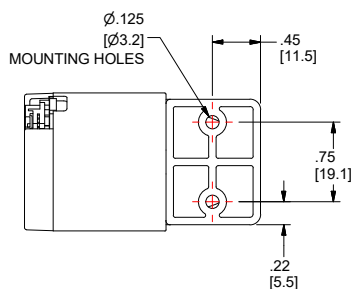
### Port Connections:

- Barbs are sized for 1/8" (3 mm) ID tubing, 70-80 durometer recommended.
- Flow direction is marked on the pump head with arrows.

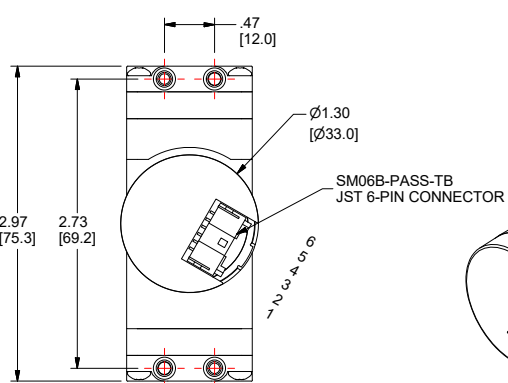
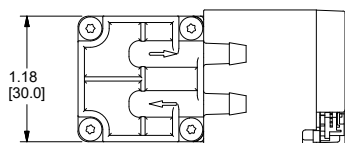
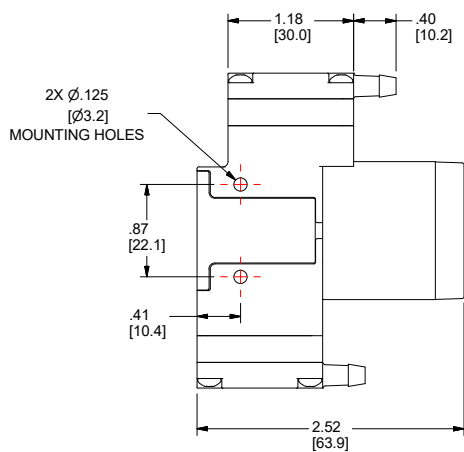
# BTX-Connect Miniature Diaphragm Pump Mechanical Drawings



NOTES:  
MOUNTING HOLES ARE DRILLED FOR  
#6-20 SELF-TAPPING SCREWS WITH  
1/4" THREAD ENGAGEMENT.  
[torque to 4 in-lbs.]



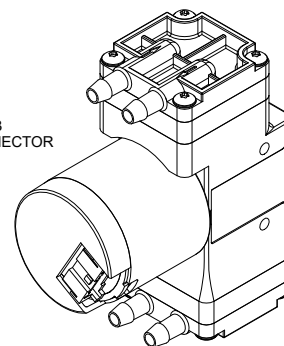
UNITS  
IN [mm]



UNITS  
IN [mm]

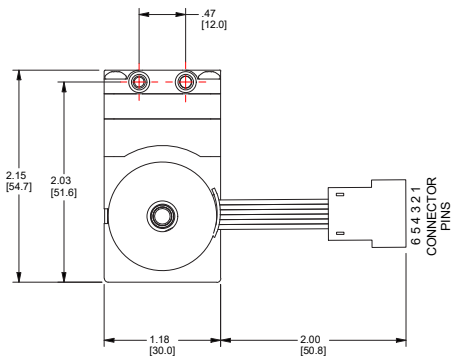
NOTES:  
MOUNTING HOLES ARE DRILLED FOR  
#6-20 SELF-TAPPING SCREWS WITH  
1/4" THREAD ENGAGEMENT.  
[torque to 4 in-lbs.]

| PIN OUT |           |
|---------|-----------|
| 1       | TACH      |
| 2       | PWM / EVC |
| 3       | V+        |
| 4       | GROUND    |
| 5       | UART Rx   |
| 6       | UART Tx   |

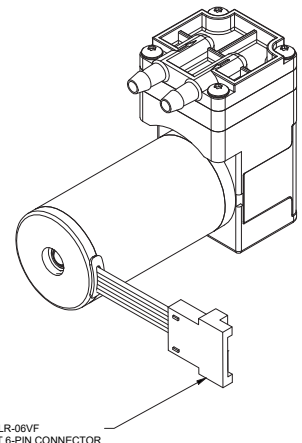
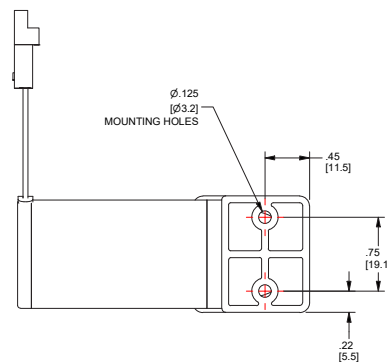
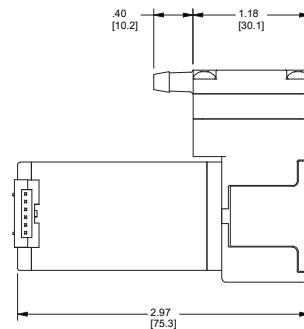


# BTX-Connect Miniature Diaphragm Pump

## Mechanical Drawings

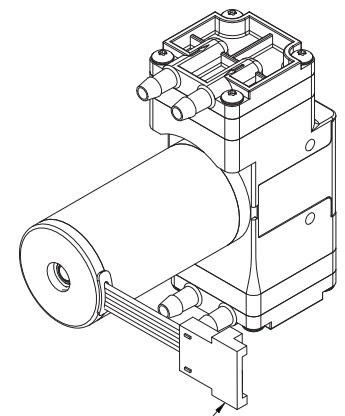
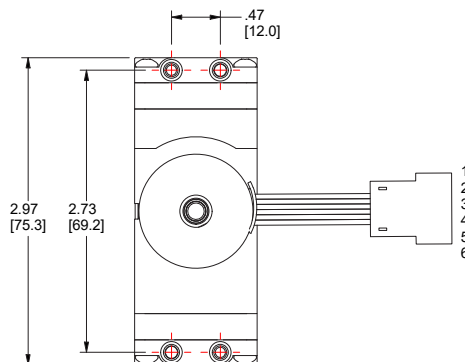
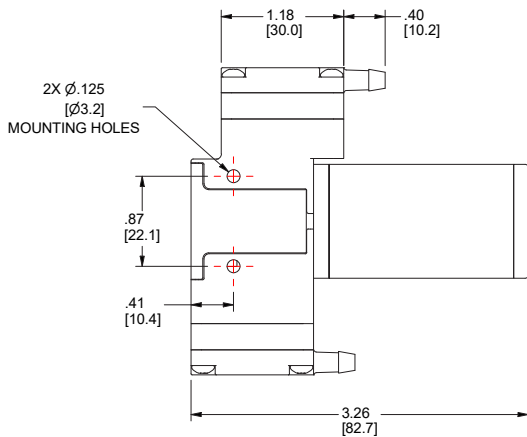


NOTES:  
MOUNTING HOLES ARE DRILLED FOR  
#6-20 SELF-TAPPING SCREWS WITH  
1/4" THREAD ENGAGEMENT.  
[torque to 4 in-lbs.]

