



Pall Corporation
Athalon[®]CM & Crixus[™] User Manual





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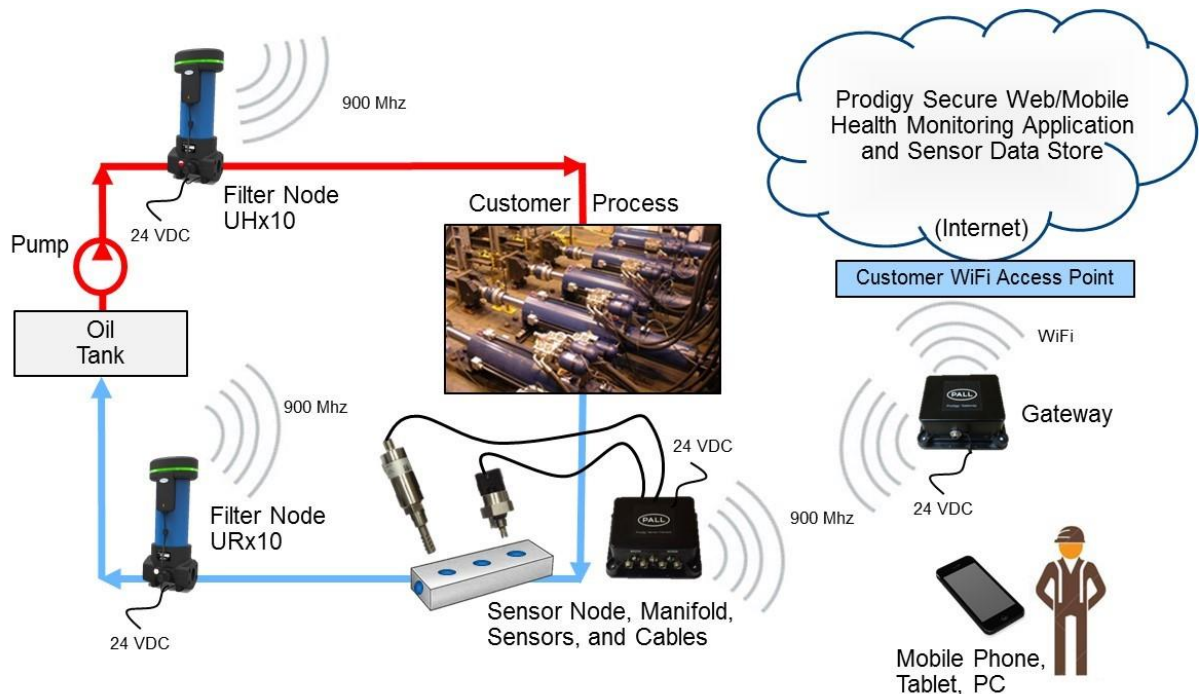
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1. Introduction

The Athalon[®]CM Platform Modular Filter Network is comprised of five main components (SKU's) and a portfolio of process sensors. The modular design allows the end user maximum flexibility to efficiently integrate Athalon[®]CM into their equipment arrangement without the expense of redundant components.

Minimum Athalon[®]CM System includes

- WiFi Gateway (SKU #1)
- Fluid Interface (SKU #2) with optional Sensor Manifold
- Filter Node – High pressure Filter Node (SKU #3&4) or Return Line Filter Node (SKU#5)



1.1. Safety Information

Connecting Utilities

CAUTION:



