

DST PrepAir Submittal Index

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VisionPRO[®] 8000



APPLICATION

The VisionPRO[®] 8000 with RedLINK[™] features an effortless, 7-Day programmable touchscreen thermostat that provides control of temperature, humidification, dehumidification, and ventilation for up to 4 Heat/2 Cool heat pump systems or up to 3 Heat/2 Cool conventional systems for residential and commercial applications.

FEATURES

- **RedLINK[™] Compatible**

Increase your content and profit per job by including RedLINK[™] accessories that meet your customers comfort and convenience needs. RedLINK accessories include the Wireless Outdoor Sensor, Portable Comfort Control (PCC), Equipment Interface Module (EIM), RedLINK Internet Gateway, Wireless Indoor Sensor, TrueSTEAM[™] humidifier with Wireless Adapter, TrueZONE[™] zoning panel with Wireless Adapter, Vent Boost Remote and Entry/Exit Remote.

- **Customizable Service Reminders**

Set up to 10 service reminders. Choose from the pre-set options or customize your own. Reminders can be based on date or the outdoor temperature.

- **Universal Inputs
Thermostat - S1**

- **EIM - S1, S2, S3, S4**

Assignable inputs allow you to setup Indoor and Outdoor Temperature Sensors, Discharge and Return Air Sensors or Dry Contact Devices. Dry Contact Devices can be used to trip pre-set or customized alerts on the thermostat home screen. Note: Dry Contact Alerts require an Equipment Interface Module (EIM).

- **User Interaction Log**

The interaction log stores history of thermostat setting changes including temperature, system and installer setup. You can use the interaction log to save time by determining if the issue is a system error or an accidental user error. The Interaction Log is only viewable on a computer after you download it from the thermostat to a microSD card.

- **Selectable for Residential and Light Commercial Applications**

One thermostat does it all to meet the needs of Residential and Light Commercial applications. Simply select Residential or Commercial during the installer setup. If Commercial is selected, the thermostat will use commercial language, meet building codes and offer 365 day holiday scheduling.

- **MicroSD Card Port for Quick Installer Setup**

Save time by using a microSD card to upload installer settings and service reminders in one simple step.

- **Selectable Sensors**

When paired with a Wireless Indoor Sensor(s) you have the ability to choose which sensor(s) to use for temperature, humidification and dehumidification. They can be used in combination for temperature averaging—or individually—to condition humidity levels in separate spaces.

SPECIFICATIONS

Thermostat Description:

Feature	Description
Powering method	<ul style="list-style-type: none"> Common wire or battery
System types (up to 4 heat/2 cool heat pump and up to 3 heat/2 cool conventional)	<ul style="list-style-type: none"> Gas, oil or electric heat with air conditioning Warm air, hot water, high-efficiency furnaces, heat pumps, steam and gravity Cool only
Changeover	Manual or Auto changeover selectable
System setting	Em Heat-Heat-Off-Cool-Auto
Fan setting	Auto-On-Circ-Follow Schedule

Electrical Ratings for: the Equipment Interface Module and VisionPRO Thermostats

NOTE: To find what terminals are available on the Equipment Interface Module and the VisionPRO Thermostats, see "Terminal Designations" below the table.

Terminal	Voltage (50/60 Hz)	Max. Current Rating
W - O/B	18 to 30 VAC and 750 mVDC	1.00A
Y (cooling)	18 to 30 VAC	1.00A
G (fan)	18 to 30 VAC	0.50A
W2 - Aux 1 (heating)	18 to 30 VAC	0.60A
W3 - Aux 2 (heating)	18 to 30 VAC	0.60A
Y2 (cooling)	18 to 30 VAC	0.60A
A-L/A (Output)	18 to 30 VAC	1.00A
U1, U1 U2, U2 U3, U3	30 VAC max.	0.50A

Terminal Designations:

- Equipment Interface Module: R, RC, RH, C, W-O/B, W2-AUX 1, W3-AUX 2, Y, Y2, G, A-L/A, U1 U1, U2 U2, U3 U3, S1 S1, S2 S2, S3 S3, S4 S4, A, B, C, D
- TH8321 Thermostat: R, RC, C, W-O/B, W2-AUX/E, Y, Y2, G, A-L/A, K, U1 U1, S1 S1
- TH8320 Thermostat: R, RC, C, W-O/B, W2-AUX/E, Y, Y2, G, A-L/A, K, S1 S1
- TH8110 Thermostat: R, RC, C, W-O/B, Y, G, K, S1 S1

Power Consumption of TH8321/TH8320/TH8110:

Backlight on: 1.44 VA
Backlight off: 1.32 VA

RedLINK Communication:

Frequency: 900 Mhz frequency range
Re-Sync Time: RedLINK devices re-establish communication within 6 minutes after AC power resumes.

Temperature Setting Range:

Heating: 40 to 90 °F (4.5 to 32 °C).
Cooling: 50 to 99 °F (10 to 37 °C).

Temperature Sensor Accuracy:

± 1.5 F at 70 F (0.75 C at 21.0 C)

Humidification Setting Range:

10% to 60% RH.

Dehumidification Setting Range:

40% to 80% RH.

Humidity Display Range:

0% to 99%.

Humidity Sensor Accuracy:

± 5% RH from 30% to 50% RH at 75 F.

Cool Indication:

VisionPRO® 8000 with RedLINK™ displays "Cool On" when the thermostat turns the cooling on.

Heat Indication:

VisionPRO® 8000 with RedLINK™ displays "Heat On" when the thermostat turns the heating on.

Auxiliary Heat Indication:

VisionPRO® 8000 with RedLINK™ displays "Aux Heat On" when the thermostat turns the auxiliary heat on.

Interstage Differential:

Comfort: The thermostat keeps the indoor temperature within 1 degree of the setpoint (droop less control). The thermostat turns on stage 2 when the capacity on stage 1 reaches 90%. When the interstage differential is set to 1.0 or higher, the thermostat stages the equipment based on how far the indoor temperature is from the setpoint (ISU 303 to 309). See page 27 for more information.

Clock Accuracy: 1 minute per month at 77 °F (25 °C). ± 2 minutes per month over the operating ambient temperature range.

Mounting Means:

Thermostat mounts directly on the wall in the living space using mounting screws and anchors provided. Fits a horizontal 2 x 4 in. junction box.

Equipment Interface Module (EIM) mounts on HVAC equipment or on a wall in the equipment room.

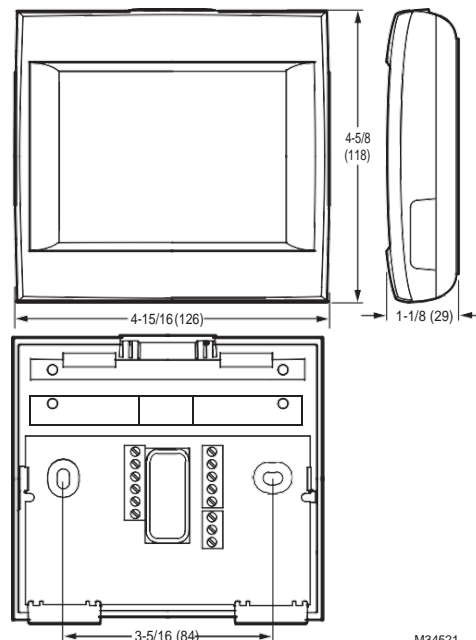


Fig. 1.

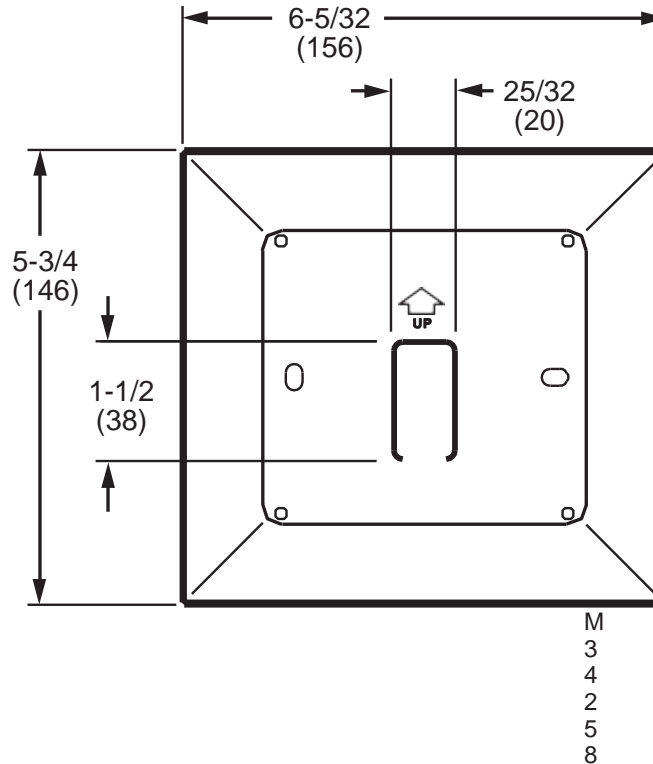


Fig. 2. Dimensions of VisionPRO cover plate in in. (mm).

Product	Part Number	Operating Ambient Temperature	Operating Relative Humidity	Shipping Temperature	Physical Dimensions in in. (mm)	Color(s)
Thermostat	TH8321R1001 TH8320R1003 TH8110R1008	32 to 120 °F (0 to 48.9 °C)	5% to 90% Non-Condensing	-20 to 120 °F (-28.9 to 48.9 °C)	4-15/16 x 4-5/8 x 1-1/8 (126 x 118 x 29)	Arctic White
Equipment Interface Module	YTHM5421R1010* THM5421R1021	-40 to 165 °F (-40 to 73.9 °C)	5% to 95% Non-Condensing	-20 to 165 °F (-28.9 to 73.9 °C)	9-11/32 x 4-53/64 x 1-19/32 (237 x 123 x 41)	Gray



1 Stage Pre-Heat

Code No. LIT-1927010
Issued February 1, 2009

A19 Series

Remote Bulb Control

Description

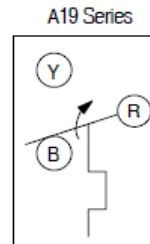
The A19 Series are single-stage temperature controls that incorporate environmentally friendly liquid-filled sensing elements.

Features

- wide temperature ranges available
- constant differential throughout the entire range
- compact enclosure
- fixed or adjustable differential available
- variety of sensing element styles
- unaffected by cross-ambient conditions

Applications

The A19 is suitable for temperature control in heating, ventilating, air conditioning, and refrigeration.



Action on Increase of Temperature

A19 Series Terminal Arrangement for SPDT



A19ABC-24

Selection Charts

A19 Series Remote Bulb Control¹

Code Number	Switch Action	Range °F (°C)	Diff °F (°C)	Bulb and Capillary	Bulb Well No. (order separately)	Range Adjuster	Max. Bulb Temp. °F (°C)
Adjustable Differential (Wide Range)							
A19ABA-40C ²	SPST Open Low	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver Slot	140 (60)
A19ABC-4C	SPDT	50 to 130 (10 to 55)	3 1/2 to 14 (1.9 to 8)	3/8 in. x 5 in., 8 ft. Cap.	WEL14A-603R	Knob	170 (77)
A19ABC-24C ³	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 8 ft. Cap.	WEL14A-602R	Convertible	140 (60)
A19ABC-36C	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 20 ft. Cap.	WEL14A-602R	Convertible	140 (60)
A19ABC-37C	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 10 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19ABC-74C	SPDT	-30 to 100 (-34 to 38)	3 to 12 (1.7 to 6.7)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
Fixed Differential							
A19AAF-12C	SPDT	25 to 225 (-4 to 107)	3 1/2 (1.9)	3/8 in. x 3 in., 10 ft. Cap.	WEL14A-602R	Screwdriver slot	275 (135)
Fixed Differential (Case Compensated)							
A19AAC-4C	SPDT	0 to 80 (-18 to 27)	5 (2.8)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19AAD-12C	SPST Open Low	-30 to 50 (-34 to 10)	2 1/2 (1.4)	3/8 in. x 4 in., 7 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
Fixed Differential (Close)							
A19AAD-5C ⁴	SPST Open Low	30 to 50 (-1 to 10) (Bulk Milk Cooler)	2 1/2 (1.4)	3/8 in. x 2 5/8 in., 6 ft. Cap.	WEL16A-601R	Screwdriver slot	190 (88)
A19AAF-20C	SPDT	-30 to 100 (-34 to 38)	2 1/2 (1.4)	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19AAF-21C	SPDT	40 to 90 (4 to 32)	1 1/2 (0.8)	3/8 in. x 5 3/4 in., 6 ft. Cap.	WEL14A-603R	Screwdriver slot	140 (60)
Manual Reset							
A19ACA-14C	SPST Open Low	-30 to 100 (-34 to 38)	Manual Reset	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19ACA-15C	SPST Open Low	-30 to 100 (-34 to 38)	Manual Reset	3/8 in. x 4 in., 10 ft. Cap.	WEL14A-602R	Screwdriver slot	140 (60)
A19ADB-1C	SPST Open High	100 to 240 (38 to 116)	Manual Reset	3/8 in. x 3 1/2 in., 6 ft. Cap.	WEL14A-602R	Knob	290 (143)
A19ADN-1C	SPST Open High	100 to 240 (38 to 116)	Manual Reset	3/8 in. x 4 in., 6 ft. Cap.	WEL14A-602R	Screwdriver slot	290 (143)

1. Specify the control model code number, packing nut code number (if required), and bulb well code number (if required).
2. Replaces White-Rodgers 1609-101
3. Replaces White-Rodgers 1609-12, -13; Ranco 010-1408, -1409, -1410, -1490, 060-110; Honeywell L6018C-1006, L6021A-1005, T675A-1011, -1508, -1516, -1821, T4301A-1008, T6031A-1011, T6031A-1029
4. Case-Compensated

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products. © 2009 Johnson Controls, Inc. www.johnsoncontrols.com



Remote Bulb Control (Continued)

Selection Charts (Continued)

Replacement Parts

Code Number	Description
CVR28A-617R	Concealed adjustment cover
CVR28A-618R	Visible scale cover
KNB20A-602R	Replacement Knob Kit

Accessories

A packing nut is available for closed tank application.
Specify the part number FTG13A-600R.

