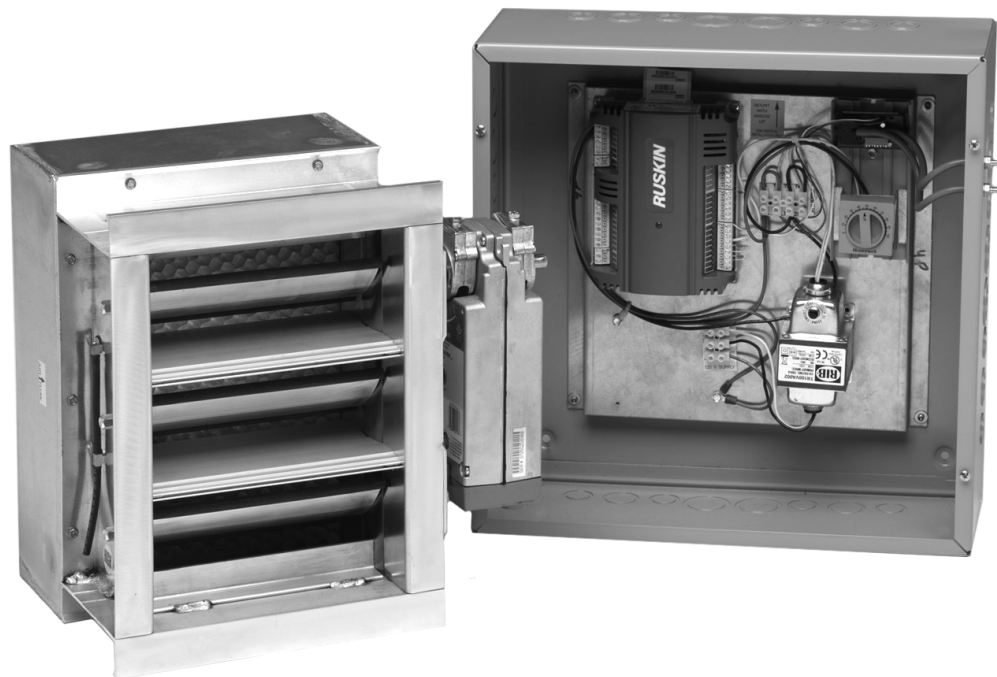




# ***Air Quality Solutions***

**Installation & Maintenance Manual**



## **Model: IAQ50X**

### **Air Measuring Station**

### **Indoor Air Quality Damper**

## Table of Contents

Product Application .....	2
Key Features .....	2
Key Benefits .....	2
Construction Details .....	2
Installation .....	3
Proper Placement of IAQ50X Damper .....	3
IAQ50X/IAQ020X Controls .....	4
IAQ50X/IAQ020X Operation .....	4
Specifications .....	4
IAQ50X/IAQ020X Field Wiring Connections .....	5 & 6
Trouble Shooting .....	7
Maintenance .....	8

## Product Application

The IAQ50X is an air measurement station with modulating outside air damper and setpoint controller. It is designed for any application requiring accurate airflow measurement at velocities between 150 and 2,000 FPM (0.76 and 10.2 M/S). This unit can be installed directly behind an outside air louver, in the duct work or in an air handling unit.

The IAQ50X air measuring damper is designed to meet the current engineering requirements for indoor air quality. The IAQ50X is a patented solution that combines three different functions into one product:

- Airfoil blade control damper
- Airflow measuring station
- Airflow setpoint controller

The IAQ50X provides the required ventilation air as stated in ASHRAE Standard 62.1 and also assists the designer in LEED/Green building design.

### Key Features

- Individual factory calibration on AMCA Wind Tunnel
- Fully commissioned actuator
- Fully commissioned IAQ50X controller
- Modulating Damper / Air Measurement station in one compact unit
- Output calibration adjustment dial
- AMCA Class 1 Low-Leakage Damper (Less than 3 CFM / SqFt @ 1" w.g. (249Pa))
- Analog interface with any automation system
- User specified 0-10V CFM setpoint per application
- LON network, 2-wire connection
- Airflow monitor alarm contacts (LEED EQ credit 1)
- 0-10VOC CFM output proportional to air flow measurement
- Optional CO<sub>2</sub> sensor for DCV applications.

