



ASSOCIATION of UNIVERSITIES for RESEARCH in ASTRONOMY, INC.

UNDER COOPERATIVE AGREEMENT WITH THE NATIONAL SCIENCE FOUNDATION
 OPERATING THE
 NATIONAL OPTICAL ASTRONOMY OBSERVATORY
 NATIONAL SOLAR OBSERVATORY
 GEMINI OBSERVATORY
 LARGE SYNOPTIC SURVEY TELESCOPE
 DOING BUSINESS FOR

**PURCHASE ORDER
 N729140-H**

June 21, 2016
 Page 1 of 1

NS1 & NS2

LSST, INC. - SOAR CONSORTIUM, INC. - WIYN CONSORTIUM, INC.

Vendor: AMERICAN CONTROLS
 2001-A KAHAI STREET
 HONOLULU, HI 96819

AMCONTROLS

Please Reference the above Purchase Order Number on all shipping documents, packing lists, invoices and other correspondence.

Attn: Ben Gabriel

Terms applicable to this order are available at:
<http://auracas.aura-astronomy.org/terms>
 For a hard copy, contact the buyer listed below.

Invoice To: AURA, Inc.
 Attn: Accounting
 P.O. Box 26732
 Tucson, AZ 85726
 520 318-8000

Ship To: AURA Gemini Observatory
 670 N. A'ohoku Place
 Hilo, HI 96720

| | | | | |
|------------------------------------|----------------------|---------------------------------|-----------------------------|--|
| INVOICE TERMS Mastercard | TAX CODE 3 | REQUISITION # 0729140 | F.O.B. Ship Point | SHIP-VIA Fed Ex 2nd Day-AURA Account |
|------------------------------------|----------------------|---------------------------------|-----------------------------|--|

| REQUESTER | LINE NO. | DESCRIPTION | REQUIRED DATE | QUANTITY | UNIT | UNIT PRICE | EXTENDED PRICE |
|-----------------|----------|--|---------------|----------|------|------------|----------------|
| CAVEDONI, CHARL | 1 | Part # B253+AFRX24-S 2in 2-way, CCV, 24 VAC, On/Off, w/ Switch, 16in Cable, 1/2in Conduit. With CW/CCW mounting for Reversible (direction of rotation) Lead: 1 week ARO Ship via AURA-Gemini FedEx 2nd Day Acct #213192477. | 07/07/2016 | 1.00 | EA | 641.25 \$ | 641.25 |

email quote dated 6/14/16
 beng.amcon@gmail.com

AURA Internal Account Distribution

| | |
|-----------------|--------|
| G-O2552-000-100 | 641.25 |
|-----------------|--------|

Total: \$ 641.25

DIRECT QUESTIONS CONCERNING THIS ORDER TO:

Tito Agbayani

(808) 974-2506

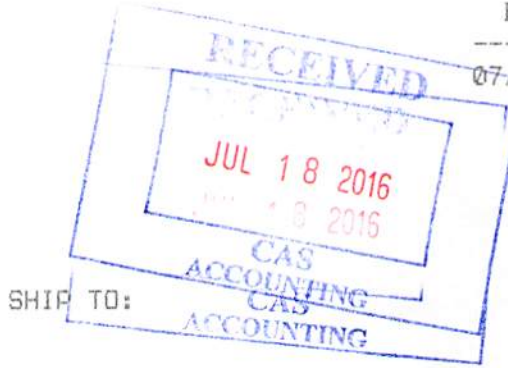
APPROVED BY: _____

AURA CAS Procurement

AMERICAN CONTROLS & EQUIPMENT
2001-A KAHAI STREET
HONOLULU, HI 96819

DATE INVOICE PAGE
07/14/16 1607-5437 1

Phone: (808)842-4484 Fax: (808)845-4047



SOLD TO:

SHIP TO:

AURA, INC.
ATTN: ACCOUNTING 520-318-8000
P.O. BOX 26732
TUCSON, AZ 85726

| ORDER NO | ORDER DATE | CUSTOMER NO. | DATE SHIPPED |
|---------------|-------------|--------------|---------------|
| 1607-647 | 07/14/16 | 951 | 06/29/16 |
| CUSTOMER P.O. | SHIPPED VIA | SALESPERSON | PAYMENT TERMS |
| N729140-H | DROP SHIP | BEN | NET 30 |

| QTY ORDERED | QTY SHIPPED | BACK ORDERED | ITEM NO | DESCRIPTION | UNIT PRICE | EXTENDED PRICE |
|-------------|-------------|--------------|---------|---|------------|----------------|
| 1 | 1 | | | ORDERED BY CHARL CAVEDONI PHONE # 808-974-2520 B253+AFRX24-S 2" 2-WAY VALVE | 641.25 | 641.25 |

**All items returned
are subject to a
25% restocking
charge**

**PAY THIS INVOICE
NO STATEMENT WILL BE SENT**

CERTIFIED ORIGINAL INVOICE
Bernadette A. Hovari
Signature

RECD BY: _____ DATE: _____

| | |
|---------------|--------|
| SALE AMOUNT | 641.25 |
| TAX | 0.00 |
| FREIGHT | 0.00 |
| INVOICE TOTAL | 641.25 |

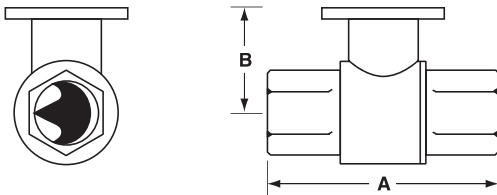
1-1/2% per month service fee will be charged on all overdue invoices.



| Technical Data | |
|------------------------------------|---|
| Service | chilled or hot water, 60% glycol |
| Flow characteristic | A-port equal percentage |
| Controllable Flow Range | 75° |
| Sizes | ½", ¾", 1", 1¼", 1½", 2" , 2½", 3" |
| Type of end fitting | NPT female ends |
| Materials: | |
| Body | forged brass, nickel plated |
| Ball | stainless steel |
| Stem | stainless steel |
| Seats | PTFE |
| Characterizing disc | Tefzel® |
| Packing | 2 EPDM O-rings, lubricated |
| Body pressure rating | |
| 600 psi | ½" - 1¼" (B230) |
| 400 psi | 1¼" (B231) - 3" |
| Media temp. range | 0°F to 250°F [-18°C to 120°C] |
| Close off pressure | |
| 200 psi | ½" - 2" (B250) |
| 100 psi | 2" (B251) - 3" |
| Maximum differential pressure (ΔP) | 50 psi for typical applications |
| Leakage | 0% for A to AB |
| External leakage | according to EN 12266-1:2003 |
| C _v rating | A-port: see product chart for values |

Tefzel® is a registered trademark of DuPont

Dimensions



2WayValve-B207-B220

| Valve Body | Valve Nominal Size | | Dimensions (Inches [mm]) | |
|------------|--------------------|---------|--------------------------|--------------|
| | Inches | DN [mm] | A | B |
| B207-B211 | ½" | 15 | 2.41" [61.1] | 1.39" [35.2] |
| B212-B216 | ½" | 15 | 2.38" [60.4] | 1.78" [45.2] |
| B217-B221 | ¾" | 20 | 2.73" [69.3] | 1.87" [47.4] |
| B222-B225 | 1" | 25 | 3.09" [78.4] | 1.87" [47.4] |
| B229-B230 | 1¼" | 32 | 3.72" [94.6] | 1.87" [47.4] |
| B231-B232 | 1¼" | 32 | 3.72" [94.6] | 2.04" [51.9] |
| B238-B240 | 1½" | 40 | 3.88" [98.5] | 2.04" [51.9] |
| B248-B250 | 2" | 50 | 4.21" [107.0] | 2.27" [57.7] |
| B251-B254 | 2" | 50 | 4.93" [125.2] | 2.73" [69.5] |
| B261-B265 | 2½" | 65 | 5.55" [140.9] | 2.73" [69.5] |
| B277-B280 | 3" | 80 | 5.82" [147.9] | 2.73" [69.5] |