Bulb wells (WEL14A Series) are available for liquid immersion applications.
Refer to the selection chart or to *Bulb Wells Catalog Page, LIT-1922135*.

Technical Specifications

Electrical Ratings

Motor Ratings VAC	120	208	240
Wide Range – Adjustable Differential			
AC Full Load A	16.0	9.2	8.0
AC Locked Rotor A	96.0	55.2	48.0
Non-Inductive A ¹	22 A, 120 to 277 VAC		
Pilot Duty – 125 VA, 24 to 600 VAC			
Fixed Differential and Close Differential			
AC Full Load A	6.0	3.4	3.0
AC Locked Rotor A	36.0	20.4	18.0
Non-Inductive A	10 A, 24 to 277 VAC		
Pilot Duty – 125 VA, 24 to 277 VAC			
Case Compensated – Fixed Differential A19AAC-4			
AC Full Load A	16.0	9.2	8.0
AC Locked Rotor A	96.0	55.2	48.0
Non-Inductive A ¹	22 A, 120 to 277 VAC		
Pilot Duty – 125 VA, 24 to 600 VAC			
A19AAD-12			
AC Full Load A	6.0	3.4	3.0
AC Locked Rotor A	36.0	20.4	18.0
Non-Inductive A	10 A, 24 to 277 VAC		
Pilot Duty – 125 VA, 24 to 277 VAC			
Manual Reset			
AC Full Load A	16.0	9.2	8.0
AC Locked Rotor A	96.0	55.2	48.0
Non-Inductive A	16.0	9.2	8.0
Pilot Duty – 125 VA, 24 to 600 VAC			

1. SPST and N.O. contact of SPDT control;
SPDT N.C. contact- 16 amps 120 to 277 VAC

***Note the Preheat thermostat is included only if needed in your region.**



3 Stage Pre-Heat

Installation Instructions
Issue Date
A36
0918

**A36 Series
Multistage Thermostats**

Application

A36 multistage thermostats operate electrically controlled equipment such as multiple refrigeration compressors, or unloading type compressors in air conditioning or chiller installations. They are available with three or four stages, and each stage has single-pole, double-throw contact action, and operates from a single, liquid-filled sensing element that is unaffected by barometric pressure changes. The control is ambient compensated for ambient temperatures from 0 to 140°F (-18 to 60°C).

IMPORTANT: The A36 multistage thermostats are intended to control equipment under normal operating conditions. Where failure or malfunction of an A36 thermostat could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory) intended to warn of or protect against failure or malfunction of the A36 thermostat must be incorporated into and maintained as part of the control system.

General Description

Series A36 thermostats supplied in "open" construction (without an enclosure) are for panel mounting. Pennswitch terminals are supplied with Number 8 binding head screws. Optional 1/4 in. x .032 in. male quick-connect tabs are available on models with knob shaft adjustment.

The differential on each stage and the sequencing between stages are established by the equipment engineer for optimum performance of his units and are *nonadjustable* in the field. This permits package unit manufacturers to completely engineer the cycling of their equipment without the potential for field misadjustment and resultant erratic sequencing.

A single adjustment moves the entire staging band up or down within the range of the control to give the most desirable balance point between the unit and load, or to produce the desired temperature condition at the bulb location.

The A36 is regularly supplied with a calibrated dial and screwdriver slot adjustment with low dial stop, factory adjustable over the lower 40 degrees of the selected range. Extended 1/4 in. diameter shaft with a flat surface (.156 in. or .187 in.) available on quantity orders.

Shaft length to 3-1/2 in. from mounting surface of panel. Mounted models available at no extra cost. Shaft models are supplied with "stops" at both adjusting limits, eliminating need for "stops" in equipment manufacturers' knob or escutcheon plate. Standard shaft rotation is clockwise for warmer temperature adjustments.

The main operating arm is counterbalanced and spring loaded. Stresses at the pivot point are kept low to avoid wear.

Rigid main frame resists distortion and is protected by shock absorber mounting pads.



Fig. 1 -- Panel mounted A36 Multistage Thermostat

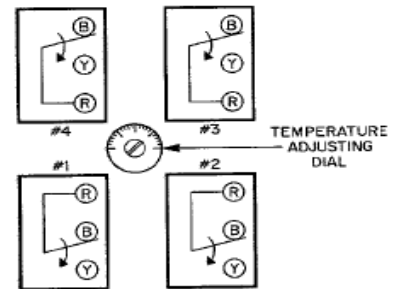


Fig. 2 -- Switch Action, R to Y Closes on Temp Increase

Optional Constructions

Capillary

Six foot standard. Optional lengths of 8, 10, and 15 feet available at extra cost. Single braid copper armor or nylon tubing on capillary available at extra cost.

Special Ranges

Available on OEM quantity orders only.

Dial Stop

High setting stop available in place of low setting stop.

Specifications

Type Number	A36AGA	3 Stages, Standard Differential Less Enclosure
	A36AHA	4 Stages, Standard Differential Less Enclosure
	A36AHB	4 Stages, Close Differential Less Enclosure
Ambient Temperature	0 to 140°F (-18 to 60°C)	
Switches	Snap-Acting SPDT Contacts in a Phenolic Enclosure	
Finish	Galvanized	
Maximum Allowable Shipping Temperature	140°F (60°C)	
Material	Baseplate	.070" (1.8 mm) Steel
	Frame	.062" (1.6 mm) Steel
Shipping Weights	Individual Pack	1.7 lb (.8 kg)
	Overpack of 10 Units	19.0 lb (8.6 kg)
Wiring Connections	Screw Type Terminals with 8-32 x 1/4" wire binding screws are standard.	

Electrical Ratings

Volts, AC	Close Differential				Standard Differential			
	120	208	240	277	120	208	240	277
Full Load Amp	6.0	3.4	3.0	–	10.0	6.9	5.0	–
Locked Rotor Amp	36.0	20.4	18.0	–	60.0	41.4	30.0	–
Non-Inductive Amp	10.0	5.7	5.0	4.3	16.0	9.6	8.0	7.2

Pilot Duty – 125 VA, 120 to 277 VAC

Range and Differential Specifications

Range °F (°C)	Fixed Differential Each Stage F° (C°)		Sequence F° (C°)		Maximum Overrun Temperature	Bulb Size	Bulb Support	Compens at Setting °F (°C)*
	Close	Standard	Minimum	Maximum				
0 to 70 (-18 to 21)	2 (1.1)	3 (1.7)	2.5 (1.4)	5 (2.8)	120 (49)	3/8" x 4-3/4"	3"	35 (1.7)
10 to 80 (-10 to 30)	2 (1.1)	3 (1.7)	2.5 (1.4)	5 (2.8)	120 (49)	3/8" x 4-3/4"	3"	35 (1.7)
55 to 95 (13 to 35)	–	2 (1.1)	1.5 (0.8)	3 (1.7)	120 (49)	3/8" x 5-1/4"	3"	55 (13)
70 to 140 (21 to 60)	2 (1.1)	3 (1.7)	2.5 (1.4)	5 (2.8)	180 (82)	3/8" x 4-3/4"	3"	95 (35)
100 to 250 (38 to 121)	2.5 (1.4)	3.8 (2.1)	2.0 (1.1)	6.5 (3.6)	290 (143)	.29" x 2.5"	3"	180 (82)

* Assuming four feet of capillary and control frame are exposed to varying ambient temperature. If more capillary is exposed, the maximum compensation accuracy will be a lower setting.

Notes: Dial Calibration Point is shown in Figs. 3, 4, and 5, unless otherwise specified.

Contact application engineering for variations of existing models.

***Note the Preheat thermostat is included only if needed in your region.**

APR CONTROL - R-410A - SPEC. & DIMENSION SHEET

Model #	Modulation Capacity	Unit Dimensions			Connection Dimensions (OD)					Application
		X	Y	Z	EE	L	M	G		
APR-410-1	1.5 tons	8.5"	8"	4"	1/4"	1/4"	5/8"	3/8"	Used for all G2 units except G2-25	
APR-410-2	2.5 tons	8.5"	8"	4"	1/4"	1/4"	5/8"	3/8"		
APR-410-3	3.5 tons	8.5"	8"	4"	1/4"	1/4"	5/8"	3/8"		
APR-410-5	5.5 tons	10"	10"	5"	1/4"	1/4"	5/8"	5/8"	G - SIDE CONNECTION	
APR-410-6	6.5 tons	9.5"	10"	4.5"	1/4"	1/4"	5/8"	5/8"	G - SIDE CONNECTION	
APR-410-10	10 tons	12"	11"	5.5"	1/4"	1/4"	7/8"	7/8"	G - SIDE CONNECTION	

Hot Gas Bypass Valve should be set to begin opening at approximately 105-109 PSI ~34 deg F

SUPPLY BALL SHUT-OFF VALVES FOR ALL CONNECTIONS
SUPPLY TEE FOR SUCTION LINE CONNECTION
SUPPLY TEE FOR HOT-GAS CONNECTION

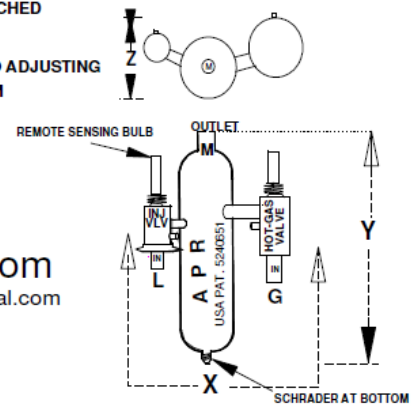
APR Control Selection:
System or Stage size is reduced by the Modulation Capacity listed above.
Oil entrainment in suction line must be addressed.
Please refer to Rawal Devices Fast Selection Chart

WHEN REQUIRED, SUPPLY TEE FOR EE CONNECTIONS
EXTERNAL EQUILIZERS - EE - HAVE 1/4" SWEAT CONNECTION
TEE EE CONNECTIONS INTO SUCTION LINE

BULB ON LIQ INJ VALVES MUST BE ATTACHED TO SUCTION LINE
BETWEEN TEE TO APR CONTROL DISCHARGE AND COMPRESSOR

BULB ON HOT GAS BYPASS VALVES MUST BE ATTACHED
TO SUCTION LINE AND INSULATED

REMOVE CAPS FROM ADJUSTMENT STEMS PRIOR TO ADJUSTING
TO ADJUST VALVES WHEN FACING ADJUSTING STEM
CLOCKWISE LOWERS PRESSURE / TEMPERATURE
COUNTER-CLOCKWISE RAISES PRESSURE / TEMP.



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TFB24-S - Damper Actuator
On/Off, Spring Return, 24 VAC/DC, Auxiliary Switch



Technical Data	
Power Supply	24 VAC, ±20%, 50/60Hz, 24VDC, ±10%
Power Consumption Running	2 W
Power Consumption Holding	1.3 W
Transformer Sizing	5 VA (class 2 power source)
Shaft Diameter	1/4" to 1/2" round, centers on 1/2"
Electrical Connection	(2) 3ft [1m], 18 GA appliance cables with 1/2" conduit connectors
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of Rotation	Max. 95°, adjustable with mechanical stop
Torque motor	Min. 22 in-lbs [2.5 Nm]
Direction of Rotation (Motor)	reversible with CW/CCW mounting
Direction of Rotation (Fail-Safe)	reversible with CW/CCW mounting
Position Indication	visual indicator, 0° to 95° (0° is full spring return position)
Running Time (Motor)	<75 sec
Running Time (Fail-Safe)	<25 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
Ambient Humidity	max. 95% RH non-condensing
Ambient Temperature Range	-22°F to 122°F [-30°C to 50°C]
Storage Temperature Range	-40°F to 176°F [-40°C to 80°C]
Housing	NEMA 2, IP42, UL Enclosure Type 2
Housing Material	UL94-5VA
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	<50 dB (A)
Noise Level (Fail-Safe)	<62 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	1.5 lb [0.7 kg]
Auxiliary switch	1 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, adjustable 0° to 95°

†Rated Impulse Voltage 800V, Type of Action 1.AA.B, Control Pollution Degree 3.

Torque min. 22 in-lb, for control of air dampers.

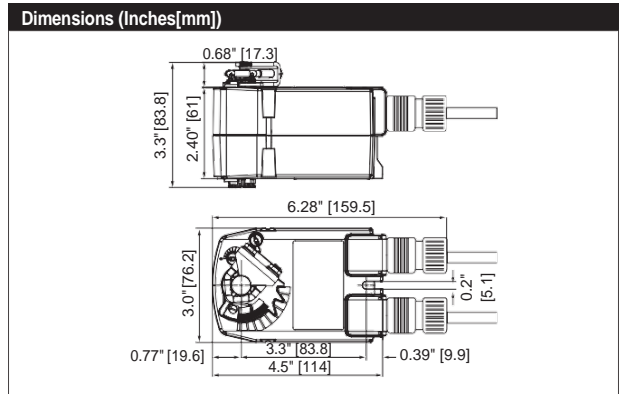
Application

For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact, or a manual switch. The actuator is mounted directly to a damper shaft from 1/4" up to 1/2" in diameter by means of its universal clamp, 1/2" shaft centered at delivery. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft.