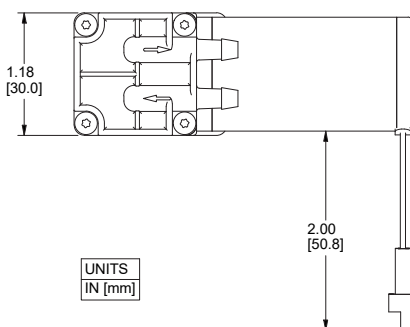


PALR-06VF  
JST 6-PIN CONNECTOR

| UNITS   |
|---------|
| IN [mm] |



PALR-06VF  
JST 6-PIN CONNECTOR



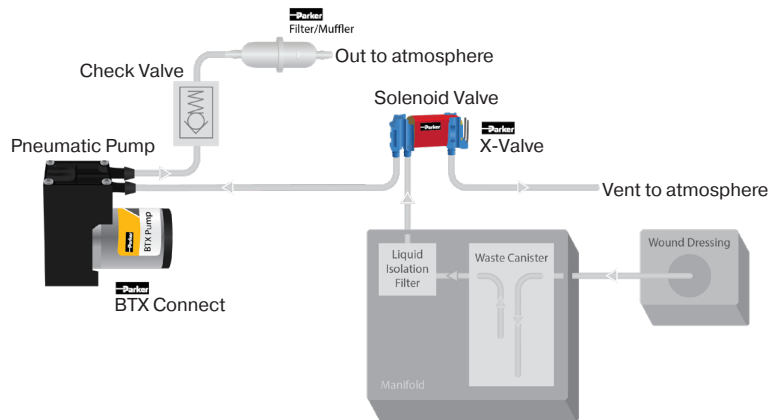
| UNITS   |
|---------|
| IN [mm] |

| PIN OUT     |
|-------------|
| 1 TACH      |
| 2 PWM / EVC |
| 3 V+        |
| 4 GROUND    |
| 5 UART Rx   |
| 6 UART Tx   |

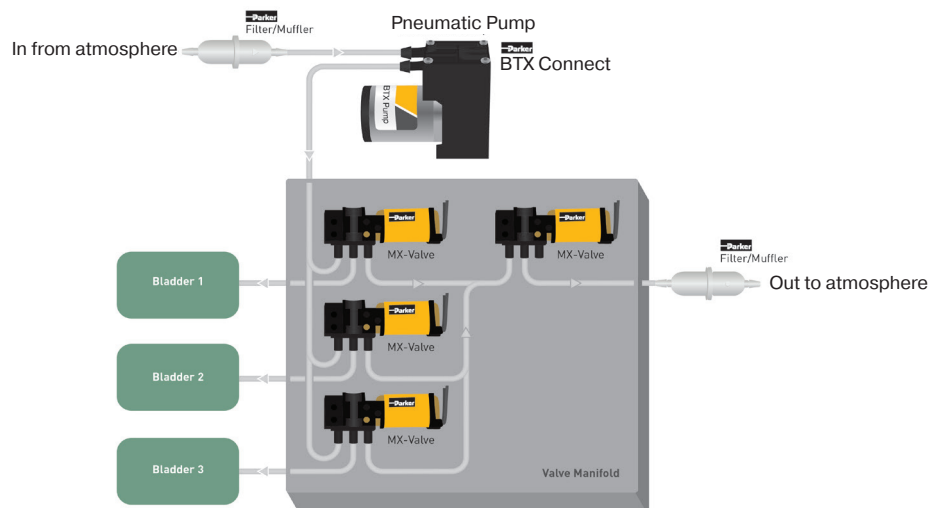
NOTES:  
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#6-20 SELF-TAPPING SCREWS WITH  
1/4" THREAD ENGAGEMENT.  
[torque to 4 in-lbs.]

## BTX-Connect Miniature Diaphragm Pump Typical Flow Diagrams

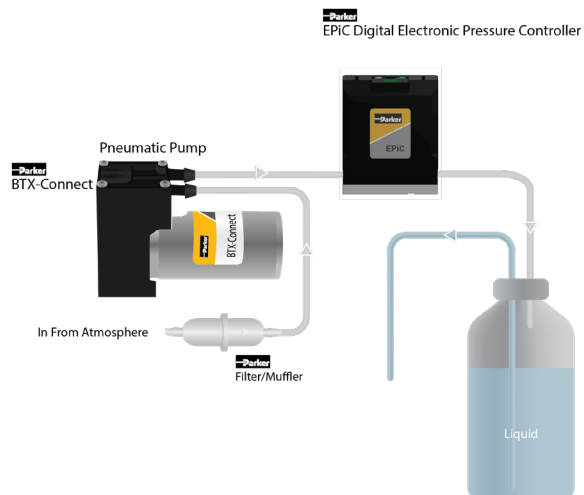
### Negative Pressure Wound Therapy (NPWT)