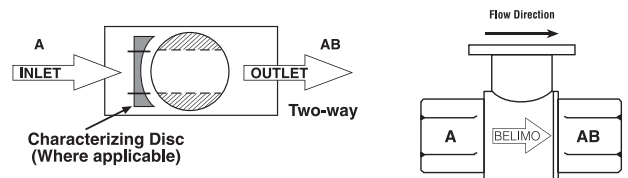
Application

This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable flow.

| C _v | Valve Nominal Size | | Type | Suitable Actuators | | |
|----------------|--------------------|-----------|-------------|--------------------|-----------|-----------|
| | Inches | DN [mm] | | Non-Spring | Spring | |
| 0.3 | ½" | 15 | B207 | TR Series | LR Series | TF Series |
| 0.46 | ½" | 15 | B208 | | | |
| 0.8 | ½" | 15 | B209 | | | |
| 1.2 | ½" | 15 | B210 | | | |
| 1.9 | ½" | 15 | B211 | | | |
| 3 | ½" | 15 | B212 | | | |
| 4.7 | ½" | 15 | B213 | | | |
| 7.4 | ½" | 15 | B214 | | | |
| 10 | ½" | 15 | B215 | | | |
| 14 | ½" | 15 | B216 | | | |
| 4.7 | ¾" | 20 | B217 | NR...N4 Series | LF Series | |
| 7.4 | ¾" | 20 | B218 | | | |
| 10 | ¾" | 20 | B219 | | | |
| 14 | ¾" | 20 | B220 | | | |
| 24 | ¾" | 20 | B221* | | | |
| 7.4 | 1" | 25 | B222 | | | |
| 10 | 1" | 25 | B223 | | | |
| 19 | 1" | 25 | B224 | | | |
| 30 | 1" | 25 | B225* | | | |
| 10 | 1¼" | 32 | B229 | | | AR Series |
| 19 | 1¼" | 32 | B230* | | | |
| 25 | 1¼" | 32 | B231 | | | |
| 37 | 1¼" | 32 | B232* | | | |
| 19 | 1½" | 40 | B238 | | | |
| 29 | 1½" | 40 | B239 | | | |
| 37 | 1½" | 40 | B240* | | | |
| 29 | 2" | 50 | B248 | | | |
| 46 | 2" | 50 | B249 | | | |
| 57 | 2" | 50 | B250* | | | |
| 65 | 2" | 50 | B251 | AF Series | | |
| 85 | 2" | 50 | B252 | | | |
| 120 | 2" | 50 | B253 | | | |
| 240 | 2" | 50 | B254* | | | |
| 60 | 2½" | 65 | B261 | | | |
| 75 | 2½" | 65 | B262 | | | |
| 110 | 2½" | 65 | B263 | | | |
| 150 | 2½" | 65 | B264 | | | |
| 210 | 2½" | 65 | B265* | | | |
| 70 | 3" | 80 | B277 | | | |
| 130 | 3" | 80 | B278 | | | |
| 170 | 3" | 80 | B280* | | | |

