Harrison
Energy Partners

Controls IOM

Date: 12/03/2024
Project Name: PVCC RENOVATIONS
Project Location: LITTLE ROCK, AR

Prepared For:

COMFORT SYSTEMS USA
NORTH LITTLE ROCK, AR

Sold To: COMFORT SYSTEMS USA

HEP Office:

HARRISON ENERGY PARTNERS
1501 WESTPARK AVE STE 9
LITTLE ROCK, AR 72204

Phone: 5016610621
Fax:
Web: http://www.harrisonenergy.com

HEP Team:

Account Manager: JOSH ROBINSON

Project Manager: CHRIS MURRELL

Design By: JERRY PICKETT

PLEASANT VALLEY COUNTRY CLUB
ADDITIONS AND RENOVATIONS
LITTLE ROCK, AR

Mechanical Contractor

COMFORT SYSTEMS USA

HEP TEAM

SALESPERSON:

JOSH ROBINSON

PROJECT MANAGER:

CHRIS MURRELL

DESIGNED BY:

JERRY PICKETT

Drawing Title

Title Page

		AS BUILT		12/03/2024	
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	**CHRIS MURRELL**	**JERRY PICKETT**	DATE 12/03/2024		BY	DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

123021 PVCC Renovation.vsdx

Harrison Energy Partners

Office Information
Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER

123021

DRAWING NUMBER

Drawing Index			
Dwg#	Drawing Title	Revision	Revision Date
1	Title Page	Original	03/05/2024
2	Drawing Index		
3	Riser		
4	Air Handling Units AHU1 ~ 4		
5	AHU1 ~ 4 Sequence		
6	AHU1 ~ 4 F4-CGM09090 Controller Detail		
7	AHU1 ~ 4 F4-XPM04060 Expansion Module		
8	AHU1 ~ 4 Point Schedule		
9	Air Handling Units 5 ~ 7		
10	AHU5 ~ 7 Sequence		
11	AHU5 ~ 7 F4-CGM09090 Controller Detail		
12	AHU5 ~ 7 F4-XPM04060 Expansion Module		
13	AHU5 ~ 7 Point Schedule		
14	Variable Air Volume Boxes w/Reheat		
15	Variable Air Volume Boxes Cooling Only		
16	VAV Box Sequences		
17	VAV Box F4-CVM03050 Controller Detail		
18	VAV Box Point Schedule		
19	Fan Coil Units FCU-1 ~ 5		
20	Blower Coil Units BCU-1 ~ 3		
21	FCU / BCU Sequence		
22	FCU / BCU F4-CGM04060 Controller Detail		
23	FCU / BCU Point Schedule		
24	Chilled Water System		
25	CHW System Sequence		
26	CHW System F4-CGM09090 Controller Detail		
27	CHW System Point Schedule		
28	Heating Water System		
29	HW System Sequence		
30	HW System F4-CGM09090 Controller Detail		
31	HW System F4-XPM04060 Expansion Module		
32	HW System Point Schedule		
33	Miscellaneous Controls	Modified	12/03/2024
34	MAU-2 CHW Valve F4-CGM04060 Controller Detail	Modified	12/03/2024
35	Wiring Details 1		
36	Wiring Details 2		
37	JC-1 JACE Bulding Controller Detai		
38	Valve Schedule		

Drawing Title

Drawing Index

		AS BUILT		12/03/2024	
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT		DATE 12/03/2024	BY	DATE

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123021 PVCC Renovation.vsdx

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Suite. 9
Little Rock, AR 72204
(501) 661-0621

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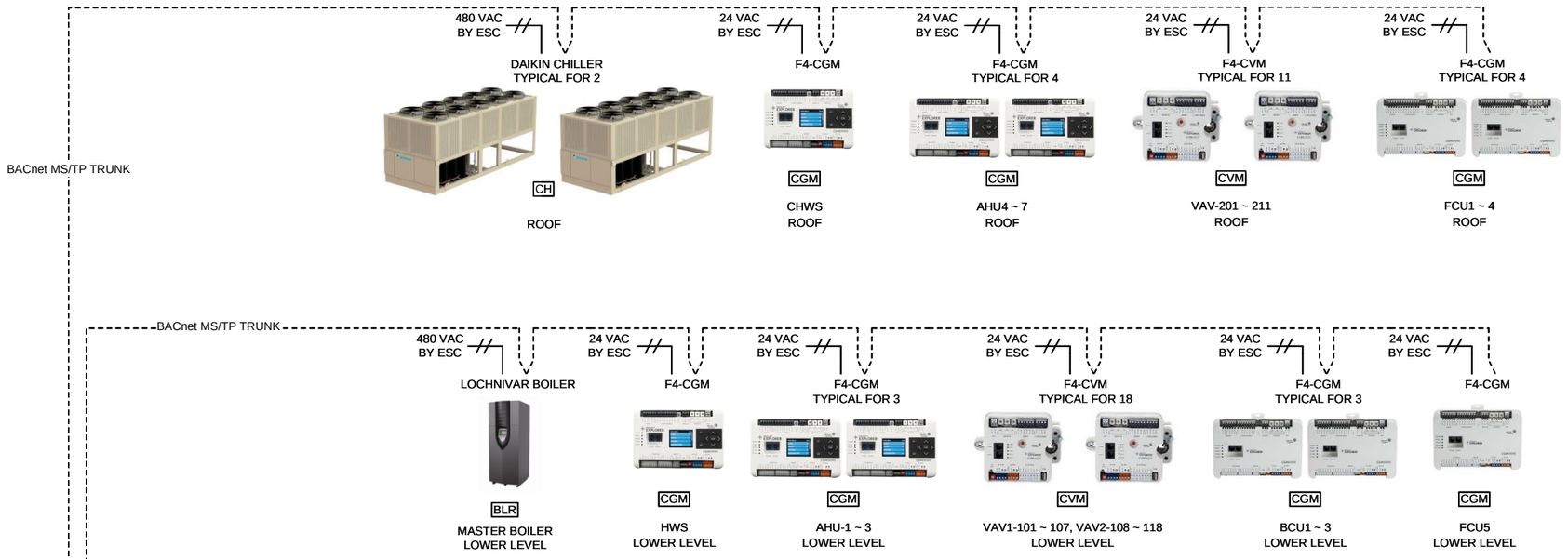
123021

DRAWING NUMBER
2 of 38

BAS RISER



Drawing Title						
Riser			AS BUILT		12/03/2024	
	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
	SALESPERSON **JOSH ROBINSON**	PROJECT MGR **CHRIS MURRELL**	DESIGNED BY **JERRY PICKETT**	DRAWN DATE 12/03/2024	APPROVED BY	DATE
Project Title ***PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR***						
123021 PVCC Renovation.vsdx						

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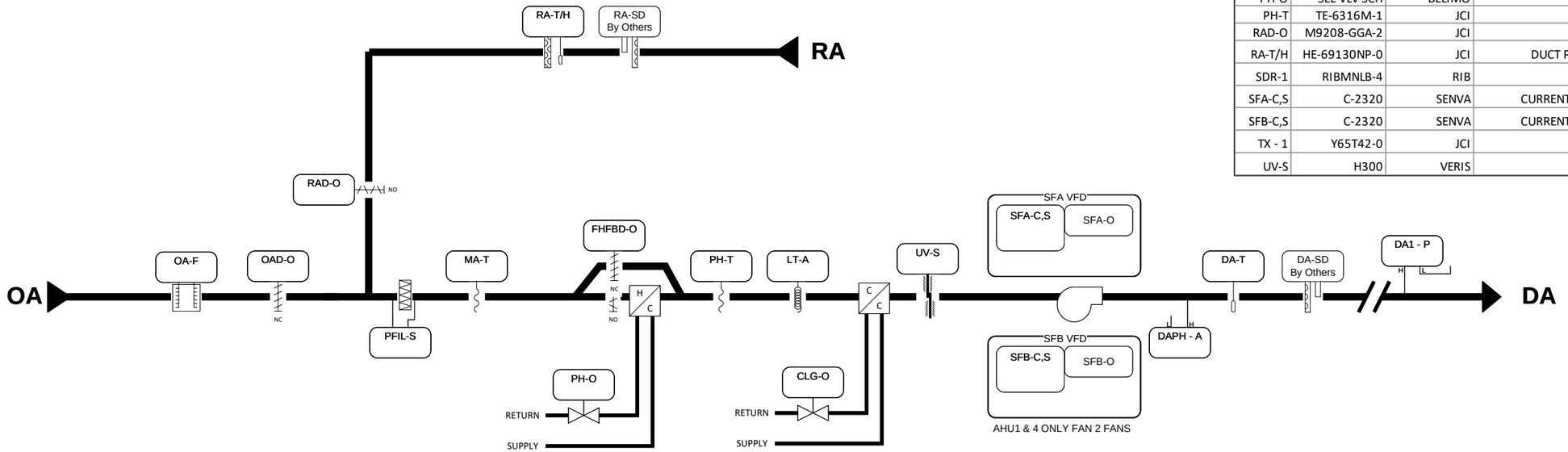
CONTRACT NUMBER 123021

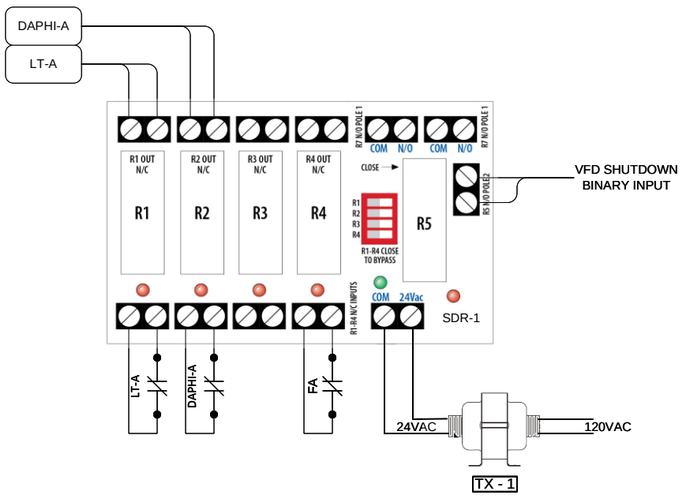
DRAWING NUMBER 3 of 38

AIR HANDLING UNITS AHU-1 ~ 4
TYPICAL FOR 4

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
CLG-O	SEE VLV SCH	BELIMO	BALL VALVE 2 WAY	4
DA1 - P	DP140005U11C	JCI	UNIDIRECTIONAL 0 TO 5IN. W.C. 0 TO 5 VDC	4
DAPH - A	AFS-460	CLEVELAND	DIFF PRESS MANUAL RESET HI LIMIT	4
DA-T	TE-6311M-1	JCI	PROBE TEMPERATURE SENSOR 6"	4
FHFBD-O	M9220-GGA-3	JCI	DAMPER ACTUATOR,24VAC,177LBS,0-10VDC	4
LT-A	A70HA-1C	JCI	15/55F, OPEN LOW,LOW LIMIT THERMOSTAT	4
MA-T	TE-6316M-1	JCI	NICKEL DUCT AVERAGING TEMP SENSOR	4
OAD-O	M9208-GGA-2	JCI	DAMPER ACTUATOR,24VAC,70LBS,0-10VDC	4
OA-F	ANSAN	JCI	ADVANCED THERMAL DISPERSION AIR FLOW MEASURINGPROBES	4
PFIL-S	P32AC-2C	JCI	DIFF AIR PRESSURE SWITCH	4
PH-O	SEE VLV SCH	BELIMO	BALL VALVE 2 WAY	4
PH-T	TE-6316M-1	JCI	NICKEL DUCT AVERAGING TEMP SENSOR	4
RAD-O	M9208-GGA-2	JCI	DAMPER ACTUATOR,24VAC,70LBS,0-10VDC	4
RA-T/H	HE-69130NP-0	JCI	DUCT PROBE HUMIDITY ELEMENT W/THERMISTOR TEMP	4
SDR-1	RIBMNLB-4	RIB	AHU FAN SAFETY ALARM AND GENERAL PURPOSE	4
SFA-C,S	C-2320	SENVA	CURRENT SWITCH, AUTOSET, SPLIT-CORE, 0.5-135A RANGE	4
SFB-C,S	C-2320	SENVA	CURRENT SWITCH, AUTOSET, SPLIT-CORE, 0.5-135A RANGE	2
TX - 1	Y65T42-0	JCI	TRANSFORMER 120 VAC;208 VAC;240 VAC	1
UV-S	H300	VERIS	UV LIGHTS STATUS	4



Safety Shutdown Wiring Detail



Drawing Title: **Air Handling Units AHU1 ~ 4**						
			AS BUILT		12/03/2024	
	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
	SALESPERSON: JOSH ROBINSON	PROJECT MGR: CHRIS MURRELL	DESIGNED BY: JERRY PICKETT	DRAWN DATE 12/03/2024	APPROVED BY / DATE	
Project Title: *PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR*						
123021 PVCC Renovation.vsdx						

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Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER: 123021

DRAWING NUMBER: 4 of 38

AHU1 ~ 4 SEQUENCE

SUPPLY FAN CONTROL:
The variable speed supply fan will be started based on occupancy schedule. When the supply fan status indicates the fan started, the control sequence will be enabled. The supply fan will modulate to maintain the discharge static pressure at setpoint. Upon a loss of airflow, the system will attempt to automatically restart until positive status is received.

ECONOMIZER CONTROL:
When the outdoor air is cooler than the economizer setpoint, the economizer will act as the initial stage of cooling, working in sequence with the cooling coil.

MINIMUM OA CONTROL:
The fresh air intake of the unit will be limited to prevent the preheat temperature from falling below the low limit setpoint.

TEMPERATURE CONTROL:
The unit will control to maintain a constant discharge air temperature.

OCCUPIED MODE:
The occupancy mode will be controlled via a network input. The occupancy mode can also be overridden by a network input.

UNOCCUPIED MODE:
The unit will remain off during unoccupied periods.

PREHEAT COIL:
The preheat face & bypass damper will remain open to the face when the preheat valve is modulating. The preheat face & bypass damper will be enabled if the outdoor air temperature falls below setpoint, at which time the preheat valve will be commanded fully open, and the preheat face & bypass damper will modulate to maintain the temperature setpoint. When the unit is shutdown, the preheat coil will be commanded to a preset position should the outdoor air temperature fall below the low outdoor air temperature setpoint. Upon a loss of airflow, the preheat coil will be commanded to a preset position should the outdoor air temperature fall below the low outdoor air temperature setpoint.

COOLING COIL:
The cooling coil will modulate to maintain the temperature setpoint. When the unit is shutdown, the cooling coil will be commanded to a preset position should the outdoor air temperature fall below the low outdoor air temperature setpoint. Upon a loss of airflow, the cooling coil will be off.

UNIT PROTECTION:
Low Temperature Alarm - When in "Alarm", the control sequence will stop running, the valve(s) will open and the fan(s) will be disabled via a hard wired shut down circuit.

ADDITIONAL POINTS MONITORED BY THE FMS:
Outdoor Air Temperature
Mixed Air Temperature
Return Air Temperature

Drawing Title

AHU1 ~ 4 Sequence

NO.	REVISION-LOCATION	ECN	DATE	BY
	AS BUILT		12/03/2024	

REFERENCE DRAWING

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024		BY	DATE

Project Title

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ADDITIONS AND RENOVATIONS
LITTLE ROCK, AR

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Suite. 9
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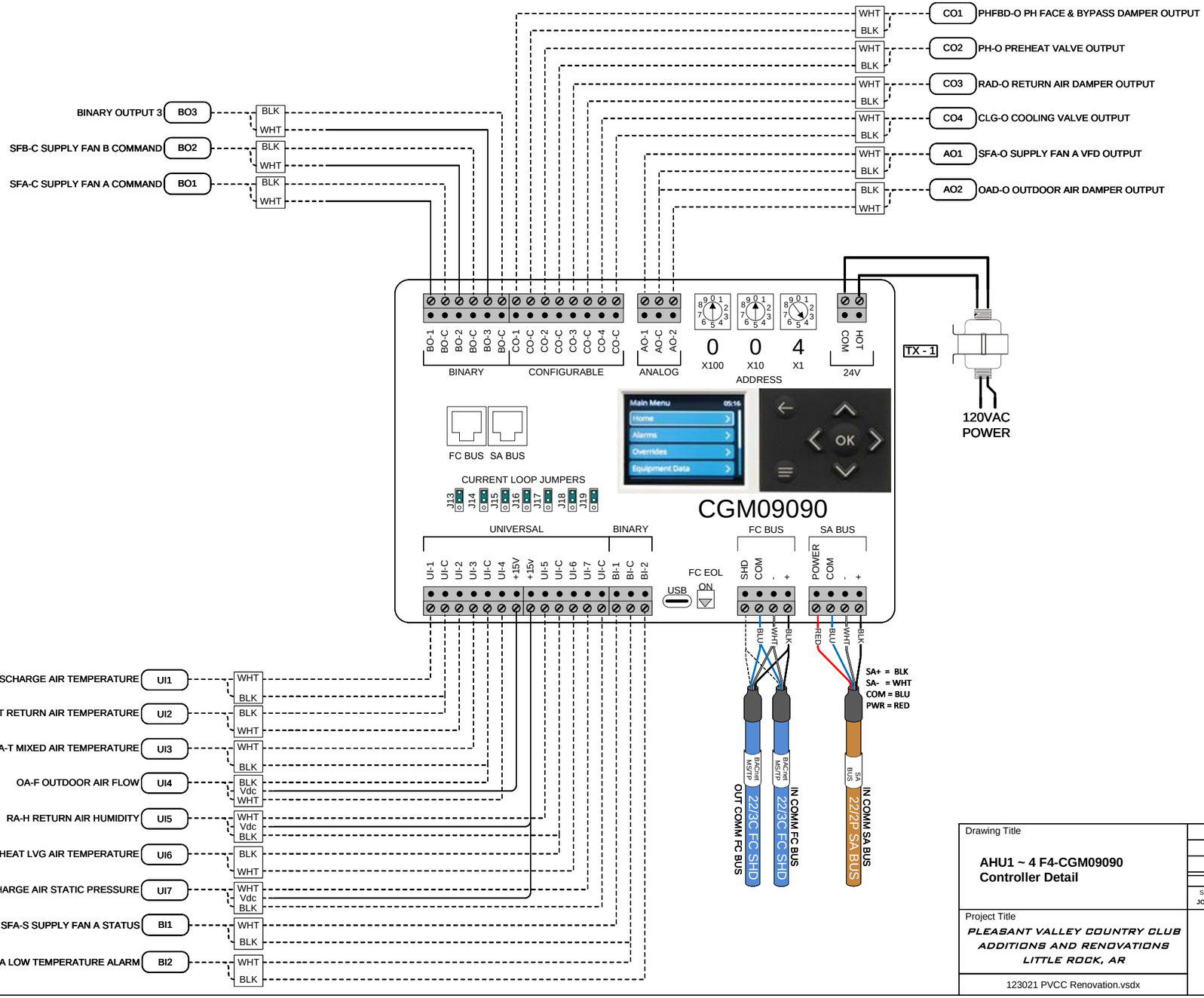
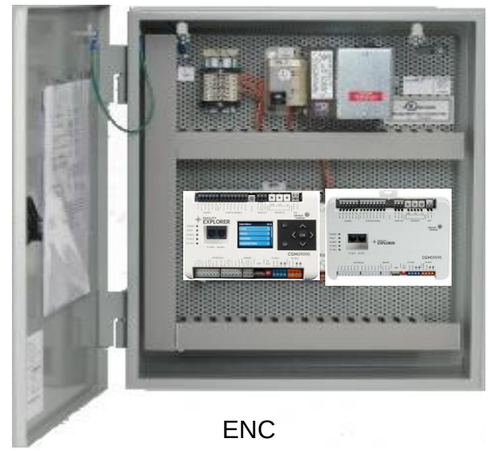
CONTRACT NUMBER
123021

DRAWING NUMBER
5 of 38

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
ENC	P2BAN-BFHE1N01	JCI	PANEL, F4-CGM09090-0H INT DIS and XPM04060-0, 24X20X6.120/24V POWER SUPPLY	4
PCG	F4-CGM09090-0H	JCI	18PT PROGRAMMABLE CONTROLLER W/INTEGRAL DISPLAY	4

CONTROLLER WIRING DETAIL





ENC

		AS BUILT		12/03/2024		
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN	APPROVED
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY / DATE

Drawing Title

AHU1 ~ 4 F4-CGM09090 Controller Detail

Project Title

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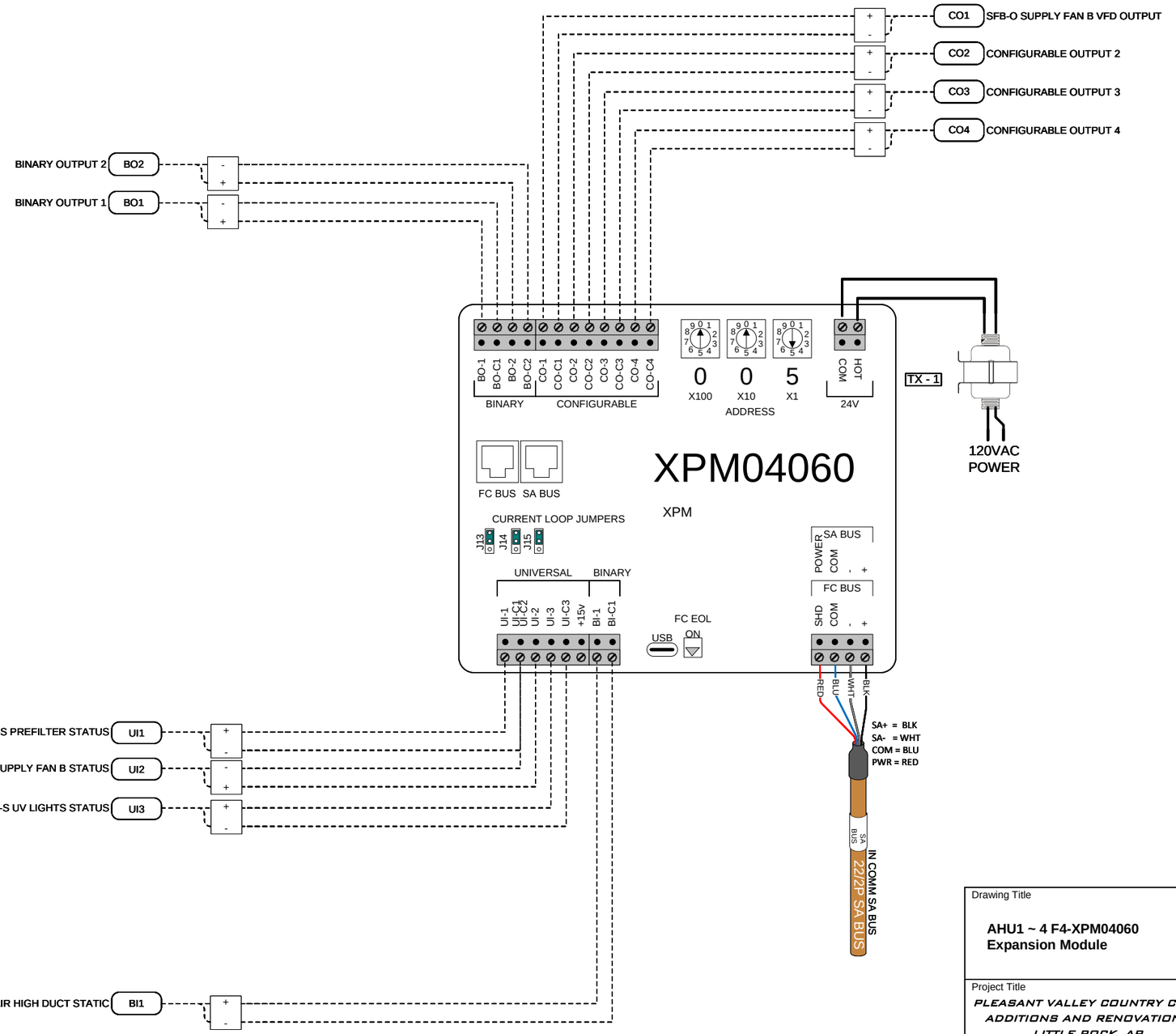
CONTRACT NUMBER 123021

DRAWING NUMBER 6 of 38

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
XPM	F4-XPM04060-0	JCI	10PT EXPANSION MODULE	4

CONTROLLER WIRING DETAIL



Drawing Title						
AHU1 ~ 4 F4-XPM04060 Expansion Module						
		AS BUILT		12/03/2024		
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY
SALESPERSON: JOSH ROBINSON	PROJECT MGR: CHRIS MURRELL	DESIGNED BY: JERRY PICKETT	DRAWN: DATE 12/03/2024		APPROVED: BY	DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