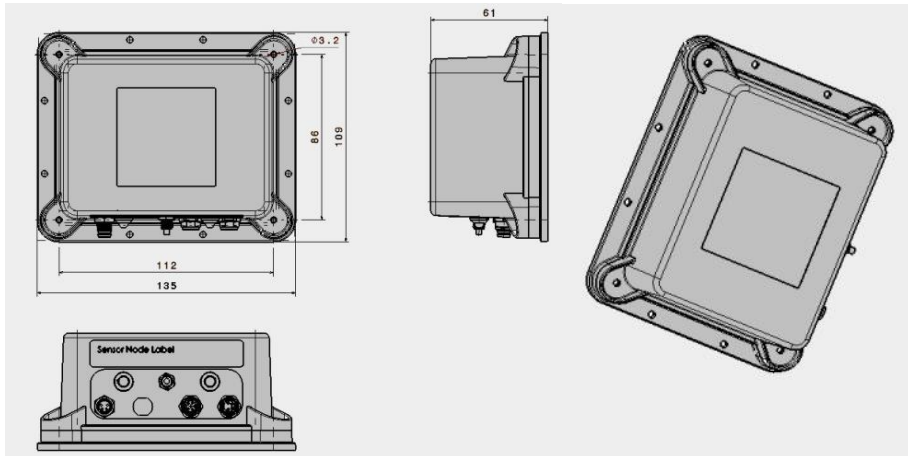
To ensure the safe and efficient operation of the equipment and adherence to existing laws and regulations, only qualified personnel should make utility connections. Pall Corporation requires that certified electricians complete all wiring connections and that qualified personnel, working with Pall Technology Services representatives if possible, complete all plumbing work. Pall Corporation is not responsible for and equipment warranties may be voided from any damage or personal injury caused by unqualified personnel performing utility connections and/or installations!

1.2. Pall System Components

Pall Corporation is supplying a system comprised of WiFi Gateways, Filter Nodes, and Fluid Interfaces to monitor the health of the hydraulic fluid within the system. Filter Nodes and Fluid Interfaces monitor the state of the fluid directly through attached sensors, and report wirelessly to the Wi-Fi Gateway. The Gateway then relays the system state through the cloud to the backend application which monitors and controls the Filter Node and Fluid Interface operation.

All external sensors along with associated cables for connecting the sensors to Filter Nodes and Fluid Interfaces are supplied as part of the system. Power supplies and associated cables are not supplied as part of the system and are the responsibility of the customer.

1.2.1. WiFi Gateway



1.2.1.1. Description

The Wifi Gateway provides the connection from the Athalon[®]CM Network to an internet connection provided by the end user. The Athalon[®]CM Network connects wirelessly to the WiFi Gateway via 915 Mhz LoRa radio. The WiFi Gateway can connect to the end users WiFi access point wirelessly via 802.11 a/b/g/n protocol.

1.2.1.2. FCC Statement

This device complies with Part 15 of the FCC Rules and with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) his device must accept any interference received, including interference that may cause undesired operation.

The Wi-Fi Gateway does not contain any user-serviceable parts. Changes or modifications not expressly approved by Pall Corporation could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause

harmful interference in which case the user will be required to correct the interference at his own expense.

This device uses RF energy to communicate. To reduce RF Exposure, this device must be installed in a manner to ensure at least 20cm separation is maintained between the device antenna and the body of the user or nearby people.

1.2.1.3. ISED (Canada) Notice

The device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareil est conforme aux normes d'exemption de licence RSS d'Industry Canada. Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas causer d'interférence, et (2) cet appareil doit accepter toute interférence, notamment les interférences qui peuvent affecter son fonctionnement.

1.2.1.4. Power Connection

CAUTION:



To ensure the safe operation of the equipment the WiFi Gateway must be powered from an NEC Class 2 power supply that is certified as a Limited Power Source (LPS). Pall Corporation **requires** that certified electricians complete all wiring connections from the Wi-Fi Gateway to the external power supply, and from the external power supply to the AC power mains.

The WiFi Gateway provides a barrel jack that is identified by the port label on the Gateway for connection to an external DC power supply. The barrel jack has an inside diameter of 2.5mm for the positive DC connection and a 5.5mm outside diameter for the negative DC connection.