The IAQ50X is available in four mounting configurations

- Full Opening
- Economizer Damper option mounted on the top or the bottom of an IAQ50X damper
- Economizer Damper option mounted on the left or right of an IAQ50X damper
- Louver option attached to the front of the IAQ50X.

Complete assemblies ship from the factory for easy installation.

### Key Benefits

- Air measurement station arrives at the job site fully calibrated and does not require field calibration. Unit has been fully tested and is 100% operational when shipped from the factory.
- The complete assembly is only only 11" (279) deep including a 3" (76) air straightening section, a damper assembly and an air measurement station.
- Meets the requirements for minimum outside air and low-leakage dampers
  - ASHRAE 62.1
  - California Title 24
  - ASHRAE 90.1
  - International Mechanical Code (IMC)
  - International Energy Conservation Code (IECC)
  - AMCA Class 1 (Less than 3 CFM / SqFt @ 1" w.g. (249 Pa))
- Contributes to earning required Indoor Environmental Quality (IEQ) and Energy and Atmosphere (EA) LEED credits for Green Building construction and operation.

### ! WARNING

THIS PRODUCT IS TO BE INSTALLED BY A QUALIFIED SERVICE TECHNICIAN. TO AVOID UNSATISFACTORY OPERATION OR DAMAGE TO THE PRODUCT AND POSSIBLE UNSAFE CONDITIONS, INCLUDING ELECTRICAL SHOCK AND FIRE, THE INSTALLATION INSTRUCTIONS PROVIDED WITH THIS PRODUCT MUST BE STRICTLY FOLLOWED AND THE PARTS SUPPLIED USED WITHOUT SUBSTITUTION. DAMAGE TO THE PRODUCT RESULTING FROM NOT FOLLOWING THE INSTRUCTIONS OR USING UNAUTHORIZED PARTS MAY BE EXCLUDED FROM THE MANUFACTURER'S WARRANTY COVERAGE.

### ! WARNING

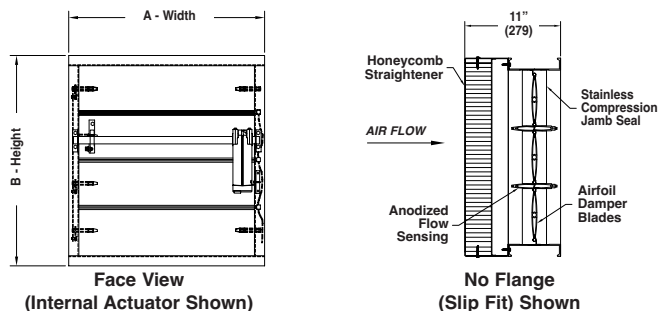
DISCONNECT ELECTRICAL POWER PRIOR TO SERVICING THIS UNIT. FAILURE TO DO SO CAN RESULT IN ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY OR DEATH.

## Construction Details

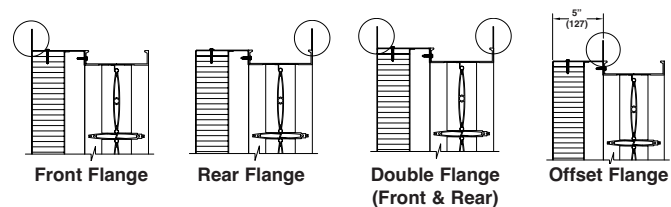
The IAQ50X combines an air measuring station and a high performance aluminum airfoil blade control damper. An air straightener section is contained in a five-inch long sleeve attached to the damper frame. The controller measures, controls and reports the airflow within an accuracy of 5%. The IAQ020X controller monitors the damper blade position using the high-resolution feedback signal from the damper actuator. Unlike other pressure drop only air measurement stations the IAQ50X controller converts the pressure differential along with the damper position feedback into a highly accurate CFM value.

