AiQ-TD-50C

Electronic Airflow Measuring Station
Air Measurement Actuator & Class 1A Aluminum Control Damper

Airflow-IQ Series

RUSKIN
AUTHORITY IN AIR CONTROL

APPLICATION

The AiQ-TD-50C offers accurate airflow measurement and control through electronic thermal dispersion technology utilized in Ruskin model TDP05K Airflow & Temperature Measuring probes(s) with the inclusion of Ruskin model CD50 control damper and Ruskin's air measurement RS-485 interface actuator; delivered from factory as one compact assembly. The AiQ-TD-50C is factory assembled and wired to provide effective setpoint airflow control from 0 to 5000 FPM (0 to 25 m/s) utilizing Modbus (Default), BACnet, or Analog interface to the BAS. The ultra low-leak, Class 1A rated model CD50 airflow control damper meets leakage requirements of the International Energy Conservation Code.

STANDARD CONSTRUCTION

Assembly Casing	**Airflow Measuring Station:** Minimum 0.080" thick aluminum sleeved assembly. Sleeve Lengths (d): - Single Section with Extended Axle and without Airflow Straightener: 15" (381) - Single Section with Extended Axle and with Airflow Straightener: 18" (457) - Single Section with Jackshaft and without Airflow Straightener: 20" (508) - Single Section with Jackshaft and with Airflow Straightener: 22.5" (572) - Mutli-Section without Airflow Straightener: 20" (508) - Multi-Section with Airflow Straightener: 22.5" (572)
Sensor Circuit	Conformal coated, water resistant flexible polyimide circuit, with heated and ambient thermistors.
Sensor Distribution	Max 128 sensing points, up to 16 probes.
TDP05K Probes	Airfoil-shaped, Low Profile 2" x 3/4" (51x19) 6063T6 extruded aluminum with acid etch clear anodized finish.
Building Automation Interface	- The Airflow-IQ airflow and temperature measurement stations by DEFAULT is factory configured prior to shipping with an airflow range of 0 to 5,000 FPM. And by DEFAULT, the digital communications on both the TDP05K Primary and the VA*B24-BAC actuator are set to Modbus RTU. BACnet MS/TP automation interface is also available. If configurations other than the DEFAULT values are required, changes can be made upon installation by following the instructions noted in the Airflow-IQ Installation, Operation, and Maintenance Manual. - The air measurement actuator (VA*B24-BAC) accepts a CFM setpoint via a 0 - 10V Analog signal or a digital communication commanded value (BACnet or Modbus) which will modulate the control damper to maintain the desired Setpoint value. - Network interface includes • Damper position feedback • Velocity • Volume • Enable/Disable Status • Ability to toggle between Flow and Position Control - When the VA*B24-BAC actuator's network interface (BACnet, Modbus) is not used to communicate with the BAS, the Analog signal from the TDP05K Primary can be used across its A02 terminals (4-20mA or 2-10VDC) to communicate active flow values. NOTE: Analog Temperature output is not available when the analog interface option is used in place of the network interface with the automation system is selected.
TDP05K Probe Accuracy	+/- 3% over measuring range when installed per Ruskin placement guidelines.

AiQ-TD-50C shown above depicts a **Right Hand (RH)** Mounting Configuration; where the airflow enters through the probe(s) and exits through the Control Damper.

Frame	**Damper:** 5" X 1" (127 x 25) 6063T5 extruded aluminum hat channel
Blades	6" (152) 6063T5 heavy gauge extruded aluminum, airfoil shaped. Parallel blade configuration.
Axles	1/2" (13) plated steel hex with molded synthetic bearings.
Seals	**Blade Seals:** Santoprene. **Jamb Seals:** flexible metal, compressible.
Linkage	Plated steel, concealed in frame.
Actuator(s)	The 180 in-lb (20 Nm) air measurement actuator includes integrated web server with two (2) analog inputs for flow sensing and receiving a DDC setpoint command. Model VAFB24-BAC is standard (spring return air measurement actuator). Option is available for non-spring return (maintain last position) model VAMB24-BAC. Single point requirement of 24VAC 50/60Hz or 24VDC, 20VA. Unit sizes greater than 30 Sq.Ft will include one or more secondary 24VAC/VDC modulating actuators in addition to the air measurement actuator model.
Single Point Power Requirement	24VAC 50/60Hz or VDC, 20VA
CFM Setpoint Input Signal	0-10V (or either Modbus (default) or BACnet network communications)
Output Signal	Digital Modbus or BACnet from air measurement actuator; 4-20mA or 2-10 VDC with 500 ohm resistor (or Modbus or BACnet) directly from TDP05K.
Velocity Requirements	Product Range - 0 to 5000 FPM (0 m/s to 25 m/s).
Operating Temperature	-20°F to 120°F (-29°C to 50°C)
Minimum Size	12"w x 12"h (305 x 305)
Maximum Size	Single section - 60"w x 72"h (1524 x 1829) Multi-Section - 120"w x 120"h (3048 x 3048)

Consult factory for special considerations.