123021 PVCC Renovation.vsdx

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Harrison Energy Partners
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CONTRACT NUMBER 123021

DRAWING NUMBER 7 of 38

		Point Information			Controller Information				Field Device						
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AHU1 - 4			CGM09090									BacNet FC Bus
		AHU1 - 4			CGM09090	MS/TP	1	4						Power to Controller
	UI IN-1	AHU1 - 4	DA-T	Discharge Air Temperature	CGM09090	MS/TP	1	4	2/22	2-Wire	TE		F131	
	UI IN-2	AHU1 - 4	RA-T	Return Air Temperature	CGM09090	MS/TP	1	4	2/22	TEMP, TEMP	HE-6900(Duct Mnt) - TE		F160	
	UI IN-3	AHU1 - 4	MA-T	Mixed Air Temperature	CGM09090	MS/TP	1	4	2/22	2-Wire	TE		F131	
	UI IN-4	AHU1 - 4	OA-F	Outdoor Air Flow	CGM09090	MS/TP	1	4	2/22	See wiring detail	Voltage Input (External Pwr)		F101	
	UI IN-5	AHU1 - 4	RA-H	Return Air Humidity	CGM09090	MS/TP	1	4	3/22	OUT,GND,PWR	HE-6900(Duct Mnt) - HE		F160	
	UI IN-6	AHU1 - 4	PH-T	Preheat Temperature	CGM09090	MS/TP	1	4	2/22	2-Wire	TE		F131	
	UI IN-7	AHU1 - 4	DA1-P	Discharge Air Static Pressure 1	CGM09090	MS/TP	1	4	3/22	OUT,COM,EXC	DPT2xxx (Vdc)		F102	
	BI IN-1	AHU1 - 4	SFA-S	Supply Fan A Status	CGM09090	MS/TP	1	4	Motor Lead	See wiring detail	Motor Status (Contact)		F307	
	BI IN-2	AHU1 - 4	LT-A	Low Temperature Alarm	CGM09090	MS/TP	1	4	'2/22 / '2/22 (Unit Shutdown)	LINE, M1, (LINE,M2)	A70 (NO)		F302	
	BO OUT-1	AHU1 - 4	SFA-C	Supply Fan A Command	CGM09090	MS/TP	1	4	2/14	See wiring detail	VFD (w/ Safety) (Sw Hi, EXT)		F1042	
	BO OUT-2	AHU1 - 4	SFB-C	Supply Fan B Command	CGM09090	MS/TP	1	4	2/14	See wiring detail	VFD (w/ Safety) (Sw Hi, EXT)		F1042	
	BO OUT-3	AHU1 - 4			CGM09090	MS/TP	1	4						
	CO OUT-1	AHU1 - 4	PHFBD-O	Preheat Face & Bypass Damper Output	CGM09090	MS/TP	1	4	2/22 / 2/18	GRY, BLK/BLK, RED	M92xx-GGx-x (Vdc) (Ext Source)		F267	
	CO OUT-2	AHU1 - 4	PH-O	Preheat Output	CGM09090	MS/TP	1	4	2/22 / 2/18	GRY, BLK/BLK, RED	BELIMO (Vdc) (Ext Source)		F267	
	CO OUT-3	AHU1 - 4	RAD-O	Return Air Damper Output	CGM09090	MS/TP	1	4	2/22 / 2/18	GRY, BLK/BLK, RED	M92xx-GGx-x (Vdc) (Ext Source)		F267	
	CO OUT-4	AHU1 - 4	CLG-O	Cooling Output	CGM09090	MS/TP	1	4	2/22 / 2/18	Gray, Black, Red	BELIMO (Vdc) (Ext Source)		F268	
	AO OUT-1	AHU1 - 4	SFA-O	Supply Fan A Output	CGM09090	MS/TP	1	4	2/22	See VFD Detail	VFD Speed Control (Vdc)			
	AO OUT-2	AHU1 - 4	OAD-O	Outdoor Air Damper Output	CGM09090	MS/TP	1	4	2/22 / 2/18	GRY, BLK/BLK, RED	M92xx-GGx-x (Vdc) (Ext Source)		F267	
		AHU1 - 4			XPM04060									BacNet SA Bus
		AHU1 - 4			XPM04060	SA Bus	1	5						Power to Controller
	UI IN-1	AHU1 - 4	PFILT-S	PreFilter Status	XPM04060	SA Bus	1	5	2/22	Y,R	P32 (NO)		F301	
	UI IN-2	AHU1 - 4	SFB-S	Supply Fan B Status	XPM04060	SA Bus	1	5	Motor Lead	See wiring detail	Motor Status (Contact)		F307	
	UI IN-3	AHU1 - 4	UV-S	UV Lights Status	XPM04060	SA Bus	1	5	2/22	2-Wire	Contact			
	BI IN-1	AHU1 - 4	DAPHI-A	Discharge Air High Duct Pressure	XPM04060	SA Bus	1	5	'2/22 / '2/22 (Unit Shutdown)	See Detail	AFS-460 (NC)		F303	
	BO OUT-1	AHU1 - 4			XPM04060	SA Bus	1	5						
	BO OUT-2	AHU1 - 4			XPM04060	SA Bus	1	5						
	CO OUT-1	AHU1 - 4	SFB-O	Supply Fan B Output	XPM04060	SA Bus	1	5	2/22	See VFD Detail	VFD Speed Control (Vdc)			
	CO OUT-2	AHU1 - 4			XPM04060	SA Bus	1	5						
	CO OUT-3	AHU1 - 4			XPM04060	SA Bus	1	5						
	CO OUT-4	AHU1 - 4			XPM04060	SA Bus	1	5						

Drawing Title

AHU1 ~ 4 Point Schedule

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
		AS BUILT		12/03/2024	

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN	APPROVED
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY / DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

123021 PVCC Renovation.vsdx

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Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
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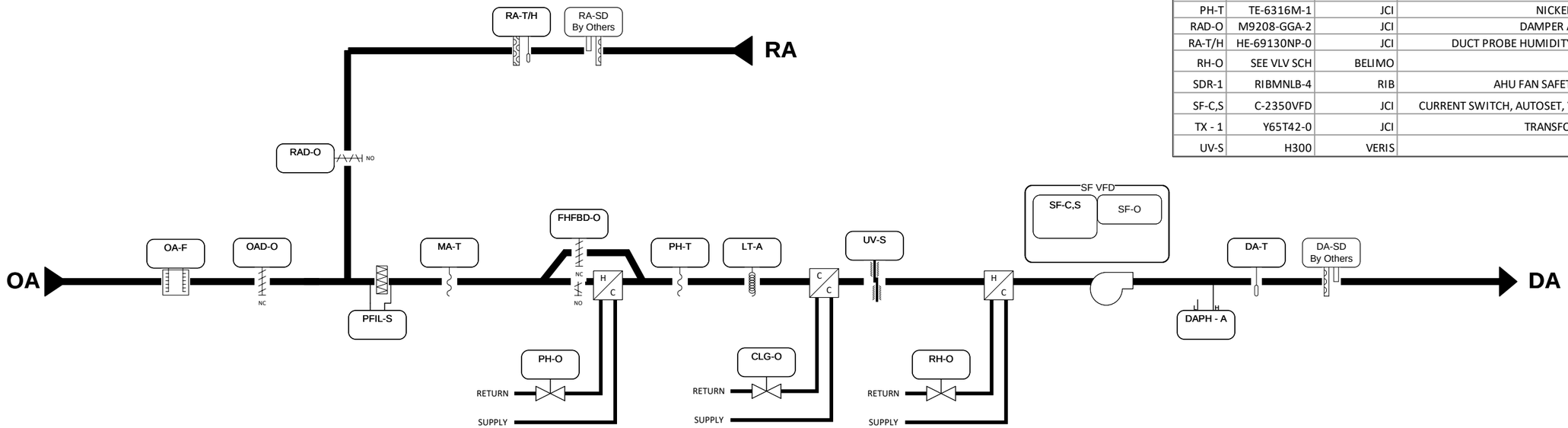
(501) 661-0621

CONTRACT NUMBER 123021

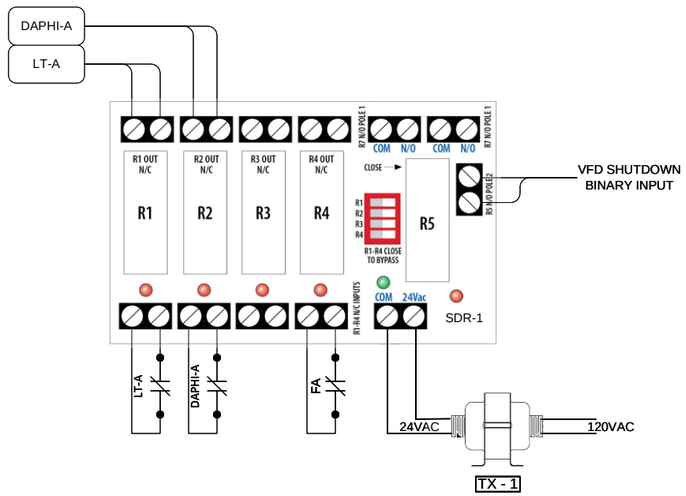
DRAWING NUMBER 8 of 38

AIR HANDLING UNITS AHU-5 ~ 7
TYPICAL FOR 3

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
CLG-O	SEE VLV SCH	BELIMO	BALL VALVE 2 WAY	3
DAPH - A	AFS-460	CLEVELAND	DIFF PRESS MANUAL RESET HI LIMIT	3
DA-T	TE-6311M-1	JCI	PROBE TEMPERATURE SENSOR 6"	3
FHFBD-O	M9220-GGA-3G	JCI	DAMPER ACTUATOR,24VAC,177LBS,0-10VDC	3
LT-A	A70HA-1C	JCI	15/55F, OPEN LOW,LOW LIMIT THERMOSTAT	3
MA-T	TE-6316M-1	JCI	NICKEL DUCT AVERAGING TEMP SENSOR	3
OAD-O	M9208-GGA-2	JCI	DAMPER ACTUATOR,24VAC,70LBS,0-10VDC	3
OA-F	ANSAN	JCI	ADVANCED THERMAL DISPERSION AIR FLOW MEASURINGPROBES	3
PFIL-S	P32AC-2C	JCI	DIFF AIR PRESSURE SWITCH	3
PH-O	SEE VLV SCH	BELIMO	BALL VALVE 2 WAY	3
PH-T	TE-6316M-1	JCI	NICKEL DUCT AVERAGING TEMP SENSOR	3
RAD-O	M9208-GGA-2	JCI	DAMPER ACTUATOR,24VAC,70LBS,0-10VDC	3
RA-T/H	HE-69130NP-0	JCI	DUCT PROBE HUMIDITY ELEMENT W/THERMISTOR TEMP	3
RH-O	SEE VLV SCH	BELIMO	BALL VALVE 2 WAY	3
SDR-1	RIBMNLB-4	RIB	AHU FAN SAFETY ALARM AND GENERAL PURPOSE	3
SF-C,S	C-2350VFD	JCI	CURRENT SWITCH, AUTOSET, VFD SPLIT-CORE, 0.5-135A RANGE	3
TX - 1	Y65T42-0	JCI	TRANSFORMER 120 VAC;208 VAC;240 VAC	1
UV-S	H300	VERIS	UV LIGHTS STATUS	3



Safety Shutdown Wiring Detail



Drawing Title						
Air Handling Units 5 ~ 7						
			AS BUILT		12/03/2024	
	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
	SALESPERSON **JOSH ROBINSON**	PROJECT MGR **CHRIS MURRELL**	DESIGNED BY **JERRY PICKETT**	DRAWN DATE 12/03/2024	APPROVED BY	DATE
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DRAWING NUMBER
9 of 38

AHU5 ~ 7 SEQUENCE

SUPPLY FAN CONTROL:
The supply fan will be started based on occupancy schedule. The supply fan speed will modulate from the minimum speed to the maximum cooling speed as the cooling command increases and from the minimum speed to the maximum heating speed as the heating command increases. When the supply fan status indicates the fan started, the control sequence will be enabled. Upon a loss of airflow, the supply fan will attempt to automatically restart until positive status is received..

ECONOMIZER CONTROL:
When the outdoor air is cooler than the economizer setpoint, the economizer will act as the initial stage of cooling, working in sequence with the cooling coil.

MINIMUM OA CONTROL:
The fresh air intake of the unit will be limited to prevent the preheat temperature from falling below the low limit setpoint.

TEMPERATURE CONTROL:
The unit will control to maintain a constant discharge air temperature.

OCCUPIED MODE:
The occupancy mode will be controlled via a network input. The occupancy mode can also be overridden by a network input.

UNOCCUPIED MODE:
The unit will remain off during unoccupied periods.

PREHEAT COIL:
The preheat face & bypass damper will remain open to the face when the preheat valve is modulating. The preheat face & bypass damper will be enabled if the outdoor air temperature falls below setpoint, at which time the preheat valve will be commanded fully open, and the preheat face & bypass damper will modulate to maintain the temperature setpoint. When the unit is shutdown, the preheat coil will be commanded to a preset position should the outdoor air temperature fall below the low outdoor air temperature setpoint. Upon a loss of airflow, the preheat coil will be commanded to a preset position should the outdoor air temperature fall below the low outdoor air temperature setpoint.

COOLING COIL:
The cooling coil will modulate to maintain the temperature setpoint. When the unit is shutdown, the cooling coil will be commanded to a preset position should the outdoor air temperature fall below the low outdoor air temperature setpoint. Upon a loss of airflow, the cooling coil will be off.

REHEAT COIL:
The reheat coil will modulate to maintain the temperature setpoint. When the unit is shutdown, the reheat coil will be off. Upon a loss of airflow, the reheat coil will remain in control.

UNIT PROTECTION:
Low Temperature Alarm - When in "Alarm", the control sequence will stop running, the valve(s) will open and the fan(s) will be disabled via a hard wired shut down circuit.

ADDITIONAL POINTS MONITORED BY THE FMS:
Mixed Air Temperature
Return Air Temperature

Drawing Title: **AHU5 ~ 7 Sequence**					
		AS BUILT		12/03/2024	
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
SALESPERSON: **JOSH ROBINSON**	PROJECT MGR: **CHRIS MURRELL**	DESIGNED BY: **JERRY PICKETT**	DRAWN: DATE 12/03/2024	APPROVED: BY	DATE

Project Title: ***PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR***

123021 PVCC Renovation.vsdx

Harrison Energy Partners

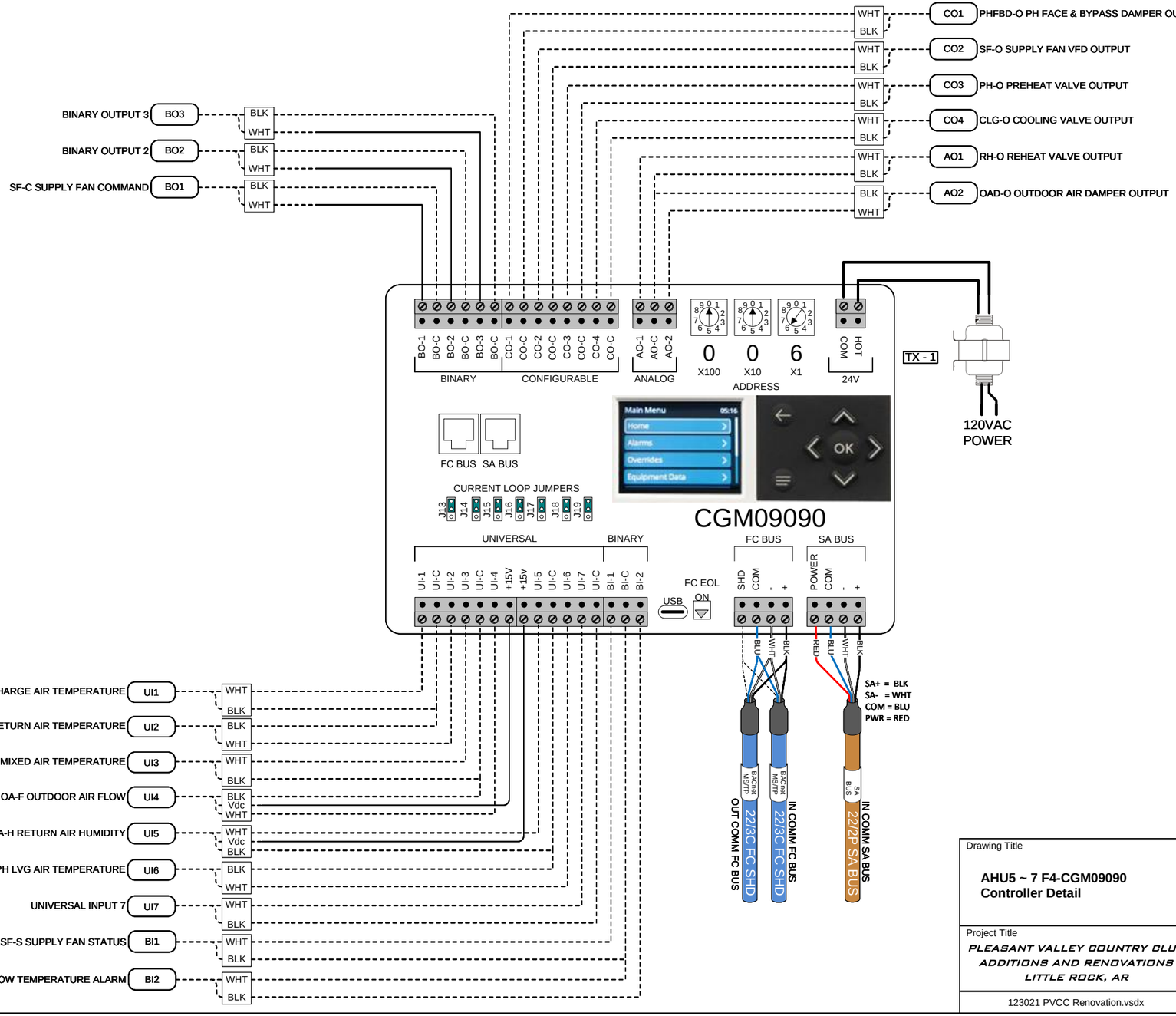
Office Information
Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

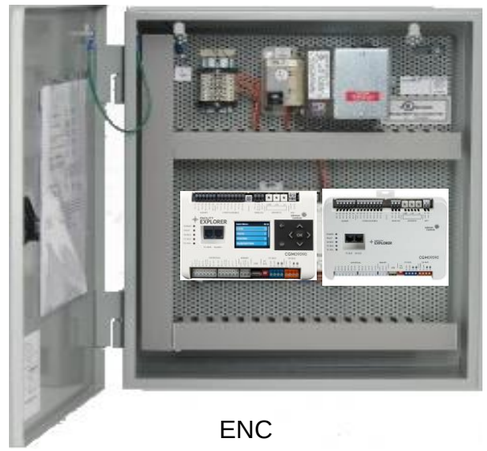
CONTRACT NUMBER: 123021

DRAWING NUMBER: 10 of 38

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
ENC	P2BAN-BFHE1N01	JCI	PANEL, F4-CGM09090-0H INT DIS and XPM04060-0, 24X20X6.120/24V POWER SUPPLY	3
PCG	F4-CGM09090-0H	JCI	18PT PROGRAMMABLE CONTROLLER W/INTEGRAL DISPLAY	3

CONTROLLER WIRING DETAIL





ENC

		AS BUILT		12/03/2024		
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY

Drawing Title

AHU5 ~ 7 F4-CGM09090 Controller Detail

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN	APPROVED
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY / DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

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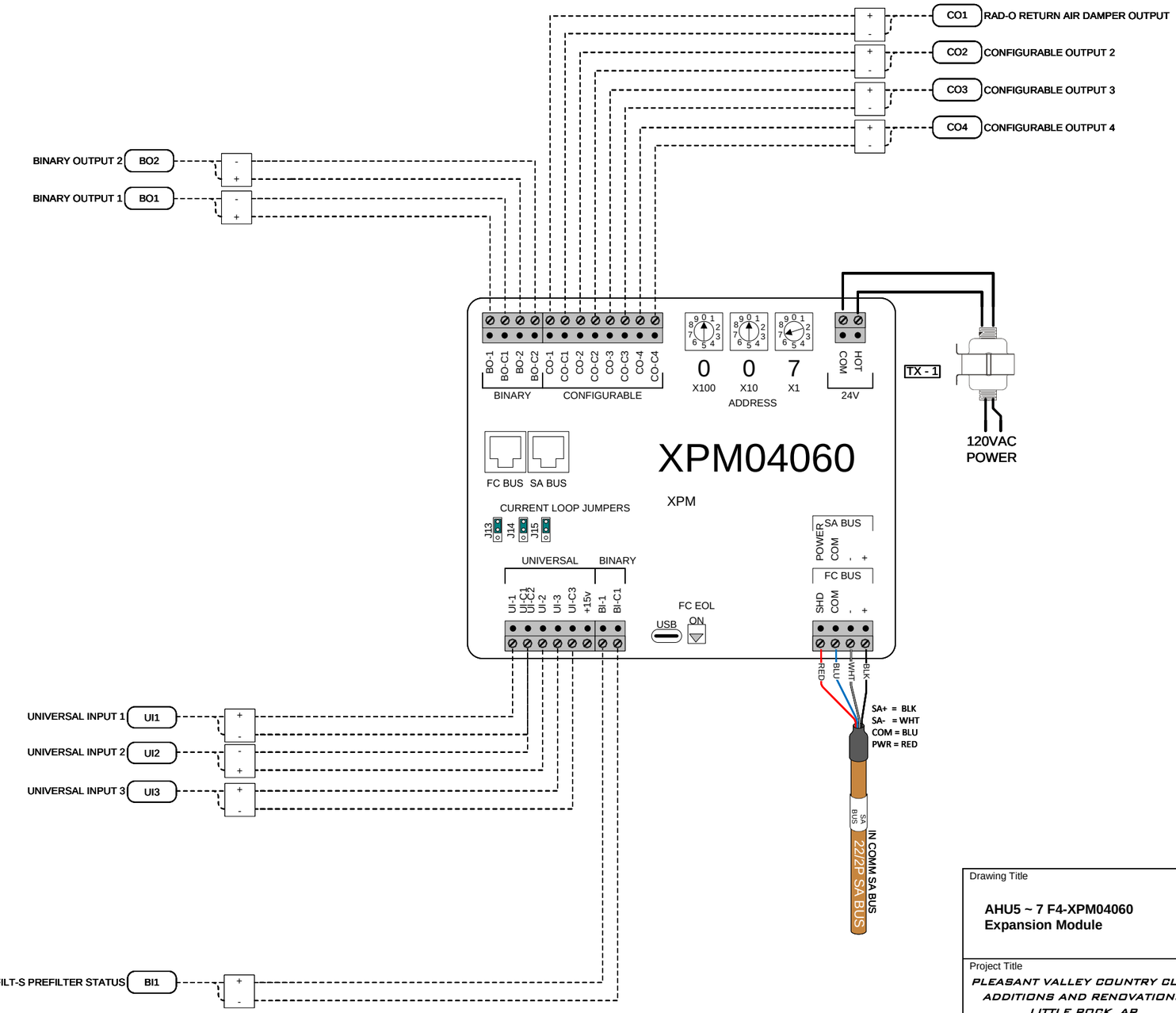
CONTRACT NUMBER 123021

DRAWING NUMBER 11 of 38

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
XPM	F4-XPM04060-0	JCI	10PT EXPANSION MODULE	3

CONTROLLER WIRING DETAIL



Drawing Title						
AHU5 ~ 7 F4-XPM04060 Expansion Module						
		AS BUILT		12/03/2024		
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY
SALESPERSON: JOSH ROBINSON	PROJECT MGR: CHRIS MURRELL	DESIGNED BY: JERRY PICKETT	DRAWN: DATE 12/03/2024		APPROVED: BY	DATE
Project Title: *PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR*			Office Information: Harrison Energy Partners, 1501 Westpark Dr. Suite. 9, Little Rock, AR 72204, (501) 661-0621		CONTRACT NUMBER: 123021	
123021 PVCC Renovation.vsdx			Harrison Energy Partners		DRAWING NUMBER: 12 of 38	