Operation

The TF series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides consistent torque to the damper with, and without, power applied to the actuator. The TF series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 90°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. Power consumption is reduced in holding mode. The TF -S versions are provided with one built-in auxiliary switch. This SPDT switch is provided for safety interfacing or signaling, for example, for fan start-up. The switching function is adjustable between 0° and 95°.

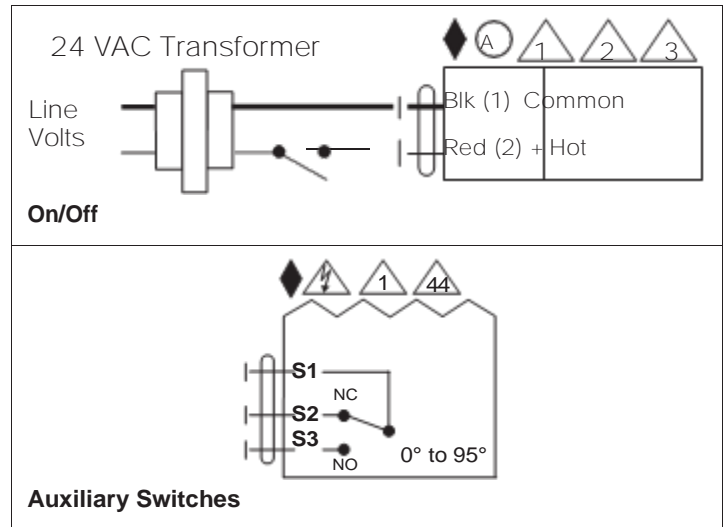
Safety Note: Screw a conduit fitting into the actuator's bushing. Jacket the actuator's input and output wiring with suitable flexible conduit. Properly terminate the conduit in a suitable junction box.



Date created, 11/29/2017 - Subject to change. © Belimo Aircontrols (USA), Inc.

Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a shaft up to a 1/2" diameter and center a 1/2" shaft. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, one SPDT auxiliary switch shall be provided having the capability of being adjustable. Actuators with auxiliary switch must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed, have a 5 year warranty, and be manufactured under ISO9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.



RUSKIN®

3900 Dr. Greaves Rd. • Kansas City, MO 64030 • (816) 761-7476 • FAX (816) 765-8955

CD36 LOW LEAKAGE CONTROL DAMPER

APPLICATION

Ruskin model CD36 incorporates the industries only one-piece steel frame construction, making it the engineer's preferred frame design. It promotes tighter leakage, and there are no bolts, screws or rivets that could fail over time. Frame corners are internally braced to reduce racking. V-groove blades are suitable for low and medium velocity applications. Blade edge seals are mechanically fastened to ensure years of dependable low leakage performance. Factory mounted and commissioned pneumatic and electric actuators are available options.

STANDARD CONSTRUCTION

FRAME

5" x 1" x 16 gage (127mm x 25mm x 1.6mm) hot dipped, roll formed galvanized steel.

BLADE

6" x 16 gage (152mm x 1.6mm) hot dipped, roll formed galvanized steel.

AXLES

1/2" (13mm) nominal hexagonal zinc plated steel.

BEARINGS

High impact, molded synthetic, formed to hexagonal axle shape.

BLADE SEALS

Mechanically fastened, fire resistant, vinyl coated polyester. Meets requirements to qualify for UL94, 5903.

JAMB SEALS

300 series stainless steel compression type.

LINKAGE

Shake proof Swedgelock™ plated steel assembly, concealed out of airstream.

PRESSURE

Up to 5" W.C. (1.2 kPa). Refer to chart.

VELOCITY

Up to 3,000 FPM (15.3 m/s). Refer to chart.

LEAKAGE

Superior to AMCA Class 2. Refer to chart.

TEMPERATURE RANGE

Standard -25°F to +185°F (-32°C to +85°C).
Enhanced -45°F to +350°F (-43°C to +177°C).
With silicone blade seals and stainless bearings, see variations.

MINIMUM SIZE

Single blade – 5" (127mm) "A" width x 5" (127mm) "B" height.
Opposed blade – 5" (127mm) "A" width x 10" (254) "B" height.

MAXIMUM SIZE

Single section – 48" (1219mm) "A" width x 72" (1829mm) "B" height.
Multi-section – multiple factory assembled equal sections with unlimited overall dimensions.

ESTIMATED SHIPPING WEIGHT

7 lbs. (3.2kg) per square foot.



ISO9001
CERTIFIED

FEATURES

- One-piece roll formed frame
- Swedgelock™ shake proof concealed linkage
- Mechanically fastened blade seals

VARIATIONS

Ruskin model CD36 is available with the following variations at additional cost.

- Front, rear or double flange frame
- Stainless axles, bearings and linkage
- Factory mounted sleeves with round and oval transitions
- Security bars
- Factory mounted and commissioned electric and pneumatic actuators, chain pull devices, and manual locking handles
- Enamel and epoxy finishes
- Remote blade position indicator switches
- Wireless (on/off) remote control



NOTES

- Values shown in parenthesis () indicate metric units.
- Units furnished approximately 1/4" (6mm) smaller than given opening dimensions.

PREPAIR G2- EXHAUST DAMPER

LEAKAGE AND PERFORMANCE DATA



LEAKAGE AND PERFORMANCE

All data represented in this literature are based on tests performed in accordance with AMCA test standards at Ruskin's AMCA accredited test facility. Third party verification of testing procedures and data are verified through ISO procedure audits.

CD36 Maximum Damper "A" Width	Leakage (CFM/Ft²)			
	1" wg (0.25 kPa)	4" wg (1 kPa)	8" wg (2 kPa)	10" wg (2.5 kPa)
48" (1219mm)	5.4	10.7	N/A	N/A

Leakage testing is performed in accordance with ANSI/AMCA Standard 500-D, figure 5.5. Leakage data are based on a closing torque of 5 inch pounds/ft² (0.57N.m).

As defined by AMCA, the maximum allowable leakage for class 2 rated dampers is as follows.

Leakage Class 2

- 10cfm/ft² @ 1 inch wg
- 20cfm/ft² @ 4 inch wg
- 28cfm/ft² @ 8 inch wg
- 35cfm/ft² @ 12 inch wg

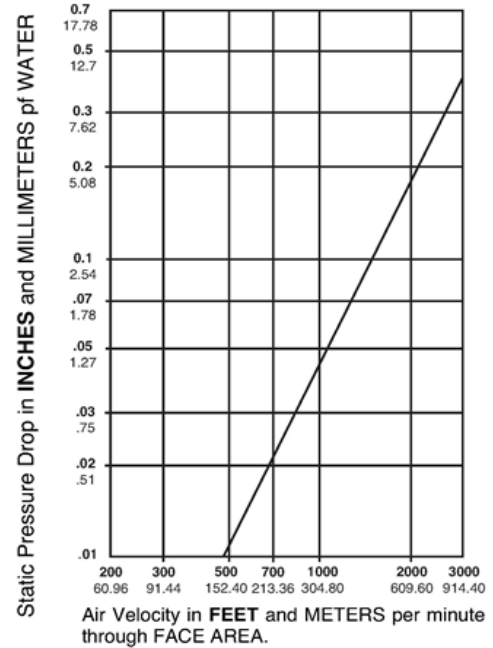
To calculate leakage at a given pressure, multiply the leakage at 1 inch wg by the square root of the given leakage.

*Example: given 5 inches wg
5.4 cfm (√5) = 20.07 cfm*

Air performance testing is performed in accordance with ANSI/AMCA Standard 500-D, figure 5.3.

Damper "A" Width	Maximum System Pressure
48" (1219)	2.5" wg (.62 kPa)
36" (914)	3.0" wg (.75 kPa)
24" (610)	4.0" wg (1 kPa)
12" (305)	5.0" wg (1.25 kPa)

PRESSURE DROP - DAMPER OPEN (24" X 24" size)



MAXIMUM VELOCITY AND RECOMMENDATIONS

Damper Width "A" Dimension in inches (mm)	Maximum Velocity	
	fpm	m/s
Above 5" (127) through 24" (609)	3000	15.25
Above 24" (609) through 36" (914)	2500	12.71
Above 36" (914) through 48" (1219)	2000	10.17
Velocity recommendation (see note below)	1500	7.6

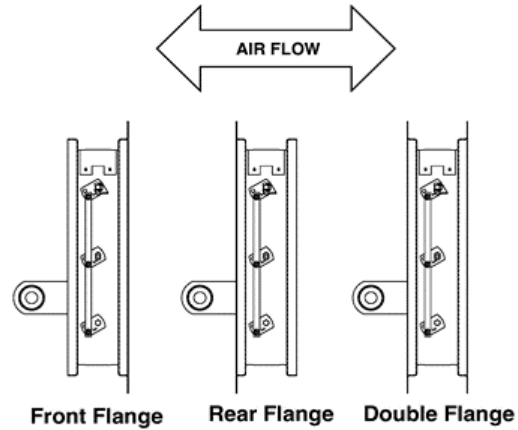
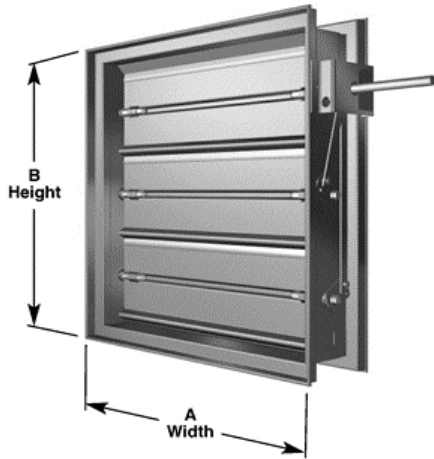
NOTE: For optimum sound characteristics and pressure drop performance on dampers with v-groove blades, we recommend sizing dampers for 1,500 fpm. Higher velocities are not recommended for outside air openings, due to water penetration concerns. For best pressure drop and sound performance at higher velocities, consider an airfoil blade damper, such as Ruskin model CD60.

INSTALLATION

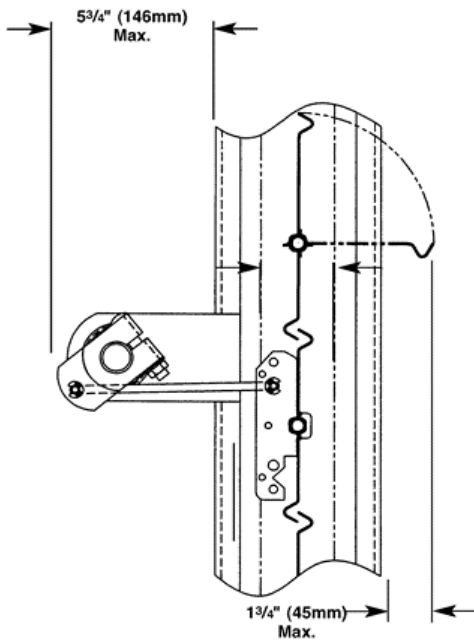
Ruskin model CD36 is not recommended for installation with blades running vertically unless ordered with thrust washers. For proper performance, damper must be installed square and free from racking. Actuator must be installed on linkage side. Opposed blade dampers must be operated from a power blade or shaft. Refer to installation instructions for additional information.

The CD36 is intended to be self supporting only in its largest single section size. Multiple section damper assemblies may require bracing to support the weight of the assembly and to hold against system pressure. Ruskin recommends appropriate bracing to support the damper horizontally at a minimum of every 8 feet of damper width. Vertical assemblies and higher system pressures may require more bracing.

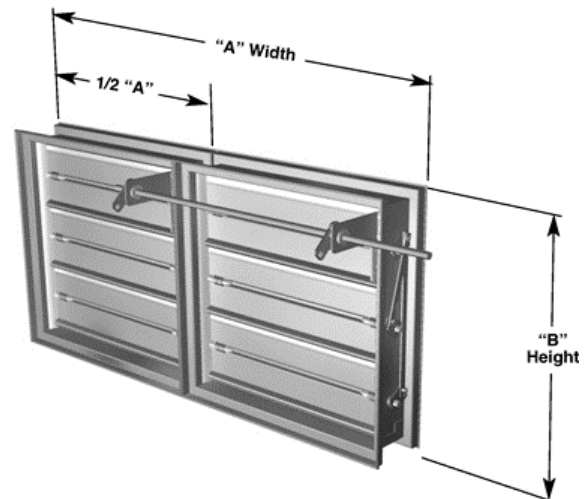
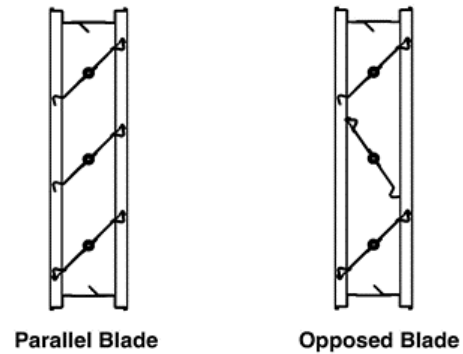
DIMENSIONAL DATA



Ruskin model CD36 is bi-directional, meaning it can be installed with the airflow in either direction. When considering mounting flange location, orientation must be defined to properly communicate the desired results. For definition purposes only, the "front" of the damper can be determined by viewing the jackshaft*, linkage, and blade rotation. When required, jackshaft is always placed on the "rear" surface of the damper. When viewing the concealed side linkage, the "front" surface is adjacent on the right side. Also, when viewing the linkage, the top blade should rotate clockwise to open, as shown in the blade orientation graphic below. If it does not, rotate the damper 180° so the blade rotation is clockwise to open when viewing the linkage side.