NOTE:
1. Values shown in ( ) are millimeters unless otherwise indicated.
2. Refer to installation manual for additional details.
3. Units are furnished actual size ordered.

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FEATURES

- Thermal Dispersion flow and temperature sensors.
- Factory calibrated Primary in nonvolatile EPROM.
- Modbus, BACnet, or Analog Output standard for TDP05K Primary & IP or MS/TP from factory mounted 24V modulating Actuator Controller.
- AMCA Class 1A Rated Ultra Low-leak CD50 Aluminum Damper.
- Factory mounted and commissioned controls.
- Type 1 rated TDP05K monitor box enclosures.
- Single-point 24V power connection.
- INSERTION mounted TDP05K probes (control boxes secured to exterior of sleeve).
- Temperature and altitude compensated.
- Right Hand (RH) mounting configuration is standard. *Refer to the AiQ-TD-xxC Actuator Configurations guide for available options.*

Ruskin's AiQ-TD-50C helps satisfy the requirements for minimum outside air as recommended by the following:

- ASHRAE 62.1, 90.1 and 189.1.
- California Title 24.
- International Mechanical Code (IMC).
- International Energy Conservation Code (IECC)d.

VARIATIONS

The AiQ-TD-50C is available with options to satisfy your specific application.

- Custom density probe/sensor array.
- TYPE 4 rated TDP05K weather-resistant enclosures.
- Non Spring-Return Air Measurement Actuator model VAMB24-BAC.
- Custom sleeve materials (Galvanized, 304SS, 316SS) and gauges.
- Available with Wired Graphic User Interface or Wireless Graphic User Interface.
- 1.5" tall Mounting Flanges on inlet, outlet, or both ends of the sleeve. Mounting holes in flanges available upon request.
- Opposed damper blade action.
- Silicone damper blade seals.
- Stainless steel damper linkage and bearings.
- Honeycomb Airflow Straightener.
- Left Hand (LH) mounting configuration.

PRODUCT FEATURES AND DATA

TDP05K Airflow and Temperature Measurement Probe Features

- Each TDP05K includes Modbus (Default), BACnet, and Analog Output communications.
- Lowest power consumption thermal dispersion device available.
- Tool-free one touch setup through surface membrane label.
- Standard cabling, no proprietary cables.
- Listings and Compliances:
  - UL Listed: UL 60730-1; UL 60730-2-9; UL 60730-2-15.
  - UL Compliant: UL 60335-1; CAN/CSA-C22.2 No. 60335-1; UL 60335-2-40; CAN/CSA C22.2 No. 60335-2-40.
  - FCC: Meets Part 15, Subpart B, Class A device requirements.
  - CE: European Shipments Only.
  - BACnet (BTL): Certified to BACnet Standard ISO 16484-5, Rev. 1.14.
- Airfoil shaped acid-etch clear anodized sensing probes featuring lower pressure drop and less noise.
- Highest density thermal dispersion sensing array up to 128 sensing points.
- Up to 8 moisture resistant flex sensor pairs per probe.
- BACnet or Modbus Low and High flow and temperature alarms.
- 16x2 character LCD (airflow, temperature, setup & diagnostics).
- Self-diagnostics utilizing artificial intelligence.
- The highest accuracy over the entire range of airflows results from probe sensing elements that are factory tested and calibrated.

Damper Model CD50 Features

- The CD50 is a low leak, extruded aluminum damper designed with airfoil blades for higher velocity and pressure HVAC systems.
- It meets the leakage requirements of the International Energy Conservation Code by leaking less than 3 cfm/sq. ft. at 1" of static pressure and is AMCA licensed as a Class 1A damper.
- Airfoil blade design for low pressure drop and less noise generation. Blades have an integral structural reinforcing tube running full length of each blade.
- Positive locking hexagonal axles, non-corrosive molded synthetic bearings and shake proof link-age for low maintenance operation.
- Blade edge seals are extruded double edge design and mechanically lock into the blade for superior sealing.
- Accuracy based on tests and procedures performed in accordance with AMCA test standards.