Numerous mounting options make the IAQ50X the correct choice for any application.

- Front Flange
- No Flange (Slip Fit)
- Rear Flange
- Dual Flange
- Offset Flange
- Actuator Internal (In the Air stream)
- Actuator External
- Actuator on right or left side (Air in the face)



## Mounting Flange Options



## Installation

The IAQ50X Air Measuring and Control Damper and dedicated Control Panel may ship in separate containers. However, each IAQ50X is calibrated to match a unique control panel. Match the control number on the damper to the control number on the control panel prior to installation.

### IAQ50X Air Flow Monitor Damper Installation Instructions

1. The IAQ50X Damper is factory calibrated and tested prior to shipment. **DO NOT REMOVE OR ADJUST THE ACTUATOR FOR ANY REASON!** Damper position feedback is used by the controller to determine the air flow. **REPOSITIONING THE ACTUATOR VOIDS THE WARRANTY AND THE CALIBRATION OF THE UNIT.** The actuator has a manual override to open the damper and lock it into position. Consult factory when it becomes necessary to manually open the damper.
2. Remove the IAQ50X Damper from its shipping container and inspect for damage, rust or corrosion. Care must be taken in handling the unit. Always handle the IAQ50X Damper by its frame. Do not lift it by the blade, linkage, axle, motor or jackshaft. Do not drop, drag, step on or apply excessive bending, twisting or racking loads to the IAQ50X Damper. Improper handling of the unit will have adverse affects on the calibration and could result in cancellation of the warranty.
3. Inspect the ductwork and/or the opening where the IAQ50X Damper will be installed for any obstructions or irregularities that might interfere with blade, linkage rotation or the actuator. When installed in the ductwork, the ductwork should be supported in the area of the IAQ50X Damper to prevent sagging.
4. The IAQ50X Damper must be installed with the frame square and without twisting or bending. Unless specifically designed for a vertical blade appli-

cation, the unit must be mounted with its blade axis in the horizontal plane. The damper blades, axles and linkage must be able to operate without binding.

5. The best location for the extended shaft or jackshaft must be determined before installing the damper. The damper may be rotated 180 degrees to get the extended shaft on the correct side of the ductwork. After the damper is installed the shaft location cannot be changed without removing the damper. The jackshaft, when present, will always be in the leaving air stream. The IAQ50X Damper has a specific inlet and outlet and must be installed in the correct orientation. The air enters through the air straightener section and exits the unit from the damper frame side.
6. Use appropriate shims between damper frame and duct opening to prevent distortion of the frame by the fasteners holding the unit in place. When assembling a multi-section IAQ50X, be sure that all of the sections are fastened together on both sides.

### IAQ50X Control Panel Installation Instructions

1. The IAQ50X Control Panel should be mounted securely on an adjacent wall, attached to the air handling unit or placed with other similar control panels. The panel should be mounted within 120 feet of the IAQ50X Damper to assure accurate pressure signals from the IAQ50X Damper to the control panel.
2. Loosen the enclosure's cover screws and remove the cover.
3. Remove the appropriate knockouts for connection of the field wires to the enclosure's terminal block.
4. Fasten the enclosure to the wall or flat surface using the four 1/4" (6) dia. holes at the four corners.
5. See wiring connections and control panel wiring drawing.