Typical Envelope Dimensions



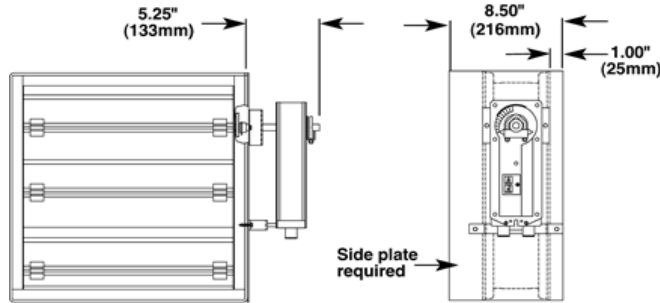
***TYPICAL JACKSHAFT ASSEMBLY**

Unless other wise specified, all dampers larger than the maximum single section 48" (1219mm) "A" width of 72" (1829mm) "B" height will be built in equal smaller sections and factory assembled with jackshaft as indicated in the detail to the right. In this detail, the damper is over the 48" (1219mm) width, but is less than 96" (2438mm), so it will be built two sections wide. The height is less than 72" (1829mm) so it remains one section tall. Multiple section dampers are not intended to be structural supports, or self-supporting. Additional bracing is recommended to support the damper weight and support against system pressure. Ruskin recommends appropriate bracing to support the damper horizontally at a minimum of every 96" (2438mm) of damper width. Vertical assemblies and higher pressure systems may require additional bracing.

DIMENSIONAL DATA

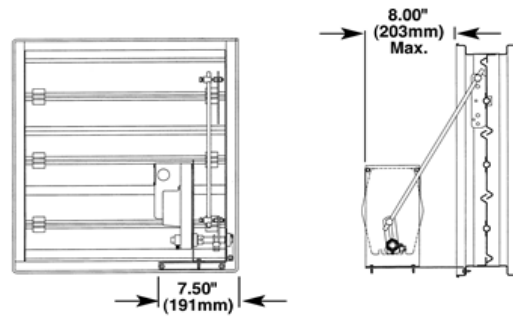
Ruskin model CD36 is available with a wide variety of factory furnished, installed, and commissioned actuators. Actuators can be installed for a fraction of the cost when compared to field installation. It also makes installation faster and more reliable. Actuators vary from manufacturer to manufacturer, so it is not practical to illustrate every mounting arrangement. The four illustrations below

are intended to be used for general guidance on similar mounting arrangements. These provide typical maximum envelope dimensions for layout purposes. If space is a concern, consult your local Ruskin representative for specific details based on your unique actuator selection and installation requirements.



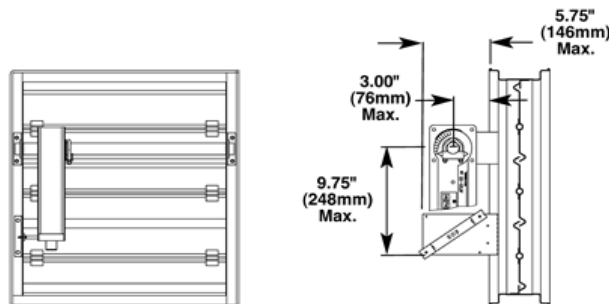
External side plate mounted actuators

Figure 1



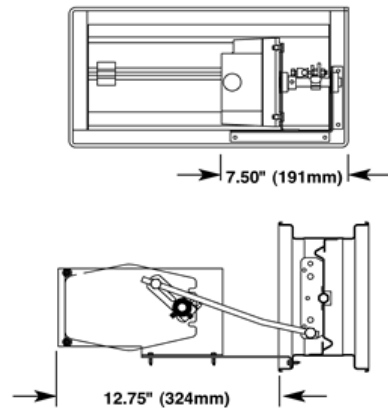
"A" width 9" (229mm) x "B" height 20" (508mm) minimum

Figure 2



Jackshaft mounted actuators. If "A" width is greater than 9" (229mm) and "B" height is more than 20" (508mm) jackshaft will be used for internally mounted actuators.

Figure 3



If "B" height is less than 20" (508mm) it may be necessary to rotate the actuator 90° as illustrated.

Figure 4

SUGGESTED SPECIFICATION

Furnish and install, at locations shown on plans, or in accordance with schedules, control dampers that meet the following minimum construction standards. Control dampers shall be produced in an ISO9001 certified factory. Frame shall be 16 ga. (1.6mm) galvanized steel structural hat channel with tabbed corners for reinforcement. The blades shall be 6" (152mm) single skin, 16 gage (1.6mm) galvanized steel with three longitudinal grooves to reduce blade deflection. Bearings shall be corrosion resistant, molded synthetic sleeve type turning in an extruded hole in the damper frame. Axles shall be hexagonal positively locked into the damper blade. Linkage shall be concealed out of airstream, within the damper frame to

reduce pressure drop and noise. Blade edge seals shall be PVC coated polyester fabric suitable for -25°F to +185°F (-32°C to +85°C) mechanically locked into the blade edge. Adhesive or clip-on type seals are unacceptable. Jamb seals shall be stainless steel compression type to prevent leakage between blade end and damper frame. Blade end overlapping frame is unacceptable. Multiple section dampers must have factory installed jackshafts unless clearly eliminated by the engineer. Submittal must include leakage, pressure drop, maximum velocity and maximum pressure data based on AMCA Publication 500D. Dampers shall be in all respects equivalent to **Ruskin Model CD36**.



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CD50 LOW LEAKAGE CONTROL DAMPER
High Performance Extruded Aluminum Airfoil
Class 1A Leakage Rated

APPLICATION

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.

STANDARD CONSTRUCTION

FRAME

5" x 1" x 6063T5 extruded aluminum hat channel with .125" minimum wall thickness (127 x 25 x 3.2). Low profile, 5" x 1/2" (127 x 13) top and bottom frames on dampers 12" (305) high and less. Mounting flanges on both sides of frame.

BLADES

6" (152) wide, 6063T5 heavy gage extruded aluminum, airfoil shape.

SEALS

Ruskiprene blade edge seals and flexible metal compressible jamb seals.

BEARINGS

Molded synthetic.

LINKAGE

Concealed in frame.

AXLES

1/2" (13) plated steel hex.

MAXIMUM SIZE

Single section – 60"w x 72"h (1524 x 1829).
Multiple section assembly – Unlimited size.

MINIMUM SIZE

Single blade – 6"w x 5"h (152 x 127).
Two blades, parallel or opposed action: 6"w x 9"h (152 x 229).

TEMPERATURE LIMITS

-72°F (-58°C) and +275°F (+135°C) .

FEATURES

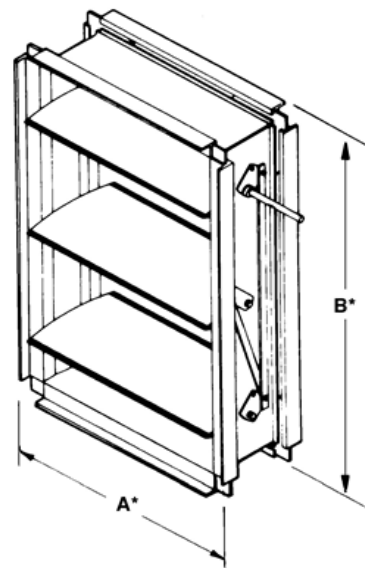
- Airfoil blade design for low pressure drop and less noise generation.
- Positive lock axles, noncorrosive bearings and shake proof linkage for low maintenance operation.
- Blade edge seals mechanically lock into the blade for superior sealing.

OPTIONS

- Factory-installed, pneumatic and electric actuators.
- Enamel and epoxy finishes.
- SP100 Switch Package to remotely indicate damper blade position.
- 16 gage galvanized steel hat channel frame.
- Front, rear or double flange frame with or without bolt holes.
- Face and bypass configurations.

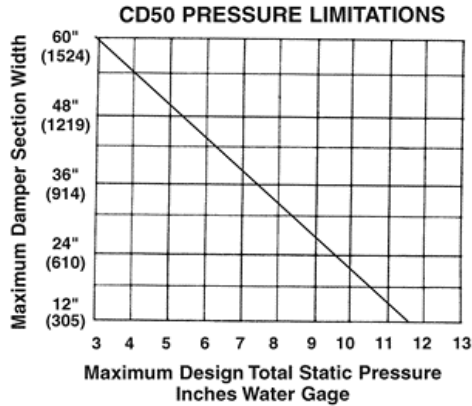
NOTE: Dimensions shown in parenthesis () indicate millimeters.

*Units furnished approximately 1/4" (6) smaller than given opening dimensions.



**PREPAIR
G2- INTAKE
DAMPER**

CD50 AMCA LICENSED PERFORMANCE DATA



The CD50 may be used in systems with total pressures exceeding 3.5" by reducing damper section width as indicated. Example: Maximum design total pressure of 8.5" w.g. would require CD50 damper with maximum section width of 36" (914).

Pressure limitations shown above allow maximum blade deflection of 1/180 of span on 60" (1524) damper widths. Deflections in other damper widths (less than 48" [1219]) at higher pressures shown will result in blade deflection substantially less than 1/180 of span.



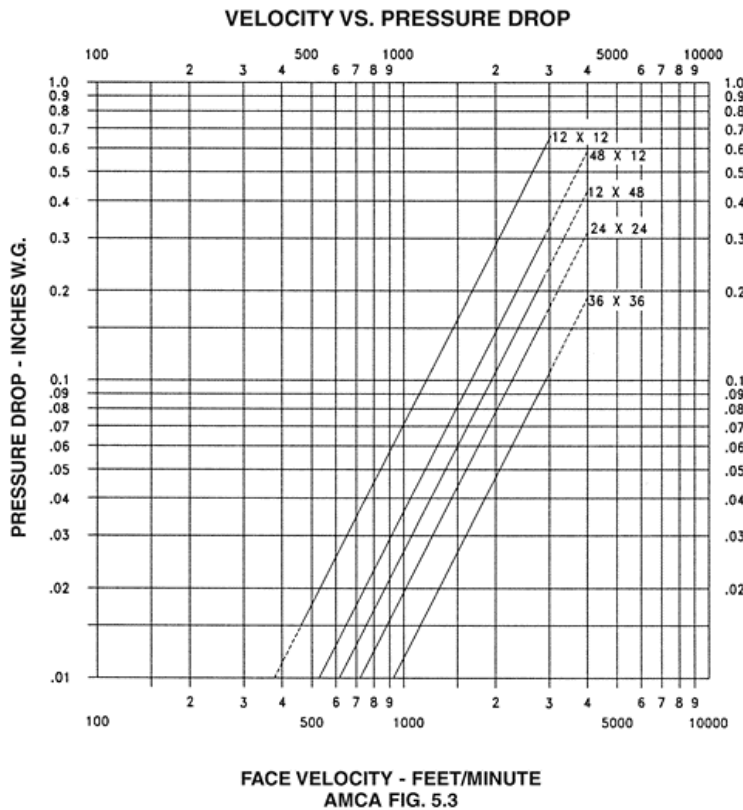
Ruskin Company certifies that the CD50 shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program. The AMCA International Certified Ratings Seal applies to Air Performance and Air Leakage.

Pressure/ Class	Leakage, L/s/m ² (ft ³ /min/ft ²)			
	Required Rating		Extended Ranges (Opt.)	
	1" (0.25 kPa)	4" (1.0 kPa)	8" (2.0 kPa)	12" (3.0 kPa)
1A	3 (15.2)	N/A	N/A	N/A
1	4 (20.3)	8 (40.6)	11 (55.9)	14 (71.1)
2	10 (50.8)	20 (102)	28 (142)	35 (178)
3	40 (203)	80 (406)	112 (569)	140 (711)

DAMPER WIDTH (INCHES)	1 IN. W.G.	4 IN. W.G.	8 IN. W.G.
12" (305)	IA	I	II
24" (610)	IA	I	II
36" (914)	IA	I	NA
48" (1219)	IA	I	NA
60" (1524)	IA	I	NA

Leakage testing conducted in accordance with AMCA Standard 500-D-98. Torque applied holding damper closed, 5 in. lbs./sq. ft. on opposed blade dampers and 7 in. lbs./sq. ft. on parallel blade

dampers. Air leakage is based on operation between 50°F to 104°F. All data corrected to represent standard air density 0.075 lbs/ft³.



CD50 sizes 12 x 12, 24 x 24, 48 x 12, 12 x 48, 36 x 36 (305 x 305, 610 x 610, 1219 x 305, 305 x 1219, 914 x 914)
All data corrected to represent standard air at a density of 0.075 lbs/ft³.