The DC supply must meet the following requirements for proper operation of the Wi-Fi Gateway:

1. DC Output Voltage Range: 4.5 – 6.5 VDC
2. DC Output Current: 1.25 A Minimum
3. Supply must be an NEC Class II power supply that is certified as a Limited Power Source (LPS)

The cabling used to connect the external DC supply to the Wi-Fi Gateway DC power connector must comply with Article 725 of the NEC for Class 2 circuits.

1.2.1.5. Power Supply Installation

(TBD)

1.2.1.6. Technical Specifications

| Functional Description | Specification/Range |
|----------------------------|--|
| Node communication | 915 MHz LoRa Radio |
| WiFi network adapter | WiFi access point, 100m theoretical distance |
| Ambient Temperature | -25 – 60°C (-13 – 140°F) |
| Power requirement. | 24VDC, 200mA |
| Ingress Rating Electronics | IP65 Minimum |
| 802.11 Supported Protocols | 2.4 GHz Wi-Fi 802.11 a/b/g/n |
| WiFi Authentication types | Open (no security), WEP-40, WEP-104, WPA (AES & TKIP), WPA2 (AES, TKIP & Mixed mode) |

1.2.2. Fluid Interface

1.2.2.1. Description

The Athalon[®]CM Fluid Interface is a wall mounted electrical enclosure equipped with circular M8 connectors for the flexible cords connecting the process sensors. The Fluid Interface allows the end user to mount process sensors in a section of the system operating below 20 bar. The process sensors are equipped with SAE 1926-1 compliant diagnostic tee fittings allowing the sensors to be easily installed in end user piping systems.

1.2.2.2. FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) his device must accept any interference received, including interference that may cause undesired operation.

The Fluid Interface does not contain any user-serviceable parts. Changes or modifications not expressly approved by Pall Corporation could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device uses RF energy to communicate. To reduce RF Exposure, this device must be installed in a manner to ensure at least 20cm separation is maintained between the device antenna and the body of the user or nearby people.

1.2.2.3. ISED (Canada) Notice

The device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareil est conforme aux normes d'exemption de licence RSS d'Industry Canada. Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas causer d'interférence, et (2) cet appareil doit accepter toute interférence, notamment les interférences qui peuvent affecter son fonctionnement.

1.2.2.4. Power Connection

CAUTION:



To ensure the safe operation of the equipment, Fluid Interfaces must be powered from an NEC Class 2 power supply that is certified as a Limited Power Source (LPS). Pall Corporation requires that certified electricians complete all wiring connections from Fluid Interfaces to the external power supply, and from the external power supply to the AC power mains.

The Fluid Interface provides a 4-pin M8 style connector plug that is identified by the port label on the Fluid Interface for connection to an external DC power supply.



The DC supply must meet the following requirements for proper operation of the Sensor Node:

1. DC Output Voltage Range: 24 VDC +/-10%
2. DC Output Current: 1.0 A Minimum
3. Supply must be an NEC Class II power supply that is certified as a Limited Power Source (LPS)

The cabling used to connect the external DC supply to the Sensor Node DC power connector must comply with the following requirements:

1. Connector on Sensor Node end of power cable must be a 4-socket M8 style connector that will mate with: Phoenix Contact - 1453481
2. Cabling must comply with Article 725 of the NEC for Class 2 circuits

1.2.2.5. Power Supply Installation

(TBD)

1.2.2.6. Sensor Connections

The Fluid Interface provides two ports for connection to external sensors that monitor the properties of the hydraulic fluid in the system. Cables for connecting the external sensors are included with the system.