		Point Information			Controller Information				Field Device						
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AHU5 - 7			CGM09090									BacNet FC Bus
		AHU5 - 7			CGM09090	MS/TP	1	6						Power to Controller
	UI IN-1	AHU5 - 7	DA-T	Discharge Air Temperature	CGM09090	MS/TP	1	6	2/22	2-Wire	TE		F131	
	UI IN-2	AHU5 - 7	RA-T	Return Air Temperature	CGM09090	MS/TP	1	6	2/22	TEMP, TEMP	HE-6900(Duct Mnt) - TE		F160	
	UI IN-3	AHU5 - 7	MA-T	Mixed Air Temperature	CGM09090	MS/TP	1	6	2/22	2-Wire	TE		F131	
	UI IN-4	AHU5 - 7	OA-F	Outdoor Air Flow	CGM09090	MS/TP	1	6	2/22	See wiring detail	Voltage Input (External Pwr)		F101	
	UI IN-5	AHU5 - 7	RA-H	Return Air Humidity	CGM09090	MS/TP	1	6	3/22	OUT,GND,PWR	HE-6900(Duct Mnt) - HE		F160	
	UI IN-6	AHU5 - 7	PH-T	Preheat Temperature	CGM09090	MS/TP	1	6	2/22	2-Wire	TE		F131	
	UI IN-7	AHU5 - 7			CGM09090	MS/TP	1	6						
	BI IN-1	AHU5 - 7	SF-S	Supply Fan Status	CGM09090	MS/TP	1	6	Motor Lead	See wiring detail	Motor Status (Contact)		F307	
	BI IN-2	AHU5 - 7	LT-A	Low Temperature Alarm	CGM09090	MS/TP	1	6	'2/22 / '2/22 (Unit Shutdown)	LINE, M1, (LINE,M2)	A70 (NO)		F302	
	BO OUT-1	AHU5 - 7	SF-C	Supply Fan Command	CGM09090	MS/TP	1	6	2/14	See wiring detail	VFD (w/ Safety) (Sw Hi, EXT)		F1042	
	BO OUT-2	AHU5 - 7			CGM09090	MS/TP	1	6						
	BO OUT-3	AHU5 - 7			CGM09090	MS/TP	1	6						
	CO OUT-1	AHU5 - 7	PHFBD-O	Preheat Face & Bypass Damper Output	CGM09090	MS/TP	1	6	2/22 / 2/18	GRY, BLK/BLK, RED	M92xx-GGx-x (Vdc) (Ext Source)		F267	
	CO OUT-2	AHU5 - 7	SF-O	Supply Fan Output	CGM09090	MS/TP	1	6	2/22	See VFD Detail	VFD Speed Control (Vdc)			
	CO OUT-3	AHU5 - 7	PH-O	Preheat Output	CGM09090	MS/TP	1	6	2/22 / 2/18	GRY, BLK/BLK, RED	BELIMO (Vdc) (Ext Source)		F267	
	CO OUT-4	AHU5 - 7	CLG-O	Cooling Output	CGM09090	MS/TP	1	6	2/22 / 2/18	Gray, Black, Red	BELIMO (Vdc) (Ext Source)		F268	
	AO OUT-1	AHU5 - 7	RH-O	Reheat Output	CGM09090	MS/TP	1	6	2/22 / 2/18	Gray, Black, Red	BELIMO (Vdc) (Ext Source)		F268	
	AO OUT-2	AHU5 - 7	OAD-O	Outdoor Air Damper Output	CGM09090	MS/TP	1	6	2/22 / 2/18	GRY, BLK/BLK, RED	M92xx-GGx-x (Vdc) (Ext Source)		F267	
		AHU5 - 7			XPM04060									BacNet SA Bus
		AHU5 - 7			XPM04060	SA Bus	1	7						Power to Controller
	UI IN-1	AHU5 - 7			XPM04060	SA Bus	1	7						
	UI IN-2	AHU5 - 7			XPM04060	SA Bus	1	7						
	UI IN-3	AHU5 - 7			XPM04060	SA Bus	1	7						
	BI IN-1	AHU5 - 7	PFILT-S	PreFilter Status	XPM04060	SA Bus	1	7	2/22	Y,R	P32 (NO)		F301	
	BO OUT-1	AHU5 - 7			XPM04060	SA Bus	1	7						
	BO OUT-2	AHU5 - 7			XPM04060	SA Bus	1	7						
	CO OUT-1	AHU5 - 7	RAD-O	Return Air Damper Output	XPM04060	SA Bus	1	7	2/22 / 2/18	GRY, BLK/BLK, RED	M92xx-GGx-x (Vdc) (Ext Source)		F267	
	CO OUT-2	AHU5 - 7			XPM04060	SA Bus	1	7						
	CO OUT-3	AHU5 - 7			XPM04060	SA Bus	1	7						
	CO OUT-4	AHU5 - 7			XPM04060	SA Bus	1	7						
		AHU5 - 7			NET STAT									
		AHU5 - 7			NET STAT	SA Bus	1	199						
	STAT	AHU5 - 7	ZN-T	Zone Temperature	NET STAT	SA Bus	1	199	6/24	Phone Jack	NS8000 NetSensor Modular Jack		NS201	
	STAT	AHU5 - 7	ZN-SP	Zone Setpoint	NET STAT	SA Bus	1	199						
	STAT	AHU5 - 7	ZN-TOCC	Zone Temporary Occupancy	NET STAT	SA Bus	1	199						
	STAT	AHU5 - 7	ZN-H	Zone Humidity	NET STAT	SA Bus	1	199	6/24	Phone Jack	NS8000 NetSensor Modular Jack		NS201	
	STAT	AHU5 - 7	OCC-MODE	Occupancy Status Display	NET STAT	SA Bus	1	199						

Drawing Title

AHU5 ~ 7 Point Schedule

NO.	REVISION-LOCATION	ECN	DATE	BY
	AS BUILT		12/03/2024	

REFERENCE DRAWING

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY	DATE	

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

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Harrison Energy Partners

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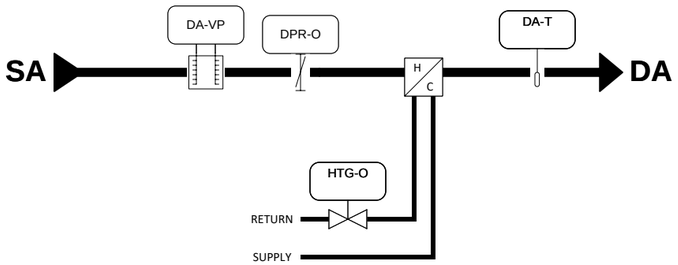
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER
123021

DRAWING NUMBER
13 of 38

VARIABLE AIR VOLUME BOXES W/HW REHEAT
TYPICAL FOR 28



ZN - T,H

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
DA-T	TE-631GV-2	JCI	PROBE TEMPERATURE SENSOR 4"	28
HTG-O	SEE VLV SCH	BELIMO	BALL VALVE 2 WAY	28
ZN - T,H	NSB8BHN240-0	JCI	NET SPACE TEMP SENSOR, 3% RH	28

Drawing Title

Variable Air Volume Boxes w/ Reheat

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
		AS BUILT		12/03/2024	

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT		DATE 12/03/2024	BY	DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

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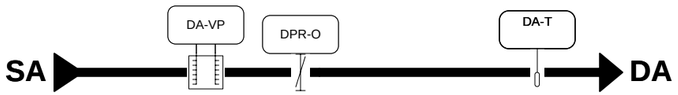
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER
123021

DRAWING NUMBER
14 of 38

VARIABLE AIR VOLUME BOX COOLING ONLY
TYPICAL FOR 1



ZN - T,H

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
DA-T	TE-631GV-2	JCI	PROBE TEMPERATURE SENSOR 4"	1
ZN - T,H	NSB8BHN240-0	JCI	NET SPACE TEMP SENSOR, 3% RH	1

Drawing Title

Variable Air Volume Boxes Cooling Only

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
		AS BUILT		12/03/2024	

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT		DATE 12/03/2024	BY	DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

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Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER
123021

DRAWING NUMBER
15 of 38

VAV BOX W/RH SEQUENCE

OCCUPIED MODE:
When the zone temperature is between the occupied heating and cooling setpoints (inside of the bias), the primary air damper will be at the minimum CFM and there will be no mechanical heating. On a rise in zone temperature above the cooling setpoint, the primary air damper will increase the CFM and there will be no mechanical heating. On a drop in zone temperature below the heating setpoint, the reheat coil will be used to maintain the zone temperature and the damper is controlled to provide a minimum CFM.

UNOCCUPIED MODE:
When in this mode, while the zone temperature is between the unoccupied heating and cooling setpoints (inside of the bias), the primary air damper will be at the minimum CFM and there will be no mechanical heating. On a rise in zone temperature above the unoccupied cooling setpoint, the primary air damper will increase the CFM (if available) and there will be no mechanical heating. On a drop in zone temperature below the unoccupied heating setpoint, the reheat coil will be used to maintain the zone temperature and the primary air damper will be at the minimum CFM.

DISCHARGE AIR TEMP SENSOR:
A discharge air temp sensor is provided on each box for monitoring purposes.

UNIT ENABLE:
A network unit enable signal will control the mode of the box.

NETWORK WARMUP-COOL DOWN:
Warm-up and Cool down modes will be activated by a network command. When the zone temperature is below the effective heating setpoint, the box damper will be modulated to allow warm air flow, then reheat coil to maintain the zone temperature. When the box effective heating setpoint is satisfied the flow will remain at the warm-up minimum position until the warm command has been removed.

VAV BOX COOLING ONLY SEQUENCE

OCCUPIED MODE:
When the zone temperature is between the occupied heating and cooling setpoints (inside of the bias), the primary air damper will be at the minimum. On a rise in zone temperature above the cooling setpoint, the primary air damper will increase the CFM. On a drop in zone temperature below the heating setpoint, the damper is controlled to provide a minimum CFM.

UNOCCUPIED MODE:
When in this mode, while the zone temperature is between the unoccupied heating and cooling setpoints (inside of the bias), the primary air damper will be at the minimum. On a rise in zone temperature above the unoccupied cooling setpoint, the primary air damper will increase the CFM. On a drop in zone temperature below the unoccupied heating setpoint, the primary air damper will be at the minimum CFM.

DISCHARGE AIR TEMP SENSOR:
A discharge air temp sensor is provided on each box for monitoring purposes.

UNIT ENABLE:
A network unit enable signal will control the mode of the box.

NETWORK WARMUP-COOL DOWN:
Warm-up and Cool down modes will be activated by a network command. When the zone temperature is below the effective heating setpoint, the box damper will be modulated to allow warm air flow. When the box effective heating setpoint is satisfied the flow will remain at the warm-up minimum position until the warm command has been removed.

Drawing Title

VAV Box Sequences

		AS BUILT		12/03/2024	
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN	APPROVED
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY / DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

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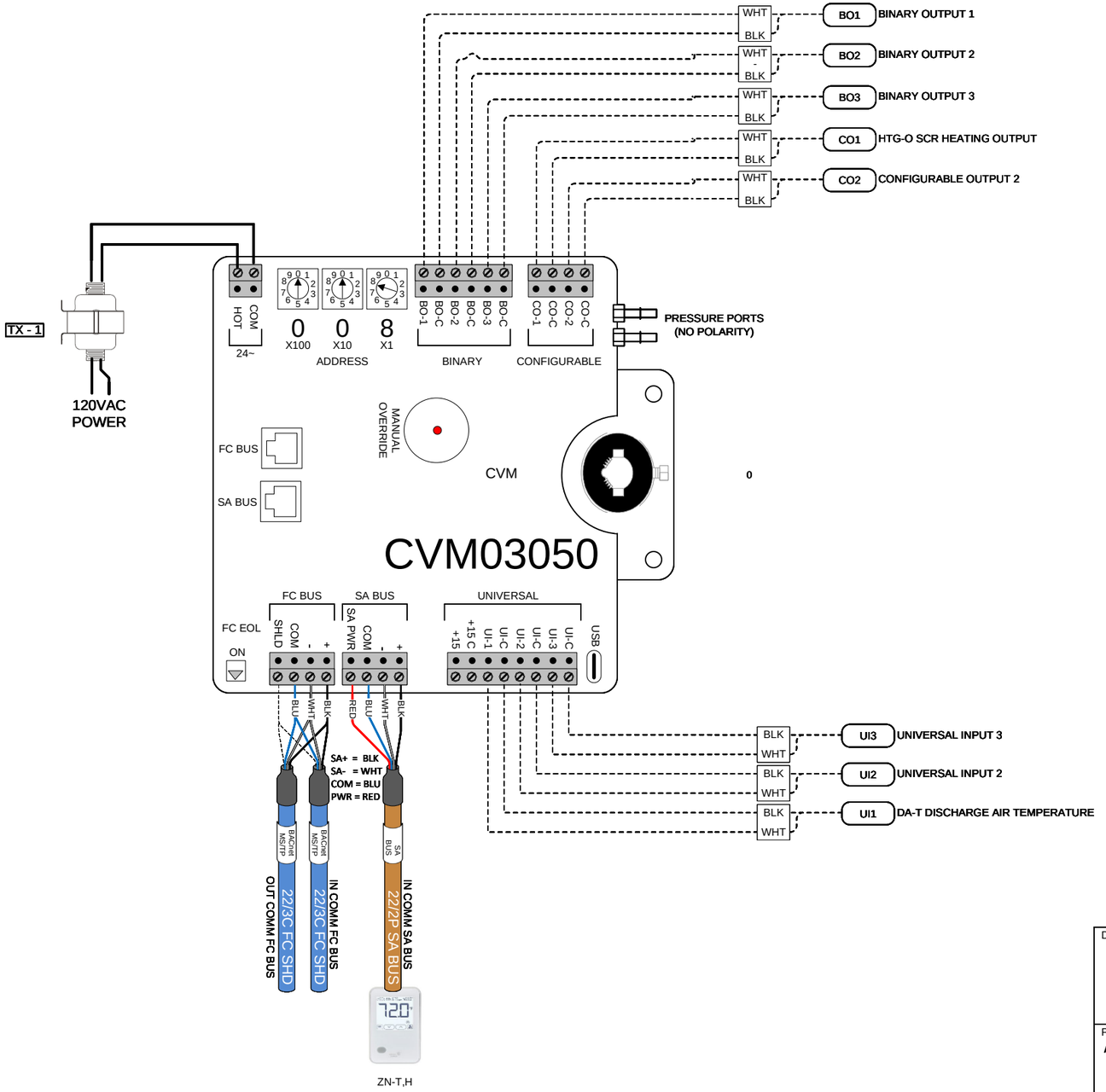
(501) 661-0621

CONTRACT NUMBER
123021

DRAWING NUMBER
16 of 38

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
CVM	F4-CVM03050-0	JCI	PROGRAMMABLE VAV CONTROLLER	29

VAV BOX CONTROLLER DETAIL



Drawing Title: **VAV Box F4-CVM03050 Controller Detail**						
			AS BUILT		12/03/2024	
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY
SALESPERSON: JOSH ROBINSON	PROJECT MGR: CHRIS MURRELL	DESIGNED BY: JERRY PICKETT	DRAWN: DATE 12/03/2024		APPROVED: BY / DATE	
Project Title: *PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR*			Office Information: Harrison Energy Partners, 1501 Westpark Dr. Suite. 9, Little Rock, AR 72204, (501) 661-0621		CONTRACT NUMBER: 123021	
123021 PVCC Renovation.vsdx			Harrison Energy Partners		DRAWING NUMBER: 17 of 38	

		Point Information			Controller Information				Field Device						
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		VAV			CVM03050									BacNet FC Bus
		VAV			CVM03050	MS/TP	1	8						Power to Controller
		VAV			CVM03050	MS/TP	1	8						
		VAV			CVM03050	MS/TP	1	8						
		VAV			CVM03050	MS/TP	1	8						
		VAV			CVM03050	MS/TP	1	8						
	UI IN-1	VAV	DA-T	Discharge Air Temperature	CVM03050	MS/TP	1	8	2/22	2-Wire	TE		V131	
	UI IN-2	VAV			CVM03050	MS/TP	1	8						
	UI IN-3	VAV			CVM03050	MS/TP	1	8						
	BO OUT-1	VAV			CVM03050	MS/TP	1	8						
	BO OUT-2	VAV			CVM03050	MS/TP	1	8						
	BO OUT-3	VAV			CVM03050	MS/TP	1	8						
	CO OUT-1	VAV	HTG-O	Heating Output	CVM03050	MS/TP	1	8	3/18	GRY, BLK, RED	TR24-SR (Vdc) (Int Source)		V250	Not Reqd on Clg Olny Box
	CO OUT-2	VAV			CVM03050	MS/TP	1	8						
		VAV			NET STAT									
		VAV			NET STAT	SA Bus	1	199						
	STAT	VAV	ZN-T	Zone Temperature	NET STAT	SA Bus	1	199	6/24	Phone Jack	NS8000 NetSensor Modular Jack		NS201	
	STAT	VAV	ZN-SP	Zone Setpoint	NET STAT	SA Bus	1	199	6/24	Phone Jack	NS8000 NetSensor Modular Jack		NS201	
	STAT	VAV	ZN-TOCC	Zone Temporary Occupancy	NET STAT	SA Bus	1	199						
	STAT	VAV	ZN-H	Zone Humidity	NET STAT	SA Bus	1	199	6/24	Phone Jack	NS8000 NetSensor Modular Jack		NS201	
	STAT	VAV	OCC-MODE	Occupancy Status Display	NET STAT	SA Bus	1	199						

Drawing Title

VAV Box Point Schedule

		AS BUILT		12/03/2024	
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY	DATE	

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

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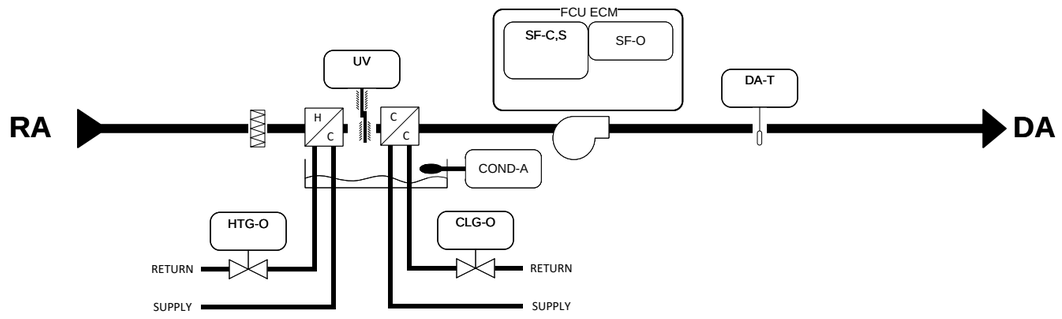
CONTRACT NUMBER
123021

DRAWING NUMBER
18 of 38

FAN COIL UNITS FCU-1 ~ 5
TYPICAL FOR 5

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
CLG-O	SEE VLV SCH	BELIMO	BALL VALVE 2 WAY	5
DA-T	TE-6311M-1	JCI	PROBE TEMPERATURE SENSOR 6"	5
HTG-O	SEE VLV SCH	BELIMO	BALL VALVE 2 WAY	5
SF-C,S	C-2320-L ECM	SENVA	CURRENT SWITCH, ECM, N.O., SPLIT-CORE, 0.25-200A RANGE	5
ZN - T	NSB8BTN240-0	JCI	NET SPACE TEMP SENSOR	5



ZN - T

Drawing Title

Fan Coil Units FCU-1 ~ 5

		AS BUILT		12/03/2024	
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT		DATE 12/03/2024	BY	DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

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CONTRACT NUMBER
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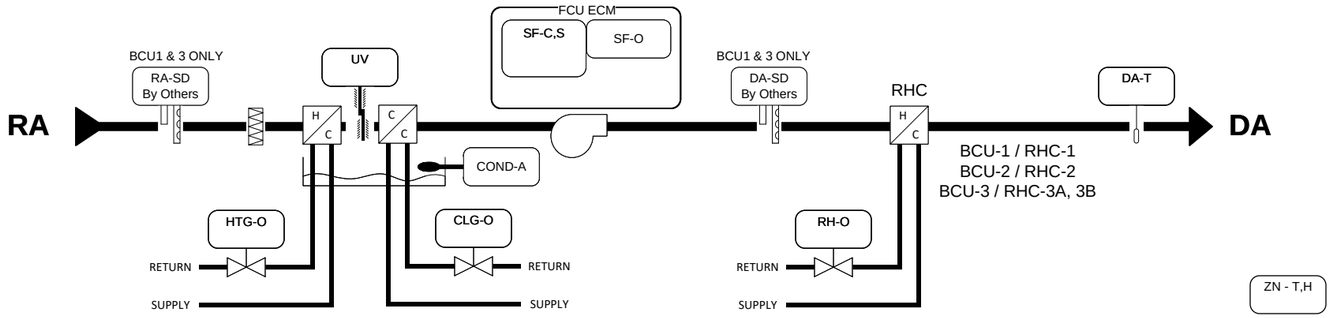
DRAWING NUMBER
19 of 38

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
CLG-O	SEE VLV SCH	BELIMO	BALL VALVE 2 WAY	3
DA-T	TE-6311M-1	JCI	PROBE TEMPERATURE SENSOR 6"	3
HTG-O	SEE VLV SCH	BELIMO	BALL VALVE 2 WAY	3
RH-O	SEE VLV SCH	BELIMO	BALL VALVE 2 WAY	4
SF-C,S	C-2320-L ECM	SENVA	CURRENT SWITCH, ECM, N.O., SPLIT-CORE, 0.25-200A RANGE	3
ZN - T,H	NSB8BHN240-0	JCI	NET SPACE TEMP SENSOR, 3% RH	3

BLOWER COIL UNITS BCU-1 ~ 3
TYPICAL FOR 3



Drawing Title						
Blower Coil Units BCU-1 ~ 3						
			AS BUILT		12/03/2024	
	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
	SALESPERSON: **JOSH ROBINSON**	PROJECT MGR: **CHRIS MURRELL**	DESIGNED BY: **JERRY PICKETT**	DRAWN: DATE 12/03/2024	APPROVED: BY / DATE	
Project Title: ***PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR***						
123021 PVCC Renovation.vsdx						

Harrison Energy Partners

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Harrison Energy Partners
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Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER: 123021

DRAWING NUMBER: 20 of 38

FCU SEQUENCE

UNIT ENABLE:
When the network input unit enable switch is set to occupied, the control sequence will be enabled.

OCCUPIED MODE:
Occupancy mode will be controlled via a network input. During occupied mode, the variable speed supply fan will be started and will run continuously. The supply fan will modulate as needed to satisfy the heating or cooling demand. The cooling coil and heating coil will modulate in sequence to maintain the zone temperature setpoint. When the condensate float switch is in "Alarm", the cooling control sequence will be disabled.

UNOCCUPIED MODE:
The unit will cycle on to maintain unoccupied zone setpoints during unoccupied periods. When the condensate float switch is in "Alarm", the cooling control sequence will be disabled in the summer mode.

ADDITIONAL POINTS MONITORED BY THE FMS:
Discharge Air Temperature

BCU SEQUENCE

UNIT ENABLE:

When the network input unit enable switch is set to occupied, the control sequence will be enabled.

OCCUPIED MODE:

Occupancy mode will be controlled via a network input. During occupied mode, the variable speed supply fan will be started and will run continuously. The supply fan will modulate as needed to satisfy the heating or cooling demand. The cooling coil and heating coil will modulate in sequence to maintain the zone temperature setpoint. When the condensate float switch is in "Alarm", the cooling control sequence will be disabled.

UNOCCUPIED MODE:

The unit will cycle on to maintain unoccupied zone setpoints during unoccupied periods. When the condensate float switch is in "Alarm", the cooling control sequence will be disabled in the summer mode.

DEHUMIDIFICATION:

The cooling coil output will be overridden to maintain zone humidity below the dehumidification setpoint.

REHEAT COIL:

The reheat coil will modulate to maintain the temperature setpoint during dehumidification. When the unit is shutdown, the reheat coil will be off. Upon a loss of airflow, the reheat coil will remain in control.