SOUND RATINGS

CD50 SOUND RATINGS

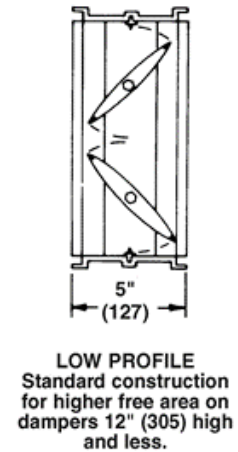
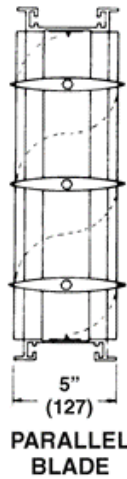
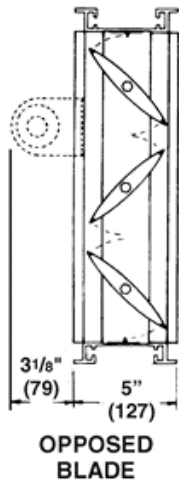
Damper Size	Damper Full Open		Damper 75% Open		Damper 50% Open		Damper 25% Open	
	CFM	NC	CFM	NC	CFM	NC	CFM	NC
12 x 12 (305 x 305)	2000	17	1500	11	1000	11	500	*
	3000	28	2250	22	1500	19	750	*
	4000	35	3000	29	2000	24	1000	*
18 x 18 (457 x 457)	2250	17	1688	10	1125	21	563	*
	4500	33	3375	26	2250	32	1125	*
	6750	43	5063	37	3375	40	1688	15
24 x 24 (610 x 610)	4000	11	3000	10	2000	26	1000	*
	8000	32	6000	30	4000	38	2000	21
	12000	43	9000	42	6000	46	3000	31

NC = Noise criteria in Decibels is based on 10db room effect and 10db of room attenuation.

* = Less than 10 NC

See ASHRAE Handbook (1977 Fundamentals, Chapter 7) for explanation of NC Ratings.

DIMENSIONAL INFORMATION



CD50 SUGGESTED SPECIFICATION

Furnish and install, at locations shown on plans, or in accordance with schedules, Low leakage dampers shall meet the following minimum construction standards: Frames shall be 5" x 1" x .125" (minimum thickness) (127 x 25 x 3.2) 6063T5 extruded aluminum hat channel with hat mounting flanges on both sides of the frame. Each corner shall be reinforced with two die formed internal braces and machine staked for maximum rigidity. Blades shall be airfoil type extruded aluminum (maximum 6" [152] depth) with integral structural reinforcing tube running full length of each blade.

Blade edge seals shall be extruded double edge design with inflatable pocket which enables air pressure from either direction to assist in blade to blade seal off. Blades seals shall be mechanically locked

in extruded blade slots, yet shall be easily replaceable in field. Adhesive or clip-on type blade seals are not acceptable. Bearings shall be non-corrosive molded synthetic. Axles shall be hexagonal (round not acceptable) to provide positive locking connection to blades and linkage. Linkage shall be concealed in frame. Submittal must include leakage, maximum air flow and maximum pressure ratings based on AMCA Publication 500. Damper shall be tested and licensed in accordance with AMCA 511 for Air Performance and Air Leakage. Damper widths from 12" to 60" (305 to 1524) wide shall not leak any greater than 8 cfm sq. ft. @ 4" w.g. and a maximum of 3 CFM sq. ft. @ 1" w.g. Dampers shall be in all respects equivalent to Ruskin Model CD50.

PRODUCT SPECIFICATIONS ^[1] -- 4TXC-DS - HIGH EFFICIENCY STAGED SPLIT SYSTEM HEAT PUMP /
COOLING COMFORT™ COILS
CASED UPFLOW / DOWNFLOW / HORIZONTAL

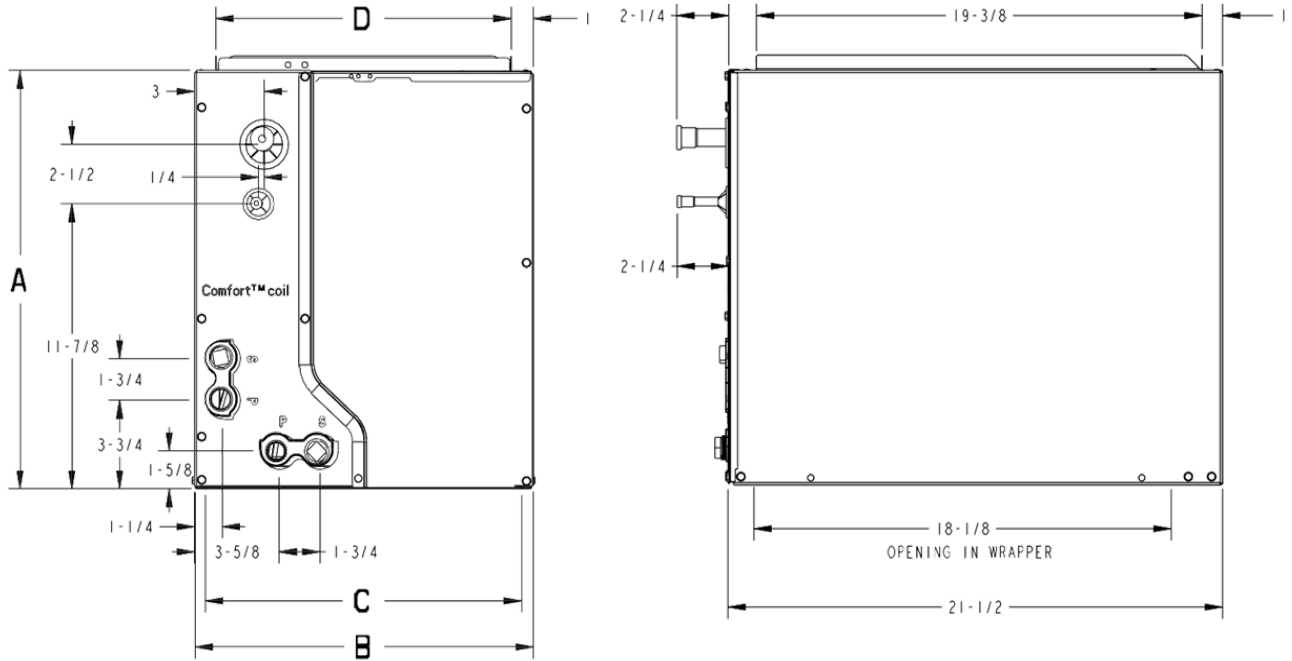


FIGURE A

MODEL	4TXC0002DS3	4TXC8004DS3	4TXC0005DS3	4TXC8006DS3	4TXC0007DS3	4TXC0009DS3
WEIGHT (LBS)	42	58	60	65	69	78
REFRIGERANT CONTROL	TXV (NON-BLEED)					
HEIGHT "A" (IN)	17-1/2	22-1/2	22-1/2	26-7/8	26-7/8	30-3/4
OVERALL WIDTH "B" (IN)	14-1/2	17-1/2	21	17-1/2	21	21
OPENING WIDTH "C" (IN)	13-5/8	16-5/8	20-1/8	16-5/8	20-1/8	20-1/8
TOP OPENING "D" (IN)	12-3/4	15-3/4	19-1/4	15-3/4	19-1/4	19-1/4
GAS CONNECTION	3/4			7/8		
LIQUID CONNECTION	3/8					
MATCHED FURNACE WIDTH (NO ADAPTER REQUIRED)	14-1/2	17-1/2	21	17-1/2	21	21
DRAIN PAN	PLASTIC					

↑
G2-6, G2-8, G2-10

↑
G2-12

Performance Data

	4TXCA002DS3HCA	4TXCB003DS3HCA	4TXCB004DS3HCA	4TXCB006DS3HCA	4TXCC005DS3HCA
INDOOR COIL -- Type	PLATE FIN	PLATE FIN	PLATE FIN	PLATE FIN	PLATE FIN
Rows / F.P.I.	2 / 20	3 / 14	3 / 12	3 / 14	3 / 12
Face Area (sq.ft.)	3.00	3.50	5.00	6.00	5.00
Tube Size	3/8	3/8	3/8	3/8	3/8
Refrigerant Control (No internal check valve)	Non-BleedTXV	Non-BleedTXV	Non-BleedTXV	Non-BleedTXV	Non-BleedTXV
Drain Conn. Size (in.)	3/4 NPT	3/4 NPT	3/4 NPT	3/4 NPT	3/4 NPT
Duct Connections	See Outline Drawing	See Outline Drawing	See Outline Drawing	See Outline Drawing	See Outline Drawing
REFRIGERANT CONNECTIONS	R-410A BRAZED	R-410A BRAZED	R-410A BRAZED	R-410A BRAZED	R-410A BRAZED
Line Size -- Gas (in.)	3/4	3/4	7/8	7/8	7/8
Line Size -- Liquid (in.)	3/8	3/8	3/8	3/8	3/8
DIMENSIONS (in.)	H X W X D	H X W X D	H X W X D	H X W X D	H X W X D
Crated (Hx Wx D)	21-3/8 x 17-1/2 x 26-1/2	21-3/8 x 20-1/2 x 26-1/2	22-3/8 x 20-1/2 x 26-1/2	23-5/8 x 20-1/2 x 26-1/2	26-3/8 x 24 x 26-1/2
Uncrated	17-5/8 x 14-1/2 x 21-1/2	17-5/8 x 17-1/2 x 21-1/2	22-5/8 x 17-1/2 x 21-1/2	22-7/8 x 17-1/2 x 21-1/2	22-5/8 x 21 x 21-1/2
WEIGHT (lbs)					
Shipping -- Net	42 / 34	50 / 42	58 / 50	60 / 52	65 / 57

PRESSURE DROP CHARACTERISTICS FOR COOLING AND HEAT PUMP COILS AIRFLOW (CFM) VS. PRESSURE DROP ACROSS WET COIL								
PRESSURE DROP (INCHES OF WATER COLUMN)								
MODEL	.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4
4TXCA002DS3HCA	225	340	430	510	585	650	715	775
4TXCB003DS3HCA	350	525	665	790	900	1000	1095	1180
4TXCB004DS3HCA	440	655	825	970	1100	1220	1330	1435
4TXCB006DS3HCA	430	640	815	965	1095	1220	1335	1445
4TXCC005DS3HCA	520	770	970	1145	1300	1440	1570	1695
4TXCC007DS3HCA	505	760	965	1140	1300	1445	1580	1710
4TXCC009DS3HCA	490	740	940	1120	1280	1425	1565	1695
4TXCD008DS3HCA	580	870	1100	1300	1485	1650	1805	1950
4TXCD010DS3HCA	555	835	1065	1265	1445	1615	1770	1915

R-22 CONVERSION NON-BLEED TXV KITS	
Coils	R-22 TXV Kit
4TXCA002DS3HCA 4TXCB003DS3HCA 4TXCB004DS3HCA 4TXCC005DS3HCA	2AYTXVH3H1836A

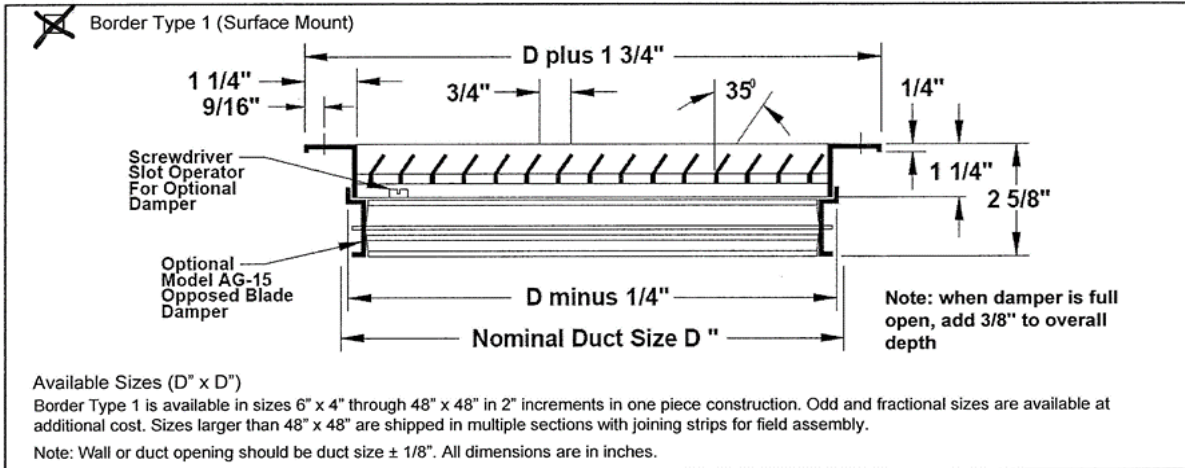


Submittal

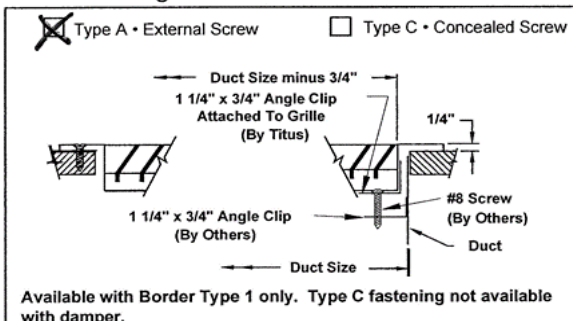
G-350F-1.0 6-16-09

- | | | | | |
|---|------------------|----------------|-----------------------|----------------|
| <input checked="" type="checkbox"/> 350FL | • 35° Deflection | • Long Blades | • 3/4" Blades Spacing | EXHAUST |
| <input type="checkbox"/> 350FS | • 35° Deflection | • Short Blades | • 3/4" Blades Spacing | |

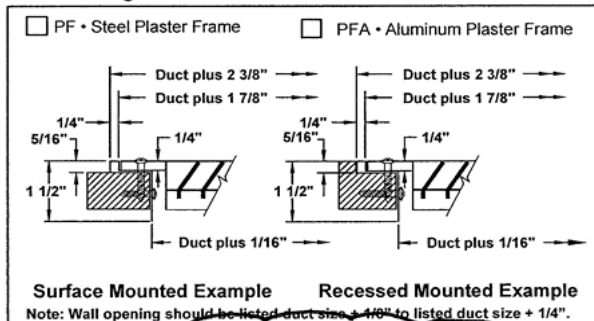
Louvered Return Grilles • Aluminum



Fastenings



Mounting Frames



Accessories (Optional) Check if provided.