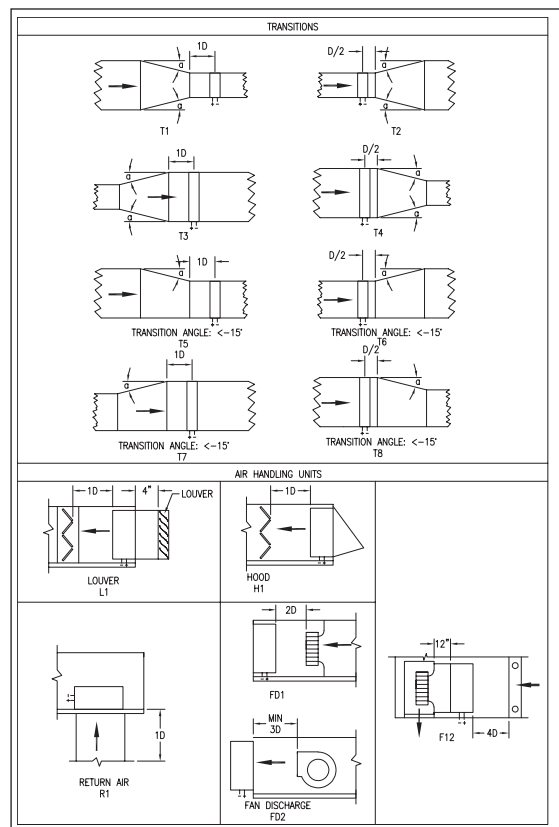
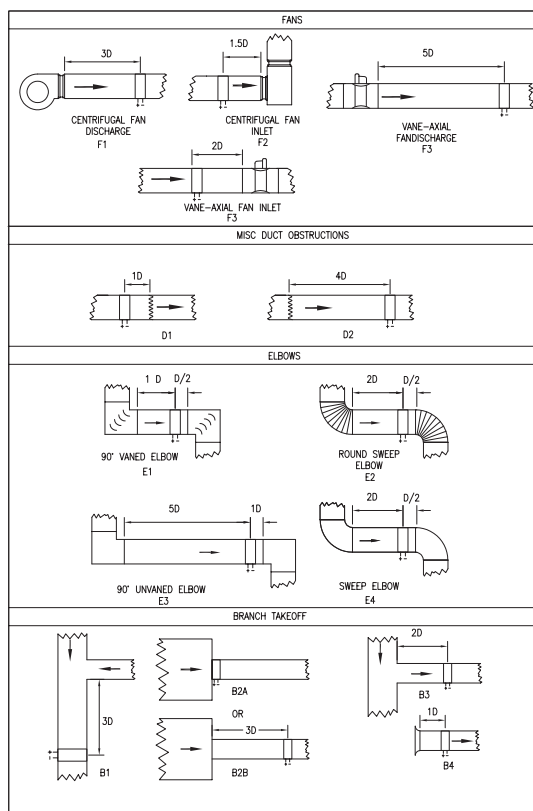
## RECTANGULAR DUCT

$$D = \frac{2.26667 (W \times H)}{W + H}$$

## ROUND DUCT

$$D = \text{DUCT DIAMETER}$$

## PROPER PLACEMENT OF IAQ50X DAMPER



## IAQ50X/IAQ020X Controls

IAQ50X tubing/piping connections connect the damper to a differential pressure transducer located in the IAQ50X control panel. The IAQ020X controller also monitors the damper position feedback. The combination of the damper position and the differential pressure are converted by the IAQ50X controller into a very accurate CFM value.

After determining the air flow the controller compares this value to the CFM set point value and modulates the damper position to maintain the CFM set point value. The controller outputs a 0-10VDC signal confirming the actual air-flow at any point in time.

The controller can accept an analog signal establishing a minimum damper position of 10 to 100% of damper opening. Using dry contacts connected to discrete inputs on the IAQ50X controller, the damper position can be overridden open or closed.

## IAQ50X/IAQ020X Operation

The IAQ50X accepts a 0-10V CFM setpoint signal on terminals T37 (+) & T36 (-) and then modulates the damper to maintain the setpoint CFM value. The IAQ50X controller outputs a 0-10VDC signal on terminals T22 (-) & T23 (+) proportional to the amount of air flowing. Separate charts are provided with the controller showing the setpoint range and output expected for a range of CFM value. (See sample on next page.)

When power is applied with no air flowing, the damper will move to the 100% open position.