ADDITIONAL POINTS MONITORED BY THE FMS:

Discharge Air Temperature

Drawing Title

FCU / BCU Sequence

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
		AS BUILT		12/03/2024	

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT		DATE 12/03/2024	BY	DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

123021 PVCC Renovation.vsdx

Harrison Energy Partners

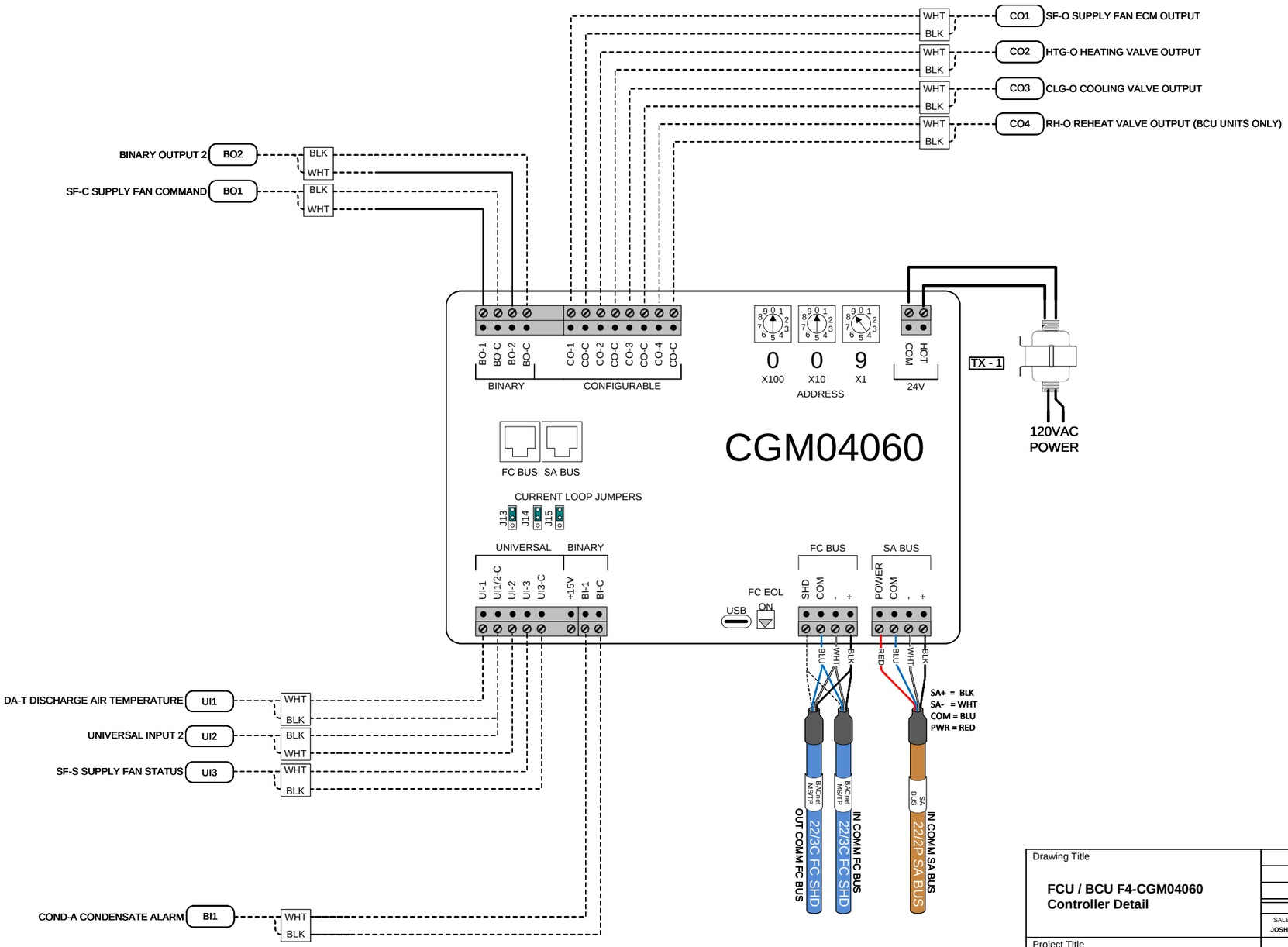
Office Information
Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER
123021

DRAWING NUMBER
21 of 38

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
CGM	F4-CGM04060-0	JCI	F4-CGM 10 PT CNTL GENPURP, MSTP, B-AAC	5
TX - 1	Y65T42-0	JCI	TRANSFORMER 120 VAC;208 VAC;240 VAC	5

CONTROLLER WIRING DETAIL



		AS BUILT			12/03/2024	
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY

Drawing Title

FCU / BCU F4-CGM04060 Controller Detail

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY	DATE	

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

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CONTRACT NUMBER

123021

DRAWING NUMBER

22 of 38

		Point Information			Controller Information				Field Device						
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		FCU_BCU			CGM04060									BacNet FC Bus
		FCU_BCU			CGM04060	MS/TP	1	9						Power to Controller
	UI IN-1	FCU_BCU	DA-T	Discharge Air Temperature	CGM04060	MS/TP	1	9	2/22	2-Wire	TE		F131	
	UI IN-2	FCU_BCU			CGM04060	MS/TP	1	9						
	UI IN-3	FCU_BCU	SF-S	Supply Fan Status	CGM04060	MS/TP	1	9	Motor Lead	See wiring detail	Motor Status (Contact)		F307	
	BI IN-1	FCU_BCU	COND-A	Condensate Alarm	CGM04060	MS/TP	1	9						
	BO OUT-1	FCU_BCU	SF-C	Supply Fan Command	CGM04060	MS/TP	1	9	2/14	See wiring detail	Motor (Single Phase)		F1030	
	BO OUT-2	FCU_BCU			CGM04060	MS/TP	1	9						
	CO OUT-1	FCU_BCU	SF-O	Supply Fan Output	CGM04060	MS/TP	1	9	2/22	See wiring detail	Output (Voltage)		F201	
	CO OUT-2	FCU_BCU	HTG-O	Heating Output	CGM04060	MS/TP	1	9	3/18	GRY, BLK, RED	TR24-SR (Vdc) (Int Source)		F250	
	CO OUT-3	FCU_BCU	CLG-O	Cooling Output	CGM04060	MS/TP	1	9	3/18	GRY, BLK, RED	TR24-SR (Vdc) (Int Source)		F250	
	CO OUT-4	FCU_BCU	RH-O	Reheat Output	CGM04060	MS/TP	1	9	3/18	GRY, BLK, RED	TR24-SR (Vdc) (Int Source)		F250	
		FCU_BCU			NET STAT									
		FCU_BCU			NET STAT	SA Bus	1	199						
	STAT	FCU_BCU	ZN-T	Zone Temperature	NET STAT	SA Bus	1	199	6/24	Phone Jack	NS8000 NetSensor Modular Jack		NS201	
	STAT	FCU_BCU	ZN-SP	Zone Setpoint	NET STAT	SA Bus	1	199	6/24	Phone Jack	NS8000 NetSensor Modular Jack		NS201	
	STAT	FCU_BCU	OCC-MODE	Occupancy Status Display	NET STAT	SA Bus	1	199						

Drawing Title

FCU / BCU Point Schedule

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
		AS BUILT		12/03/2024	

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT		DATE 12/03/2024	BY	DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB
ADDITIONS AND RENOVATIONS
LITTLE ROCK, AR

123021 PVCC Renovation.vsdx

Harrison Energy Partners

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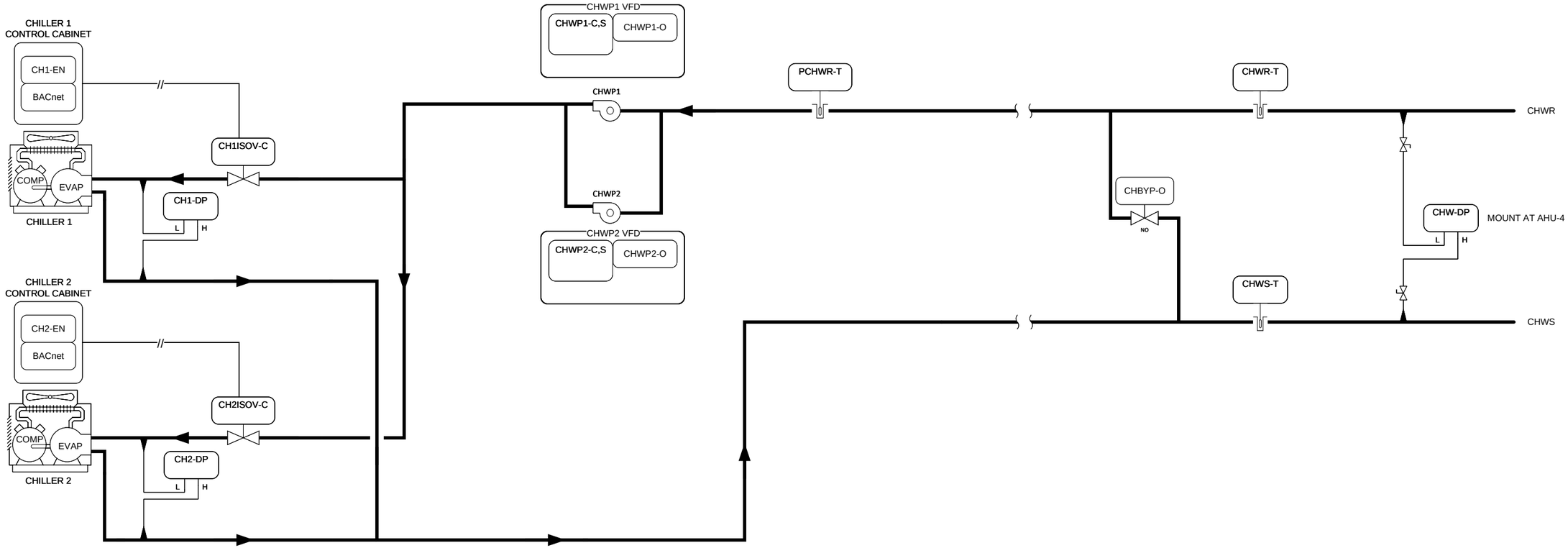
Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER
123021

DRAWING NUMBER
23 of 38

CHILLED WATER SYSTEM

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
CH1-DP	DP110050U5V3V	JCI	0 TO 100 PSID, UNIDIRECTIONAL 1/4IN. NPT (F),0.05-10.05 VDC	1
CH1ISOV-C	SEE VLV SCH	BELIMO	BUTTERFLY VALVE 2 WAY	1
CH2-DP	DP110050U5V3V	JCI	0 TO 100 PSID, UNIDIRECTIONAL 1/4IN. NPT (F),0.05-10.05 VDC	1
CH2ISOV-C	SEE VLV SCH	BELIMO	BUTTERFLY VALVE 2 WAY	1
CHWBYP-O	SEE VLV SCH	BELIMO	GLOBE VALVE, 2-WAY, ANSI CLASS 125	1
CHW-DP	DP110050U2F3V	JCI	WET_T0_WET DIFF PRESSURE,0 TO 50 PSID, UNIDIRECTIONAL 1/4IN. NPT (F)	1
CHWP1-C,S	C-2320	SENVA	CURRENT SWITCH, AUTOSET, SPLIT-CORE, 0.5-135A RANGE	1
CHWP2-C,S	C-2320	SENVA	CURRENT SWITCH, AUTOSET, SPLIT-CORE, 0.5-135A RANGE	1
CHWR-T	TE-631AM-2	JCI	WELL INSERTION TEMP PROBE, 1K OHM, 6"	1
CHWS-T	TE-631AM-2	JCI	WELL INSERTION TEMP PROBE, 1K OHM, 6"	1
PCHWR-T	TE-631AM-2	JCI	WELL INSERTION TEMP PROBE, 1K OHM, 6"	1
WELL	TE-6300W-101	JCI	THERMOWELL. 6" SBRASS DIRECT MOUNT	3



Drawing Title

Chilled Water System

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
		AS BUILT		12/03/2024	

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN	APPROVED
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY / DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

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1501 Westpark Dr.
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CONTRACT NUMBER 123021

DRAWING NUMBER 24 of 38

CHILLED WATER SYSTEM SEQUENCE

SYSTEM ENABLE:
The cooling system will automatically start when the system enable is "ON". When the system enable is "OFF", the cooling system will be disabled.

CHILLER CONTROL:
This system consists of two chillers. The chillers shall be controlled via their own internal controls to maintain a chilled water supply temperature. Each chiller will be staged on and off in order to maintain the differential setpoint between the supply and return temperatures.

SECONDARY LOOP PUMPING:
The lead secondary pump will be started when the system is enabled. Each variable frequency drive will be modulated in unison to maintain loop pressure. Additional pumps will be started as required to maintain the differential pressure in the secondary loop. When an additional pump is required, the pump with the lowest runtime total shall be enabled to run. If the pump status does not match the command, an alarm will be generated and the pump will be stopped. Upon loss of status, the pump will restart after the system reset is activated.

CHILLED WATER BYPASS VALVE CONTROL:
The chilled water bypass valve shall be controlled to maintain minimum flow thru operating chiller(s).

ADDITIONAL POINTS MONITORED BY THE BAS:
Secondary Supply Temperature
Secondary Return Temperature

Drawing Title

CHW System Sequence

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
		AS BUILT		12/03/2024	

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT		DATE 12/03/2024	BY	DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

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1501 Westpark Dr.
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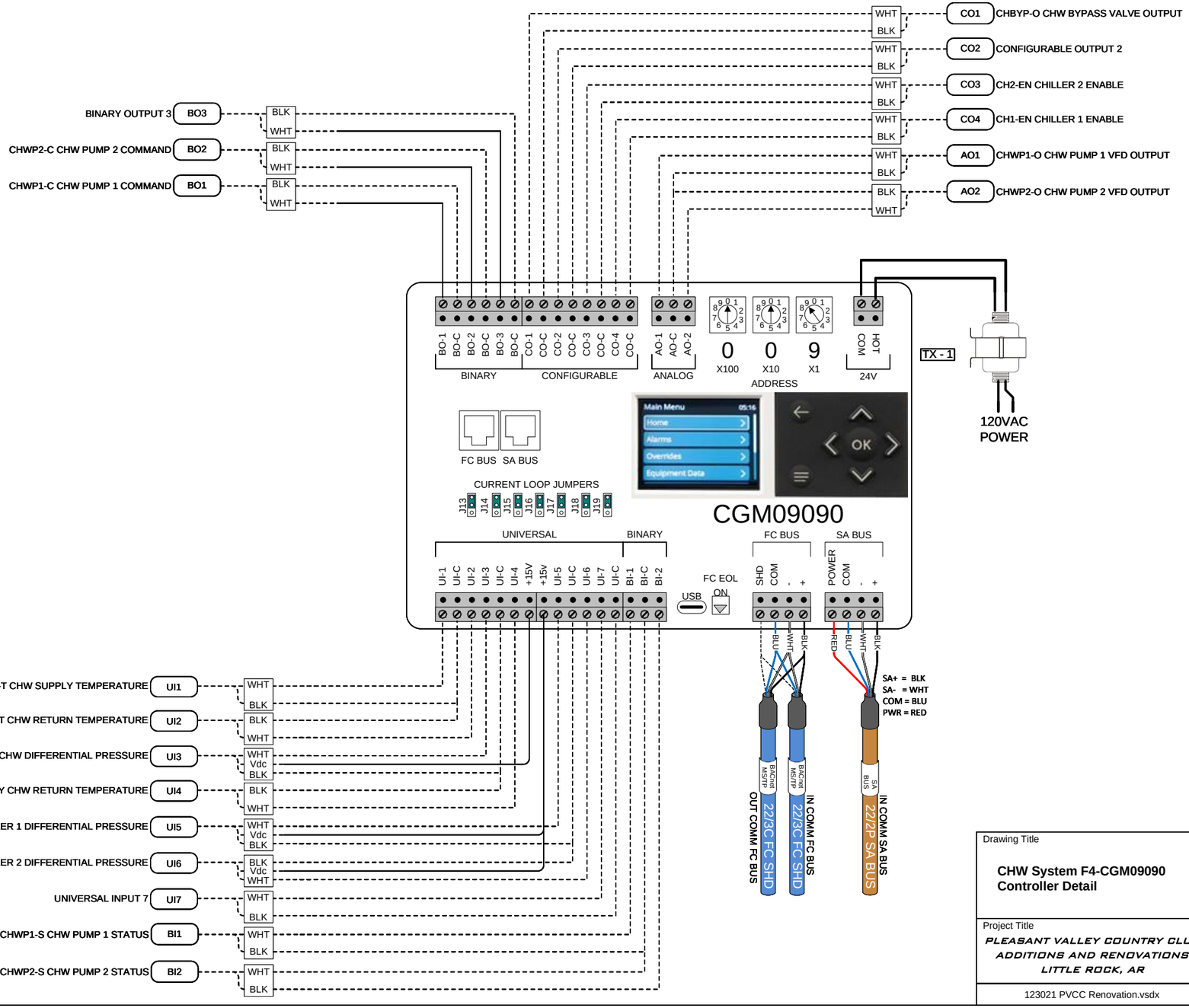
CONTRACT NUMBER
123021

DRAWING NUMBER
25 of 38

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
ENC	P2AAN-BF001N00	JCI	ENCLOSURE 16x20x6, F4-CGM09090, 96VA PWR	1
PCG	F4-CGM09090-0H	JCI	18PT PROGRAMMABLE CONTROLLER W/INTEGRAL DISPLAY	1

CONTROLLER WIRING DETAIL



ENC

		AS BUILT		12/03/2024		
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN	APPROVED
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY / DATE

Drawing Title

CHW System F4-CGM09090 Controller Detail

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

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Harrison Energy Partners
1501 Westpark Dr.
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Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER 123021

DRAWING NUMBER 26 of 38

		Point Information			Controller Information				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		CHWS			CGM09090									BacNet FC Bus
		CHWS			CGM09090	MS/TP	1	4						Power to Controller
	UI IN-1	CHWS	CHWS-T	CHW Supply Temp	CGM09090	MS/TP	1	4	2/22	2-Wire	TE		F131	
	UI IN-2	CHWS	CHWR-T	CHW Return Temp	CGM09090	MS/TP	1	4	2/22	2-Wire	TE		F131	
	UI IN-3	CHWS	CHW-DP	Chilled Water Differential Pressure	CGM09090	MS/TP	1	4	3/22	OUT,COM,EXC	DPT2xxx (Vdc)		F102	
	UI IN-4	CHWS	PCHWR-T	Primary CHW Return Temp	CGM09090	MS/TP	1	4	2/22	2-Wire	TE		F131	
	UI IN-5	CHWS	CH1-DP	Chiller 1 Differential Pressure	CGM09090	MS/TP	1	4	3/22	OUT,COM,EXC	DPT2xxx (Vdc)		F102	
	UI IN-6	CHWS	CH2-DP	Chiller 2 Differential Pressure	CGM09090	MS/TP	1	4	3/22	OUT,COM,EXC	DPT2xxx (Vdc)		F102	
	UI IN-7	CHWS			CGM09090	MS/TP	1	4						
	BI IN-1	CHWS	CHWP1-S	CHW Pump 1 Status	CGM09090	MS/TP	1	4	Motor Lead	See wiring detail	Motor Status (Contact)		F307	
	BI IN-2	CHWS	CHWP2-S	CHW Pump 2 Status	CGM09090	MS/TP	1	4	Motor Lead	See wiring detail	Motor Status (Contact)		F307	
	BO OUT-1	CHWS	CHWP1-C	CHW Pump 1 Command	CGM09090	MS/TP	1	4	2/14	See wiring detail	VFD (w/o Safety) (Sw Hi, EXT)		F1043	
	BO OUT-2	CHWS	CHWP2-C	CHW Pump 2 Command	CGM09090	MS/TP	1	4	2/14	See wiring detail	VFD (w/o Safety) (Sw Hi, EXT)		F1043	
	BO OUT-3	CHWS			CGM09090	MS/TP	1	4						
	CO OUT-1	CHWS	CHBYP-O	Chilled Water Bypass Valve Output	CGM09090	MS/TP	1	4	2/22 / 2/18	2, 3, 10, 9	Belimo (Vdc)		F289	
	CO OUT-2	CHWS			CGM09090	MS/TP	1	4						
	CO OUT-3	CHWS	CH2-EN	Chiller 2 Enable	CGM09090	MS/TP	1	4	2/14	See wiring detail	Chiller Control Panel (Sw Hi, EXT Src)		F1002	
	CO OUT-4	CHWS	CH1-EN	Chiller 1 Enable	CGM09090	MS/TP	1	4	2/14	See wiring detail	Chiller Control Panel (Sw Hi, EXT Src)		F1002	
	AO OUT-1	CHWS	CHWP1-O	CHW Pump 1 Output	CGM09090	MS/TP	1	4	2/22	See VFD Detail	VFD Speed Control (Vdc)			
	AO OUT-2	CHWS	CHWP2-O	CHW Pump 2 Output	CGM09090	MS/TP	1	4	2/22	See VFD Detail	VFD Speed Control (Vdc)			

Drawing Title

CHW System Point Schedule

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
		AS BUILT		12/03/2024	

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT		DATE 12/03/2024	BY	DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

123021 PVCC Renovation.vsdx

Harrison Energy Partners

Office Information
Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER 123021

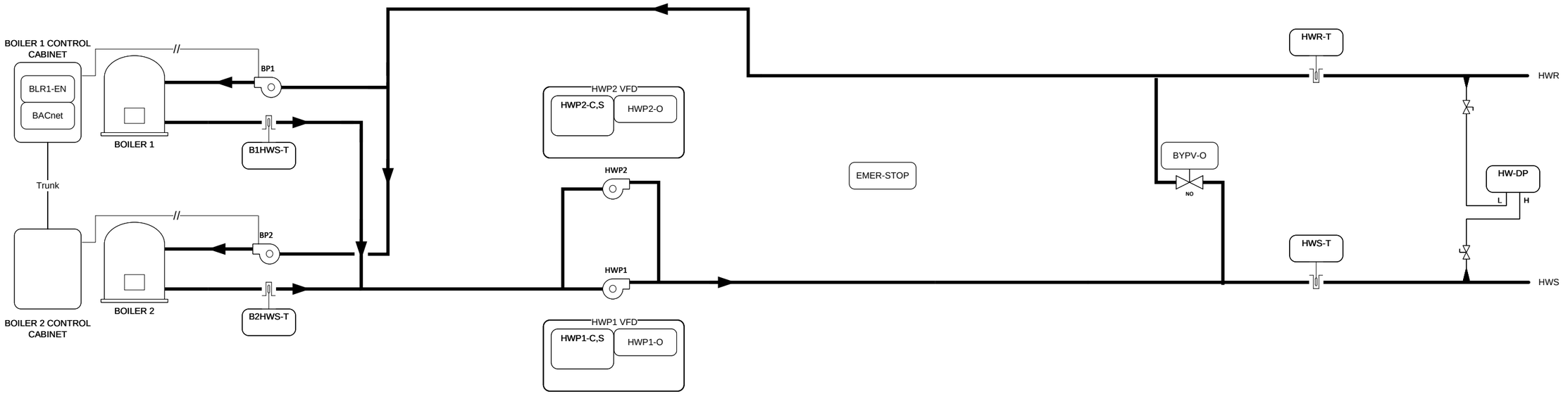
DRAWING NUMBER 27 of 38

HEATING WATER SYSTEM

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
B1HWS-T	TE-631AM-2	JCI	WELL INSERTION TEMP PROBE, 1K OHM, 6"	1
B2HWS-T	TE-631AM-2	JCI	WELL INSERTION TEMP PROBE, 1K OHM, 6"	1
BYPV-O	SEE VLV SCH	BELIMO	GLOBE VALVE, 2-WAY, ANSI CLASS 125	1
EMER-STOP	ESMM1SPP0BS	JCI	EMERGENCY SHUTDOWN PUSHBUTTON	1
HW-DP	DP110050U2F3V	JCI	WET_T0_WET DIFF PRESSURE,0 TO 50 PSID, UNIDIRECTIONAL 1/4IN. NPT (F)	1
HWP1-C,S	C-2320	SENVA	CURRENT SWITCH, AUTOSET, SPLIT-CORE, 0.5-135A RANGE	1
HWP2-C,S	C-2320	SENVA	CURRENT SWITCH, AUTOSET, SPLIT-CORE, 0.5-135A RANGE	1
HWR-T	TE-631AM-2	JCI	WELL INSERTION TEMP PROBE, 1K OHM, 6"	1
HWS-T	TE-631AM-2	JCI	WELL INSERTION TEMP PROBE, 1K OHM, 6"	1
OA-T,H	HT1O-3EUX	SENVA	OA MOUNT TEMP / HUMIDITY SENSOR	1
WELL	TE-6300W-101	JCI	THERMOWELL. 6" BRASS DIRECT MOUNT	4

OA-T,H

LOCATED IN THE SHADE ON THE NORTH SIDE OF THE BUILDING



Drawing Title						
Heating Water System						
			AS BUILT		12/03/2024	
	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
	SALESPERSON: JOSH ROBINSON	PROJECT MGR: CHRIS MURRELL	DESIGNED BY: JERRY PICKETT	DRAWN: DATE 12/03/2024	APPROVED: BY / DATE	
Project Title: *PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR*						
123021 PVCC Renovation.vsdx						

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1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER: 123021

DRAWING NUMBER: 28 of 38

HEATING WATER SYSTEM SEQUENCE

SYSTEM ENABLE:
The heating system will automatically start when the outside air temperature falls below the system enable setpoint while the system enable is "ON". When the outside air temperature (OA-T) rises above this setpoint or the system enable is "OFF", the heating system will be disabled.