### Compression Therapy (DVT Prevention)



### Air-Over-Liquid Flow Control



## BTX-Connect Miniature Diaphragm Pump

### CE Compliant

| Reference Number | Title of Standard                                                                                                                                                                     | Year | Amendment/<br>Version |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------------|
| EN 61000-4-2     | Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test                                                            | 2008 | Ed 2.0                |
| EN 61000-4-3     | Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency electromagnetic field immunity test                                    | 2020 | Ed 4.0                |
| EN 61000-4-4     | Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test                                                    | 2012 | Ed 3.0                |
| EN 61000-4-8     | Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test                                                     | 2009 | Ed 2.0                |
| EN 61000-6-1     | Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity standard for residential, commercial, and light-industrial environments                                  | 2016 | Ed 3.0                |
| EN 61000-6-3     | Electromagnetic compatibility (EMC) – Part 6-3: Generic Standards – Emission standard for equipment in residential environments                                                       | 2020 | Ed 3.0                |
| EN 60601-1-2     | Medical electrical equipment – Part 1-2: General requirements for basic safety and essential performance – Collateral Standard: Electromagnetic disturbances – Requirements and tests | 2020 | Ed 4.1                |

## Electrical Integration and Motor Control

### Motor Electrical Connection

|                                 |                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------|
| Integrated Electrical Connector | Male pin JST PALR - 06VF                                                                     |
| Recommended Mating Connector    | Manufacturer ~ JST<br>Housing Part Number: PAP-06V-S<br>Terminal Part Number: SPHD-001T-P0.5 |
| Recommended Wire                | 22 AWG Stranded Wire                                                                         |

### Power Supply Requirements

|                   |                                                                                          |
|-------------------|------------------------------------------------------------------------------------------|
| Voltage Range     | 6-30 VDC                                                                                 |
| Current Level     | 2.3A Max, firmware current limit setting will override.                                  |
| Voltage Rise Time | Minimum: 50µs for 24V , 25µs for 12V                                                     |
| Quiescent Current | ~20mA                                                                                    |
| Power Sequence    | Do not connect motor electrical connector harness while power is applied (Hot Plugging). |

### BTX- Connect Speed Control Options

The motor speed control feature is factory selected between 4 speed control settings: On/Off control, PWM input, 0-5VDC input or UART Serial port control. All external speed control inputs affect the set-point of the internal master duty cycle, they are not directly controlling the motor speed. These modes are described in detail in the sections below. The Tachometer signal is always enabled and is configurable as detailed below.

\*The controller utilizes the on-board micro-controller clock, it is not a real time clock.

# BTX-Connect Miniature Diaphragm Pump

## Application Notes

### Stored Speed Setting

|                |                                                                                                                                                                                                                                  |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| On/Off Control | With this configuration, the pump speed is factory set, only ground and input voltage must be supplied. The speed can only be adjusted using UART command with this mode and will reset to internal setting after a power-cycle. |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### PWM Speed Control

|                    |                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PWM Input          | A PWM signal is provided on the speed input wire to change pump speed.                                                                                       |
| Frequency Range    | 1 - 20 kHz; 15-20 kHz Recommended                                                                                                                            |
| Duty Cycle Range   | 0-100%; setting is a % of full scale. <5% is off, 5% represents 0.1% of full scale; >95% is 100% full scale.<br>See Connect Speed Control Scheme for visual. |
| PWM Signal Voltage | 5Vdc Signal; Minimum 4.5V peak-to-peak                                                                                                                       |
| Response Time      | Response time to set point changes will be 50ms maximum                                                                                                      |

### External Voltage Speed Control

|                         |                                                         |
|-------------------------|---------------------------------------------------------|
| Voltage Range Low Side  | 0V to .248V +/- 3% = 0% of Full Scale Voltage Range     |
| Voltage Range High Side | 4.75V to 5V +/- 3% = 100% of Full Scale                 |
| Response Time           | Response time to set point changes will be 50ms maximum |

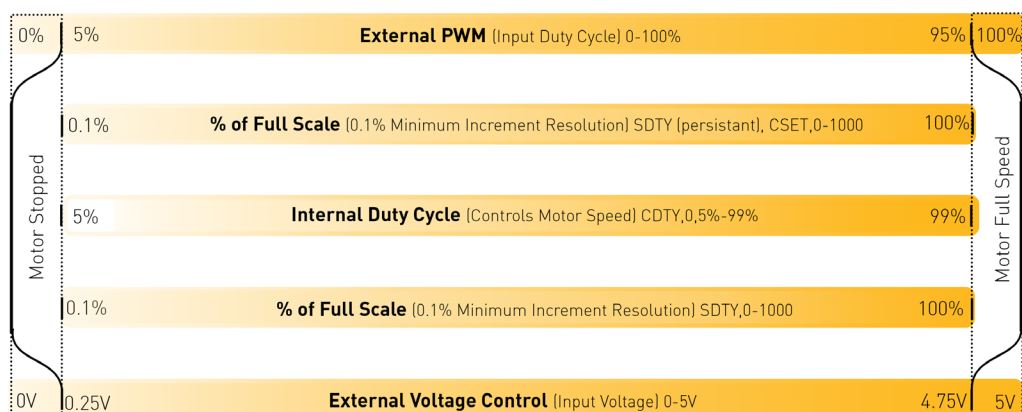
### UART Speed Control

|                  |                                                                                                                                        |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Motor Operation  | Motor will wait for a \$CMD\$SDTY_Setpoint_# command, where Setpoint range is 0-1000 representing 0.1% increments of Full Scale Range. |
| Motor Start/Stop | \$CMD\$SDTY,0# = Motor Stop; Any non-zero CMD\$SDTY command will start the motor at the given duty cycle.                              |

### Tachometer Output

|                        |                                                                                     |
|------------------------|-------------------------------------------------------------------------------------|
| Speed Signal Output    | The feature is always on, regardless of speed control mode                          |
| Compact BLDC Signal    | 4 Pulses per rotation of the pump, configurable.                                    |
| Slotless BLDC Signal   | 1 Pulse per rotation of the pump, configurable.                                     |
| On Board Motor Circuit | 0 to 5 VDC rectangular signal<br>Low signal will be < 0.5VDC, High will be > 4.5VDC |

## CONNECT Speed Control



## BTX-Connect Miniature Diaphragm Pump

### Serial UART Details

The BTX with Connect technology includes a UART Serial port that is available regardless of speed control mode. Communication with the pump allows a user to monitor pump performance and pump health. This provides more detail to the host's system for more integrated pump management and error handling.

#### UART Configuration

|                   |                                     |
|-------------------|-------------------------------------|
| Electrical Signal | 5 VDC TTL Level*                    |
| Baud Rate         | 115200 bps                          |
| Data Bits         | 8                                   |
| Parity            | None                                |
| Stop Bits         | 1                                   |
| Flow Control      | None                                |
| Timing            | Allow > 20ms delay between messages |

\*For integration with RS232 or USB, a transceiver/converter is required.