VAFB24-BAC (Spring Return) & VAMB24-BAC (Non-Spring Return) BACnet Actuator Features

- Torque 180 in-lb.
- Ethernet 10/100 Mbit/s, TCP/IP, integrated Web server.
- Modbus RTU, BACnet MS/TP, BACnet I/P.
- Two analog inputs for flow sensing and receiving a DDC set point.
- Air Measurement actuators are configured at the factory prior to shipping. Should reconfiguration be required at the installation site, setup is available via integrated Web Server and Ethernet IP connection; directly to actuator using a web browser.
- Fail Safe Signal Interlock, drives damper closed on loss of signal.
- VAFB24-BAC Spring open or spring close on loss of power as required for application.
- Optional VAMB24-BAC Non-Spring Return (Maintain Last Position).
- 95 seconds open, less than 60 seconds spring close.
- NEMA 1 rated actuator housing.
- Built in Data Logging.
- Control up to three additional actuators via MP-Bus.

VAFB24-BAC VAMB24-BAC

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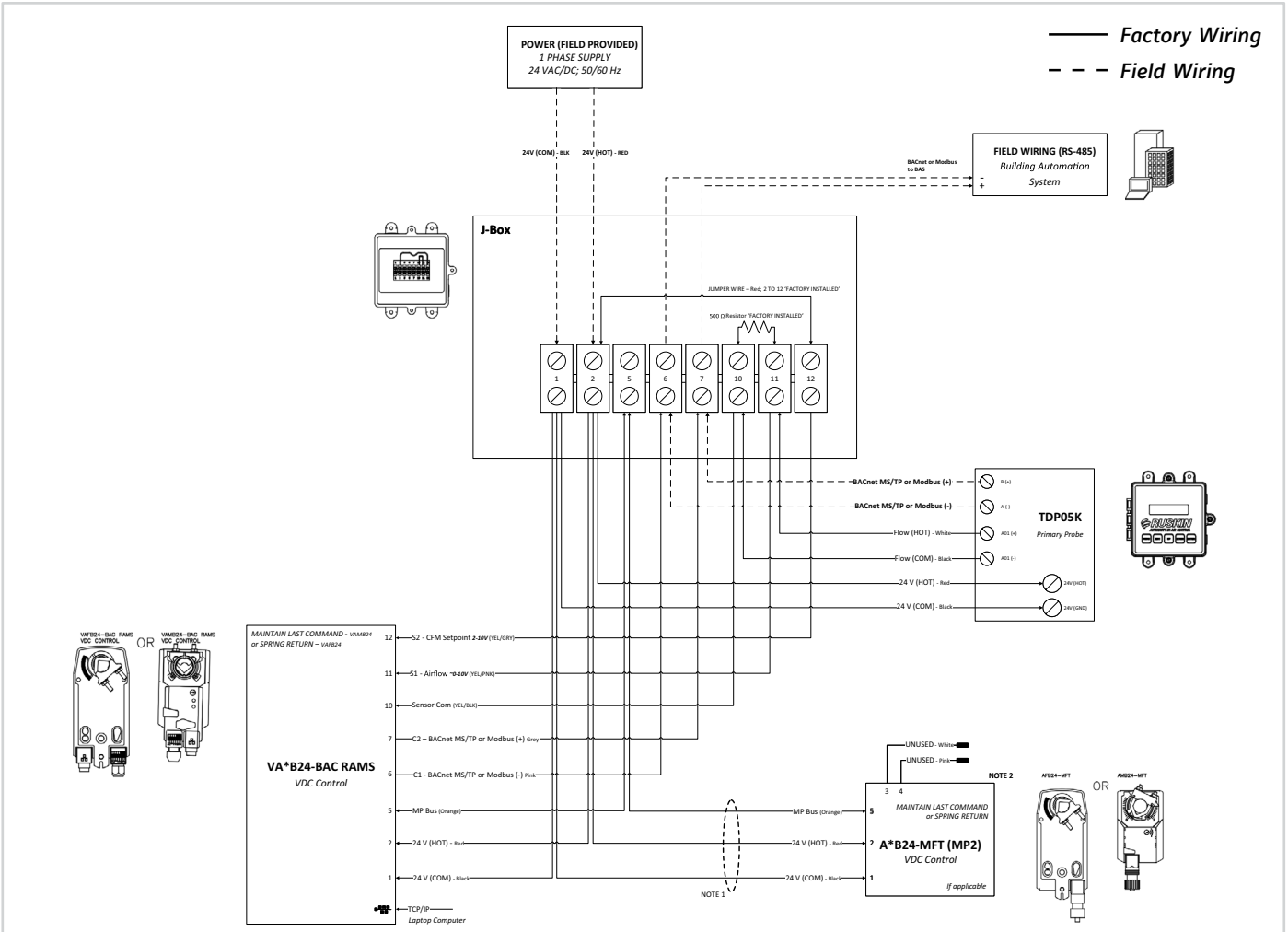
WIRING SCHEMATIC