BOILER CONTROL:
This system consists of two boilers. The burners shall be controlled via their own internal controls. The outdoor air temperature shall determine the number of boilers running. Heating water supply temperature set point will be reset based on outdoor air temperature.

HOT WATER PUMP CONTROL:
When enabled, the pump associated with each boiler will be started by factory controls. After the boiler is commanded off, the pump will continue to run for a short time to dissipate the heat.

SECONDARY LOOP PUMPING:
The lead secondary pump will be started when the system is enabled. Each variable frequency drive will be modulated in unison to maintain loop pressure. Additional pumps will be started as required to maintain the differential pressure in the secondary loop. When an additional pump is required, the pump with the lowest runtime total shall be enabled to run. If the pump status does not match the command, an alarm will be generated and the pump will be stopped. Upon loss of status, the pump will restart after the system reset is manually activated.

ADDITIONAL POINTS MONITORED BY THE FMS:
Secondary Supply Temperature
Secondary Return Temperature

Drawing Title

HW System Sequence

		AS BUILT		12/03/2024	
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY	DATE	

Project Title

PLEASANT VALLEY COUNTRY CLUB
ADDITIONS AND RENOVATIONS
LITTLE ROCK, AR

123021 PVCC Renovation.vsdx

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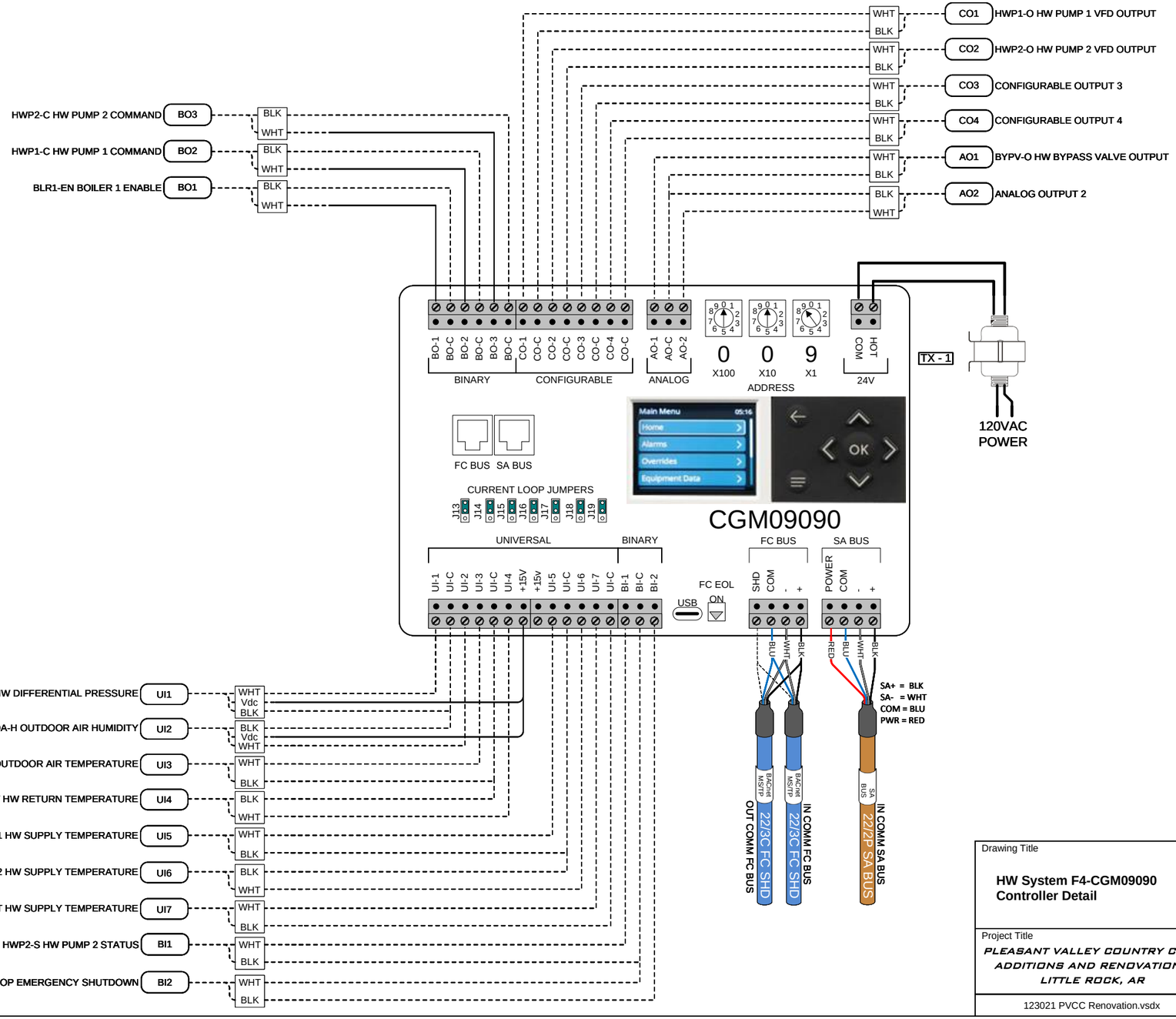
Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

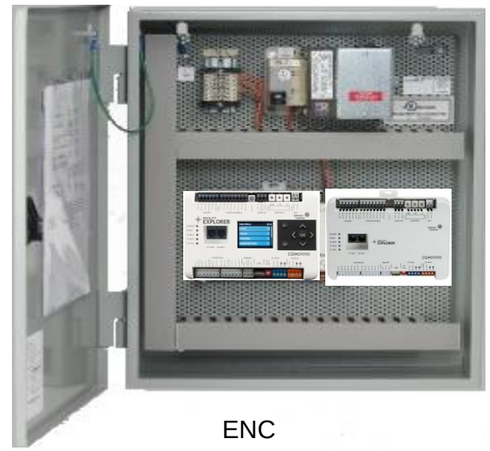
CONTRACT NUMBER
123021

DRAWING NUMBER
29 of 38

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
ENC	P2BAN-BFHE1N01	JCI	PANEL, F4-CGM09090-0H INT DIS and XPM04060-0, 24X20X6.120/24V POWER SUPPLY	1
PCG	F4-CGM09090-0H	JCI	18PT PROGRAMMABLE CONTROLLER W/INTEGRAL DISPLAY	1

CONTROLLER WIRING DETAIL





ENC

		AS BUILT		12/03/2024		
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN	APPROVED
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY / DATE

Drawing Title

HW System F4-CGM09090 Controller Detail

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

123021 PVCC Renovation.vsdx

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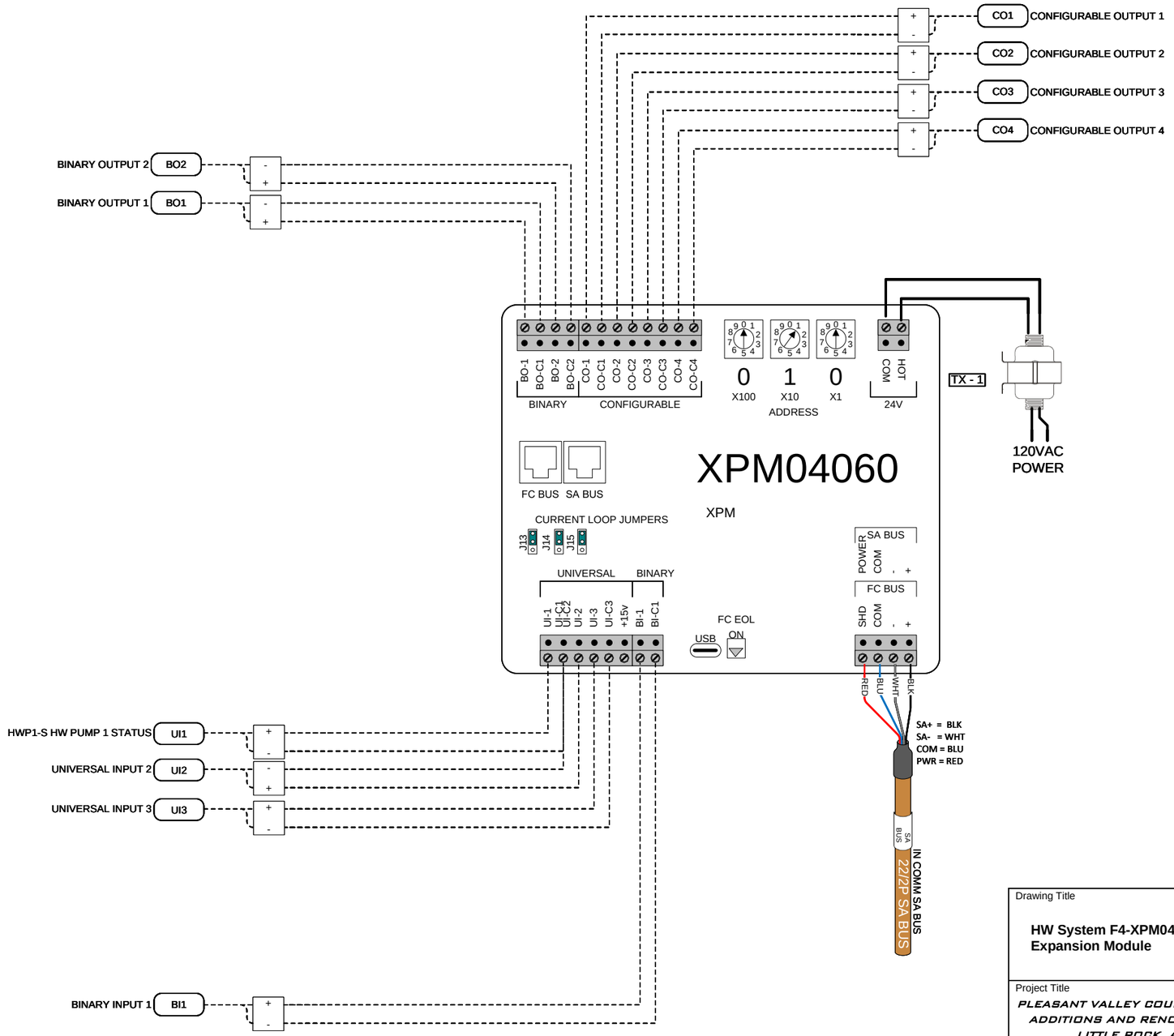
Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER 123021

DRAWING NUMBER 30 of 38

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
XPM	F4-XPM04060-0	JCI	10PT EXPANSION MODULE	1

CONTROLLER WIRING DETAIL



Drawing Title						
HW System F4-XPM04060 Expansion Module						
		AS BUILT		12/03/2024		
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY
SALESPERSON: JOSH ROBINSON	PROJECT MGR: CHRIS MURRELL	DESIGNED BY: JERRY PICKETT	DRAWN: DATE 12/03/2024		APPROVED: BY	DATE
Project Title: *PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR*			Office Information: Harrison Energy Partners, 1501 Westpark Dr. Suite. 9, Little Rock, AR 72204, (501) 661-0621		CONTRACT NUMBER: 123021	
123021 PVCC Renovation.vsdx			Harrison Energy Partners		DRAWING NUMBER: 31 of 38	

		Point Information			Controller Information				Field Device						
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		HWS			CGM09090									BacNet FC Bus
		HWS			CGM09090	MS/TP	1	4						Power to Controller
	UI IN-1	HWS	HW-DP	Hot Water Differential Pressure	CGM09090	MS/TP	1	4	3/22	OUT,COM,EXC	DPT2xxx (Vdc)		F102	
	UI IN-2	HWS	OA-H	Outdoor Air Humidity	CGM09090	MS/TP	1	4	2/22 / 2/18	See wiring detail	HE-68P3-0N000 OA-H (Vdc)		F159	
	UI IN-3	HWS	OA-T	Outdoor Air Temperature	CGM09090	MS/TP	1	4	2/22	2-Wire	TE		F131	
	UI IN-4	HWS	HWR-T	HW Return Temperature	CGM09090	MS/TP	1	4	2/22	2-Wire	TE		F131	
	UI IN-5	HWS	B1HWS-T	Boiler 1 Leaving Water Temperature	CGM09090	MS/TP	1	4	2/22	2-Wire	TE		F131	
	UI IN-6	HWS	B2HWS-T	Boiler 2 Leaving Water Temperature	CGM09090	MS/TP	1	4	2/22	2-Wire	TE		F131	
	UI IN-7	HWS	HWS-T	HW Supply Temperature	CGM09090	MS/TP	1	4	2/22	2-Wire	TE		F131	
	BI IN-1	HWS	HWP2-S	HW Pump 2 Status	CGM09090	MS/TP	1	4	Motor Lead	See wiring detail	Motor Status (Contact)		F307	
	BI IN-2	HWS	EMER-STOP	Emergency Shutdown	CGM09090	MS/TP	1	4	2/22	See wiring detail	Dry Contact		F301	
	BO OUT-1	HWS	BLR1-EN	Boiler 1 Enable	CGM09090	MS/TP	1	4	2/14	See wiring detail	Boiler Control Panel (Sw Hi, EXT Src)		F1001	
	BO OUT-2	HWS	HWP1-C	HW Pump 1 Command	CGM09090	MS/TP	1	4	2/14	See wiring detail	Starter (w/o Safeties) (Sw Hi, EXT)		F1015	
	BO OUT-3	HWS	HWP2-C	HW Pump 2 Command	CGM09090	MS/TP	1	4	2/14	See wiring detail	Starter (w/o Safeties) (Sw Hi, EXT)		F1015	
	CO OUT-1	HWS	HWP1-O	HW Pump 1 Output	CGM09090	MS/TP	1	4	2/22	See VFD Detail	VFD Speed Control (Vdc)			
	CO OUT-2	HWS	HWP2-O	HW Pump 2 Output	CGM09090	MS/TP	1	4						
	CO OUT-3	HWS			CGM09090	MS/TP	1	4						
	CO OUT-4	HWS			CGM09090	MS/TP	1	4						
	AO OUT-1	HWS	BYPV-O	Bypass Valve Output	CGM09090	MS/TP	1	4	2/22 / 2/18	2, 3, 10, 9	VA-9070 (Vdc)		F289	
	AO OUT-2	HWS			CGM09090	MS/TP	1	4						
		HWS			XPM04060									BacNet SA Bus
		HWS			XPM04060	SA Bus	1	5						Power to Controller
	UI IN-1	HWS	HWP1-S	HW Pump 1 Status	XPM04060	SA Bus	1	5	Motor Lead	See wiring detail	Motor Status (Contact)		F307	
	UI IN-2	HWS			XPM04060	SA Bus	1	5						
	UI IN-3	HWS			XPM04060	SA Bus	1	5						
	BI IN-1	HWS			XPM04060	SA Bus	1	5						
	BO OUT-1	HWS			XPM04060	SA Bus	1	5						
	BO OUT-2	HWS			XPM04060	SA Bus	1	5						
	CO OUT-1	HWS			XPM04060	SA Bus	1	5						
	CO OUT-2	HWS			XPM04060	SA Bus	1	5						
	CO OUT-3	HWS			XPM04060	SA Bus	1	5						
	CO OUT-4	HWS			XPM04060	SA Bus	1	5						

Drawing Title

HW System Point Schedule

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
		AS BUILT		12/03/2024	

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN	APPROVED
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY / DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

123021 PVCC Renovation.vsdx

Harrison Energy Partners

Office Information

Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

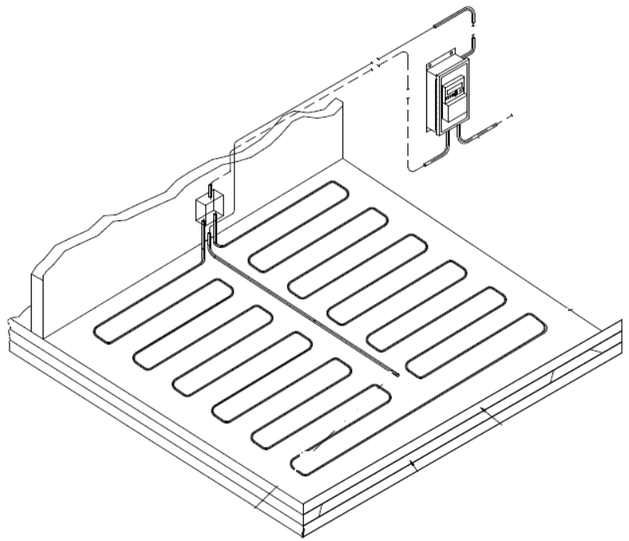
CONTRACT NUMBER 123021

DRAWING NUMBER 32 of 38

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
CLG-O	G340B-N+AFB24-SR-X1	BELIMO	BALL VALVE 1 1/2" 3 WAY MIXING	1
DA-T	TE-6311M-1	JCI	PROBE TEMPERATURE SENSOR 6"	1
SF-S	C-2320	SENVA	MICRO SPLIT-CORE CURRENT SWITCH	1

ELECTRIC FLOOR MAT HEAT TRACE SYSTEM

FLOOR MAT, SENSOR, THERMOSTAT FURNISHED BY OTHERS. HEP TO MOUNT THERMOSTAT AND WIRE REMOTE SENSOR TO THERMOSTAT



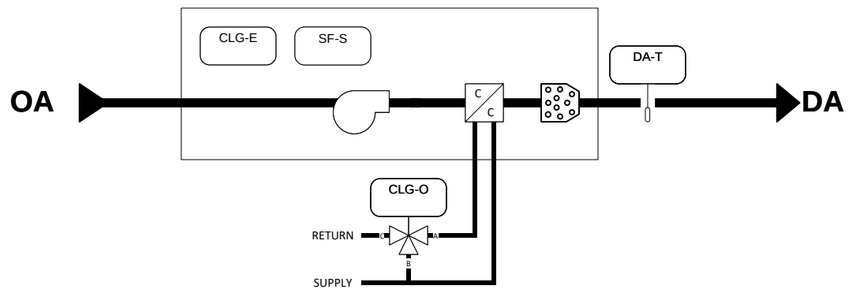
SAUNA STEAM GENERATOR

HEP TO INSTALL FACTORY FURNISHED SENSORS AND CONTROL PANEL PER MANUFACTURER WIRING DIAGRAMS

KITCHEN HOODS AND MAU-1 & 2

HEP TO INSTALL FACTORY FURNISHED SENSORS AND INTERLOCK WIRING BETWEEN HOOD AND MAU

MAKE UP AIR UNIT MAU-2



CHW VALVE SEQUENCE
WHEN COOLING IS ENABLED (CLG-E), COOLING VALVE WILL MODULATE TO MAINTAIN 65°F (ADJ.) DISCHARGE AIR TEMPERATURE SETPOINT. VALVE WILL CLOSE WHEN COOLING IS DISABLED OR SUPPLY FAN IS OFF.

Drawing Title

Miscellaneous Controls

		AS BUILT		12/03/2024	

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT		DATE 12/03/2024	BY	DATE

Project Title

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1501 Westpark Dr.
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(501) 661-0621

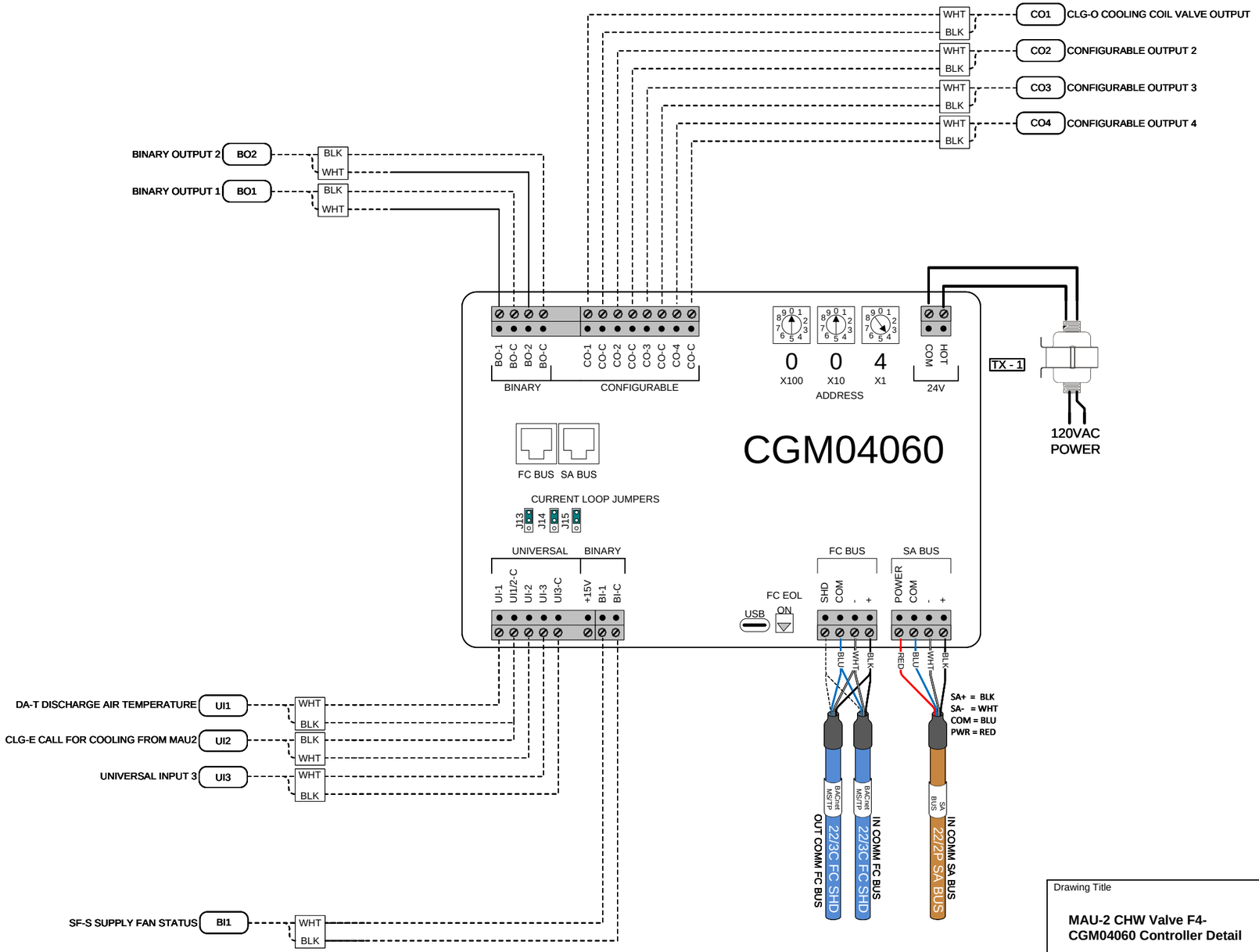
CONTRACT NUMBER 123021

DRAWING NUMBER 33 of 38

CONTROLLER WIRING DETAIL

SEE WIRING DETAIL SHEET FOR DETAILED INPUT AND OUTPUT WIRING DIAGRAMS

Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
CLG-O	G340B-N+AFB24-SR-X1	BELIMO	BALL VALVE 1 1/2" 3 WAY MIXING	1
DA-T	TE-6311M-1	JCI	PROBE TEMPERATURE SENSOR 6"	1



Drawing Title						
MAU-2 CHW Valve F4-CGM04060 Controller Detail						
			AS BUILT		12/03/2024	
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY
SALESPERSON: JOSH ROBINSON	PROJECT MGR: CHRIS MURRELL	DESIGNED BY: JERRY PICKETT	DRAWN: DATE 12/03/2024	APPROVED: BY	DATE	
Project Title: *PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR*						
123021 PVCC Renovation.vsdx						

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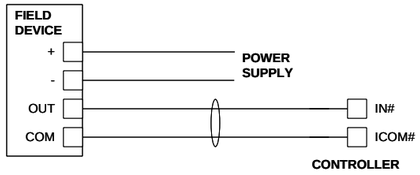
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

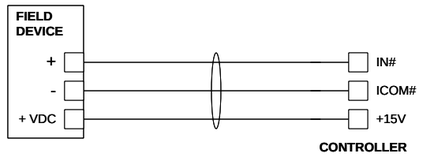
CONTRACT NUMBER: 123021

DRAWING NUMBER: 34 of 38

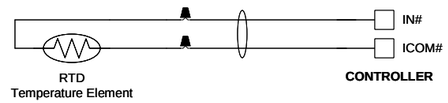
DETAIL F101 VOLTAGE INPUT - EXTERNAL SOURCE



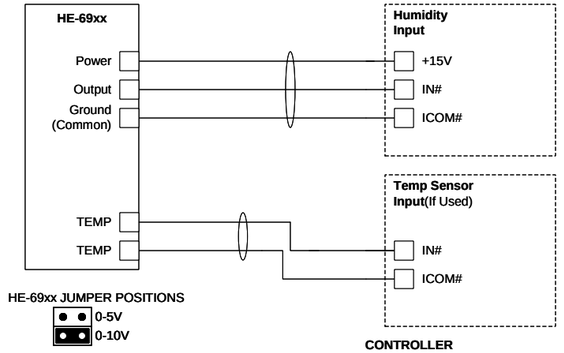
DETAIL F102 VOLTAGE INPUT - INTERNAL SOURCE 15VDC



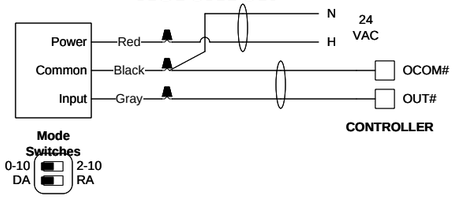
DETAIL F131 TEMPERATURE SENSOR INPUT



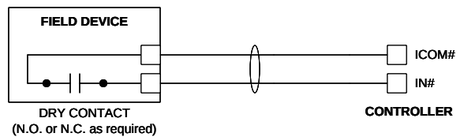
DETAIL F160 HE-6900 SERIES DUCT HUMIDITY SENSOR



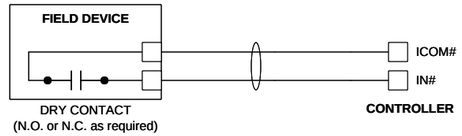
DETAIL F268 0-10VDC OUTPUT to BELIMO ACTUATOR



DETAIL F301 BINARY INPUT (DRY CONTACT)

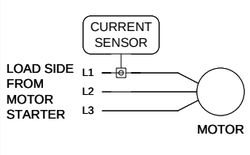


DETAIL F307 CURRENT SENSOR (GO/NO GO)

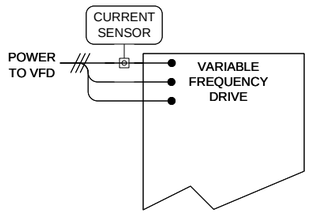


PLACEMENT

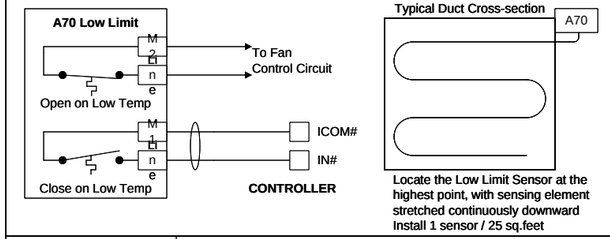
ON MOTORS CONTECTED TO A STARTER CLAMP THE CURRENT SENSOR ON THE LINE SIDE OF THE STARTER



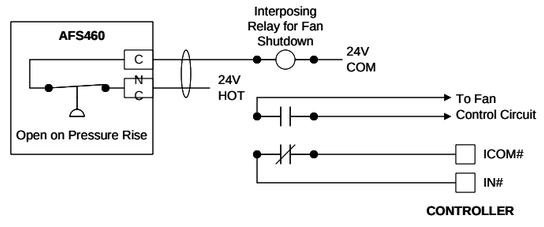
ON MOTORS CONTECTED TO A VFD CLAMP THE CURRENT SENSOR ON THE INCOMING POWER TO THE DRIVE.