1.2.2.7. Fluid Properties Sensor

The Fluid Property Sensor (FPS) is used to measure the viscosity, density, dielectric constant and temperature of the hydraulic fluid. This sensor connects to the ‘Fluid Sensor’ port where indicated on the port label using the M8 to automotive style connector cable.



| FPS Sensor (Fluid Viscosity, Density, Temperature, TAN) | |
|--|---|
| Seal Material | Viton Fluorocarbon |
| Housing Material | Stainless Steel |
| Port Option | M14 x 1.5 mm (male) To fit Port 2 Manifold |
| Maximum Working Pressure | 20 bar (290 psi) |
| Rated Fatigue Pressure | 20 bar (290 psi) |
| Measurement Viscosity | 0.5 to 50.0 cp |
| Measurement Density | 0.65 to 1.50 gm/cc |
| Measurement Dielectric Constant | Qualitative Output |
| Flow Rate | >0.2m/s |
| Process Fluid Temperature | -40 – 90°C (-40 – 194°F) |
| Ambient Temperature | -40 – 60°C (-40 – 140°F) |
| Ingress Rating Electronics | IP 68 to IEC 60529 when assembled |
| Physical Dimensions | 30 Hex x 73(H)mm. Installed on Sensor Manifold. |

Technical specifications for the FPS refer to the manufacturer’s data sheet (Measurement Specialties Part No. FPS2800B12C4).

1.2.2.8. Water Sensor

The Water Sensor is used to measure the dissolved water content in the hydraulic fluid. This sensor connects to the ‘Water Sensor’ port where indicated on the port label and using the M8 to 8-pin, M12 connector cable.



| WS12 Water in oil sensor (Water content in oil %RH or PPM and Temperature °C or °F) | |
|--|---|
| Seal Material | Viton Fluorocarbon |
| Housing Material | Stainless Steel |
| Port Options | ½” NPT Internal Pipe Thread to ANSI B2.1 ½” BSP (G) to ISO228 To Fit Port 3 Manifold |
| Maximum Working Pressure | 20 bar (290 psi) |
| Rated Fatigue Pressure | 20 bar (290 psi) |
| Process Fluid Temperature | -40 – 90°C (-40 – 194°F) |
| Ambient Temperature | -40 – 60°C (-40 – 140°F) |
| Electrical Connector | 8 pin M12 Plug To IEC 61076-2-101 |
| Measurement %RH | 0 - 100% RH |
| Temp. Measurement Range | -25 – 125°C (-13 – 257°F) |
| Compatibility | The water sensor is not to be used in water based fluids |
| Ingress Rating Electronics | IP 68 to IEC 60529 when assembled |
| Physical Dimensions | 30 Hex x 73(H)mm |
| Power Requirement | 24V DC |

Technical Specifications refer to data sheet for Pall Water Sensor (WS12/WS13 Series).

1.2.3. Sensor Manifold

1.2.3.1. Description

The sensor manifold is an optional fitting that can be plumbed into a hydraulic system and is used to install the Fluid Properties Sensor and the Water Sensor.



1.2.3.2. Specifications

| Functional Description | Specification/Range |
|----------------------------|--|
| Manifold (9004D497) | |
| Port Options | 2" O-Ring Boss Per SAE J1926. 2" BSP (G) to ISO228 |
| Maximum Working Pressure | 20 bar (290 psi) |
| Rated Fatigue Pressure | 20 bar (290 psi) |
| Seal Material | Fluorocarbon |
| Manifold Material | SG Iron (Chemical Black) |
| Sensor Port 1 Options | ¼" Internal O RING Boss Per SAE J514 ¼" BSP (G) to ISO228 |
| Sensor Port 2 | M14 x 1.5mm Internal O RING Boss Per ISO 6149-1 |
| Sensor Port 3 Options | ½" NPT Internal Pipe Thread to ANSI B2.1 ½" BSP (G) to ISO228 |
| Physical Dimensions | Diameter 120mm x 225(L)mm. |

1.2.4. Filter Node

1.2.4.1. Description

The Athalon[®]CM Filter Node is a Athalon housing mounted, electrical enclosure equipped with a circular M8 connector for the flexible cord connecting the dP Sensor. The Filter Node also connects to the lid mounted RFID antennae via inductive coupling.

1.2.4.2. FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) his device must accept any interference received, including interference that may cause undesired operation.