Ruskin's AIRFLOW-IQ model AiQ-TD-50C is supplied and calibrated with a dedicated TDP05K Primary probe that is factory wired to one or more airflow and temperature measurement probe(s). The Primary probe has been configured at the factory with customer supplied parameters.

Ruskin's AiQ-TD-50C combines the functionality of a highly accurate thermal dispersion airflow station and a low leakage model CD50 control damper to control airflow volumes to a target set point. This model comes standard with TDP05K Thermal Dispersion Probes factory-installed in the damper sleeve, a 24VAC modulating actuator (Spring Return VAFB24-BAC or Non-Spring Return VAMB24-BAC) and a TDP05K airflow and temperature measurement Primary probe that outputs a signal proportional to the airflow going through the unit. The air measurement actuator is factory wired to a terminal block for easy single-point wiring. The actuator controller can position the damper to deliver a target CFM set point. An output from the controller can also communicate the measured airflow rate to a building management system, which can use that signal to regulate a fan's VFD or signal an under-ventilation alarm.

For normal applications the Primary probe's configuration should not need to be modified in the field. For more detailed information refer to the online installation and maintenance manual at www.ruskin.com.

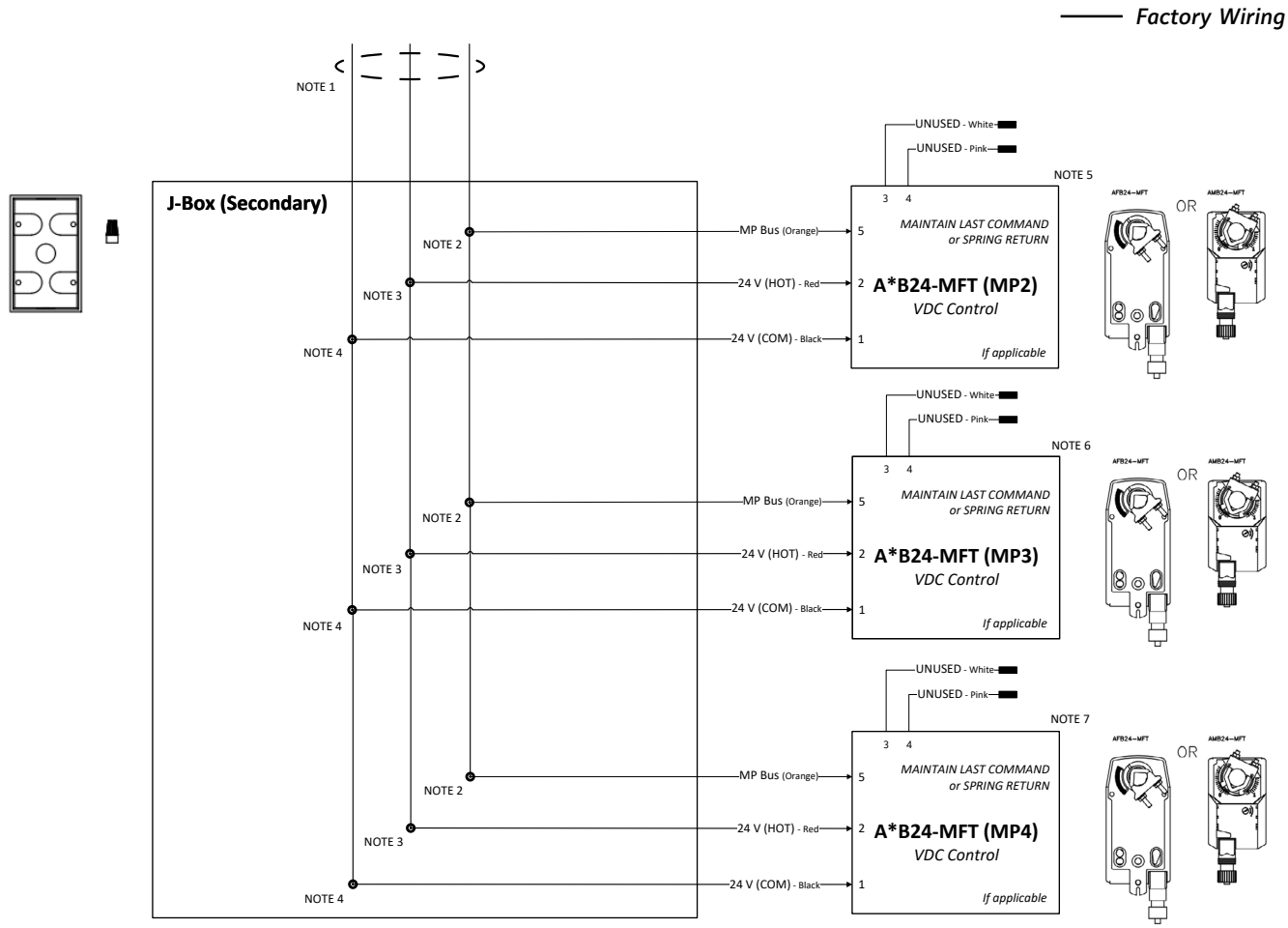
Models AiQ-TD-xxC
BACnet or Modbus - Field Wiring