- Neck mounted opposed blade damper, ~~galvanized steel~~ **ALUMINUM**
- EQT • Earthquake Tabs
- IS • Insect Screen (1/16" square mesh – galvanized steel)
- DS • Debris Screen (1/4" square mesh – galvanized steel)
- Other: _____

Standard Finish: #26 White
 Other Finish: _____

General Description

- Available with louvers vertical or horizontal.
- #8 x 1 1/4" lg. Phillips flat head sheet metal screws painted white.
- Optional opposed blade damper has screwdriver adjustment accessible through face of grille.
- Material is Aluminum.
- All dimensions are ± 1/16".



Submittal

CT-1.0

4-9-09

Linear Bar Diffusers Aluminum • Fixed Bars

- Models: CT-480 • 1/4" Spacing • 1/8" Bars • 0° Deflection
 CT-481 • 1/4" Spacing • 1/8" Bars • 15° Deflection
 CT-580 • 1/2" Spacing • 1/8" Bars • 0° Deflection
 → CT-581 • 1/2" Spacing • 1/8" Bars • 15° Deflection
 CT-540 • 1/2" Spacing • 1/4" Bars • 0° Deflection
 CT-541 • 1/2" Spacing • 1/4" Bars • 15° Deflection

<p>Core with Border</p> <p>Type 13 border is shown. For other available types, please see next page.</p>	<p>Core with Frame & Border</p> <p>Type 1A frame & border combination is shown. For other available types, please see next page.</p>
<p>Core with Heavy Duty Mounting Frame for Floor Applications</p> <p>Type 5 heavy duty mounting frame is shown. For other available types, please see next page.</p> <p>Core is always furnished with Type H additional reinforcing.</p>	<p>Core only</p> <p>Model CT-540 core is shown. For other available models, please see below.</p>

Available Cores Check selection

1/4" Spacing		1/2" Spacing	
1/8" Bars		1/8" Bars	1/4" Bars
<input type="checkbox"/> Model CT-480 • 0° Deflection 		<input type="checkbox"/> Model CT-580 • 0° Deflection 	<input type="checkbox"/> Model CT-540 • 0° Deflection
<input type="checkbox"/> Model CT-481 • 15° Deflection 		<input checked="" type="checkbox"/> Model CT-581 • 15° Deflection 	<input type="checkbox"/> Model CT-541 • 15° Deflection

All dimensions are in inches.

† NOTE: Not recommended for floor applications with heavy loads or high traffic.

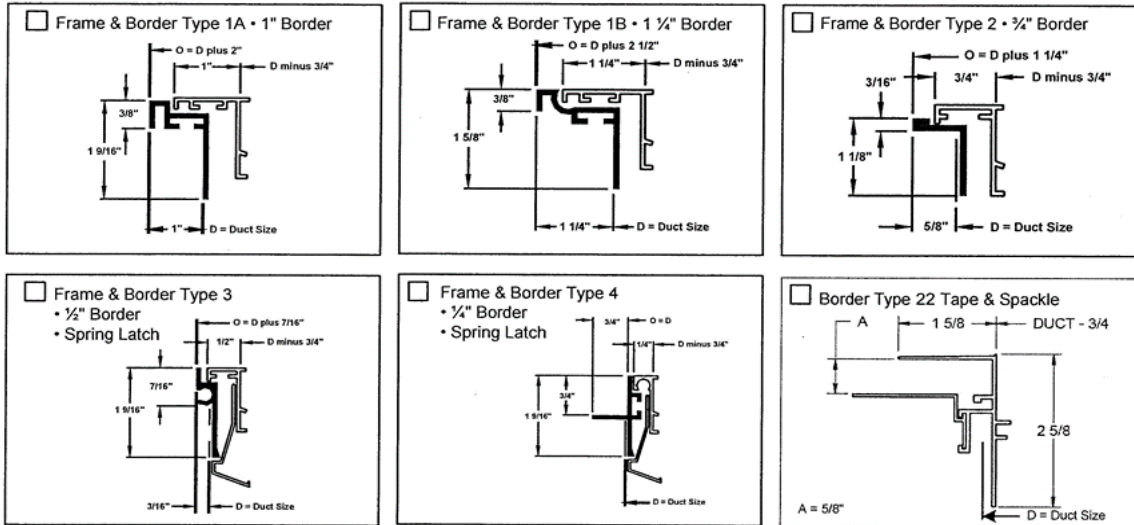
Note: If placing furniture on cores, furniture legs should be a minimum of core spacing plus two bars wide to avoid placing a horizontal load on core.

D-4.0-S

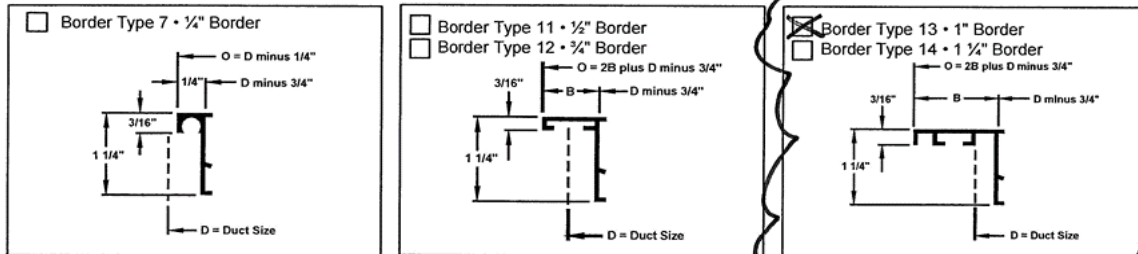
(Please see reverse side.)

Submittal CT-2.0 4-9-09

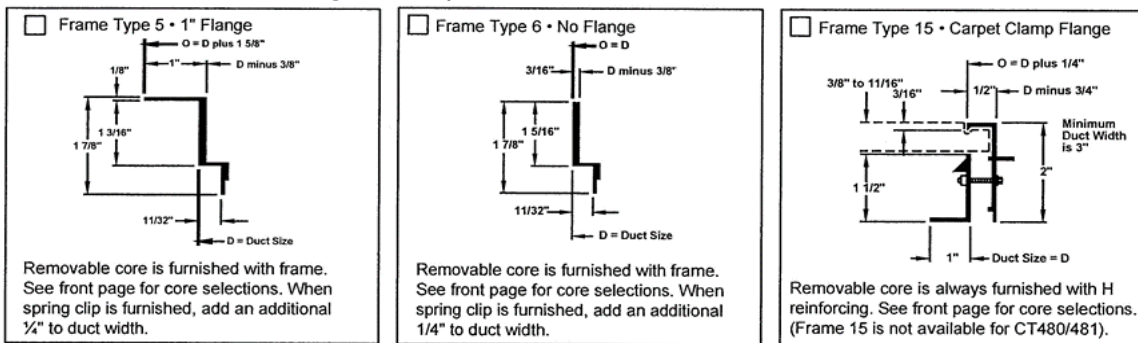
Frame & Border Types • Dimensions Check if provided.



Border Types • Dimensions Check if provided.



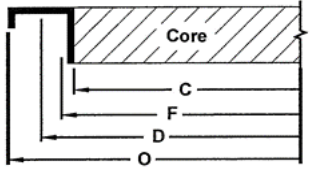
Heavy Duty Mounting Frames for Floor Applications Check if provided.
(See submittal D-CT-HD for loading limitations.)



Core Only (No Frame, No Border) Type CO

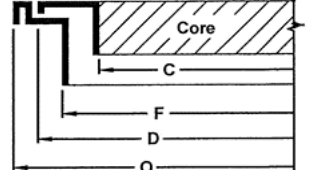
Submittal CT-3.0 4-9-09

Overall Length and Widths for Various Frame & Border Types



Type	F Border Length	O Overall Length	C Core Opening Length
5	D	D plus 1 5/8	D minus 3/8
6	D	D	D minus 3/8
7	D minus 5/8	D minus 1/4	D minus 3/4
11	D minus 5/8	D plus 1/4	D minus 3/4
12	D minus 5/8	D plus 3/4	D minus 3/4
13	D minus 5/8	D plus 1 1/4	D minus 3/4
14	D minus 5/8	D plus 1 3/4	D minus 3/4
22	D minus 5/8	D plus 2 1/2	D minus 3/4

Dimensions are for length or width.

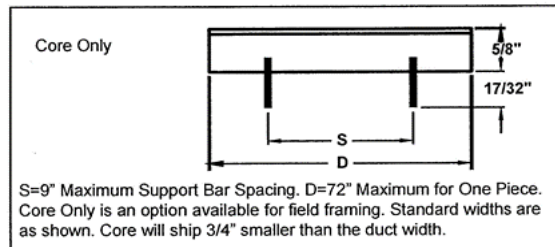


Type	F Border Length	O Overall Length	C Core Opening Length
1A	D	D plus 2	D minus 1/4
1B	D	D plus 2 1/2	D minus 1/4
2	D	D plus 1 1/4	D minus 1/4
3	D	D plus 7/16	D minus 1/4
4	D	D	D minus 1/4
15	D	D plus 1/4	D minus 1/4

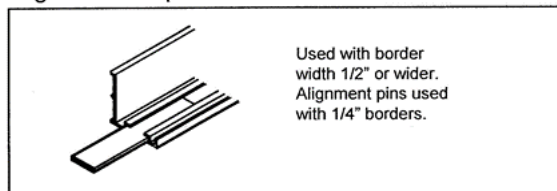
Dimensions are for length or width.

Standard Core Width Information

Duct Size D	1/2" Spacing		3/4" or 7/16" Spacing	
	Core Opening C	Number of Bars	Core Opening C	Number of Bars
2	1 1/4	3	1 1/4	2
2 1/2	1 3/4	5	1 3/4	3
3	2 1/4	7	2 1/4	4
3 1/2	2 3/4	9	2 3/4	5
4	3 1/4	11	3 1/4	6
5	4 1/4	15	4 1/4	8
6	5 1/4	19	5 1/4	10

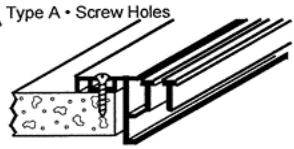


Alignment Strips



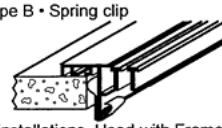
Available Fastenings Check if provided.

Type A • Screw Holes



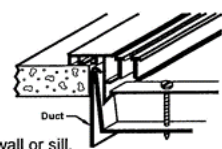
For ceiling, side wall or sill. Used with Frame & Border Types 1B, 5, 11, 12, 13, 14.

Type B • Spring clip



For sill installations. Used with Frame & Border Types 7, 11, 12, 13, 14. Must use AG-35B instead of AG-35 with Type B fastening. Sill opening size must be slightly larger to accommodate spring clips.

Type C • Concealed Fastening

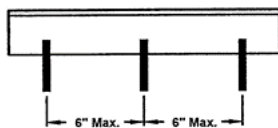


For ceiling, side wall or sill. Used with Frame & Border Types 1A, 1B, 2, 7, 11, 12, 13, 14, & Border Type 22

Additional Reinforcing (optional) Check if provided.

Type H • Optional Heavy Duty Core

- Standard with Heavy Duty Mounting Frame Types 5, 6, 15



Optional Heavy Duty Core has support bars on 6" maximum centers. (Standard core has 9" maximum centers.) See Submittal CT-HD for maximum loading.

All dimensions are in inches.

Submittal CT-4.0 4-9-09

Additional Reinforcing (optional) Check if provided.

Model 07 Directional Blades

For all widths of Model CT diffusers 3" or greater. Cannot be attached to Frame & Border Types 3 and 4. Can be used with Type 5, 6, 15 if Type B Spring Clip Fastening is omitted.

Model AG-30 Single Blade Damper

For Model CT diffuser widths 1 1/2 through 4". Friction hinge on 1 1/2" and 2" widths. Screwdriver operator on 2 1/2" through 4". Cannot be attached to Frame & Border Types 3, 4, 5, 6 or 15. For those types use Model AG-35B damper on diffusers 3" and wider.

Model AG-35 Opposed Damper

For Model CT diffusers 3" and wider. Cannot be attached to Frame & Border Types 3 and 4. Use Model AG-35 B damper for those types. Note: Minimum duct width is 3".

Model BLKS Steel Blank-Off

For all widths of Model CT diffusers. Furnished in 6 foot lengths for field cutting and installation. Steel, painted flat black.