The Filter Node does not contain any user-serviceable parts. Changes or modifications not expressly approved by Pall Corporation could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device uses RF energy to communicate. To reduce RF Exposure, this device must be installed in a manner to ensure at least 20cm separation is maintained between the device antenna and the body of the user or nearby people.

1.2.4.3. ISED (Canada) Notice

The device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareil est conforme aux normes d'exemption de licence RSS d'Industry Canada. Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas causer d'interférence, et (2) cet appareil doit accepter toute interférence, notamment les interférences qui peuvent affecter son fonctionnement.

1.2.4.4. Power Connection

CAUTION:



To ensure the safe operation of the equipment, Filter Nodes must be powered from an NEC Class 2 power supply that is certified as a Limited Power Source (LPS). Pall Corporation requires that certified electricians complete all wiring connections from Filter Nodes to the external power supply, and from the external power supply to the AC power mains.

The Filter Node provides a 4-pin M8 style connector plug for connection to an external DC power supply. The DC supply must meet the following requirements for proper operation of the Filter Node:

1. DC Output Voltage Range: 24 VDC +/-10%
2. DC Output Current: 1.0 A Minimum
3. Supply must be an NEC Class II power supply that is certified as a Limited Power Source (LPS)

The cabling used to connect the external DC supply to the Filter Node DC power connector must comply with the following requirements:

1. Connector on Filter Node end of power cable must be a 4-socket M8 style connector that will mate with: Phoenix Contact - 1453481
2. Cabling must comply with Article 725 of the NEC for Class 2 circuits

1.2.4.5. Power Supply Installation

(TBD)

1.2.4.6. DPS Connection

The Filter Node provides a single port for connection of the Differential Pressure Sensor (DPS) mounted at the base of the filter tube. This sensor connects to the M8 style socket connector on the electronics housing using the M8 to 5-pin, M12 connector cable.



| Differential Pressure Transducer | |
|--|---|
| Seal Material | Viton Fluorocarbon |
| Housing Material | Brass |
| Port Options | 3/4"-16 UNF Thread To BS1580 To Fit housing Pall DPI Port. |
| Maximum Working Pressure | 450 bar (6500 psi) |
| Proof Pressure | 675 bar (9800 psi) |
| Burst Pressure (Typical) | 1100 bar (15900 psi) |
| Rated Fatigue Pressure | 0-400-0 bar (5800 psi) |
| Process Fluid Temperature | -25 – 90°C (-13 – 194°F) |
| Ambient Temperature | -40 – 60°C (-40 – 140°F) |
| Measurement Differential Pressure Option | 0.25 – 1.0 bar (3.6 – 14.5 psi) 1.0 – 4.0 bar (14.5 - 58 psi) 2.0 – 8.0 bar ((29 - 116 psi) |
| Pressure Dead Band | 25% Full Scale (As Shown Above) |
| Temp. Measurement Range | 0 – 100°C (-32 – 212°F) |
| Compatibility | Petroleum oils and synthetic hydraulic and lubrication fluids. |
| Ingress Rating Electronics | IP 65 to IEC 60529 when assembled |

Technical Specifications refer to data sheet for Pall Part No. RCA222.

1.2.4.7. Athalon Housing Specifications

1.2.4.7.1. Athalon H210 or H310 Filter Housings

| Functional Description | Specification/Range | |
|-------------------------------|-----------------------------------|--------------|
| H310 / H210 Housing | | |
| Port Options H210 | O-Ring Boss Per SAE J1926. | 1" or 1 1/4" |
| | BSP Thread To ISO228. | 1" or 1 1/4" |
| | Split Flange To SAE J518. | 1" or 1 1/4" |
| | Split Flange To SAE J518 Code 62. | 1" or 1 1/4" |