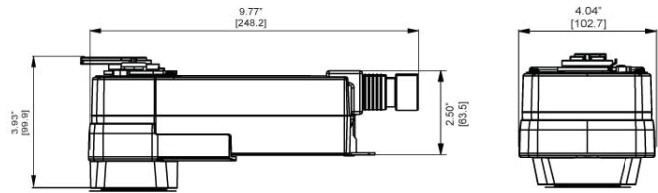
*Models without characterizing disc

Flow Patterns





Dimensions



Models

- AFRB24
- AFRB24-S
- AFRX24
- AFRX24-S**

| Technical Data | |
|-----------------------|---|
| Power supply | 24 VAC \pm 20% 50/60 Hz 24 VDC +20% / -10% |
| Power consumption | running 5 W holding 2.5 W |
| Transformer sizing | 7.5 VA (class 2 power source) |
| Electrical connection | |
| AFRB24... | 3 ft., 18 GA appliance cable, 1/2" conduit connector -S models: two 3 ft., 18 gauge appliance cables with 1/2" conduit connectors |
| AFRX24... | 3 ft. [1m], 10 ft. [3m] or 16 ft. [5m] 18 GA appliance or plenum cables, with or without 1/2" conduit connector -S models: two 3 ft. [1m], 10 ft. [3m] or 16 ft. [5m] appliance cables, with or without 1/2" conduit connectors |
| Overload protection | electronic throughout 0 to 95° rotation |
| Control | on/off |
| Direction of rotation | spring reversible with CW/CCW mounting |
| Angle of rotation | 95° |
| Running time | motor < 75 seconds spring 20 seconds @ -4°F to 122°F [-20°C to 50°C]; < 60 seconds @ -22°F [-30°C] |
| Position indication | visual indicator, 0° to 95° (0° is full spring return position) |
| Manual override | 5 mm hex crank (3/16" Allen), supplied |
| Ambient temperature | -22°F to 122°F [-30°C to 50°C] |
| Storage temperature | -40°F to 176°F [-40°C to 80°C] |
| Housing | NEMA 2, IP54, Enclosure Type2 |
| Agency listings † | cULus according to UL60730-1A/-2-14, CAN/GSA E60730-1:02, CE according to 2004/108/EC & 2006/95/EC |
| Noise level | <50dB(A) motor @ 75 seconds <62dB(A) spring return |
| Quality standard | ISO 9001 |

† Rated Impulse Voltage 800V, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.

AFRB24-S, AFRX24-S

| | |
|--------------------|--|
| Auxiliary switches | 2 x SPDT 3A (0.5A) @ 250 VAC, UL approved one set at +10°, one adjustable 10° to 90° |
|--------------------|--|

Wiring Diagrams

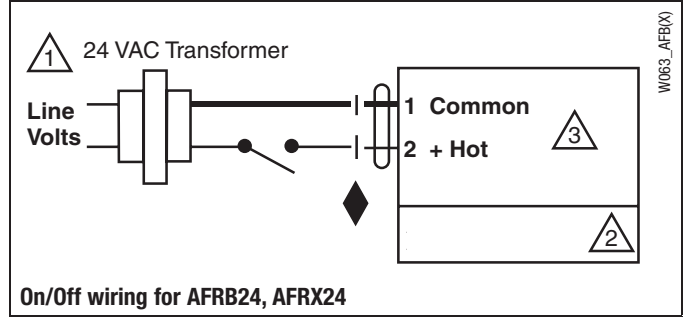
✂️ INSTALLATION NOTES

- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 For end position indication, interlock control, fan startup, etc., AFRB24-S and AFRX24-S incorporates two built-in auxiliary switches: 2 x SPDT, 3A (0.5A) @250 VAC, UL Approved, one switch is fixed at +10°, one is adjustable 10° to 90°.

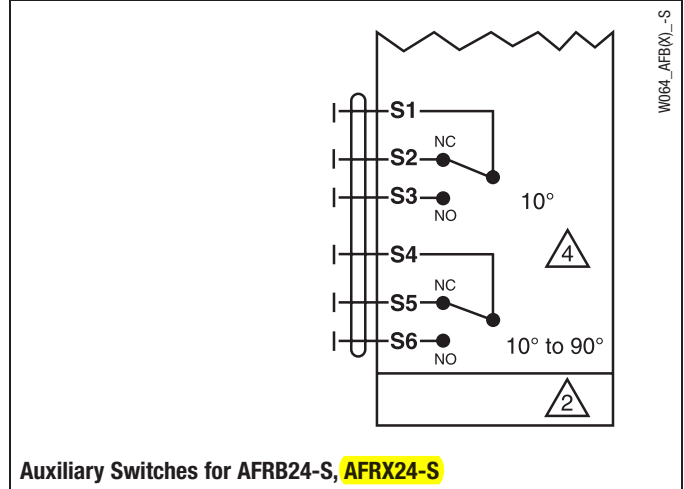
📄 APPLICATION NOTES

- ◆ Meets cULus requirements without the need of an electrical ground connection.

- ⚠️ **WARNING Live Electrical Components!**
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



On/Off wiring for AFRB24, AFRX24



Auxiliary Switches for AFRB24-S, **AFRX24-S**