NOTE:
1. When -MFT Actuator quantity exceeds 1, refer to page 2 of 2.
2. Factory Configures: Belimo Address MP2.

WIRING SCHEMATIC

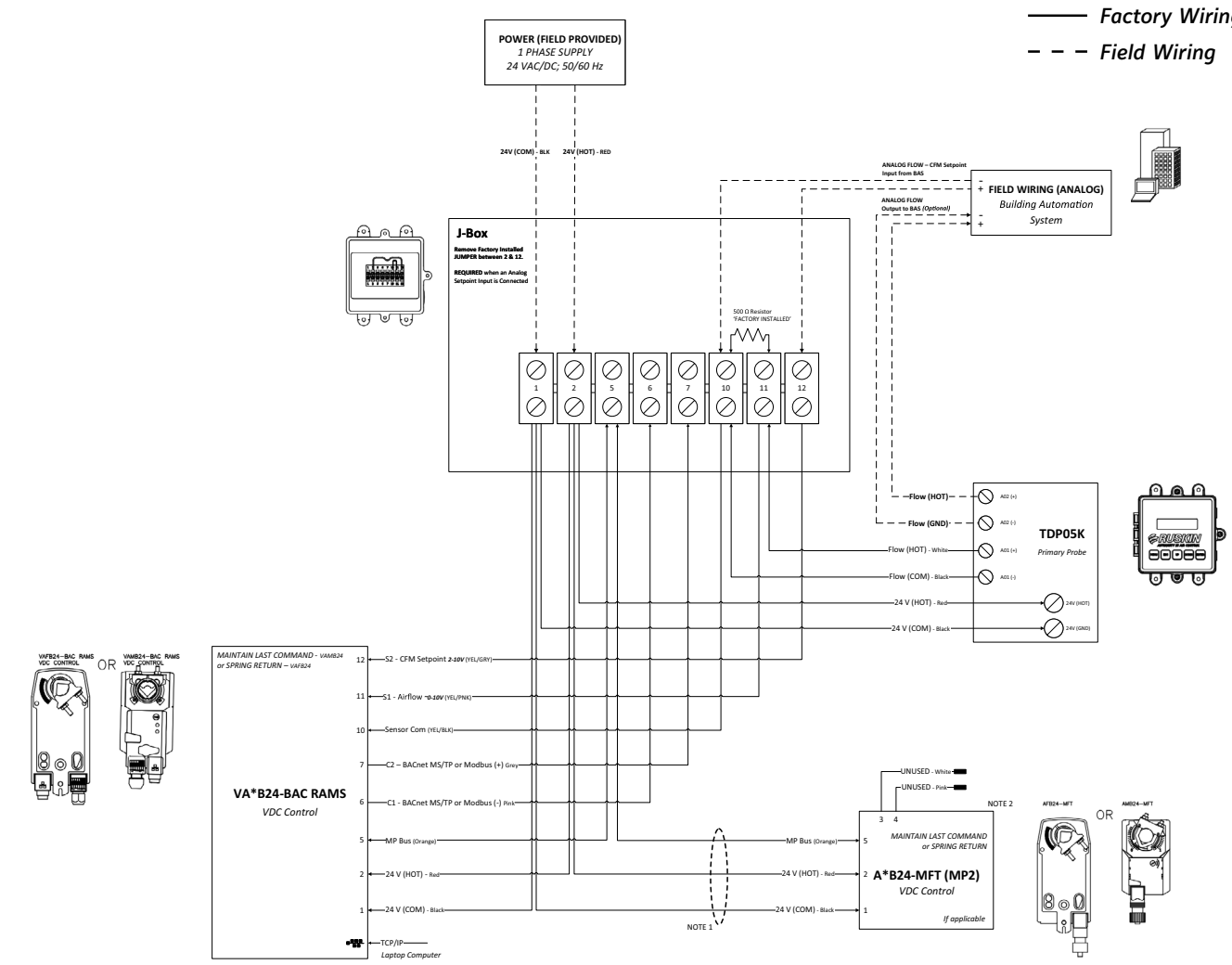
Models AiQ-TD-xxC
Factory Wiring



NOTE:
1. Secondary J-Box wiring to Primary J-Box Wiring, refer to page 1 of 2.
2. Wire Nut #1: MP BUS (Orange) wires under the same wire nut.
3. Wire Nut #2: 24 V HOT (Red) wire under the same wire nut.