| | | |
|---------------------------------|---|------------------|
| Port Options H310 | Split Flange To ISO6162 (Metric) | 1" or 1 ¼" |
| | Side Manifold Mount. | 1 ¼" Only |
| | Top Manifold Mount. | 1 ¼" Only |
| | O-Ring Boss Per SAE J1926. | 1 ¼", 1 ½" or 2" |
| | BSP Thread To ISO228. | 1 ¼", 1 ½" or 2" |
| | Split Flange To SAE J518 Code 61. | 1 ¼", 1 ½" or 2" |
| | Split Flange To SAE J518 Code 62. | 1 ¼", 1 ½" or 2" |
| Port Options H310 | Split Flange To ISO6162 (Metric). | 1 ¼", 1 ½" or 2" |
| | Side Manifold Mount. | 1 ¼", 1 ½" or 2" |
| | Top Manifold Mount. | 1 ½" Only |
| Differential Pressure | 1, 2 or 4 bard, 25% Dead band | |
| Seal Material | Fluorocarbon | |
| Filtration Rating | β ₂₀₀₀ ≥ 2000 (In to out flow path) | |
| Element Media Option | AZ (3 μm(c)), AP (5 μm(c)), AN (7 μm(c)), AS (12 μm(c)) and AT (25 μm(c)). (μm(c) where Beta =2000) | |
| Flow | UH210 to 230 l/min (60 US gpm) UH310 to 600 l/min (160 US gpm) | |
| Process Fluid Temperature | -25 – 90°C (-13 – 194°F) | |
| Ambient Temperature | -25 – 60°C (-13 – 140°F) | |
| Maximum Working Pressure | 400 bar (6000 psi) | |
| Rated Fatigue Pressure | 240 bar (3500 psi) | |
| Filter Element P/N and Grade | Read from RFID tag on Filter Element | |
| Filter Element Runtime | Data Stored on RFID Tag | |
| Filter Element Lot Number | Data Stored on RFID Tag | |
| Filter Element Activation Date | Data Stored on RFID Tag | |
| Filter Element Hours in Service | Data Stored on RFID Tag | |
| Filter Element Machine ID | Data Stored on RFID Tag | |
| Filter Element dP Max | Data Stored on RFID Tag | |
| Filter Element Temperature Max | Data Stored on RFID Tag | |
| Ingress Rating Electronics | IP65 Minimum | |
| Compatibility | Compatible with all petroleum oils and synthetic hydraulic and lubrication fluids. | |

1.2.4.7.2. Athalon R310 Filter Housings

| Functional Description | Specification/Range | |
|------------------------|-----------------------------------|------------|
| R310 Housing | | |
| Port Options R310 | O-Ring Boss Per SAE J1926. | 1 ½" or 2" |
| | BSP Thread To ISO228. | 1 ½" or 2" |
| | Split Flange To SAE J518 Code 61. | 2" or 2½" |
| | Split Flange To ISO6162 (Metric) | 2" or 2½" |
| Differential Pressure | 1, 2 or 4 bard, 25% Dead band | |



| | |
|---------------------------------|---|
| Seal Material | Fluorocarbon |
| Filtration Rating | $\beta_{\geq 2000}$ (In to out flow path) |
| Element Media Option | AZ (3 $\mu\text{m(c)}$), AP (5 $\mu\text{m(c)}$), AN (7 $\mu\text{m(c)}$), AS (12 $\mu\text{m(c)}$) and AT (25 $\mu\text{m(c)}$). ($\mu\text{m(c)}$ where Beta =2000) |
| Flow | R310 to 760 l/min (200 US gpm) |
| Process Fluid Temperature | -25 – 90°C (-13 – 194°F) |
| Ambient Temperature | -25 – 60°C (-13 – 140°F) |
| Maximum Working Pressure | 41 bar (600 psi) |
| Rated Fatigue Pressure | 41 bar (600 psi) |
| Filter Element Presence | Detect that the Filter Element is Installed (via RFID) |
| Filter Element P/N and Grade | Read from RFID tag on Filter Element |
| Filter Element Runtime | Data Stored on RFID Tag |
| Filter Element Lot Number | Data Stored on RFID Tag |
| Filter Element Activation Date | Data Stored on RFID Tag |
| Filter Element Hours in Service | Data Stored on RFID Tag |
| Filter Element Machine ID | Data Stored on RFID Tag |
| Filter Element dP Max | Data Stored on RFID Tag |
| Filter Element Temperature Max | Data Stored on RFID Tag |
| Power requirement. | 24VDC, 100mA |
| Ingress Rating Electronics | IP65 Minimum |
| Compatibility | Compatible with all petroleum oils and synthetic hydraulic and lubrication fluids. |