Model AD Access Door (Not available on Types 3, 4 5, 6, 15 and 22)

Note: Maximum Length is 6 Feet

Specify Dimension X

Optional Mitered Corners

MC-480 • 1/4" Spacing • 1/8" Bars • 0° Deflection
 MC-481 • 1/4" Spacing • 1/8" Bars • 15° Deflection
 MC-580 • 1/2" Spacing • 1/8" Bars • 0° Deflection
 MC-581 • 1/2" Spacing • 1/8" Bars • 15° Deflection
 MC-540 • 1/2" Spacing • 1/4" Bars • 0° Deflection
 MC-541 • 1/2" Spacing • 1/4" Bars • 15° Deflection

Floor, Ceiling or Sill

Type O • 0° Deflection
 Type A • Deflection Inside
 Type B • Deflection Outside

Type C • Side Wall, Inside
 Type D • Side Wall, Outside

Duct Width D'	Duct Length D	Frame & Border Type													
		1A	1B	2	3	4	5	6	7	11	12	13	14	15	CO
2 - 4	12	12 15/16	13 3/16	12 5/8	12 3/16	12	12 13/16	12	11 7/8	12 1/8	12 3/8	12 5/8	12 7/8	12 1/8	12
4 1/2 - 6	18	18 15/16	19 3/16	18 5/8	18 3/16	18	18 13/16	18	17 7/8	18 1/8	18 3/8	18 5/8	18 7/8	18 1/8	18

Standard Finish: #26 White

General Description

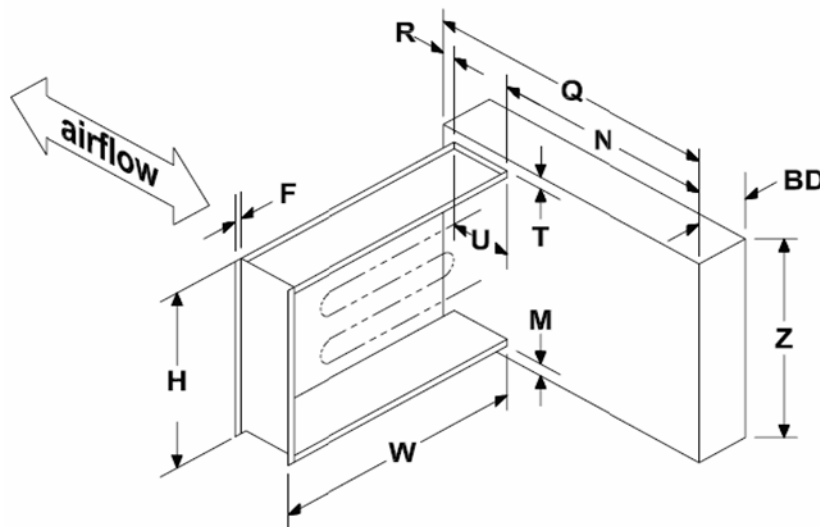
- TITUS linear bar diffusers are designed for both supply and return applications.
- Standard lengths are 1, 2, 3, 4, 5 and 6 feet, furnished as complete, welded assemblies.
- Lengths greater than 6 feet are furnished in multiple sections, the number and size determined by the factory.
- Sections can be joined end-to-end for continuous appearance, using standard alignment strips or alignment pins.
- All deflection bars are fixed and are parallel to the long dimension.
- Fixed Bars are extruded aluminum.
- Border Types 5, 6 and 15 are the only frame styles available for floor applications.

This submittal is meant to demonstrate general dimensions of this product. The drawings are not meant to detail every aspect of the product. Drawings are not to scale. Titus reserves the right to make changes without written notice.

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Electric Preheat and Comfort Heat E-Series - Flip-Able Duct Heater

- Standard supply voltages, 120-600
- Standard control voltages, 24-277
- Single or three phase
- Staging is custom per your needs
- Slip in, flange, or custom designs available
- Disconnecting contactors
- Recessed control box
- Offset control box
- 80/20 (Ni/Cr) resistance wire
- Stainless steel terminals
- Derated Coils
- Vapor barrier
- Gasketed cover



Preheat (EBH) & Comfort Heat (EVH)
See DST drawing sheets PA-1 & PA-2 for
KW/Voltage/Amps and Dimensions

***Note the Preheat thermostat is included only if
needed in your region.**

Date: 7/24/2015

PrepAir G2 Series Pre-Heat Submittal Duncan Stuart Todd, Ltd

ACCESSORIES



2 Pole Magnetic Contactor



3 Pole Magnetic Contactor

MAGNETIC CONTACTORS

- Standard in all duct heaters
- Used for primary or back-up control
- UL approved for 250,000 cycle operation

Date: 7/24/2015

PrepAir G2 Series Pre-Heat Submittal Duncan Stuart Todd, Ltd



Air Flow Switch

AIR FLOW SWITCH

- Prevents heater from being energized when the fan is not on
- UL Required
- Non adjustable airflow switch (shown) requires a minimum of .07"WC pressure
- Adjustable airflow switch available with rating of .05" ± .02" WC to 12"WC



Control Transformer

CONTROL TRANSFORMER

- Utilized when control voltage differs from line voltage
- Primary over current protection
- Class 1 units must have primary side protection by fusing
- Class 2 units have internal protection and do not require additional fusing unless specified

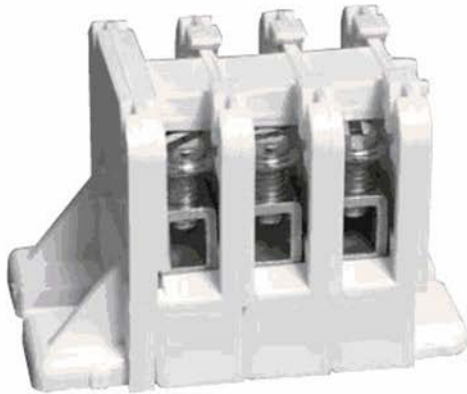
Quote No: TQ00015646
Date Quoted: 07/24/2015
Expires: 10/19/2015
Project: Duncan Stuart Todd

Date: 7/24/2015

PrepAir G2 Series Pre-Heat Submittal Duncan Stuart Todd, Ltd



Terminal Blocks



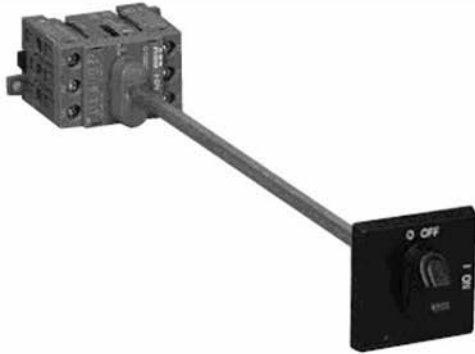
Terminal Blocks

TERMINAL BLOCKS

- High voltage terminal blocks are sized for copper conductors only
- Sized to accept up to: (1) 500 MCM line feeder per pole. Heaters requiring feeders greater than 500 MCM will be supplied with main power terminal blocks which will accept (2) parallel feeders up to 500 MCM each per pole.
- Low voltage control circuit terminal boards are included for ease of field connection

Date: 7/24/2015

PrepAir G2 Series Pre-Heat Submittal Duncan Stuart Todd, Ltd



Disconnect Switch

DISCONNECT SWITCHES

- Available unfused door interlocking disconnect switch (max. 384 AMPS)



MS56L Series
Ø56mm LED Steady & Flashing Lights

- LED Modular Component
- Direct mount
- Lead wire connection



Specifications

Style	LED Steady+Flashing		
	12V AC/DC	24V AC/DC	110/220V AC
Power Supply	12V AC/DC	24V AC/DC	110/220V AC
Current Consumption	0.1A	0.12A	0.03A
Flash Rate	AC:110/min DC:60/min	80/min	80/min
Vibration	15~55 Hz; xyz/60min (70m/s ² , 7G)		
Insulation Resistance	100 MΩ minimum (500VDC mega)		
Ambient Temperature	-15~40°C		
Storage Temperature	-20~70°C		
Ambient Humidity	45~85% RH		
Certificate/Compliance	RoSH		
Recommended Wire Size	UL1007/22AWG		
Degree of protection	IP65		
Weight	Approx. 66g		

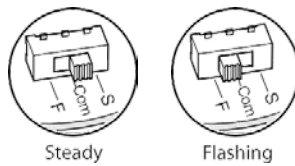
Ordering Information

MS56L - F 02 - R
① ② ③

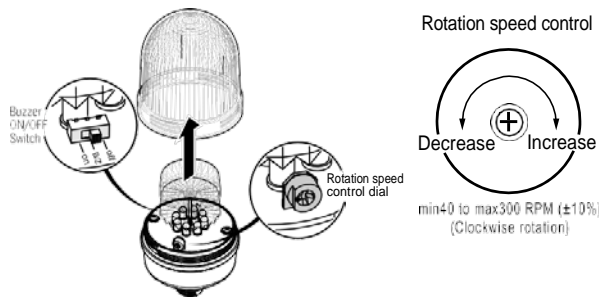
① Light Style	F	Steady
	R	Steady + Flashing
② Power Supply	01	Rotating 12V AC/DC
	02	24V AC/DC
	10 20	110V AC 220V AC
③ Lens Colors	R	Red
	Y	Yellow
	G	Green
	B	Blue
	C	Clear

Function controls

MS56L Series



MS66 Series



Wall Mounting Option
(MS56L & MS66)

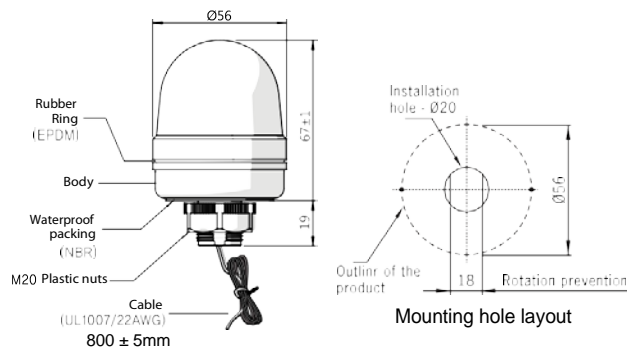
MAM-DS25



See page B1 - B2
for mounting options and accessories

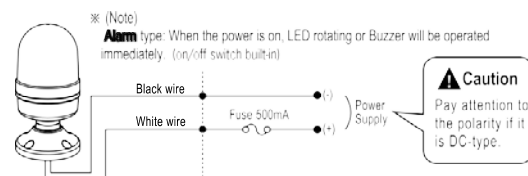
Dimensions

(unit: mm)



Wiring Diagram (MS56L & MS66)

12~24VAC/DC, 110~220VAC Rotating (Alarm)



C1

Electrical

Contact Rating 15 amps, 125 VAC
10 amps, 250 VAC
3/4 HP 125-250 VAC
15 amps, 12-30 VDC

Life 25,000 cycles circuit dependent
50,000 cycles circuit dependent
consult factory for applicable circuits.

Contacts Fine silver, silver cad-oxide

Terminals Brass or copper/silver plate
1/4" (6.3mm) Quick Connect terminations standard.
Solder lug - Brass Tin Plated
Wire Lead 16 gauge standard 105°C
600VAC
Screw Terminals - Brass

Mechanical

Endurance 100,000 cycles minimum

Physical

Lighted Incandescent - rated 10,000 hours
Neon - rated 25,000 hours

Seals Bracket - Actuator WBL/MBL
optional external gasket panel seal

Base Phenolic (150°C)
Rocker/Bracket Nylon 66 (105°C)

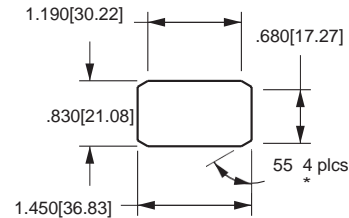
Agency Certifications



Select circuits and constructions with IEC approvals are available. Consult factory

Mounting

MOUNTING HOLE
(Nylon Snap-in Brackets)
Panel Thickness:
.040 min. - .250 max.



1 BASE PART NUMBER: SERIES/POLES/CIRCUITRY^{1,19}/RATING⁷/TERMINATION⁹
10A 250VAC, 15A 125VAC, 3/4 HP 125-250VAC, 15A 6-28VDC⁷

Single Pole in Double Pole base ²				Double Pole			
solder lug	.250 tab	screw term.	wire leads	solder lug	.250 tab	screw term.	wire leads
TIGA50	TIGA51	TIGA54	TIGA55	TIGK50	TIGK51	TIGK54	TIGK55
TIGA5A	TIGA5B	TIGA5E	TIGA5F	TIGK5A	TIGK5B	TIGK5E	TIGK5F
TIGA5L	TIGA5M	TIGA5S	TIGA5T	TIGK5L	TIGK5M	TIGK5S	TIGK5T
TIGB50	TIGB51	TIGB54	TIGB55	TIGL50	TIGL51	TIGL54	TIGL55
TIGB5A	TIGB5B	TIGB5E	TIGB5F	TIGL5A	TIGL5B	TIGL5E	TIGL5F
TIGC50	TIGC51	TIGC54	TIGC55	TIGM50	TIGM51	TIGM54	TIGM55
TIGC5A	TIGC5B	TIGC5E	TIGC5F	TIGM5A	TIGM5B	TIGM5E	TIGM5F
TIGC5L	TIGC5M	TIGC5S	TIGC5T	TIGM5L	TIGM5M	TIGM5S	TIGM5T
Three Pole				Four Pole			
solder lug	.250 tab	screw term.	wire leads	solder lug	.250 tab	screw term.	wire leads
TIHK50	TIHK51	TIHK54	TIHK55	TIHK50	TIHK51	TIHK54	TIHK55
TIHK5A	TIHK5B	TIHK5E	TIHK5F	TIHK5A	TIHK5B	TIHK5E	TIHK5F
TIHK5L	TIHK5M	TIHK5S	TIHK5T	TIHK5L	TIHK5M	TIHK5S	TIHK5T
TIHL50	TIHL51	TIHL54	TIHL55	TIHL50	TIHL51	TIHL54	TIHL55
TIHL5A	TIHL5B	TIHL5E	TIHL5F	TIHL5A	TIHL5B	TIHL5E	TIHL5F
TIHM50	TIHM51	TIHM54	TIHM55	TIHM50	TIHM51	TIHM54	TIHM55
TIHM5A	TIHM5B	TIHM5E	TIHM5F	TIHM5A	TIHM5B	TIHM5E	TIHM5F
TIHM5L	TIHM5M	TIHM5S	TIHM5T	TIHM5L	TIHM5M	TIHM5S	TIHM5T

VDE APPROVED
10A 250VAC, 15A 125VAC, 12(6)A 250VAC T85

Single Pole in Double Pole base ²				Double Pole			
solder lug	.250 tab	wire lead		solder lug	.250 tab	wire lead	
TIGA90	TIGA91	TIGA95	On-None-Off	TIGK90	TIGK91	TIGK95	
TIGB90	TIGB91	TIGB95	On-None-On	TIGL90	TIGL91	TIGL95	
TIGC90	TIGC91	TIGC95	On-Off-On	TIGM90	TIGM91	TIGM95	

Additional ratings up to 20A 125-277VAC, 1 1/2HP 125 VAC, 2HP 250VAC are available. Consult factory for specifics.