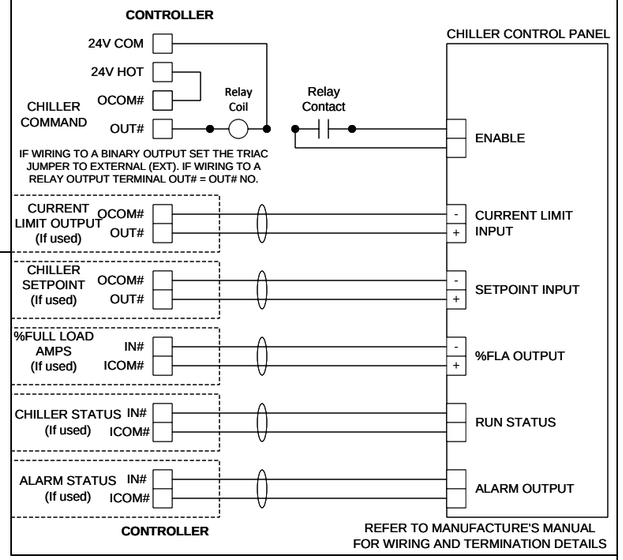
DETAIL F302 N.O. BINARY INPUT - A70



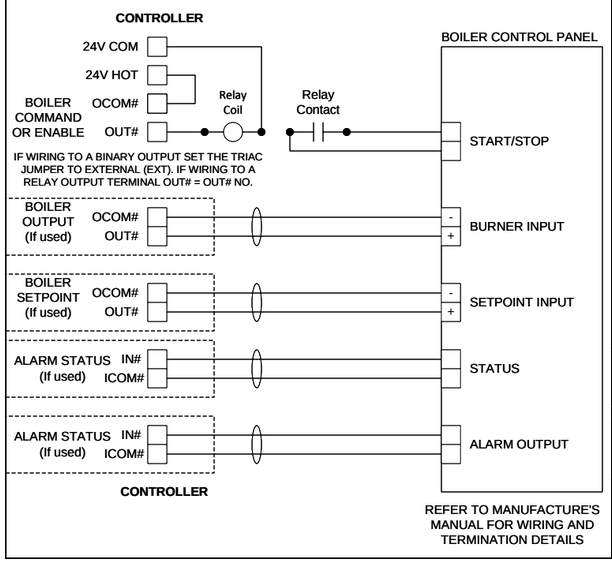
DETAIL F303 N.C. BINARY INPUT – AFS460



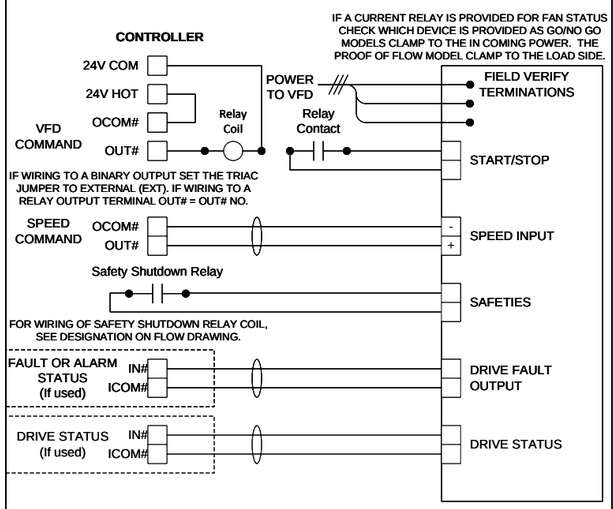
DETAIL F1002 Chiller Control Wiring Detail



DETAIL F1001 Boiler Control Wiring Detail



DETAIL F1042 VFD with Safeties Wiring



Drawing Title

Wiring Details 1

		AS BUILT		12/03/2024	
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN	APPROVED
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY / DATE

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

123021 PVCC Renovation.vsdx

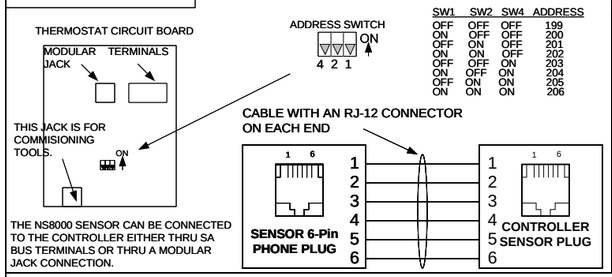
Harrison Energy Partners

Office Information
Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER 123021

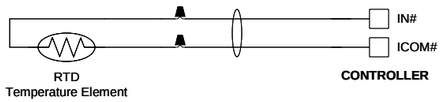
DRAWING NUMBER 35 of 38

DETAIL NS201 — NS8000 NET SENSOR MODULAR JACK

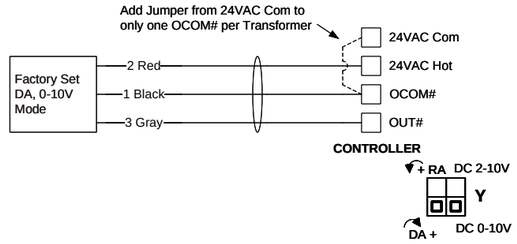


SW1	SW2	SW4	ADDRESS
OFF	OFF	OFF	199
ON	OFF	OFF	200
OFF	ON	OFF	201
ON	ON	OFF	202
OFF	OFF	ON	203
ON	OFF	ON	204
OFF	ON	ON	205
ON	ON	ON	206

DETAIL V131 — TEMPERATURE SENSOR INPUT



DETAIL V250 — 0 (2)-10VDC OUTPUT to Belimo TR24-SR



			AS BUILT		12/03/2024	
REFERENCE DRAWING		NO.	REVISION-LOCATION	ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY	DATE	

Drawing Title

Wiring Details 2

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

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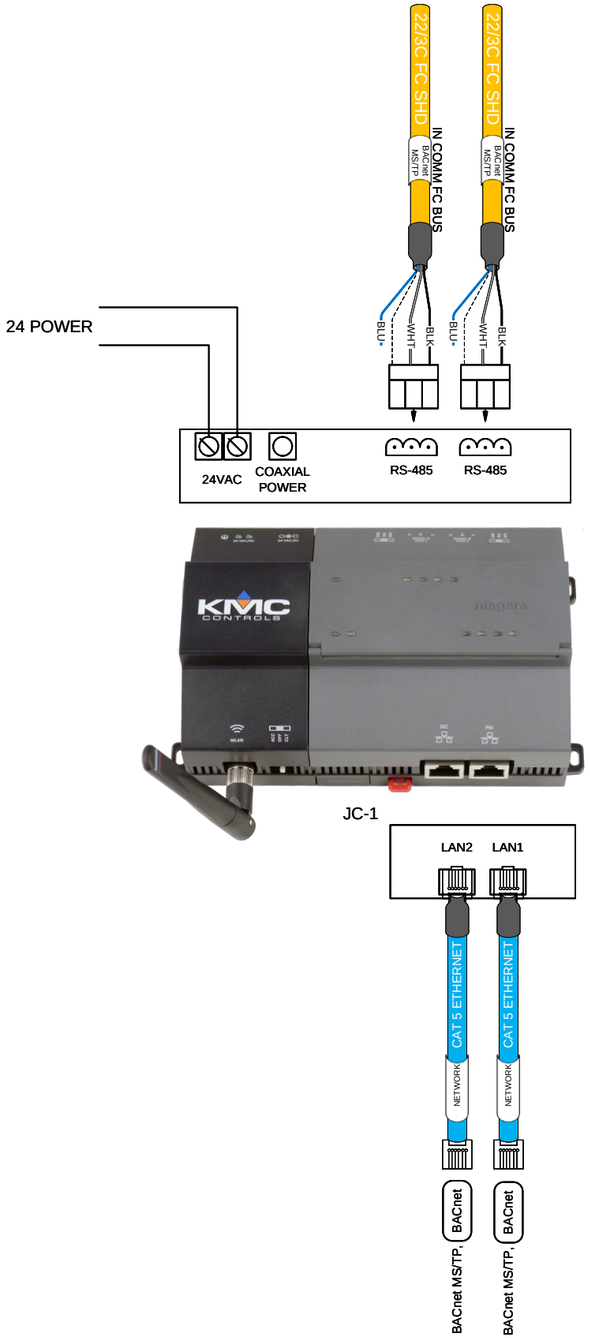
Office Information
Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER 123021

DRAWING NUMBER 36 of 38

JACE DETAIL



Bill_of_Material				
TAG	PART NO	VENDOR	DESCRIPTION	QTY
ENC	NSTA2018VA100-GY	KELE	NEMA 1 20" X 18" ENCLOSURE W/100 VA TRANSFORMER	1
JC-1	KMN-J-8100	KMC	NIAGARA SUPERVISOR CONTROLLER 100 DEVICES, 5000 POINTS	1

ENC

		AS BUILT			12/03/2024	
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY

Drawing Title

JC-1 JACE Bulding Controller Detai

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT		DATE 12/03/2024	BY	DATE

Project Title

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1501 Westpark Dr.
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Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER
123021

DRAWING NUMBER
37 of 38

VALVE SCHEDULE

Pos	Qty	Tag	Voltage	Control Signal	Valve Pattern	Pipe Size	Flow	ΔP	Req. Cv	Body Size	Valve Cv	Actual ΔP	Close Off Pressure	Valve Part Nr.	Actuator Part Nr.	Clip Position	Set Up	P-Code
1	2	CH1 ISO ; CH2 ISO	100-240 VAC	On/Off/Floating Point	2W	6"	0	5	0	6"	1579	0	200 psi	F6150HD	PRXUP-3-T		NC	
2	1	CH Bypass	24 VAC/VDC	MFT (Configurable)	2W	6"	275	5	122.98	4"	170	2.62	140 psi	G6100C	EVX24-MFT		NO	G53
3	1	HW Bypass	24 VAC/VDC	MFT (Configurable)	2W		18	5	8.05	1"	10	3.24	250 psi	G225B-K	LVX24-MFT		NO	G53
4	1	AHU1 CLG	24 VAC/VDC	MFT (Configurable)	2W	2-1/2"	89	5	39.8	2"	46	3.74	200 psi	B249	ARX24-MFT		NC	A02
5	1	AHU2 CLG	24 VAC/VDC	MFT (Configurable)	2W	2-1/2"	54	5	24.15	1-1/4"	25	4.67	200 psi	B231	ARX24-MFT-T N4		NC	A02
6	1	AHU3 CLG	24 VAC/VDC	MFT (Configurable)	2W	2"	61	5	27.28	1-1/2"	29	4.42	200 psi	B239	ARX24-MFT		NC	A02
7	1	AHU4 CLG	24 VAC/VDC	MFT (Configurable)	2W	3"	125	5	55.9	2-1/2"	58	4.64	100 psi	B261	ARX24-MFT		NC	A02
8	1	AHU5 CLG	24 VAC/VDC	MFT (Configurable)	2W	2-1/2"	70	5	31.3	1-1/2"	34	4.24	200 psi	B240	ARX24-MFT		NC	A02
9	1	AHU6 CLG	24 VAC/VDC	MFT (Configurable)	2W	2-1/2"	53	5	23.7	1-1/4"	25	4.49	200 psi	B231	ARX24-MFT		NC	A02
10	2	AHU7 CLG ; AHU1 PH	24 VAC/VDC	MFT (Configurable)	2W	1-1/2"	37	5	16.55	1-1/4"	18.8	3.87	200 psi	B230	LRX24-MFT		NC	A02
11	1	AHU2 PH	24 VAC/VDC	MFT (Configurable)	2W	2"	20	5	8.94	1-1/4"	10	4	200 psi	B229	NRX24-MFT-T N4		NC	A02
12	1	AHU3 PH	24 VAC/VDC	MFT (Configurable)	2W	1-1/2"	13	5	5.81	1"	7.4	3.09	200 psi	B222	LRX24-MFT		NC	A02
13	1	AHU4 PH	24 VAC/VDC	MFT (Configurable)	2W	3"	50	5	22.36	2"	29	2.97	200 psi	B248	ARX24-MFT		NC	A02
14	2	AHU5 PH ; AHU7 PH	24 VAC/VDC	MFT (Configurable)	2W	2"	22	5	9.84	1-1/4"	10	4.84	200 psi	B229	LRX24-MFT		NC	A02
15	1	AHU6 PH	24 VAC/VDC	MFT (Configurable)	2W	2"	26	5	11.63	1-1/4"	18.2	2.04	200 psi	B230	LRX24-MFT		NC	A02
16	1	AHU5 RH	24 VAC/VDC	MFT (Configurable)	2W	1-1/2"	14	5	6.26	1"	7.4	3.58	200 psi	B222	LRX24-MFT		NC	A02
17	1	AHU6 RH	24 VAC/VDC	2-10 VDC	2W	1-1/4"	9	5	4.02	3/4"	4.7	3.67	200 psi	B217B	TR24-SR-T US		NC	
18	1	AHU7 RH	24 VAC/VDC	2-10 VDC	2W	1"	7	5	3.13	3/4"	4.7	2.22	200 psi	B217B	TR24-SR-T US		NC	
19	1	BCU1 CLG	24 VAC/VDC	2-10 VDC	2W	1-1/4"	14	5	6.26	3/4"	7.4	3.58	200 psi	B218B	TR24-SR-T US		NC	
20	1	BCU2 CLG	24 VAC/VDC	2-10 VDC	2W	3/4"	5	5	2.24	1/2"	3	2.78	200 psi	B212B	TR24-SR-T US		NC	
21	1	BCU3 CLG	24 VAC/VDC	2-10 VDC	2W	1-1/2"	38	5	16.99	1-1/4"	18.8	4.09	200 psi	B230	LRX24-SR-T		NC	0
22	1	BCU1 PH	24 VAC/VDC	2-10 VDC	3W M/D	1"	6	5	2.68	1/2"	3	4	200 psi	B312B	TR24-SR-T US		NO	
23	1	BCU2 PH	24 VAC/VDC	2-10 VDC	2W	3/4"	2	5	0.89	1/2"	1.2	2.78	200 psi	B210B	TR24-SR-T US		NC	
24	1	BCU3 PH	24 VAC/VDC	2-10 VDC	3W M/D	1-1/4"	13	5	5.81	3/4"	7.4	3.09	200 psi	B318B	TR24-SR-T US		NO	
25	1	RHC1 RH	24 VAC/VDC	2-10 VDC	2W		3.5	5	1.57	1/2"	1.9	3.39	200 psi	B211B	TR24-SR-T US		NC	
26	1	RHC2 RH	24 VAC/VDC	2-10 VDC	2W	3/4"	1	5	0.45	1/2"	0.46	4.73	200 psi	B208B	TR24-SR-T US		NC	
27	2	RHC3A RH ; RHC3B RH	24 VAC/VDC	2-10 VDC	2W	3/4"	4	5	1.79	1/2"	1.9	4.43	200 psi	B211B	TR24-SR-T US		NC	
28	2	FCU1 CLG ; FCU2 CLG	24 VAC/VDC	2-10 VDC	2W		12	5	5.37	3/4"	4.7	6.52	200 psi	B217B	TR24-SR-T US		NC	
29	3	FCU3 CLG ; FCU4 CLG ; FCU5 CLG	24 VAC/VDC	2-10 VDC	2W	1"	7.5	5	3.35	3/4"	4.7	2.55	200 psi	B217B	TR24-SR-T US		NC	
30	1	FCU1 PH	24 VAC/VDC	2-10 VDC	2W	1"	6	5	2.68	1/2"	3	4	200 psi	B212B	TR24-SR-T US		NC	
31	1	FCU2 PH	24 VAC/VDC	2-10 VDC	3W M/D	1"	6	5	2.68	1/2"	3	4	200 psi	B312B	TR24-SR-T US		NO	
32	3	FCU3 PH ; FCU4 PH ; FCU5 PH	24 VAC/VDC	2-10 VDC	2W	3/4"	3.5	5	1.57	1/2"	1.9	3.39	200 psi	B211B	TR24-SR-T US		NC	
33	1	VAV1-101 RH	24 VAC/VDC	2-10 VDC	2W	3/4"	1.75	5	0.78	1/2"	0.8	4.79	200 psi	B209B	TR24-SR-T US		NC	
34	2	VAV1-102 RH ; VAV4-206 RH	24 VAC/VDC	2-10 VDC	2W	3/4"	0.75	5	0.34	1/2"	0.46	2.66	200 psi	B208B	TR24-SR-T US		NC	
35	2	VAV1-103 RH ; VAV1-106 RH	24 VAC/VDC	2-10 VDC	2W	3/4"	2	5	0.89	1/2"	1.2	2.78	200 psi	B210B	TR24-SR-T US		NC	
36	2	VAV1-104 RH ; VAV4-202 RH	24 VAC/VDC	2-10 VDC	2W	3/4"	2.5	5	1.12	1/2"	1.2	4.34	200 psi	B210B	TR24-SR-T US		NC	
37	2	VAV1-105 RH ; VAV2-108 RH	24 VAC/VDC	2-10 VDC	2W	1-1/4"	14	5	6.26	3/4"	7.4	3.58	200 psi	B218B	TR24-SR-T US		NC	
38	4	VAV1-107 RH ; VAV2-109 RH ; VAV3-116 RH ; VAV4-209 RH	24 VAC/VDC	2-10 VDC	2W	3/4"	0.5	5	0.22	1/2"	0.3	2.78	200 psi	B207B	TR24-SR-T US		NC	
39	3	VAV2-110 RH ; VAV3-113 RH ; VAV3-117 RH	24 VAC/VDC	2-10 VDC	2W	3/4"	0.33	5	0.15	1/2"	0.3	1.21	200 psi	B207B	TR24-SR-T US		NC	
40	1	VAV2-111 RH	24 VAC/VDC	2-10 VDC	2W		0.3	5	0.13	1/2"	0.3	1	200 psi	B207B	TR24-SR-T US		NC	
41	4	VAV2-112 RH ; VAV3-115 RH ; VAV4-201 RH ; VAV4-207 RH	24 VAC/VDC	2-10 VDC	2W	3/4"	1	5	0.45	1/2"	0.46	4.73	200 psi	B208B	TR24-SR-T US		NC	
42	1	VAV3-114 RH	24 VAC/VDC	2-10 VDC	2W	3/4"	0.6	5	0.27	1/2"	0.3	4	200 psi	B207B	TR24-SR-T US		NC	
43	1	VAV3-118 RH	24 VAC/VDC	2-10 VDC	3W M/D	3/4"	5.5	5	2.46	1/2"	3	3.36	200 psi	B312B	TR24-SR-T US		NO	
44	2	VAV4-210 RH	24 VAC/VDC	2-10 VDC	2W	1-1/4"	10	5	4.47	3/4"	4.7	4.53	200 psi	B217B	TR24-SR-T US		NC	
45	2	VAV4-204 RH ; VAV4-211 RH	24 VAC/VDC	2-10 VDC	2W	3/4"	1.5	5	0.67	1/2"	0.8	3.52	200 psi	B209B	TR24-SR-T US		NC	
46	1	VAV4-208 RH	24 VAC/VDC	2-10 VDC	2W	3/4"	3	5	1.34	1/2"	1.9	2.49	200 psi	B211B	TR24-SR-T US		NC	
47	1	VAV4-203 RH	24 VAC/VDC	2-10 VDC	3W M/D	3/4"	3	5	1.34	1/2"	1.9	2.49	200 psi	B311B	TR24-SR-T US		NO	

Drawing Title

Valve Schedule

		AS BUILT		12/03/2024	

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

SALESPERSON	PROJECT MGR	DESIGNED BY	DRAWN		APPROVED	
JOSH ROBINSON	CHRIS MURRELL	JERRY PICKETT	DATE 12/03/2024	BY	DATE	

Project Title

PLEASANT VALLEY COUNTRY CLUB ADDITIONS AND RENOVATIONS LITTLE ROCK, AR

123021 PVCC Renovation.vsdx

Harrison Energy Partners

Office Information
Harrison Energy Partners
1501 Westpark Dr.
Suite. 9
Little Rock, AR 72204
(501) 661-0621

CONTRACT NUMBER
123021

DRAWING NUMBER
38 of 38

Harrison
Energy Partners

Datasheet Index

The following is a list of datasheets.

FX80 Supervisory Controller Catalog Page

LIT-1901010

2020-08-14

Overview

The FX80 Supervisory Controller is a web-based supervisory-class controller in the Facility Explorer® product family. The FX80 controller manages networks of field controllers using open communication protocols, such as BACnet®, LonWorks®, and N2 protocols. The FX80 controller supports a full set of building automation features, such as scheduling, alarming, historical data collection and management, data sharing, energy management, totalization, customized control routines, tagging, templates, search, and hierarchies, which are specifically designed for commercial facilities.

Each FX80 controller includes a graphical system user interface with an HTML5 web profile, a configuration tool that you can access with the web browser, and robust security. Remote access is easily achieved using a wired or wireless connection from the Internet or intranet. Multiple users can concurrently connect to the FX80 controller. You can manage security and presentation preferences through user profiles, login IDs, and passwords.

The FX80 Supervisory Controller is a compact DIN rail mountable controller with the capability for remote external input and output points.