#### UART Syntax

| Description | Starting Flag | Command Type | Comma Selector | Command | Ending Flag |
|-------------|---------------|--------------|----------------|---------|-------------|
| Char Length | 1 Byte        | 4 Bytes      | 1 Byte         | 4 Bytes | 1 Byte      |
| Example     | \$            | GETS         | ,              | TACH    | #           |

| Description | Starting Flag | Command Type | Comma Selector | Command | Comma Separator | Input Parameter | Ending Flag |
|-------------|---------------|--------------|----------------|---------|-----------------|-----------------|-------------|
| Char Length | 1 Byte        | 4 Bytes      | 1 Byte         | 4 Bytes | 1 Byte          | 1-4 Byte        | 1 Byte      |
| Example     | \$            | CMDS         | ,              | CSET    | ,               | 500             | #           |

\*Each message from the motor will end with a carriage return (0x 0D)

#### UART Command Set

|                          | Command Sent to Motor       | Response from Motor | Description                                                                       |
|--------------------------|-----------------------------|---------------------|-----------------------------------------------------------------------------------|
| Pump Heartbeat Message   | No Command Required         | \$HBN#              | \$HBN# - Normal (Pump will report a heartbeat message over UART every 30 seconds) |
| Invalid Message Response | Incorrect Command or Syntax | Various             | See Response Syntax Table below                                                   |

#### Control Commands

|                | Command Sent to Motor | Response from Motor    | Description                                                       |
|----------------|-----------------------|------------------------|-------------------------------------------------------------------|
| Set Pump Speed | \$CMDS,CSET,505#      | \$ACKN,CMDS,CSET,505#  | Set Motor Duty Cycle, <1-100%>, 505 = 50.5%                       |
| Stop Pump      | \$CMDS,CSET,0#        | \$ACKN,CMDS,CSET,0#    | Can use \$CMDS,CSET,0# to stop motor                              |
| Restart Pump   | \$CMDS,CSET,xxxx#     | \$ACKN,CMDS,CSET,xxxx# | Can use \$CMDS,CSET,xxxx# with preferred set point to start motor |

#### History Command

|                   | Command Sent to Motor | Response from Motor        | Description                                                                                                                                                                                                                                                        |
|-------------------|-----------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Read Pump History | \$GETS,LOGS#          | \$STAT,LOGS,1,1,0,0,0,0,1# | Log counters output (maximum output length: 58 characters):<br>-Controller Boot-Ups<br>-Startup Count<br>-Over Temp Count<br>-Over Current Count<br>-Over Power Count<br>-Over Voltage Count<br>-Operational Minutes (counter is active when motor is operational) |

## BTX-Connect Miniature Diaphragm Pump

### Serial UART Details

| Status Commands                          | Command Sent to Motor | Response from Motor          | Description                                                                                                                                                                                                                                              |
|------------------------------------------|-----------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Read Motor Current                       | \$GETS,CURR#          | \$STAT,CURR,1100#            | Pump reports average motor current, reported in mA                                                                                                                                                                                                       |
| Read Motor Temp.                         | \$GETS,TEMP#          | \$STAT,TEMP,50#              | Pump reports temperature on the board to within +/- 5°C, measurement is taken from a discrete temperature sensor circuit, the in-chip temp sensor is not used                                                                                            |
| Read Measured Speed                      | \$GETS,TACH#          | \$STAT,TACH,3200#            | Measured motor speed between -60 and +60 RPM are reported as zero                                                                                                                                                                                        |
| Read Pump Health                         | \$GETS,HLTH#          | \$STAT,HLTH,0x00#            | Motor health Hex bitfield:<br>0x00 - No health issues<br>0x01 - Over Current<br>0x02 - Over Temp<br>0x04 - Over Voltage<br>0x08 - Under Voltage<br>0x10 - Over Power<br>0x20 - Hall Sequence Error<br>0x40 - Incorrect Hall State<br>0x80 - EEPROM Error |
| Read Input Voltage                       | \$GETS,VOLT#          | \$STAT,VOLT,12#              | Pump reports voltage input measurement                                                                                                                                                                                                                   |
| Read Duty Cycle Setpoint                 | \$GETS,SDTY#          | \$STAT,SDTY,500#             | Get persistent duty cycle setpoint                                                                                                                                                                                                                       |
| Read Current Duty Cycle Input Setpoint   | \$GETS,CSET#          | \$STAT,CSET,500#             | Get active duty cycle setpoint                                                                                                                                                                                                                           |
| Read Current Internal Duty Cycle Setting | \$GETS,CDTY#          | \$STAT,CDTY,500#             | Get active duty cycle setting                                                                                                                                                                                                                            |
| Read Pump Part Number                    | \$GETS,PRTN#          | \$STAT,PRTN,B1C-050F12AN-00# | Pump reports pump part number                                                                                                                                                                                                                            |
| Read Pump Serial Number                  | \$GETS,SRNR#          | \$STAT,SRNR,ABC-1000#        | Pump reports pump serial number                                                                                                                                                                                                                          |

### Return Syntax

| Field Name      | Field Length | Field   | Description                                                             |
|-----------------|--------------|---------|-------------------------------------------------------------------------|
| Start Flag      | 1            | \$      | Beginning of packet marker                                              |
| Response Syntax | 3-4          | CMND    | Unrecognized Command                                                    |
|                 |              | DTER    | Invalid or missing data                                                 |
|                 |              | ACKN    | Acknowledge accepted message                                            |
|                 |              | PARM    | Unrecognized Parameter                                                  |
|                 |              | HBN     | Heartbeat Message                                                       |
|                 |              | STAT    | Returned data from a GETS command                                       |
| Delimiter       | 1            | ,       | Field Delimiter (comma)                                                 |
| Parameter       | 4            | various | Parameters are provided in the SETP parameter tables                    |
| Delimiter       | 1            | ,       | Optional delimiter based on command                                     |
| Data            | 1 to 50      | nnnn    | Decimal value in ASCII format or ASCII string Optional based on command |
| End Flag        | 1            | #       | End of packet marker                                                    |
| End Packet      | 1            | 0x0D    | Carriage Return                                                         |