4. Wire Nut #3: 24 V COM (Black) wire under the same wire nut.
5. Factory Configured: Belimo Address MP2.
6. Factory Configured: Belimo Address MP3.
7. Factory Configured: Belimo Address MP4.

WIRING SCHEMATIC

Models AiQ-TD-xxC
Analog (BAS) - Field Wiring



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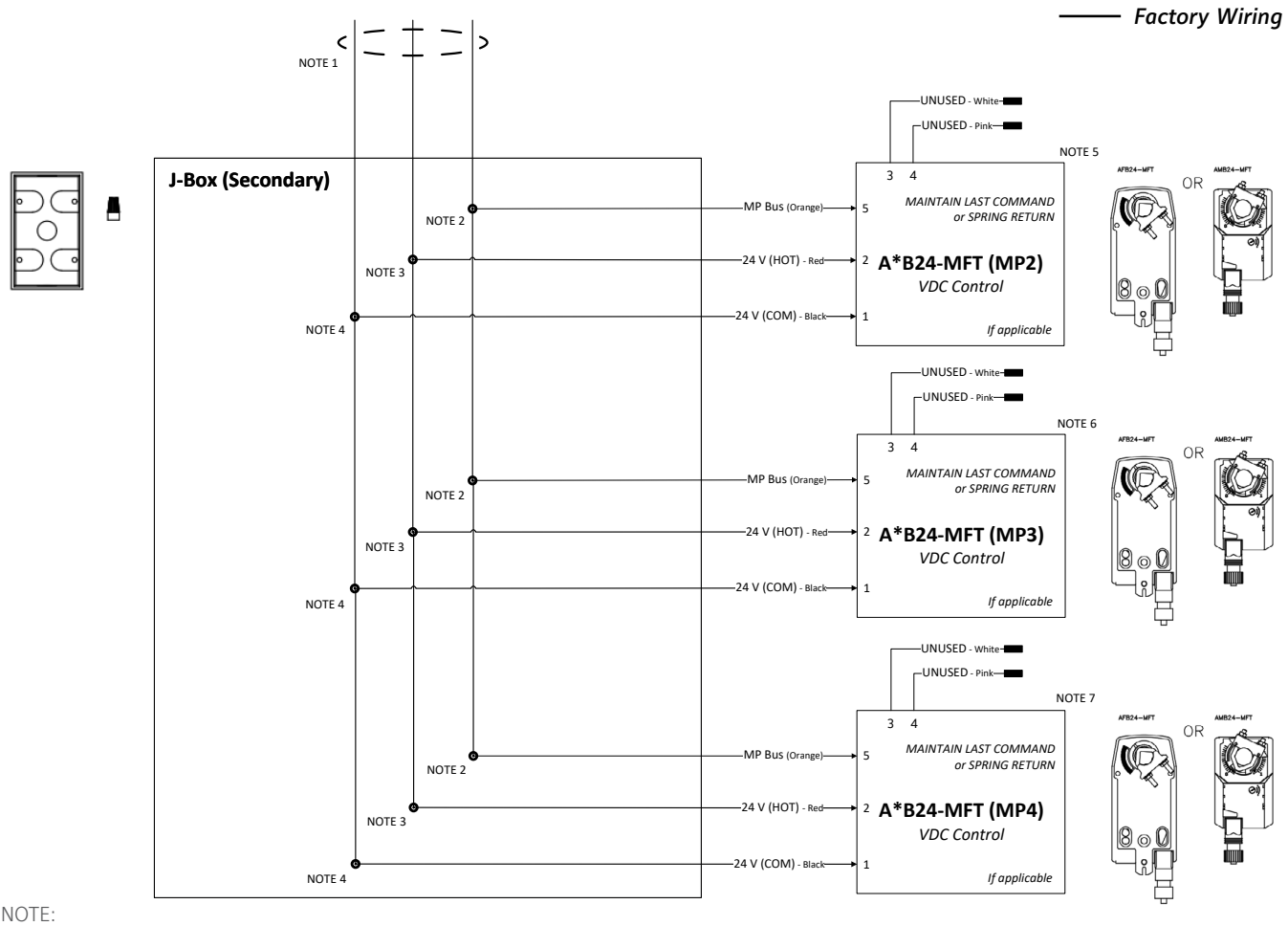
2. Factory Configures: Belimo Address MP2.