In addition, the FX80 controller's hardware and software design is modular, so you can plug in accessories, such as communications option modules, if needed. The device and point licensing options allow you to select the device and point capacity most appropriate for the size of your facility and those options best needed to control it. And, in many cases, future expansions do not require the replacement of hardware.

Refer to the *FX80 Supervisory Controller Product Bulletin (LIT-12012250)* for important product application.

Johnson Controls

FX80 features and benefits

Fully commissioned and licensed out of the box

Power up, connect to a web browser, change default passwords, set up network parameters, and start adding your field controllers.

Web-based user interface

Provides rich, graphical displays for system operation and analysis.

Adoption of industry standard communication protocols

Allows for the integration of a wide variety of field controllers, including Facility Explorer field controllers and controllers provided by others without intermediate gateways or translators.

Embedded Configuration Tool

Requires no proprietary or desktop software to configure the FX80 controller. You only need a web browser for basic configuration and monitoring.

Modular design

Allows you to select only those components needed to meet specific project requirements.

Small, compact design

Installs easily.

FX Workbench

Reduces engineering and installation time by easily and quickly creating the FX80 database from field controller configurations offline.

Niagara® analytics

Allows you to apply a variety of analytical algorithms and diagnostics to both historical and real-time data.

North American emissions compliance

United States

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

Canada

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Ordering information

FX80 Supervisory Controller ordering information

Table 1: FX80 Supervisory Controller ordering information

Region	Product code number	Description
North America	FX-SC8BDWIFI-0	FX80 Supervisory Controller and micro Secure Digital (SD) card, licensing required and purchased separately, disabled WLAN
Europe	FX-SC8BDWIFI-0E	
FX-SC8BASE-0		FX80 Supervisory Controller and micro Secure Digital (SD) card, licensing required and purchased separately
FX-SC8BASE-700		Replacement FX80 Supervisory Controller, no micro SD card, no licenses

FX80 core device licenses ordering information

Table 2: North America

Product code number	Description
FX-SC8CL005-0	FX80 Supervisory Controller core device license, 5 field devices, 250 points
FX-SC8CL010-0	FX80 Supervisory Controller core device license, 10 field devices, 500 points
FX-SC8CL025-0	FX80 Supervisory Controller core device license, 25 field devices, 1,250 points
FX-SC8CL100-0	FX80 Supervisory Controller core device license, 100 field devices, 5,000 points
FX-SC8CL200-0	FX80 Supervisory Controller core device license, 200 field devices, 10,000 points
FX-SC8CLDEMO-0	FX80 Supervisory Controller demo license, 500 field devices, 25,000 points. Enables all features needed to engineer and demonstrate FX Supervisory Controllers and FX Server stations. Intended for installing contractors. Requires annual support fee. Expires yearly.

Table 3: Europe

Product code number	Description
FX-SC8CL100-OE	FX80 Supervisory Controller core device license, 100 points
FX-SC8CL250-0E	FX80 Supervisory Controller core device license, 250 points
FX-SC8CL500-0E	FX80 Supervisory Controller core device license, 500 points
FX-SC8CL01K-0E	FX80 Supervisory Controller core device license, 1,250 points

Table 3: Europe

Product code number	Description
FX-SC8CLO5K-0E	FX80 Supervisory Controller core device license, 5,000 points
FX-SC8CL10K-0E	FX80 Supervisory Controller core device license, 10,000 points
FX-SC8CLDEMO-0E	FX80 Supervisory Controller demo license, 25,000 points. Enables all features needed to engineer and demonstrate FX Supervisory Controllers and FX Server stations. Intended for installing contractors. Requires annual support fee. Expires yearly.

- Each FX80 controller requires the purchase of a single core device license.
- Device licenses are also dependent on point (proxy) counts. For each device that is licensed, 50 points are licensed. A 5-device core license also licenses 250 points. This could satisfy five devices with 25 points each or three devices with 80 points each. For three devices with 90 points each, you need to purchase the 10-device core license (or add a 5-device additional license to the 5-device core license).

Initial purchase FX80 Controller software maintenance ordering information

Table 4: North America

Product code number	Description
FX-SC8D005M1-0	Initial 1 year software maintenance for FX80 Supervisory Controller with 5–9 field device capacity
FX-SC8D005M3-0	Initial 3 year software maintenance for FX80 Supervisory Controller with 5–9 field device capacity
FX-SC8D005M5-0	Initial 5 year software maintenance for FX80 Supervisory Controller with 5–9 field device capacity
FX-SC8D010M1-0	Initial 1 year software maintenance for FX80 Supervisory Controller with 10–24 field device capacity
FX-SC8D010M3-0	Initial 3 year software maintenance for FX80 Supervisory Controller with 10–24 field device capacity
FX-SC8D010M5-0	Initial 5 year software maintenance for FX80 Supervisory Controller with 10–24 field device capacity
FX-SC8D025M1-0	Initial 1 year software maintenance for FX80 Supervisory Controller with 25–99 field device capacity
FX-SC8D025M3-0	Initial 3 year software maintenance for FX80 Supervisory Controller with 25–99 field device capacity

Table 4: North America

Product code number	Description
FX-SC8D025M5-0	Initial 5 year software maintenance for FX80 Supervisory Controller with 25–99 field device capacity
FX-SC8D100M1-0	Initial 1 year software maintenance for FX80 Supervisory Controller with 100–199 field device capacity
FX-SC8D100M3-0	Initial 3 year software maintenance for FX80 Supervisory Controller with 100–199 field device capacity
FX-SC8D100M5-0	Initial 5 year software maintenance for FX80 Supervisory Controller with 100–199 field device capacity
FX-SC8D200M1-0	Initial 1 year software maintenance for FX80 Supervisory Controller with 200 and up field device capacity
FX-SC8D200M3-0	Initial 3 year software maintenance for FX80 Supervisory Controller with 200 and up field device capacity
FX-SC8D200M5-0	Initial 5 year software maintenance for FX80 Supervisory Controller with 200 and up field device capacity

Table 5: Europe

Product code number	Description
FX-SC8P250M1-0E	Initial 1 year software maintenance for FX80 Supervisory Controller with 100 and 250 points
FX-SC8P250M3-0E	Initial 3 year software maintenance for FX80 Supervisory Controller with 100 and 250 points
FX-SC8P250M5-0E	Initial 5 year software maintenance for FX80 Supervisory Controller with 100 and 250 points
FX-SC8P500M1-0E	Initial 1 year software maintenance for FX80 Supervisory Controller with 500 points
FX-SC8P500M3-0E	Initial 3 year software maintenance for FX80 Supervisory Controller with 500 points
FX-SC8P500M5-0E-0	Initial 5 year software maintenance for FX80 Supervisory Controller with 500 points
FX-SC8P01KM1-0E	Initial 1 year software maintenance for FX80 Supervisory Controller with 1,250 points
FX-SC8P01KM3-0E	Initial 3 year software maintenance for FX80 Supervisory Controller with 1,250 points
FX-SC8P01KM5-0E	Initial 5 year software maintenance for FX80 Supervisory Controller with 1,250 points
FX-SC8P05KM1-0E	Initial 1 year software maintenance for FX80 Supervisory Controller with 5,000 points
FX-SC8P05KM3-0E	Initial 3 year software maintenance for FX80 Supervisory Controller with 5,000 points
FX-SC8P05KM5-0E	Initial 5 year software maintenance for FX80 Supervisory Controller with 5,000 points

Table 5: Europe

Product code number	Description
FX-SC8P10KM1-0E	Initial 1 year software maintenance for FX80 Supervisory Controller with 10,000 points
FX-SC8P10KM3-0E	Initial 3 year software maintenance for FX80 Supervisory Controller with 10,000 points
FX-SC8P10KM5-0E	Initial 5 year software maintenance for FX80 Supervisory Controller with 10,000 points

Note:

- Device capacity is equal to the sum of the core device license and any additional device license applied to the FX80 controller. Select the device capacity that is equal or lesser than the sum.
- Maintenance cannot be purchased for any period beyond December 31, 2025.

FX80 Controller software maintenance (post initial) ordering information

Table 6: North America

Product code number	Description
FX-SC8D005M1-6	1 year software maintenance for FX80 Supervisory Controller with 5–9 field device capacity
FX-SC8D005M3-6	3 year software maintenance for FX80 Supervisory Controller with 5–9 field device capacity
FX-SC8D005M5-6	5 year software maintenance for FX80 Supervisory Controller with 5–9 field device capacity
FX-SC8D010M1-6	1 year software maintenance for FX80 Supervisory Controller with 10–24 field device capacity
FX-SC8D010M3-6	3 year software maintenance for FX80 Supervisory Controller with 10–24 field device capacity
FX-SC8D010M5-6	5 year software maintenance for FX80 Supervisory Controller with 10–24 field device capacity
FX-SC8D025M1-6	1 year software maintenance for FX80 Supervisory Controller with 25–99 field device capacity
FX-SC8D025M3-6	3 year software maintenance for FX80 Supervisory Controller with 25–99 field device capacity
FX-SC8D025M5-6	5 year software maintenance for FX80 Supervisory Controller with 25–99 field device capacity
FX-SC8D100M1-6	1 year software maintenance for FX80 Supervisory Controller with 100–199 field device capacity

Table 6: North America

Product code number	Description
FX-SC8D100M3-6	3 year software maintenance for FX80 Supervisory Controller with 100–199 field device capacity
FX-SC8D100M5-6	5 year software maintenance for FX80 Supervisory Controller with 100–199 field device capacity
FX-SC8D200M1-6	1 year software maintenance for FX80 Supervisory Controller with 200 and up field device capacity
FX-SC8D200M3-6	3 year software mintenance for FX80 Supervisory Controller with 200 and up field device capacity
FX-SC8D200M5-6	5 year software maintenance for FX80 Supervisory Controller with 200 and up field device capacity

Table 7: Europe

Product code number	Description
FX-SC8P250M1-6E	1 year software maintenance for FX80 Supervisory Controller with 100 & 250 points
FX-SC8P250M3-6E	3 year software maintenance for FX80 Supervisory Controller with 100 & 250 points
FX-SC8P250M5-6E	5 year software maintenance for FX80 Supervisory Controller with 100 & 250 points
FX-SC8P500M1-6E	1 year software maintenance for FX80 Supervisory Controller with 500 points
FX-SC8P500M3-6E	3 year software maintenance for FX80 Supervisory Controller with 500 points
FX-SC8P500M5-6E	5 year software maintenance for FX80 Supervisory Controller with 500 points
FX-SC8P01KM1-6E	1 year software maintenance for FX80 Supervisory Controller with 1,250 points
FX-SC8P01KM3-6E	3 year software maintenance for FX80 Supervisory Controller with 1,250 points
FX-SC8P01KM5-6E	5 year software maintenance for FX80 Supervisory Controller with 1,250 points
FX-SC8P05KM1-6E	1 year software maintenance for FX80 Supervisory Controller with 5,000 points
FX-SC8P05KM3-6E	3 year software maintenance for FX80 Supervisory Controller with 5,000 points
FX-SC8P05KM5-6E	5 year software maintenance for FX80 Supervisory Controller with with 5,000 points
FX-SC8P10KM1-6E	1 year software maintenance for FX80 Supervisory Controller with 10,000 points
FX-SC8P10KM3-6E	3 year software mintenance for FX80 Supervisory Controller with 10,000 points
FX-SC8P10KM5-6E	5 year software maintenance for FX80 Supervisory Controller with 10,000 points

Note:

- Device capacity is equal to the sum of the core device license and any additional device license applied to the FX80 controller. Select the device capacity that is equal or lesser than the sum.
- Maintenance cannot be purchased for any period beyond December 31, 2025.

FX80 Controller additional field device licenses ordering information

Table 8: North America

Product code number	Description
Initial purchase	
FX-SC8DL10-0	License enabling an additional 10 field devices, 500 points for one FX80, initial purchase only
FX-SC8DL25-0	License enabling an additional 25 field devices, 1,250 points for one FX80, initial purchase only
FX-SC8DL50-0	License enabling an additional 50 field devices, 2,500 points for one FX80, initial purchase only
After initial purchase	
FX-SC8DL10-6	License enabling an additional 10 field devices, 500 points for one FX80;upgrade after initial purchase
FX-SC8DL25-6	License enabling an additional 25 field devices, 1,250 points for one FX80; upgrade after initial purchase
FX-SC8DL50-6	License enabling an additional 50 field devices, 2,500 points for one FX80; upgrade after initial purchase

Table 9: Europe

Product code number	Description
Initial purchase	
FX-SC8PL500-0E	License enabling an additional 500 points for one FX80, initial purchase only
FX-SC8PL01K-0E	License enabling an additional 1,250 points for one FX80, initial purchase only
FX-SC8PL02K-0E	License enabling an additional 2,500 points for one FX80, initial purchase only
After initial purchase	

Table 9: Europe

Product code number	Description
FX-SC8PL500-6E	License enabling an additional 500 points for one FX80;upgrade after initial purchase
FX-SC8PL01K-6E	License enabling an additional 1,250 points for one FX80; upgrade after initial purchase
FX-SC8PL02K-6E	License enabling an additional 2,500 points for one FX80; upgrade after initial purchase

Note: Additional devices are used to expand capacity from the core device license. For example, you can order the FX-SC8DL25-0 with the FX-SC8CL025-0 for a total of 50 devices, 2,500 points.

Niagara analytics licenses ordering information

Table 10: North America

Product code number	Description
FX-ASCL100-0	License enabling 100 analytic points for Niagara Analytics on an FX80 Supervisory Controller at FX Supervisory Family Software Release 14.2 or greater
FX-ASCL250-0	License enabling 250 analytic points for Niagara Analytics on an FX80 Supervisory Controller at FX Supervisory Family Software Release 14.2 or greater
FX-ASCL500-0	License enabling 500 analytic points for Niagara Analytics on an FX80 Supervisory Controller at FX Supervisory Family Software Release 14.2 or greater
FX-ASCL1000-0	License enabling 1,000 analytic points for Niagara Analytics on an FX80 Supervisory Controller at FX Supervisory Family Software Release 14.2 or greater

Table 11: Europe

Product code number	Description
FX-ASCL100-0E	License enabling 100 analytic points for Niagara Analytics on an FX80 Supervisory Controller at FX Supervisory Family Software Release 14.2 or greater. Only available to partners that are Niagara Analytics TCP trained.
FX-ASCL250-0E	License enabling 250 analytic points for Niagara Analytics on an FX80 Supervisory Controller at FX Supervisory Family Software Release 14.2 or greater. Only available to partners that are Niagara Analytics TCP trained.
FX-ASCL500-0E	License enabling 500 analytic points for Niagara Analytics on an FX80 Supervisory Controller at FX Supervisory Family Software Release 14.2 or greater. Only available to partners that are Niagara Analytics TCP trained.
FX-ASCL1000-0E	License enabling 1000 analytic points for Niagara Analytics on an FX80 Supervisory Controller at FX Supervisory Family Software Release 14.2 or greater. Only available to partners that are Niagara Analytics TCP trained.

ⓘ **Note:** Niagara Analytics products require Niagara Analytics N4 certification. Niagara Analytics certification training requires Niagara 4 TCP Certification.

FX80 supporting software ordering information

Table 12: FX80 supporting software ordering information

Region	Product code number	Description
North America	FX-WBALM-0	License enabling Alarm Portal Client for FX Supervisory Family Software Release 14.2 or greater
Europe	FX-WBALM-0E	

FX80 Controller software accessories ordering information

Table 13: North America

Product code number	Description
FX-SC8LCCN-0	License enabling Carrier® Communication/Comfort Network (CCN) driver for one FX80 Supervisory Controller; initial purchase
FX-SC8LAX-0	License enabling AX 3.8 downgrade for one FX80; initial purchase
FX-SC8LCCN-6	License enabling Carrier CCN driver for one FX80; upgrade after initial purchase
FX-SC8LAX-6	License enabling AX 3.8 downgrade for one FX80; upgrade after initial purchase
FX-SC8LAC-6	License enabling AC256 over RS-232 or RS-485 driver
FX-SC8LAINF-6	License enabling Andover® Infinity driver

Table 13: North America

Product code number	Description
FX-SC8LAPHP-6	License enabling American Auto-Matrix™ PHP over RS-232 or RS-485 driver
FX-SC8LAPUP-6	License enabling American Auto-Matrix™ PUP over RS-232 or RS-485 driver
FX-SC8LFLEX-6	License enabling Flex™ driver over RS-232 or RS-485
FX-SC8LGLOB-6	License enabling control of IR AV equipment through an RS-232 to Global Cache FC module
FX-SC8LHELV-6	License enabling Helvar lighting control driver
FX-SC8LHORT-6	License enabling European Hortsmann meter driver
FX-SC8LJOS-6	License enabling Josam® grease trap sensor driver
FX-SC8LLANG-6	License enabling Lang™ oven RS-232 or RS-485 driver
FX-SC8LMCQ-6	License enabling McQuay® driver to OPM driver
FX-SC8LSMS-6	License enabling SMS alarms through Global System for Mobile Communication (GSM)/General Packet Radio Services (GPRS) modem to RS-232 serial port driver
FX-SC8LVDRT-6	License enabling Veeder-Root® RS-232 or RS-485 driver

ⓘ **Note:** FX-SC8LAC-6 is available in Beta version only.

ⓘ **Note:** The FX-SC8LGLOB-6, FX-SC8LHORT-6, FX-SC8LJOS-6, FX-SC8LLANG-6, FX-SC8LSMS-6, and FX-SC8LVDRT-6 are supported at FX Supervisory Family Software Release 6.3 only. These drivers are not supported at FX Supervisory Family Software Release 14.x.

Table 14: Europe

Product code number	Description
FX-SC8LCCN-0E	License enabling Carrier® Communication/Comfort Network (CCN) driver for one FX80 Supervisory Controller; initial purchase
FX-SC8LAX-0E	License enabling AX 3.8 downgrade for one FX80; initial purchase
FX-SC8LCCN-6E	License enabling Carrier CCN driver for one FX80; upgrade after initial purchase
FX-SC8LAX-6E	License enabling AX 3.8 downgrade for one FX80; upgrade after initial purchase

FX80 Controller hardware accessories ordering information

Table 15: FX80 Controller hardware accessories ordering information

Region	Product code number	Description
North America	FX-SC8SD-700	FX80 micro SD replacement (micro SD only); no licenses
Europe	FX-SC8SD-700E	
North America	FX-SC8XLON-0	LonWorks FX80 expansion module for the FX80 Supervisory Controller
Europe	FX-SC8XLON-0E	
North America	FX-SC8XD485-0	Dual port isolated RS-485 expansion module for the FX80 Supervisory Controller
Europe	FX-SC8XD485-0E	
North America	FX-SC8X232-0	RS-232 expansion module for the FX80 Supervisory Controller
Europe	FX-SC8X232-0E	
FX-SC8AKIT-700		FX80 accessory kit including replacement connectors
FX-SC8XKIT-700		FX80 expansion module kit including one-size-fits-all replacement connector
North America	FX-SC8XPS-0	FX80 universal wall mount power supply 100–240 VAC/24 V includes United States, Europe, United Kingdom, and Australia style plugs
Europe	FX-SC8XPS-0E	
Europe	FX-SC8XIOPSU-0E	PSU Remote FX IO Modules, 90-240Vac to 15Vdc DIN rail mount 30Va
FX-SC8WKIT-700		Extension cable and bracket for FX80 WLAN
North America	FX-SC8XIOR16-0	Remote input/output module for the FX Supervisory Controllers; includes 8 universal inputs, 4 relay outputs, and four 0-10 V analog outputs.
Europe	FX-SC8XIOR16-0E	
North America	FX-SC8XIOR34-0	Remote input/output module for the FX Supervisory Controllers; includes 16 universal inputs, 10 relay outputs, and eight 0-10 V analog outputs.
Europe	FX-SC8XIOR34-0E	

FX80 Controller - ESIGN and FIPS 140-2 accessories (North America only)

Table 16: FX80 Controller - ESIGN and FIPS 140-2 accessories (North America only)

Product code number	Description
FX-SC8FIPS-0	Provides FIPS 140-2 Level 1 conformance that uses the integrated FIPS-certified BouncyCastle module for an FX80. Compatible with FX version 14.6 and later.
FX-SC8LES250-0	License enabling e-signature application with 250 points for FX80
FX-SC8LESUNL-0	License enabling e-signature application with unlimited points for FX80
FX-SC8LESUP25-0	License adding 250 e-signature points for FX80
FX-TSES-0	E-signature technical support - up to 8 hours in 90-day period following order placement.

ⓘ **Note:** FX-TSES-0 is required with the first ESIGN order.

FX80 is restricted from being sold in the following countries

Table 17: FX80 is restricted from being sold

Country	Country Code	FX80 Part Number with Wi-Fi	FX80 Part Number with Wi-Fi Disabled
Cuba	—	Restricted from Sale	Restricted from Sale
Iran	—	Restricted from Sale	Restricted from Sale
North Korea	—	Restricted from Sale	Restricted from Sale
Sudan	—	Restricted from Sale	Restricted from Sale
Syria	—	Restricted from Sale	Restricted from Sale

Technical specifications

Table 18: FX80 Supervisory Controller

Enclosure/ mounting	Plastic/DIN Rail
Dimension	216 mm x 152 mm x 68 mm (8.5 in. x 6 in. x 2.625 in.)
Power supply	24 VAC/DC
Processor	TI AM3352: 1000MHz ARM® Cortex™ A8
RAM memory	1 GB DDR3 SD RAM
Flash memory	Removable micro-SD card with 4GB flash total storage, 2 GB user storage
Environment	Operating Temperature: -20°C to 60°C (-4°F to 140°F) Storage Temperature: -40°C to 85°C (-40°F to 185°F) Relative Humidity: 5% to 95%, noncondensing
Onboard	2 Ethernet 10/100 Mbps; 2 RS-485 (Isolated); 1 USB, 1 Micro USB, Fast USB Bus; Wi-Fi
Plug-in options	Dual port RS-485 (Isolated); LON FT/TP-10; RS-232
Network drivers	
Embedded	N2, BACnet, Niagara
Direct I/O	
Onboard	None
Optional	Up to 256 by using 16 Remote I/O Modules (FXRIO16)
Local (NDIO)	None
Remote I/O	Up to 256 I/O by using 16 Remote I/O Modules (FXRIO16)
Compliance CE	**United States** UL Listed, File E207782, CCN PAZX, under UL 916, Energy Management Equipment FCC compliant to CFR 47, part 15, subpart C, Class B
	Canada UL Listed, File E207782, CCN PAZX7, under CSA C22.2 No. 205, Signal Equipment Industry Canada compliant to ICES-003
	Europe CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive.

Table 19: Remote Input Output Modules

Product codes	LP-FXRIO16-0: 8 universal inputs, 4 relay outputs, 4 analog outputs
Dimensions	102 mm x 92 mm x 67 mm (4 in. x 3.625 in. x 2.625 in.)
Universal input types supported	10k ohm Type 3 thermistors. Thermistor Sensor Range: -23.3° C to 115.5° C (-10° F to 240° F). Input accuracy is in the range of ±1% of span. Characteristic curve is customizable. 0–10 V; accuracy is ±2% of span, without user calibration; uses an external resistor for current input (four provided, mounted by installer on terminal connections) 4–20 mA current loop; accuracy is ±2% of span, without user calibration; self-powered or board-powered sensors accepted Dry contact: V open circuit, 300- µA short-circuit current Pulsing dry contact at a rate of up to 20 Hz; 50% duty cycle
Digital outputs	Form A relay contacts suitable for on/off control only; floating control not supported Maximum voltage 30 volts AC or DC, 1/2 A maximum current rating
Analog outputs	0–10 V DC Minimum load supported per output is 2,500 ohms minimum or 4 mA drain maximum

Table 20: FX Workbench Requirements

Processor	Intel® Pentium® 4, 1 GHz or higher 102 mm x 92 mm x 67 mm (4 x 3.625 x 2.625 in.)
Operating System	**32-bit**: Windows® 10 Pro or Enterprise, Windows 8 Pro or Enterprise, Windows 7 Professional, Enterprise, or Ultimate, or Windows XP® Professional **64-bit**: Windows® 10 Pro or Enterprise, Windows 8.1 Pro or Enterprise, Windows 8 Pro or Enterprise, Windows 7 Professional, Enterprise, or Ultimate, Windows Server 2012 Standard or Enterprise with SP2, or Windows Server® 2012 R2 Standard or Enterprise with SP2
Memory	1 GB minimum, 4 GB or more recommended for larger systems
Hard disk	4 GB minimum, more recommended depending on archiving requirements
Network support	Ethernet 10/100 Mbps with RJ-45 connector

Note: The information relating to Processor in this table applies to both the FX Supervisory Software Release 14.x and FX Supervisory Software Release 6.x if using the AX license

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIJANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS WESTENDHOF 3 45143 ESSEN GERMANY	JOHNSON CONTROLS 507 E MICHIGAN ST MILWAUKEE WI 53202 USA

Contact information

Contact your local branch office:
www.johnsoncontrols.com/locations

Contact Johnson Controls:
www.johnsoncontrols.com/contact-us

General Purpose Application Controllers (CG Series)

The CG series general purpose application controllers are well-suited for controlling a wide variety of facility and HVAC equipment, including fan coils, air handling units, packaged HVAC equipment, and central plant equipment. CG series controllers run pre-engineered and user-programmed applications.