## BTX-Connect Miniature Diaphragm Pump Application Notes

### Chemical Compatibility Chart\*

| <b>BTX-Connect</b>                              |       |                |
|-------------------------------------------------|-------|----------------|
| Chemical Compatibility of Wetted Path Materials |       |                |
| Chemical                                        | AEPDM | PBT            |
| Air                                             | 1     | 1              |
| Ozone (1000 ppm)                                | 1     | 1              |
| Oxygen                                          | 1     | 1              |
| Ethylene (Ethene)                               | 1     | 1              |
| Methane                                         | 4     | 2              |
| Nitrogen                                        | 1     | 1              |
| Carbon Dioxide                                  | 2     | 1              |
| Acetone (Vapor/Cleaning)                        | 1     | 1(5%), 3(100%) |

#### Compatibility Legend

1. EXCELLENT  
Minimal or no effect
2. GOOD  
Possible swelling and/or loss of physical properties
3. LIMITED  
Moderate or severe swelling and loss of physical properties
4. NOT RECOMMENDED  
Severe effect and should not be considered

Note: Consult factory for other gases.

\*The above is an Abbreviated Chemical Compatibility Chart. Please consult factory for details.

### Pulse Width Modulation (PWM)

Pulse-width modulation is a commonly used technique for controlling DC motors.

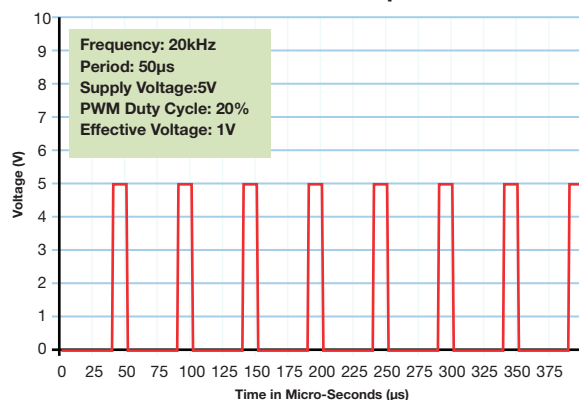
The average value of the voltage fed to the motor is controlled by turning a switch between the voltage supply and the motor on-and-off at a fast pace. The longer the switch is on compared to the off time, the higher the power supplied to the motor.

The PWM switching frequency varies for different types of devices, and is selected based on how it affects the device. For example, some applications require a faster switching frequency to prevent audible noise or electrical noise.

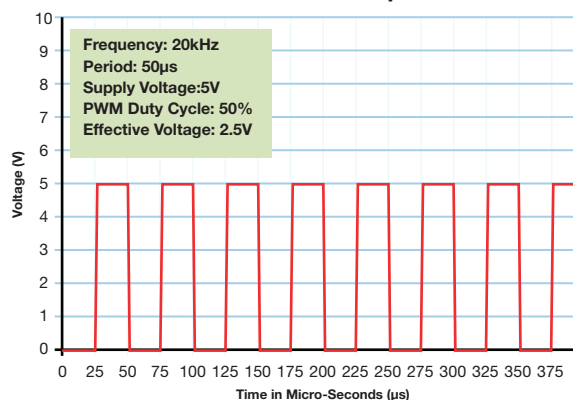
The term duty cycle describes the ratio of on-time to the period (one complete on-and-off cycle). Duty cycle is normally expressed as a percentage of on-time, 100% being full-power and 50% being half-power.

The advantage of PWM is the reduction of power-loss due to switching versus other control methods. Parker Hannifin recommends controlling the pump using 15kHz - 20 kHz frequency range.

20% PWM Example



50% PWM Example

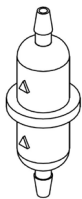


## BTX-Connect Miniature Diaphragm Pump

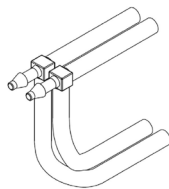
### Accessories Information

A Filter-Muffler is always recommended in the air inlet or outlet to reduce noise and risk of debris that may affect pump performance.

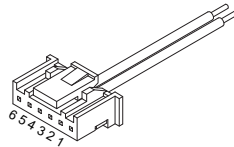
Parker recommends 40 micron or better filtration to be used with this pump series.



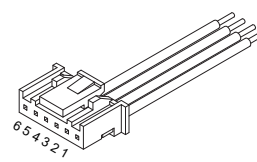
00492-15  
(10 micron Filter)



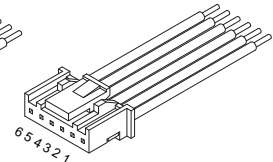
01881-KT  
(Parallel Tubing)



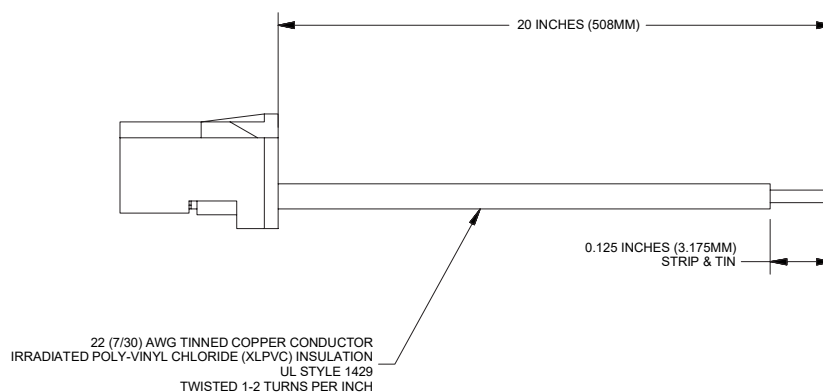
HRN-2-NN20  
(2-Wire Harness)



HRN-4-PT20  
HRN-4-AT20  
(4-Wire Harness)



HRN-6-UT20  
(6-Wire Harness)



### Connector Pin-out

|   | Color        | Function    |
|---|--------------|-------------|
| 1 | Blue         | Tachometer  |
| 2 | White/Yellow | Speed Input |
| 3 | Red          | Power V+    |
| 4 | Black        | Ground V-   |
| 5 | Brown        | UART Rx     |
| 6 | Violet       | UART Tx     |

## BTX-Connect Miniature Diaphragm Pump

### EZ Mount available

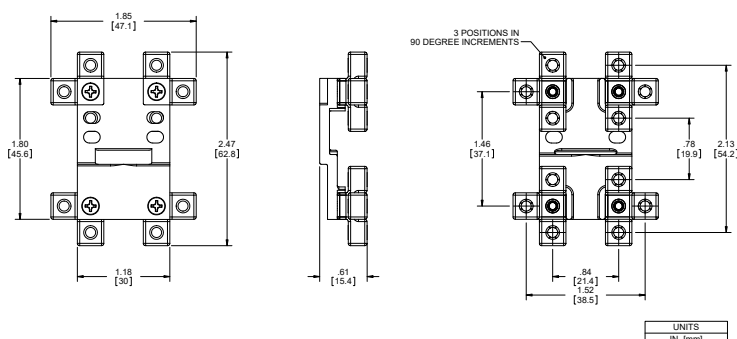


EZ Mount provides ease of installation and effective control of vibration transfer. EZ Mount was designed to mount easily to the Precision Fluidic BTX Family of diaphragm pumps.