To verify the actuator is wired correctly and will operate as expected place a jumper between terminals T27 and T28 on the controller. The damper will move to the closed position. Remove the jumper to restore normal operation.

With a zero setpoint voltage on T37 & T36 the damper will automatically modulate to maintain the minimum CFM value specified. With 10V setpoint the damper will automatically modulate to maintain the maximum CFM values specified.

Please note the IAQ50X controller uses both damper position feedback and the information from the low-pressure transducer to calculate the airflow. DO NOT REMOVE OR REPOSITION THE DAMPER ACTUATOR. The warranty and the calibration of the air measurement station will be voided if the actuator is loosened or removed. Use manual override feature on actuator to manually open the damper and lock it into place when necessary.

## Specifications

### Power Requirements

120VAC 50/60 HZ 100VA

### Digital Controller (IAQ020X)

Application Specific Controller

Program logic and calibration in nonvolatile EPROM

Output adjustment potentiometer

### Electric Actuators

Power: 24VAC 50/60HZ (from control panel)

Signal: 0-10VDC modulating (from control panel)

Position Feedback: 0-10VDC (to control panel)

Spring Return: 20 sec.

### Air Flow

Minimum 150 FPM (.76 m/s)

Maximum 2000 FPM (10.2 m/s)

### Control Panel Enclosure

Type NEMA 1

Size 18" x 18" x 6" (457 x 457 x 152 mm)

### Operating Temperature

-40°F to 150°F (-40°C to 66°C) standard

Humidity 5% to 95% non-condensing

### Approvals

Controller – Listed UL916 as Class 2 Device

CE Approval

### Low Leak Damper Section

Aluminum Frame & Airfoil blades

Jamb seals: Stainless steel compression type

Blade seals: Ruskiprene along control blade edges

Bearings Molded synthetic

Linkage Galvanized Steel concealed in frame

Air straightener section contained in 5" (127) sleeve attached to damper frame

Ultra-low Leakage – Less than 2.0 CFM/Sqft at 1.0" w.g. (249 Pa)

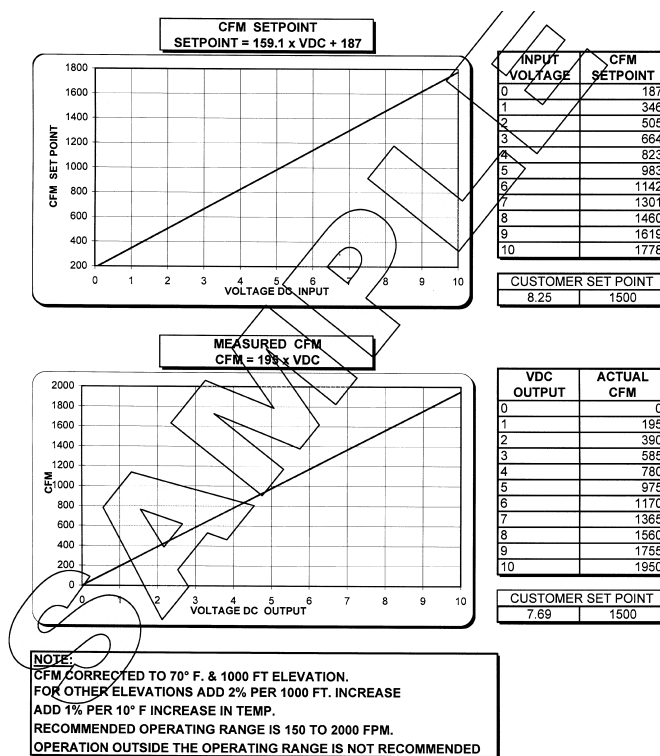
### Accuracy:

Measures, controls, and reports within an accuracy of 5%.

### Pressure Drop

0.13" w.g. (32 Pa) at 1000 FPM (5.1 M/S) with damper in the full open position.