WIRING SCHEMATIC

Models AiQ-TD-xxC
Analog (BAS) - Factory Wiring



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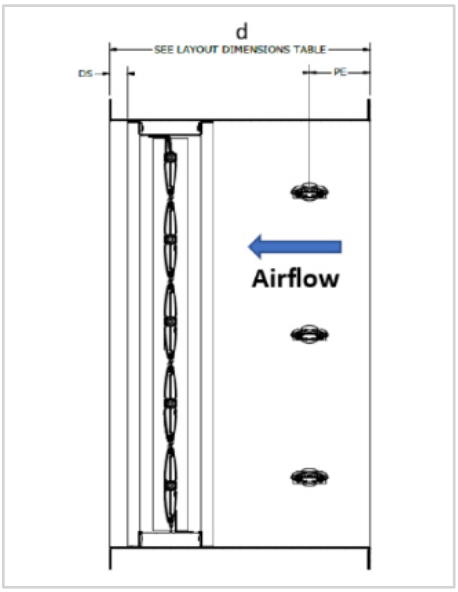
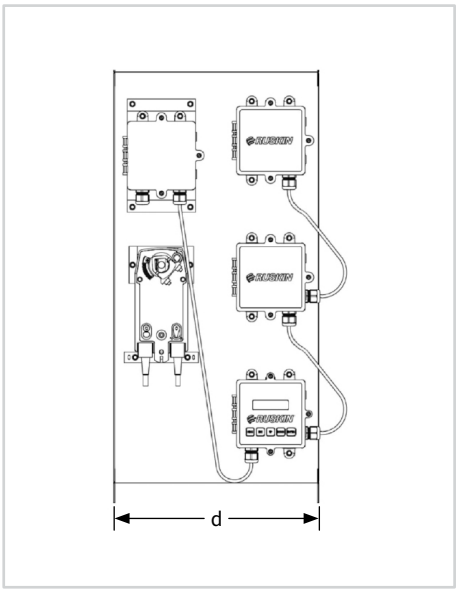
MODE OF OPERATION

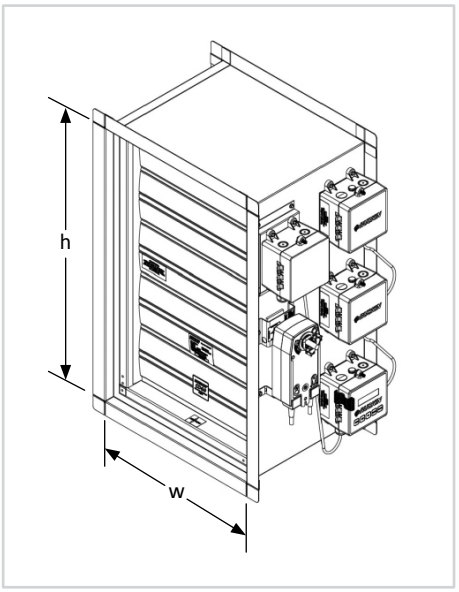
Ruskin's airflow measurement actuator is the RS-485 interface and setup BAS device for the airflow measurement station. The actuator accepts a CFM SETPOINT via analog input S2 (terminal 12) or a RS-485 network commanded setpoint. The actuator will modulate the damper to maintain the airflow setpoint value. The AIRFLOW measurement for the TDP05K is connected to input S1 (terminal11) of the actuator and represents a velocity airflow measurement. The active airflow measurement is reported based on the actuator's configuration, either the RS-485 interface or an analog output from the TDP05K to the building automation system. The airflow measurement actuator includes a WEB SERVER and can be reconfigured at the installation site using a web browser such as Google Chrome should values other than the factory defaults be required.