3 ACTUATOR COLOR*

BL black WH white RD red

4 BRACKET STYLE*

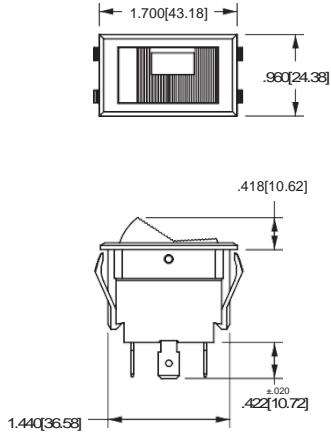
A Screw Mount⁵
B Screw Mount^{5,12}
C Screw Mount⁵
H Screw Mount⁵
NBL Nylon Black
WBL Watershedding Black⁴
MBL Marine Style Black^{4,6}
FN Metal Snap-In⁵
FN BLK Black Metal Snap-In⁵
FN SS Stainless Steel Snap-In⁵
FW Wide Stainless Steel Snap-In⁵

- Notes:
- NBL, FN, & FW brackets only.
 - For single pole switch in a single pole base, specify TIL with single pole circuitry/rating/termination.
 - NBL, WBL, & MBL brackets only. With 6M actuator, brackets also will be matte finish.
 - 6M & 6S actuators only
 - Not available with 6M & 6S actuators.
 - Consists of WBL bracket, neoprene seal, and dummy rivets at open holes. Consult factory for agency approval status.
 - All ratings are appropriate for usage in low voltage applications.
 - For additional special circuits, see page 21.....!?!?!?
 - Custom colors are available, consult factory.
 - .187 tab and PC terminations are also available. Consult factory for catalog number callout.
 - () momentary
 - Not available with WBL or MBL style brackets.
 - Additional circuits available. See page 21.
 - Available with bracket A, C or H only.
 - Not available with MBL, WBL or H brackets. Can be supplied as a double rocker to control separate poles of a TIG, TIH or TIL switch. Consult factory for details.

2 ACTUATOR STYLE

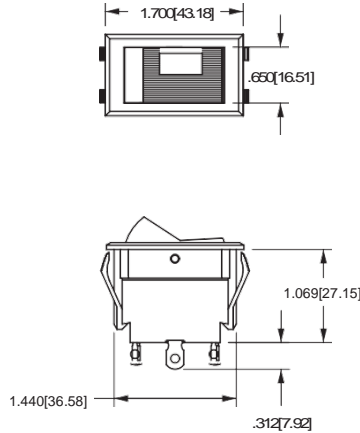
1S	Angular/Smooth Face Gloss ¹²	6M	Curved/Smooth Face Matte ³
1C	Angular/Cross Serations Gloss ¹²	6S	Curved/Smooth Face Gloss ³
1F	Flatted/Smooth Face Gloss ¹²	7S	Rounded Paddle/Smooth Face Gloss ¹
1L	Angular/Longline Serations Gloss ^{1,12}	7N	Witch's Hat/Narrow ¹⁵
2L	Long Smooth/Narrow ¹⁵	7P	Witch's Hat/Wide ¹⁵

1C
CROSS-LINE W/ONE LENS



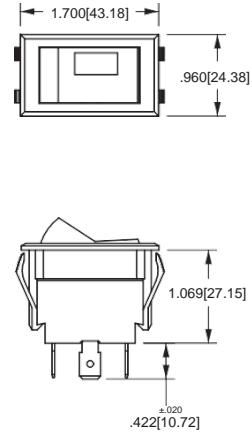
WITH .250 TAB
TERMINALS
AND NBL BRACKET

1L
LONG-LINE W/ONE LENS



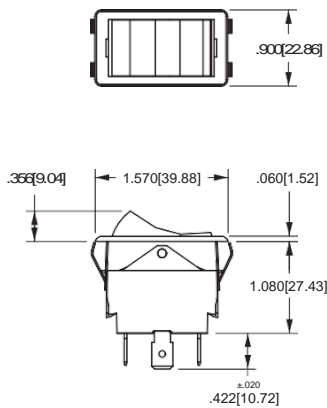
WITH SOLDER LUG
TERMINAL
AND NBL BRACKET

1S
SMOOTH W/ONE LENS



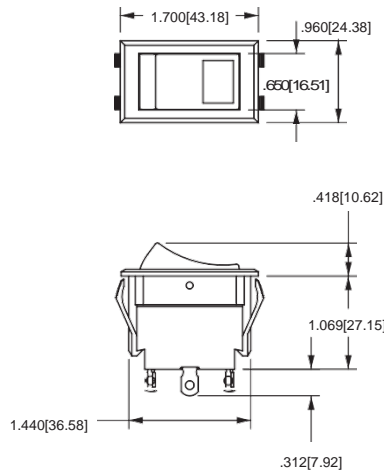
WITH .250 TAB
TERMINALS
AND NBL BRACKET

1F
FLATTED STYLE NO LENS



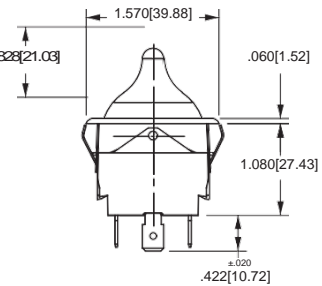
WITH .250 TAB
TERMINALS

6M, 6S
CURVED W/ONE LENS

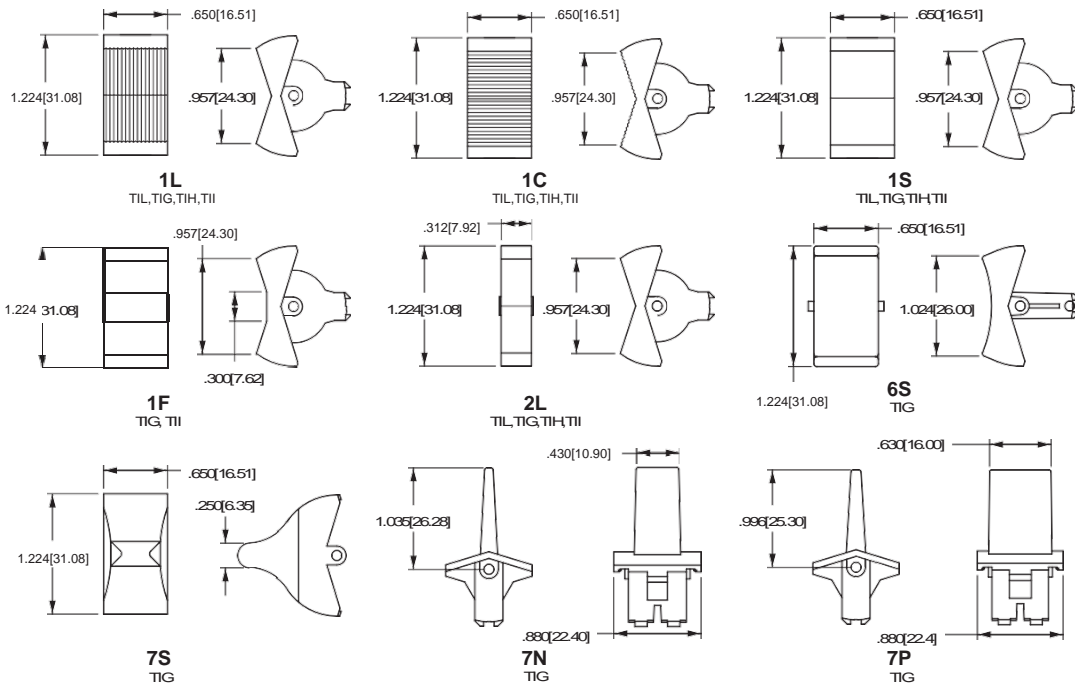
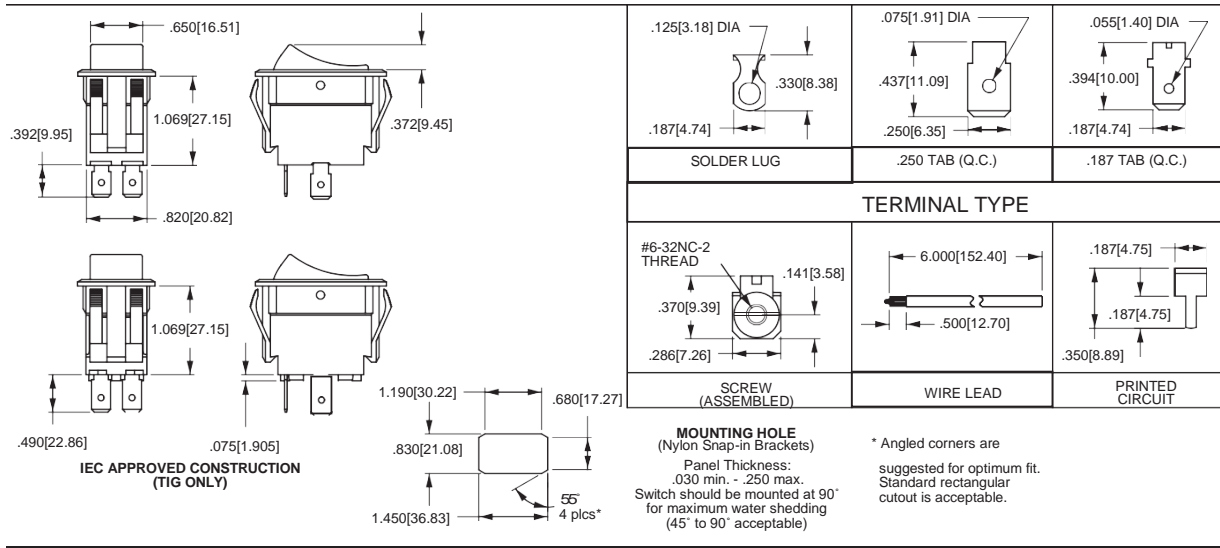


WITH SOLDER LUG
TERMINALS

7S
TOGGLE-STYLE W/ONE LENS



WITH .250 TAB
TERMINALS

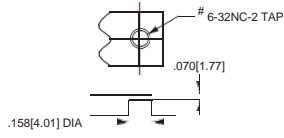


SPECIAL CIRCUITS FOR TIPPETTE ROCKER SWITCHES

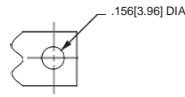
Circuit	Position 1	Position 2	Position 3
Progressive Two Circuit			
GG	BOTH CIRCUITS ON	ONE CIRCUIT ON	OFF
GG	BOTH CIRCUITS (ON)	ONE CIRCUIT ON	OFF
Single Pole Triple Throw			
GE	ON	ON	ON
Two Circuit			
GH	CIRCUIT 1 ON	BOTH CIRCUITS ON	CIRCUIT 2 ON
GP	CIRCUIT 2 ON	CIRCUIT 1 ON	OFF
Reversing Double Pole Double Throw			
GO	ON	OFF	ON
GX	ON	NONE	ON

() Indicates momentary function.

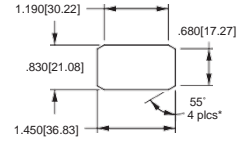
Dimensional Specifications: in. [mm]



TAPPED HOLE
Standard with
A & B Brackets



CLEARANCE HOLE
Standard with
C Bracket



MOUNTING HOLE
(Nylon Snap-in Brackets)
Panel Thickness:
.030 min. - .250 max.

* Angled corners are suggested for optimum fit. Standard rectangular cutout is acceptable.

TIL	TIG	TII	TIH
<p>A TIL</p>	<p>A TIG</p>	<p>A TII</p>	<p>A TIH</p>
<p>2.093 [53.16]</p> <p>.156 [3.96]</p> <p>1.625 [41.27]</p> <p>B TIL</p>	<p>2.090 [53.08]</p> <p>.156 [3.96]</p> <p>1.625 [41.27]</p> <p>B TII, TIG</p>		
<p>1.875 [47.62]</p> <p>437 [11.09]</p> <p>1.625 [41.27]</p> <p>CX TIL</p>	<p>1.940 [49.27]</p> <p>.426 [10.82]</p> <p>1.625 [41.27]</p> <p>C TIG</p>	<p>2.062 [52.37]</p> <p>.426 [10.82]</p> <p>1.625 [41.27]</p> <p>C TIH, TII</p>	
	<p>H TIG</p>	<p>GCP / GMP GLOSS FINISH / MATTE FINISH HOLE PLUG FOR TIL, TIG, TIH & TII</p>	