## IAQ50X INTEGRAL AIR MONITOR DAMPER WITH IAQ020X CONTROLLER



CUSTOMER: Company, Inc  
CONTROL NO: 123456789-A  
TAG: Building Project  
Damper Width: 18"  
Damper Height: 10"  
Square Feet: 1.25

**RUSKIN®**  
Air & Sound Control

## IAQ50X/IAQ020X Field Wiring Connections

- Wire the actuator to the IAQ020X controller/terminal block
  - Connect **24H** from terminal block **T1** to actuator **1 T**
  - Connect **24G** from terminal block **T2** to actuator **2 C**
  - Connect 0-10VAC signal from controller terminal **T21 AO1** to actuator **3 +**
  - Connect feedback signal from actuator **5 F** to IAQ020X controller terminal **34 UI-2**
- Connect 0-10V setpoint adjustment signal by others to IAQ020X controller.
  - Connect **( + )** to controller **T37 UI-4**
  - Connect **( - )** to controller **T36 COM**
  - Remove 2K resistor installed between **T36 & T37** (Discard or keep for future use.)
- Connect 0-10VDC CFM output signal from controller to Building Automation System (BAS)
  - Connect controller output **T23 AO2** to **BAS ( + ) input**
  - Connect controller **T22 COM** to **BAS ( - ) input**
  - Note: controller output COM is earth ground. Ground loops can adversely affect CFM output signal.
- Connect 120VAC power to transformer
  - Connect **L1** to terminal block for 120VAC to 24VAC transformer
  - Connect **L2** to terminal block for 120VAC to 24VAC transformer
- (Optional) Discrete Damper Open / Damper Closed override signals
  - Connect dry contact between controller **T27 DI-2** and **T28 COM** to **Close damper**
  - Connect dry contact between controller **T29 DI-3** and **T28 COM** to **Open damper**
  - Contact sequence is as shown in the table.

SEQUENCE	CONTROL FUNCTION
<b>29 &amp; 28 Closed 27 &amp; 28 Open</b>	<b>Open Damper</b>
<b>29 &amp; 28 Closed 27 &amp; 28 Closed</b>	<b>Open Damper</b>
<b>29 &amp; 28 Open 27 &amp; 28 Closed</b>	<b>Closed Damper</b>
<b>29 &amp; 28 Open 27 &amp; 28 Open</b>	<b>IAQ50X Control Mode</b>

## Piping Connections

- Connect the tubing marked "H" to the barbed fitting on the side of the IAQ50X controller labeled "H" and the tubing marked "L" to the fitting labeled "L".

## Inputs and Outputs

### Analog Input (AI) Circuits

**Voltage Input Range:** 0 to 10.0 Vdc

UI-1 Transducer Signal

UI-2 Actuator Position Feedback

UI-3 System Adjustment Knob, (5 Vdc Default)

UI-4 CFM Setpoint 0 Volts = Min, 10V = Max

UI-5 Optional CO2 Sensor

### Analog Output (AO) Circuits

**ANALOG VOLTAGE OUTPUTS:**

**Voltage Output Range:** 0 to 10.0 Vdc

**Maximum Output Current:** 10.0 mA

AO-1 Actuator Position Command

AO-2 Measured CFM

AO-3 Reserved

### Digital Input (DI) Circuits

**Voltage Rating:** <30 Vdc open circuit

**Input Type:** Dry contact to detect open and closed circuit

**Operating Range:** Open circuit = False; Closed circuit = True

**Resistance:** Open circuit >3,000 Ohms; Closed circuit <500 Ohms

DI-1 Auto Zero for low flows at full open remove resistor

DI-2 When True Damper will close (Normal = False)

DI-3 When True Damper will open (Normal = False)