Direct position control or flow control via BACnet or Analog input are also possible using the setpoint input when the actuator is configured for **position control** in place of the factory default **flow control**.

DIMENSIONAL DETAILS (Shown with Extended Axle and Optional Front/Rear Flanges)







Dimensions WITH Airflow Straightener			
DS	PE	Single Section Units with Extended Axle (d)	Multi-Section Units (or Single Section with Jackshaft) (d)
1″	6″	18″	22.5″

Dimensions WITHOUT Airflow Straightener			
DS	PE	Single Section Units with Extended Axle (d)	Multi-Section Units (or Single Section with Jackshaft) (d)
1″	3.5″	15″	20″

NOTE: For this example, three (3) probes are shown in the dimensional details above.
Refer to the TDP05K Product Data Sheet for the actual number of probes and sensors supplied for site specific installation.

SUGGESTED SPECIFICATION

Furnish and install an electronic thermal dispersion airflow measuring station with integral damper and controls. Airflow measuring assembly shall include a Class 1A leakage rated control damper with 6" (152) wide, 6063T5 heavy gauge extruded aluminum, airfoil shaped blades. Damper bearings shall be molded synthetic. Damper frame shall be 6063T5 extruded aluminum hat channel. Damper shall be supplied with stainless steel compression jamb seals and Santoprene blade edge seals that are mechanically fastened.

The electronic thermal dispersion type airflow and temperature measuring station (AFTMS) shall be capable of monitoring and reporting the airflow and temperature at each measuring location with up to 16 measuring probes containing 1 to 8 sensor points per probe. AFTMS shall include a Primary that interfaces with the building automation system (BAS) using Modbus or BACnet protocol or 4-20mA analog outputs reporting velocity and temperature measurements. Probe(s) shall be constructed of an airfoil shaped acid-etch clear anodized 6063T6 aluminum extrusion containing the sensor circuit(s) for low pressure drop and low noise in installed applications. Each moisture resistant flexible polyimide sensor circuit shall consist of thermistors for velocity and temperature. The Primary user interface shall feature tool-free touch setup through surface membrane label on a hinged enclosure with dust tight or weather resistant construction. Factory calibration of thermal dispersion sensors shall be between 0 and 5,000 FPM. Complete assembly shall be constructed, calibrated, and configured in an ISO 9001 certified facility following strict ISO calibration test procedures.

Proprietary cables are not acceptable. Factory wiring shall be completed using a factory-supplied, composite 4 wire cable similar to Connect Air W41282P-2306BL with communications and power in one cable. The Primary shall be capable of processing up to 128 (16 probes, 8 sensors/probe each) independent sensing points per AFTMS and shall operate on a Class 2 24VAC/VDC low voltage supply. The Primary shall feature a 16 character x 2 line alphanumeric backlit LCD FP display, digital offset/gain adjustment, continuous performing sensor/transmitter diagnostics and a visual alarm to detect malfunctions. The display shall be field adjustable to read either imperial system (IP) or metric system (SI) units. The Primary's output shall be Modbus and BACnet compatible and supply a field adjustable 4-20 mA, or 2-10 VDC across a 500 ohm resistor. All electronic components of the assembly shall be lead-free RoHS compliant. Accuracy shall be based on tests and procedures performed in accordance with AMCA publications 610 and 611.

A factory furnished and calibrated controller shall be programmed with the product's full flow range. The controller shall report a 0-10V linear output that is proportional to the flow and shall be altitude and temperature compensating. Controller shall have a field configurable Modbus (Default) or BACnet communications feature to facilitate digital communication, when required. Installing contractor shall coordinate proper sizing and placement of the air measuring station with a qualified manufacturer's representative prior to installation.

Airflow Measuring Stations shall be, in all respects, equivalent to the Ruskin AIRFLOW-IQ model AiQ-TD-50C.

LINKS TO IMPORTANT DOCUMENTS

Document Title
The general Airflow-IQ document (AIRFLOW-IQ-0121)
The Airflow-IQ AiQ-TD-50C Actuator Configurations (AiQ-TD-xxC Actuator Configurations)
Limited Warranty Document

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