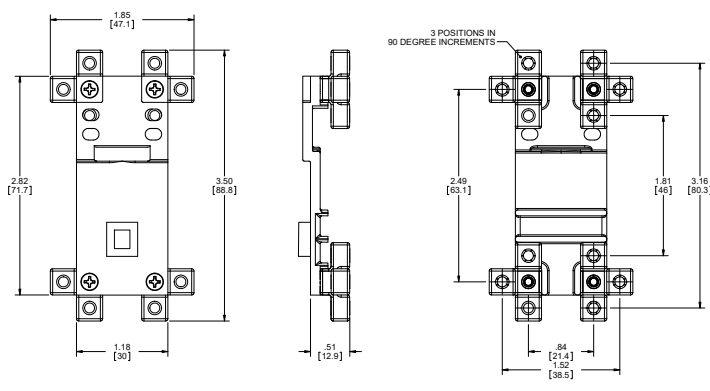
### Features

- Isolation feet on the EZ mount can be rotated in any one of three ninety-degree planes and is designed for top-down or bottom-up mounting providing simple installation
- EZ Mount was designed to minimize weight added to the pump assembly. Approximate weight is: 0.63 oz (18 g)
- Effectively absorbs vibration to minimize most vibration-induced noise and vibration transfer into an instrument
- Designed to keep height and size to a minimum
- All necessary hardware to attach to a BTX pump is included

### Style A Dimensions



### Style B Dimensions



### Physical Properties

#### Operating Environment:

41 - 158°F (5 - 70°C)

#### Humidity:

0 - 95% Relative Humidity

#### Base Plate:

Noryl GTX830

#### Feet:

Silicone

#### Feet Insert:

Brass

#### Hardware:

Zinc-Plated Steel

- Isolation Feet are available in either threaded or thru-hole clearance for standard #4-40 or #6-32 (M3 for clearance hole only).

### EZ Mount for BTX with Compact Motor Single and Dual Head (B1C and B2C)

| Part Number   | Style | Feet Type         |
|---------------|-------|-------------------|
| 00328-10-A45S | A     | #4-40 Threaded    |
| 00328-10-B45S | A     | #4 Clearance      |
| 00328-10-D45S | A     | #6-32 Threaded    |
| 00328-10-C45S | A     | #6 / M3 Clearance |

### EZ Mount for BTX with Slotless Single Head (B1S and B1H)

| Part Number   | Style | Feet Type         |
|---------------|-------|-------------------|
| 01074-10-A45S | B     | #4-40 Threaded    |
| 01074-10-B45S | B     | #4 Clearance      |
| 01074-10-D45S | B     | #6-32 Threaded    |
| 01074-10-C45S | B     | #6 / M3 Clearance |

### EZ Mount for BTX with Slotless Dual Head (B2S and B2H)

| Part Number   | Style | Feet Type         |
|---------------|-------|-------------------|
| 00329-10-A45S | B     | #4-40 Threaded    |
| 00329-10-B45S | B     | #4 Clearance      |
| 00329-10-D45S | B     | #6-32 Threaded    |
| 00329-10-C45S | B     | #6 / M3 Clearance |