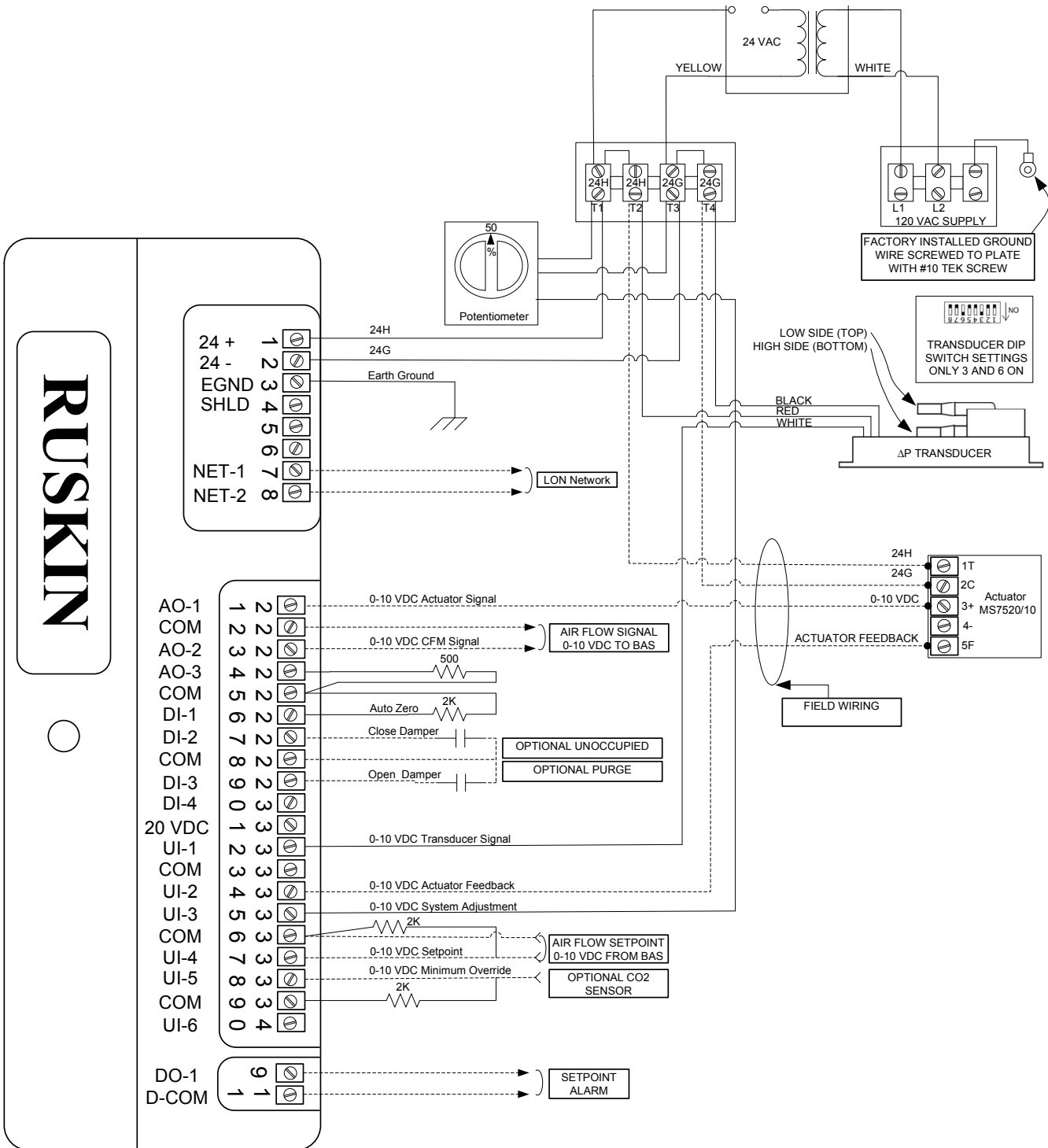
### Digital Triac Output (DO) Circuits

**Voltage Rating:** 20 to 30 Vac @ 50-60Hz

**Current Rating:** 25mA to 500 mA continuous, 800 mA

(AC rms) for 60 milliseconds

DO-1 Setpoint Alarm when actual air flow is not within 15% of setpoint.