2. Installation & Setup

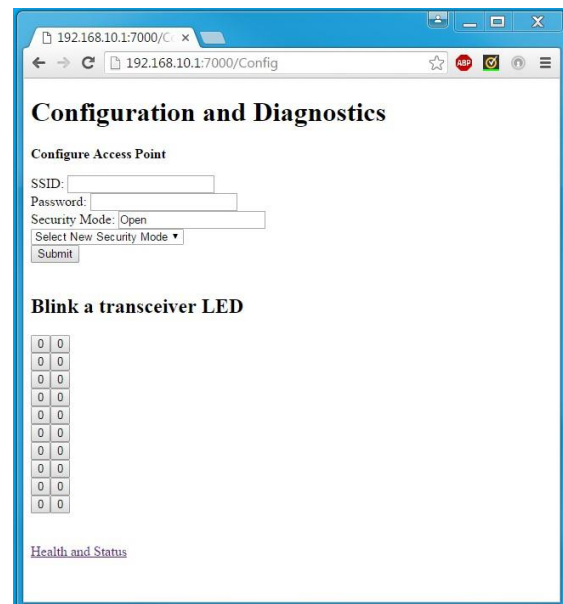
2.1. Filter Node Installation

2.2. Providing a WiFi Access Point

The customer site must provide a WiFi access point (2.4 GHz Wi-Fi 802.11 a/b/g/n) that is in range of the gateway.

If a WiFi access point is not available, but a wired/Ethernet connection is available at the customer's site, Pall recommends one of Cisco's Meraki wireless LANs, such as the MR18 (<https://meraki.cisco.com/products/wireless/mr18>) indoor access point.

If a WiFi access point is not available and a wired/ethernet internet connection is not available, Pall recommends one of CradlePoint's wireless routers, such as the MBR1200B wireless router with 3G/4G wireless WAN connectivity (<https://cradlepoint.com/products/mbr1200b>). Wireless routers connect with the internet via mobile broadband service available from carriers in the customer's region. A wireless router provides a WiFi access point for the Prodigy Gateway.



2.3. Configuring the Athalon[®]CM Gateway

The customer must configure the WiFi Gateway to communicate with an on-site WiFi access point. The gateway associates to a WiFi access point using a service set identifier (SSID) broadcast by the WiFi access point. The gateway securely communicates with the following common WiFi security types:

Open (no security code), WEP-40, WEP-104, WPA (AES & TKIP), WPA2 (AES, TKIP & Mixed mode). Each gateway comes with a unique MAC address assigned by the factory, which may also be used for authentication.

Upon initial power-up, the WiFi Gateway will function as a WiFi Access Point. Using a laptop or similar device, connect to the gateway's network SSID, which is set to its MAC address. Once connected, browse to the Configuration page at 192.168.10.1:7000/Config. On the Configuration page, fill in the SSID, Password, and Security Mode of the WiFi Access Point the gateway should communicate with, and press the "Submit" button (See Figure below). The settings will be saved in the gateway. Once configuration is complete, press the button on the gateway enclosure to switch the gateway from Access Point mode to Client mode. The Prodigy gateway will now communicate with the cloud based server through the WiFi access point. If the WiFi Access Point needs to be changed in the future, the Prodigy gateway can be placed back into its WiFi Access Point mode by pressing the button on the gateway enclosure.

7. Operation

8. Crixus Web Page



9. Mobile App

10. Troubleshooting