# BTX-Connect Miniature Diaphragm Pump

## Ordering Information

| Configuration                                               | Voltage | Motor Control | Part Number     | -16<br>inHg<br>-406<br>mmHg | -12<br>inHg<br>-305<br>mmHg | -8<br>inHg<br>-203<br>mmHg | -4<br>inHg<br>-102<br>mmHg | 0<br>Free<br>Flow | 4<br>PSIg<br>276<br>mbar | 8<br>PSIg<br>552<br>mbar | 12<br>PSIg<br>827<br>mbar | 16<br>PSIg<br>1103<br>mbar |
|-------------------------------------------------------------|---------|---------------|-----------------|-----------------------------|-----------------------------|----------------------------|----------------------------|-------------------|--------------------------|--------------------------|---------------------------|----------------------------|
| B1C<br><br>BTX-Connect Single<br>Head<br>with Compact BLDC  | 12      | On/Off        | B1C-050F12AN-00 | 0.4                         | 1.1                         | 1.8                        | 2.5                        | 3.3               | 2.7                      | 2.1                      | 1.6                       | 1.1                        |
|                                                             | 12      | PWM           | B1C-050F12AN-03 | 0.4                         | 1.1                         | 1.8                        | 2.5                        | 3.3               | 2.7                      | 2.1                      | 1.6                       | 1.1                        |
|                                                             | 12      | On/Off        | B1C-070P12AN-00 | -                           | -                           | -                          | -                          | 4.5               | 3.5                      | 2.7                      | 2                         | 1.2                        |
|                                                             | 12      | 0-5 VDC       | B1C-070P12AN-02 | -                           | -                           | -                          | -                          | 4.5               | 3.5                      | 2.7                      | 2                         | 1.2                        |
|                                                             | 12      | On/Off        | B1C-090P12AN-00 | -                           | -                           | -                          | -                          | 5.5               | 4.5                      | 3.5                      | 2.8                       | 2.2                        |
|                                                             | 12      | PWM           | B1C-090P12AN-03 | -                           | -                           | -                          | -                          | 5.5               | 4.5                      | 3.5                      | 2.8                       | 2.2                        |
|                                                             | 12      | On/Off        | B1C-090V12AN-00 | 1.5                         | 2.5                         | 3.5                        | 4.7                        | 5.8               | -                        | -                        | -                         | -                          |
|                                                             | 12      | 0-5 VDC       | B1C-090V12AN-02 | 1.2                         | 2                           | 3                          | 4.1                        | 5.2               | -                        | -                        | -                         | -                          |
|                                                             | 12      | PWM           | B1C-090V12AN-03 | 1.5                         | 2.5                         | 3.5                        | 4.7                        | 5.8               | -                        | -                        | -                         | -                          |
|                                                             | 12      | UART          | B1C-090V12AN-01 | 1.5                         | 2.5                         | 3.5                        | 4.7                        | 5.8               | -                        | -                        | -                         | -                          |
|                                                             | 24      | On/Off        | B1C-050F24AN-00 | 0.4                         | 1.1                         | 1.8                        | 2.5                        | 3.3               | 2.7                      | 2.1                      | 1.6                       | 1.1                        |
|                                                             | 24      | 0-5 VDC       | B1C-050F24AN-02 | 0.4                         | 1.1                         | 1.8                        | 2.5                        | 3.3               | 2.7                      | 2.1                      | 1.6                       | 1.1                        |
|                                                             | 24      | PWM           | B1C-050F24AN-03 | 0.4                         | 1.1                         | 1.8                        | 2.5                        | 3.3               | 2.7                      | 2.1                      | 1.6                       | 1.1                        |
|                                                             | 24      | On/Off        | B1C-090P24AN-00 | -                           | -                           | -                          | -                          | 5.5               | 4.5                      | 3.5                      | 2.8                       | 2.2                        |
|                                                             | 24      | 0-5 VDC       | B1C-090P24AN-02 | -                           | -                           | -                          | -                          | 6.1               | 4.9                      | 4                        | 3.2                       | 2.5                        |
|                                                             | 24      | PWM           | B1C-090P24AN-03 | -                           | -                           | -                          | -                          | 6.1               | 4.9                      | 4                        | 3.2                       | 2.5                        |
|                                                             | 24      | On/Off        | B1C-090V24AN-00 | 1.5                         | 2.5                         | 3.5                        | 4.7                        | 5.8               | -                        | -                        | -                         | -                          |
|                                                             | 24      | PWM           | B1C-090V24AN-03 | 1.5                         | 2.5                         | 3.5                        | 4.7                        | 5.8               |                          |                          |                           |                            |
| B1S<br><br>BTX-Connect Single<br>Head<br>with Slotless BLDC | 12      | On/Off        | B1S-090P12AN-00 | -                           | -                           | -                          | -                          | 4.8               | 3.9                      | 3.1                      | 2.5                       | 2.0                        |
|                                                             | 24      | On/Off        | B1S-090P24AN-00 | -                           | -                           | -                          | -                          | 4.8               | 3.9                      | 3.1                      | 2.5                       | 2.0                        |
|                                                             |         |               |                 |                             |                             |                            |                            |                   |                          |                          |                           |                            |
| B2C<br><br>BTX-Connect Dual<br>Head<br>with Compact BLDC    | 12      | On/Off        | B2C-050F12AN-00 | 0.4                         | 1.7                         | 2.6                        | 3.8                        | 5.1               | 4                        | 3.2                      | 2.3                       | 1.1                        |
|                                                             | 12      | PWM           | B2C-050F12AN-03 | 0.4                         | 1.7                         | 2.6                        | 3.8                        | 5.1               | 4                        | 3.2                      | 2.3                       | 1.1                        |
|                                                             | 12      | On/Off        | B2C-070P12AN-00 | -                           | -                           | -                          | -                          | 8.2               | 6                        | 4.4                      | 3                         | 2                          |
|                                                             | 12      | On/Off        | B2C-090V12AN-00 | 2.2                         | 3.5                         | 5.4                        | 7.5                        | 9.5               | -                        | -                        | -                         | -                          |
|                                                             | 12      | PWM           | B2C-090V12AN-03 | 2.2                         | 3.5                         | 5.4                        | 7.5                        | 9.5               | -                        | -                        | -                         | -                          |
|                                                             | 12      | 0-5 VDC       | B2C-090V12AN-02 | 2.2                         | 3.5                         | 5.4                        | 7.5                        | 9.5               | -                        | -                        | -                         | -                          |
|                                                             | 24      | On/Off        | B2C-050F24AN-00 | 0.4                         | 1.7                         | 2.6                        | 3.8                        | 5.1               | 4                        | 3.2                      | 2.3                       | 1.1                        |
|                                                             | 24      | PWM           | B2C-050F24AN-03 | 0.4                         | 1.7                         | 2.6                        | 3.8                        | 5.1               | 4                        | 3.2                      | 2.3                       | 1.1                        |