NOTES:

1. FIELD WIRING BETWEEN ACTUATOR AND CONTROLLER PER LOCAL CODE.
2. REFER TO 85-021540-00B FOR PART DESCRIPTION
3. \_\_\_\_\_ WIRED BY RUSKIN
4. ----- FIELD WIRING
5. ACTUATOR FEEDBACK REQUIRED ON TERMINAL 34
6. TRANSDUCER P992-5B-A USE SWITCH 2 AND 6 ON

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## TROUBLE SHOOTING GUIDE

IAQ50X Symptom	Possible Cause	Inspection	Action
IAQ50X remains closed and does not modulate.	Power failure (fail closed setup).	1. Check terminals L1 and L2 for 120VAC power supply. 2. Check terminals T1 and T2 for 24VAC power.	1. Restore power. 2. Replace transformer.
	Unoccupied mode in effect.	1. Check wiring connections to terminals T27 and T28 for a closed circuit.	1. Remove jumper wire or external control wiring.
IAQ50X remains open and does not modulate.	Power failure (fail open setup).	1. Check terminals L1 and L2 for 120VAC power supply. 2. Check terminals T1 and T2 for 24VAC power.	1. Restore power. 2. Replace transformer.
	Insufficient airflow.	1. IAQ50X is responding properly to system conditions. Check for obstructions and fan problems. Close MA Damper partially.	1. Insure proper system operation. 2. Close or partially close return air damper.
	Pressure signal loss.	1. Check tubing/piping connection from IAQ50X frame to panel. Ports could be swapped. Piping may be leaking. 2. Check terminals (+) and (-) on pressure transducer for 0-10VDC signal (10V at 1"w.c.)	1. Repair piping connections. 2. Call Ruskin.
	Actuator feedback failure.	1. Check DC voltage at terminals T33 and T34 for 0-10VDC range.	1. Check Pins in actuator housing & straighten bent pins. 2. Call Ruskin.
CFM Indication remains below setpoint with open damper.	Insufficient airflow.	1. Check supply fan and HVAC system operation.	1. Return HVAC system to normal operation. 2. Close or partially close Return Air Damper
	Poor air sensing.	1. Check the straightener section and sensing blades for excessive dirt and dust.	1. Follow maintenance procedures recommended by Ruskin.

## MAINTENANCE

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1. Semi-annually, the tiebar linkage, jackshaft, and extended shaft bearings should be lubricated with a silicone lubricant.
  2. Blade axle bearings do not normally require lubrication.
  3. When dampers are installed where they will be exposed to heavy dust-laden air, frequent flushing of the axle bearings with water is recommended for extended bearing life.
  4. The air straightener section and the damper blades should be annually inspected for particulate build-up. Use a damp cloth to wipe the damper blades clean. Use water to clean and flush the air straightener section if necessary. The air straightener section can be unbolted from the damper for ease of cleaning. Ruskin recommends using pressurized air to clear the sensing ports of water with the low-pressure transducer disconnected. See step 5.
  5. Disconnect the piping connections between the IAQ50X Damper frame and the control panel. Apply a clean, pressurized air source to the air piping connections on the IAQ50X damper frame in order to flush out the sensing ports on the fixed monitoring blade(s) of the IAQ50X. **DO NOT connect this air source to the control panel as this will damage the IAQ instrumentation.**
- 

### RECOMMENDED SPARE PARTS LIST IAQ50X Air Measuring and Control Damper

<u>DESCRIPTION</u>	<u>PART NO.</u>
Roto Clip	E-25
Blade Edge Seal - Opposed	80-020045-00B
Digital Controller	IAQ020X**
Differential Pressure Sensor	AMS800**
120V/24V Transformer 85VA	IAQ80
Wire Terminal	324-HDS/12
Electric Actuator	MS7510 IAQ or MS7520 IAQ**

\*\* Requires factory calibration. Consult Ruskin.

Contact Ruskin Manufacturing, Air Measuring Product Sales, 3900 Dr. Greaves Road,  
Grandview, MO 64030 for information.  
Telephone: 816-761-7476

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