## BTX-Connect Miniature Diaphragm Pump

### Ordering Information

| Configuration                                                                                                                     | Voltage | Motor Control | Part Number     | -16 inHg<br>-406 mmHg | -12 inHg<br>-305 mmHg | -8 inHg<br>-203 mmHg | -4 inHg<br>-102 mmHg | 0 Free Flow | 4 PSIG<br>276 mbar | 8 PSIG<br>552 mbar | 12 PSIG<br>827 mbar | 16 PSIG<br>1103 mbar |
|-----------------------------------------------------------------------------------------------------------------------------------|---------|---------------|-----------------|-----------------------|-----------------------|----------------------|----------------------|-------------|--------------------|--------------------|---------------------|----------------------|
| B2S                                                                                                                               | 12      | On/Off        | B2S-050F12AN-00 | 0.8                   | 1.9                   | 2.9                  | 4.1                  | 5.3         | 4.3                | 3.5                | 2.7                 | 2                    |
| BTX-Connect Dual Head<br>with Slotless BLDC      | 12      | On/Off        | B2S-090P12AN-00 | -                     | -                     | -                    | -                    | 9           | 7.2                | 5.7                | 4.5                 | 3.3                  |
|                                                                                                                                   | 12      | PWM           | B2S-090P12AN-03 | -                     | -                     | -                    | -                    | 9           | 7.2                | 5.7                | 4.5                 | 3.3                  |
|                                                                                                                                   | 12      | On/Off        | B2S-090V12AN-00 | 2.2                   | 3.8                   | 5.7                  | 7.6                  | 9.3         | -                  | -                  | -                   | -                    |
|                                                                                                                                   | 12      | PWM           | B2S-090V12AN-03 | 2.2                   | 3.8                   | 5.7                  | 7.6                  | 9.3         | -                  | -                  | -                   | -                    |
|                                                                                                                                   | 24      | On/Off        | B2S-050F24AN-00 | 0.8                   | 1.9                   | 2.9                  | 4.1                  | 5.3         | 4.3                | 3.5                | 2.7                 | 2                    |
|                                                                                                                                   | 24      | On/Off        | B2S-090P24AN-00 | -                     | -                     | -                    | -                    | 9           | 7.2                | 5.7                | 4.5                 | 3.3                  |
|                                                                                                                                   | 24      | On/Off        | B2S-090V24AN-00 | 2.2                   | 3.8                   | 5.6                  | 7.5                  | 9.1         | -                  | -                  | -                   | -                    |
|                                                                                                                                   | 24      | PWM           | B2S-090V24AN-03 | 2.2                   | 3.8                   | 5.6                  | 7.5                  | 9.1         | -                  | -                  | -                   | -                    |
|                                                                                                                                   |         |               |                 |                       |                       |                      |                      |             |                    |                    |                     |                      |
| B2H                                                                                                                               | 12      | 0-5 VDC       | B2H-050F12AN-02 | 0.9                   | 2.4                   | 3.7                  | 5.1                  | 6.7         | 5.4                | 4.3                | 3.2                 | 2.3                  |
| BTX-Connect Dual Head<br>with HP Slotless BLDC  | 12      | On/Off        | B2H-050A12AN-00 | 1.6                   | 2.9                   | 4.2                  | 5.7                  | 7.2         | 5.8                | 4.8                | 3.9                 | 3                    |
|                                                                                                                                   | 12      | On/Off        | B2H-090R12AN-00 | -                     | -                     | -                    | -                    | 10.7        | 8.9                | 7.3                | 5.8                 | 4.4                  |
|                                                                                                                                   | 12      | On/Off        | B2H-090V12AN-00 | 2.8                   | 4.6                   | 6.6                  | 8.7                  | 10.5        | -                  | -                  | -                   | -                    |

### Accessories Ordering Table

| Part No.   | Description                         | Comments                                                                   |
|------------|-------------------------------------|----------------------------------------------------------------------------|
| HRN-2-NN20 | 2 Pin Wire Harness 20" (508mm) Long | 2 Pin wire harness for on/off control only                                 |
| HRN-4-PT20 | 4 Pin Wire Harness 20" (508mm) Long | 4 Pin wire harness for speed control and tachometer output (Pin 2: White)  |
| HRN-4-AT20 | 4 Pin Wire Harness 20" (508mm) Long | 4 Pin wire harness for speed control and tachometer output (Pin 2: Yellow) |
| HRN-6-UT20 | 6 Pin Wire Harness 20" (508mm) Long | 6 Pin wire harness required for UART                                       |
| 00492-15   | Filter-Muffler                      | Filter to 10 microns. Not included with pump                               |
| 01881-KT   | Tubing Assembly                     | As needed for parallel flow. Not included with pump                        |

### BTX Part Number Description (see Appendix A comment 9)



## BTX-Connect Miniature Diaphragm Pump

### Ordering Information

Please refer to sizing and selection chart for identifying which one will fit your application.

Serviceable – PPF products are designed for use through the rated life and Parker does not sell replacement parts, nor is it recommended to service these in the field.

Note: In addition to Parker's innovative and flexible pump designs, we offer applications engineering expertise to our customers in order to configure and recommend the optimal pump for the application. Contact Parker Applications Engineering to discuss and configure alternate pump configurations to meet your specific application requirements. Providing information on the following requirements will assist us in developing an optimal solution for your application:

- Noise
- Operating Pressure / Vacuum
- Power Consumption
- Life Requirement
- Size
- Motor Control
- Media
- Voltage

Parker Hannifin Precision Fluidics Division reserves the right to make changes. Drawings are for reference only.

## Appendix A

All performance data is typical based on standard conditions: 70°F and 14.7 psia (21°C and 1 bar).

1. Duty Dependent. For operation above 122°F (50°C) consult factory.
2. Noise is dependent on the configuration and operation of the pump in the application. Parker has the ability to tailor the pump configuration when noise is a critical criterion in the effort to meet the performance requirements of the application. Noise level is tested to Parker protocol P-105.
3. Life rating can vary depending on application and operating conditions.
4. Custom motor options available. Custom motors may require a significant application potential. The standard motors can be configured with a special winding to meet a particular operation point at a specified voltage.
5. Current range is dependent on motor type, voltage, pressure/vacuum and flow requirement. Lower levels possible depending on application.
6. Inductance is an indicator of induced voltage with change in current, and it is a key parameter to enable customers' low energy intrinsic safety systems.
7. Maximum intermittent pressure/vacuum data is a pump capability guideline for applications that go beyond the maximum continuous levels for short periods of time. Please consult customer specific requirements with the factory or Applications Engineering.
8. Pump efficiency is a measure of the flow rate generated per unit of power consumed. Efficiency may change dependent on application and operating condition at free flow.
9. Part number description for reference only, not all configurations are available or configurable. Contact Parker Precision Fluidics Applications Engineering team for other performance options.

## BTX-Connect Miniature Diaphragm Pump

Scan for more detailed information:



## Parker Hannifin Precision Fluidics Division

The Precision Fluidics Division of Parker Hannifin is a leading supplier of miniature fluidic components and system solutions integral to the world's life sciences, life safety and high technology markets. Our innovations allow people to get more out of life. Our product portfolio includes miniature pneumatic, proportional and liquid control valves, diaphragm pumps, thermal mass flow and electronic pressure controllers, high-precision regulators and rotameters.

### Miniature Solenoid Valves



For more information about our miniature solenoid valve offerings, [visit our website](#).

### Miniature Liquid Valves



For more information about our miniature liquid valve offerings, [visit our website](#).

### Miniature Proportional Valves



For more information about our miniature proportional valve offerings, [visit our website](#).

### Miniature Pumps



For more information about our miniature pump offerings, [visit our website](#).

### Pressure and Flow Control



For more information about our flow and pressure control offerings, [visit our website](#).

### Customized Systems and Solutions

Our team of experienced engineers and technical support staff is dedicated to helping our customers find the right solutions for their specific needs. We work closely with our customers to understand their unique requirements and provide tailored solutions that meet their exact specifications.