CG series controllers include an integral real-time clock, which enables the controllers to monitor and control schedules, calendars, and trends, and operate for extended periods of time as standalone controllers when offline from the Facility Explorer system network. Some models feature an integral color display with a navigation keypad that enables enhanced local monitoring of controlled field equipment.

CGE controllers communicate using the BACnet® Secure Connect (BACnet/SC) or BACnet/IP communication protocols. CGM controllers are switchable to use either the BACnet MS/TP or N2 communications protocol. Equipment controllers in BACnet/SC, BACnet/IP, or BACnet MS/TP communication mode are BACnet network-compliant devices. You can use controllers running in N2 mode to maintain or modernize sites with installed legacy Johnson Controls® controllers.

For product application details, refer to the *Facility Explorer CG, CV Equipment Controllers Product Bulletin (LIT-12013225)*.

Features and benefits

Sleek and modern packaging and styling

Provides a modern, aesthetically pleasing industrial design.

Standard hardware and software platform

Uses a common hardware design throughout the family line to support standardized wiring practices and installation workflows. Also uses a common software design to support use of a single tool for control applications, commissioning, and troubleshooting to minimize technical training.

High memory capacity and fast processing power

Provides application engineers with the horsepower to meet sophisticated control requirements.

Auto-Tuned Control Loops

Proportional Adaptive Control (P-Adaptive) and Pattern Recognition Adaptive Control (PRAC) delivers continuous control loop tuning, which reduces commissioning time, eliminates change-of-season re-commissioning, and reduces wear and tear on actuators.

Standard BACnet protocol

Provides interoperability with other Building Automation System (BAS) products that use the widely accepted BACnet standard.

Models to support BACnet/IP and BACnet/SC communications

Provides higher speed communication with the Controller Configuration Tool (CCT) and improved bandwidth. BACnet/SC is a new protocol that provides a secure method of communication on IP networks. It uses standards widely accepted by the IT community thus eliminating many of the IT concerns.

Models to support wired BACnet MS/TP, ZFR wireless, and N2 with streamlined workflow

CGM controllers can support multiple communication protocols without the need to purchase a special model per protocol and without extra manual setup. If an application configured for N2 communication is loaded on the controller, it automatically communicates through N2. Controllers will otherwise default to MS/TP communication. If a ZFR Pro Wireless Field Bus Router is connected to the controller when the controller is initially powered on, it automatically enters wireless mode.

BACnet Testing Laboratories (BTL) listed and certified as BACnet Advanced Application Controllers (B-AAC)

Ensures openness and interoperability with other BTL-listed devices. BTL is a third-party agency, which validates that BAS vendor products meet the BACnet industry-standard protocol.

BACnet automatic discovery

Supports easy controller integration into a Facility Explorer (FX) BAS.

Device Security

Ensures device integrity while the system is rebooting and during normal operation. Embedded software in the CGE controller provides secure boot operation, firmware protection, secure communications, and secure firmware updates to comply with cyber security best practices.

FIPS 140-2 Level 1 compliance

CGE controllers are FIPS 140-2 Level 1 compliant. FIPS 140-2 is a U.S. government cyber security standard used to approve cryptographic modules and algorithms used for encryption. Assures operators that Facility Explorer uses leading cyber security techniques to help prevent unauthorized access to systems and data.

Wireless ZFR and ZFR Pro support

Wireless ZFR and ZFR Pro support provides a wireless alternative to hard-wired MS/TP networking, offering application flexibility and mobility with minimal disruption to building occupants, and also simplifies and speeds up replacements.

Integral real-time clock

An integral real-time clock, which enables the controllers to monitor and control schedules, calendars, and trends, and operate for extended periods of time as stand-alone controllers when offline from the FX system network.

Pluggable screw terminal blocks

Pluggable input/output wiring terminal blocks that can be removed from the controller provide electrical installers and field technicians the ability to quickly and easily install and service a controller without the need to disconnect and reconnect the input/output wiring.

Rotary switches for controller address/controller number

Easy-to-use rotary switches set the MS/TP address or controller number in for Ethernet controllers decimal format.

Universal Inputs and Configurable Outputs

Allows multiple signal options to provide input/output flexibility.

End-of-Line (EOL) switch in MS/TP equipment controllers

Enables equipment controllers to be terminating devices on the communications bus.

Default State for Input/Output wiring validation

Enables validation of the input and output terminals' wiring without having to download an application file.

Background transfer coupled with enable/disable logic options in Controller Configuration Tool (CCT)

Saves field technicians' time, enables productivity and minimizes equipment disruption, since the controllers are operating while file updates take place in the background and the application can be left disabled until the system is ready to run.

SA Bus device provisioning improvements

Saves field technicians time when commissioning SA Bus devices by enabling an equipment controller to transfer and apply firmware files to all the SA Bus devices (XPM, PCX, NS8000) connected to it.

Models with onboard display and navigation keypad

Provides an intuitive local interface for users to monitor point values and status, view alarms, view trends, override outputs, and adjust setpoints and parameters. The easy-to-use display provides the ability to quickly troubleshoot issues and restore control while being near the associated mechanical equipment.

Local Controller Display and the MAP Gateway Support

Enable monitoring and commanding of I/O and configuration parameters.

CG series model information

Table 1: CG series information including point type counts

Communication protocol	**CGM09090-0/0H and CGM04060-0:** BACnet MS/TP, N2, or Zigbee Wireless (using add-on modules) **CGE09090-0/0H and CGE04060-0:** BACnet/SC or BACnet/IP		
Modular jacks	**CGM09090-0/0H and CGM04060-0:** FC and SA Bus Modular Ports: RJ-12 6-Pin Modular Jacks **CGE09090-0/0H and CGE04060-0:** RJ-12 6-Pin Sensor Port		
Point types	**Signals accepted**	**CGM09090-0/0H CGE09090-0/0H**	**CGM04060-0 CGE04060-0**
Universal Input (UI)	15 VDC Power Source (Provide 100mA total current) Analog Input - Voltage Mode (0–10 VDC) Analog Input - Current Mode (4–20 mA) Analog Input - Resistive Mode (0–600k ohm), RTD (1k Nickel [Johnson Controls sensor], 1k PT, A998 SI), NTC (10k Type L, 2.252k Type 2) Binary Input - Dry Contact Maintained Mode Universal Input Common	7	3
Binary Input (BI)	Binary Input - Dry Contact Maintained Mode Binary Input - Pulse Counter/Accumulator Mode Binary Input Common	2	1
Binary Output (BO)	Binary Output - 24 VAC Triac (External Power Source) Binary Output Common	3	2
Configurable Output (CO)	Analog Output - Voltage Mode (0–10 VDC) Binary Output - 24 VAC Triac Analog Output Signal Common Binary Output Signal Common	4	4
Analog Output (AO)	Analog Output - Voltage Mode (0–10 VDC) Analog Output - Current Mode (4–20 mA) Analog Output Signal Common	2	0
SA Bus	Supports up to 10 total wired SA Bus devices, including the XPM and IOM series expansion I/O modules.		
	Supports up to four NS Series Network Sensors.		
WRZ sensors	Supports up to nine WRZ sensors when using the ZFR or ZFR Pro Series wireless router configuration.		
	Supports up to five WRZ sensors when using the one-to-one WRZ-78xx wireless configuration.		

Note: The models that end in **H** feature a built-in display.

CG series ordering information and accessories

Table 2: CG series ordering information

Product code number	Description
F4-CGM09090-0	18-point General Purpose Application MS/TP Controller Includes: MS/TP and N2 communication; 18 points (7 UI, 2 BI, 4 CO, 2 AO, 3 BO); real-time clock; 24 VAC input
F4-CGM09090-0H	18-point General Purpose Application MS/TP Controller with integral display Includes: MS/TP and N2 communication; 18 points (7 UI, 2 BI, 4 CO, 2 AO, 3 BO); real-time clock; 24 VAC input; Integral 2.4 inch color display and navigation keypad
F4-CGM04060-0	10-point General Purpose Application MS/TP Controller Includes: MS/TP and N2 communication; 10 points (3 UI, 1 BI, 4 CO, 2 BO); real-time clock; 24 VAC input
F4-CGE09090-0	18-point General Purpose Application Ethernet Controller Includes: BACnet/SC and BACnet/IP communication; 18 points (7 UI, 2 BI, 4 CO, 2 AO, 3 BO); real-time clock; 24 VAC input
F4-CGE09090-0H	18-point General Purpose Application Ethernet Controller with integral display Includes: BACnet/SC and BACnet/IP communication; 18 points (7 UI, 2 BI, 4 CO, 2 AO, 3 BO); real-time clock; 24 VAC input; Integral 2.4 inch color display and navigation keypad
F4-CGE04060-0	10-point General Purpose Application Ethernet Controller Includes: BACnet/SC and BACnet/IP communication; 10 points (3 UI, 1 BI, 4 CO, 2 BO); real-time clock; 24 VAC input

Table 3: CG series accessories (order separately)

Product code number	Description
XPM Series Expansion Modules	Refer to the *F4-XPM Expansion Modules Catalog Page (LIT-1901150)* for a complete list of available Expansion Modules.
PCX Series Expansion Modules	Refer to the *FX-PC Series Programmable Controllers and Related Products Product Bulletin (LIT-12011657)* for a complete list of available Expansion Modules.
TL-CCT-0	License enabling Controller Configuration Tool (CCT) software for one user
FX-FCP-0	License enabling Facility Explorer Equipment Controller Firmware Package Files required for CCT
Mobile Access Portal (MAP) Gateway	Refer to the *Mobile Access Portal Gateway Catalog Page (LIT-1900869)* to identify the appropriate product for your region.
FX-DIS1710-0	Legacy Local Controller Display, 3.0 in. (76 mm) monochrome display with navigation keypad
F4-DLK0350-0	Local Controller Display, 3.5 in. (89 mm) color display with navigation keypad
NS-ATV7003-0	Handheld VAV Balancing Tool
NS Series Network Sensors	Refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)* for specific sensor model descriptions.
AS-CBLTSTAT-0	Cable adapter for connection to 8-pin TE-6700 Series sensors
NS-WALLPLATE-0	Network Sensor Wall Plate
WRZ Series Wireless Room Sensors	Refer to the *WRZ Series Wireless Room Sensors Product Bulletin (LIT-12011653)* for specific sensor model descriptions.
WRZ-7860-0	Refer to the *WRZ-7860 Receiver for One-to-One Wireless Room Sensing Product Bulletin (LIT-12011640)* for a list of available products.
WRZ-SST-120	Refer to the *WRZ-SST-120 Wireless Sensing System Tool Installation Instructions (LIT-24-10563-55)* for usage instructions.
ZFR-HPSST-0	Wireless System Survey Tool. For use with the higher power WRG1830/ZFR183x System and lower power WRZ Sensors (10mW). Refer to the *Hi Power Survey Tool Installation Document (Part No.24-11461-00012)* for usage instructions.
WRG1830/ZFR183x Pro Series Wireless Field Bus System	For more information on products needed for wireless field bus installations and for a list of available products, refer to the *WRG1830/FX-ZFR183x Pro Series Wireless Field Bus System Catalog Page (LIT-1901153)*.

Table 3: CG series accessories (order separately)

Product code number	Description
ZFR-USBHA-0	ZFR USB Dongle provides a wireless connection through CCT to allow wireless commissioning of the wirelessly enabled CGM and CVM controllers. It also allows use of the ZFR Checkout Tool (ZCT) in CCT. ⓘ **Note:** The ZFR-USBHA-0 is not compatible with the WRG1830/ZFR183x Pro Series. ⓘ **Note:** The ZFR-USBHA-0 replaces the IA OEM DAUBI_2400 ZFR USB dongle. For additional information about the ZFR-USBHA-0 ZFR dongle, refer to the *ZCT Checkout Tool Help LIT-12012292* or the *WNC1800_ZFR182x Pro Series Wireless Field Bus System Technical Bulletin (LIT-12012356)*.
Y64T15-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 92 VA, Foot Mount, 72.2 cm (30 in.), Primary Leads and 76.2 cm (30 in.) Secondary Leads, Class 2
Y65A13-0	Transformer, 120 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AS), 20.32 cm (8 in.), Primary Leads and 76.2 cm (30 in.) Secondary Leads, Class 2
Y65T31-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AR+), 20.32 cm (8 in.), Primary Leads and Secondary Screw Terminals, Class 2
Y65T42-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Hub Mount (Y65SP+), 20.32 cm (8 in.), Primary Leads and Secondary Screw Terminals, Class 2
MS-FIT100-0	The Field Inspection Tool or (FIT) is a portable handheld device with a user interface that is used to test and troubleshoot the BACnet protocol MS/TP RS-485 communications bus that connects supervisory controllers and equipment controllers to field point interfaces. The FIT can be used to check out the wiring of the MS/TP RS-485 bus as well as verify proper communications of supervisory controllers and equipment controllers connected to the bus. The FIT can be used on both the FC Bus and SA Bus.
TL-BRTRP-0	Portable BACnet/IP to MS/TP Router
ACC-TBKPWFCSA-0	Power, FC Bus, and SA Bus terminal block replacement kit for SNC, CG series, CV series, and XPM products. Kit includes 5 of each terminal block type. 15 terminal blocks in total.
ACC-TBKINOUT-0	Input and Output terminal block replacement kit for SNC, CG series, CV series, and XPM products. Kit includes 5 of each 2, 3, and 4 position Input and Output terminal blocks. 30 terminal blocks in total.

CG series technical specifications

Table 4: Technical specifications for CG series controllers

Specification	Description
Power requirement	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, power supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)
Power consumption	**F4-CGM models:** 14 VA maximum[1] **F4-CGE models:** 15 VA maximum ⓘ **Note:** The USB feature is not currently supported.
Power source	+15 VDC power source terminals provide 100 mA total current. **F4-CGM09090, F4-CGE09090:** Two +15VDC power sources terminal located in Universal IN terminals for active (3-wire) input devices **F4-CGM04060, F4-CGE04060:** One +15VDC power sources terminal located in Universal IN terminals for active (3-wire) input devices
Ambient conditions	**Operating:** 0°C to 50°C (32°F to 122°F); 10 to 90% RH noncondensing **Storage:** -40°C to 80°C (-40°F to 176°F); 5 to 95% RH noncondensing
Communications protocol	**F4-CGM models:** BACnet MS/TP, N2, ZFR Wireless also supported (at FC Bus and for Sensors) with additional hardware. **F4-CGE models:** BACnet/IP or BACnet/SC
Device addressing for BACnet MS/TP	Decimal address set using three rotary switches: valid controller device addresses 4-127
Device addressing for N2	Decimal address set using three rotary switches: valid controller device addresses 1-254
Controller number for Ethernet controllers	Three rotary switches to assign a unique number for each controller to physically identify the controller and relate it to the building drawings; valid controller numbers 0-999
Communications bus	**F4-CGM models** BACnet MS/TP (default); N2 3-wire FC Bus between the supervisory controller and equipment controllers **F4-CGE models** BACnet/IP (default); BACnet/SC Two Ethernet ports; 10/100 Mbps; 8-pin RJ-45 connector **All F4-CG models** 4-wire SA Bus between equipment controller, network sensors and other sensor/actuator devices, includes a lead to source 15 VDC supply power, from equipment controller, to bus devices.
Processor	RX64M Renesas® 32-Bit microcontroller
Memory	16 MB flash memory and 8 MB SDRAM
Real-time clock backup power supply	Super capacitor maintains power to the onboard real-time clock for a minimum of 72 hours when supply power to the controller is disconnected.
Input and Output capabilities	**F4-CGM09090, F4-CGE09090** 7 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohms, or Binary Dry Contact 2 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 4 - Configurable Outputs: Defined as 0-10 VDC or 24 VAC Triac BO 2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA 3 - Binary Outputs: Defined as 24 VAC Triac (external power source only) **F4-CGM04060, F4-CGE04060** 3 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohms, or Binary Dry Contact 1 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 4 - Configurable Outputs: Defined as 0-10 VDC or 24 VAC Triac BO 2 - Binary Outputs: Defined as 24 VAC Triac (external power source only)

Table 4: Technical specifications for CG series controllers

Specification	Description
Universal Input (UI) resolution/ Analog Output (AO) accuracy	**Input:** 24-bit Analog to Digital converter **Output:** +/- 200 mV accuracy in 0–10 VDC applications
Terminations	**Input/Output:** Pluggable Screw Terminal Blocks **FC Bus, SA Bus, and Supply Power:** 4-Wire and 2-Wire Pluggable Screw Terminal Blocks **FC and SA Bus Modular Ports:** RJ-12 6-Pin Modular Jacks ⓘ **Note:** The FC Bus Terminal and FC Bus Port are only available on the CGM models
Mounting	Horizontal on single 35 mm DIN rail mount (recommended), or screw mount on flat surface with three integral mounting clips on controller
Housing	**Enclosure material:** ABS and polycarbonate UL94 5VB; Self-extinguishing Protection Class: IP20 (IEC529)
Dimensions (Height x Width x Depth)	**F4-CGM09090, F4-CGE09090:** 150 mm x 190 mm x 44.5 mm (5-7/8 in. x 7-1/2 in. x 1-3/4 in.) including terminals and mounting clips. **F4-CGM04060, F4-CGE04060:** 150 mm x 152 mm x 44.5 mm (5-7/8 in. x 6 in. x 1-3/4 in.) including terminals and mounting clips ⓘ **Note:** Mounting space requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	**F4-CGM04060,F4-CGE04060:** 0.29 kg (0.64 lb) **F4-CGM09090,F4-CGE09090:** 0.4 kg (0.89 lb) **F4-CGM09090-0H,F4-CGE09090-0H:** 0.47 kg (1.04 lb)
Compliance	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7 CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
CE	**Europe:** Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and RoHS Directive.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) Protocol Revision 18 Listed and Certified BACnet Advanced Application Controller (B-AAC), based on ANSI/ASHRAE 135-2020
UK CA	**United Kingdom:** Johnson Controls declares that this product is in compliance with Electromagnetic Compatibility Regulations, The Electrical Equipment (Safety) Regulations, and Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations.

1 The VA rating does **not** include any power supplied to the peripheral devices connected to Configurable Outputs (COs) or Binary Outputs (BOs), which can consume up to 12 VA for each CO or BO; for a possible total consumption of an additional 84 VA (maximum).

The performance specifications are nominal and conform to acceptable industry standard. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

Repair information

If a controller, network sensor, or any related product fails to operate within its specifications, replace the product. For replacement products, contact the nearest Johnson Controls representative.

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Patents

Patents: https://jcipat.com

Single point of contact

APAC	EU	UK	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS VOLTAWEG 20 6101 XK ECHT THE NETHERLANDS	JOHNSON CONTROLS TYCO PARK GRIMSHAW LANE MANCHESTER M40 2WL UNITED KINGDOM	JOHNSON CONTROLS 5757 N GREEN BAY AVE. GLENDALE, WI 53209 USA

Contact information

Contact your local branch office:
www.johnsoncontrols.com/locations

Contact Johnson Controls:
www.johnsoncontrols.com/contact-us

F4-CGM/XPM Series Standard Control Panel and Subpanel Assemblies Catalog Page

Description

The General Purpose Application MS/TP Controller (CGM) and Expansion Module (XPM) control panel is a prewired, preassembled standard control panel that contains a Facility Explorer® F4-CGM Series controller. Some models also include a F4-XPM Module. This predesigned solution saves time and money, avoiding expensive and time-consuming field installations. In addition, you can tailor the assembly to a variety of common applications for additional savings.

The control panel ships complete, mounted in either a NEMA 1 or NEMA 3R steel enclosure. In addition to the controllers, every assembly contains a power supply that incorporates a 5 A circuit breaker, a 96 VA 120/24 VAC transformer, and two 120 VAC outlets. Some models include an optional second 96 VA 120/24 VAC transformer. The F4-CGM/XPM Standard Control Panel Assembly also includes a five- or ten-point 24 VAC distribution terminal block that allows for termination of additional field mounted devices. All models have a F4-CGM09090 or F4-CGM04060 controller, which communicates through BACnet® MS/TP or wireless Zigbee® networks and integrates with Johnson Controls® and third-party systems. Designated models also include a XPM Module, an F4-DLK0350-0 remote mount display, or terminal blocks. Some models offer additional space in the panel to mount relays, transducers or other approved ancillary devices.

Subpanel assemblies are the complete internal portion of the panel without the enclosure. The subpanel assembly contains all of the same components as a comparable standard panel but it consists of only the perforated subpanel with all components already mounted. This is recommended if it is critical to preserve the panel mounting location in the designated installation area that uses an empty enclosure and add the subpanel later.

Features

- Consistent layout for all standard control panel solutions simplifies installation and commissioning
- Power supply with resettable circuit breaker and transformer provides high- and low-voltage protection
- Space and DIN rail reserved for future component additions enables easy field upgrades to the panel
- Prebuilt, pre-wired, and pretested in an ISO-9001-2015 manufacturing facility that provides products of consistently high quality
- UL 508A rated control panel and UL 50 approved enclosure meets local and national code requirements for the United States and Canada, cULus listed.
- California Office of Statewide Health Planning and Development (OSHPD) Special Seismic Certification Preapproved control panel assembly meets the standards for rigid and flexible mounting conditions to account for unit-mounted and remote-mounted application

  ⓘ **Note:** Subpanels are not available with seismic certification.

Johnson Controls

- Controller with color-coded and clearly labeled screw terminals provides easily identifiable input/output points at the control

Repair information

If the F4-CGM/XPM Standard Control Panel Assembly fails to operate within its specifications, replace the unit. For a replacement assembly, contact the nearest Johnson Controls representative.

Components included

Table 1: Components included

Quantity	Description
1	Metal enclosure, NEMA 1 or NEMA 3R
1	F4-CGM09090-0, F4-CGM04060-0 programmable controller
1	F4-XPM04060-0, F4-XPM09090-0, F4-XPM18000-0 expansion I/O module if applicable
1	F4-DLK0350-0 remote mount display, if applicable
1	96 VA 120/24 VAC power supply with 5 A primary circuit protection and two 120 VAC outlets, standard on all panels
1	96 VA 120/24 VAC transformer with secondary protection
1	Five or ten-point 24 VAC distribution terminal block ⓘ **Note:** All panels with a single power supply are provided with a five-point terminal block. Panels with an additional transformer are provided with a ten-point terminal block.

Selection charts

Table 2: Panels — 20 in. x 16 in. x 6.5 in. enclosure - NEMA 1 (dimensions in H x W x D)

Product code number	Description
P2AAN-BD001N01	Control panel, 20 in. x 16 in. x 6.5 in. (508 mm x 406 mm x 165 mm) enclosure, F4-CGM04060-0 General Purpose Controller, 120/24 VAC power supply
P2AAN-BB001N00	Control panel, 20 in. x 16 in. x 6.5 in. (508 mm x 406 mm x 165 mm) enclosure, F4-CGM09090-0 General Purpose Controller, 120/24 VAC power supply

Table 3: Panels – 20 in. x 16 in. 6.5 in. enclosure – NEMA 1 (dimensions in H x W x D) with remote door-mounted display

Product code number	Description
P2AAY-BD001N01	Control panel, 20 in. x 16 in. x 6.5 in. (508 mm x 406 mm x 165 mm) Enclosure, F4-CGM04060-0 General Purpose Controller, 120/ 24 VAC power supply and remote door-mounted display
P2AAY-BB001N00	Control panel, 20 in. x 16 in. x 6.5 in. (508 mm x 406 mm x 165 mm) Enclosure, F4-CGM09090-0 General Purpose Controller, 120/ 24 VAC power supply and remote door-mounted display

Table 4: Panels – 20 in. x 16 in. 6.5 in. enclosure – NEMA 1 (dimensions in H x W x D) with integral display controller

Product code number	Description
P2AAN-BF001N00	Control panel, 20 in. x 16 in. x 6.5 in. (508 mm x 406 mm x 165 mm) enclosure, F4-CGM09090-0H General Purpose Controller with Integral Display, 120/24 VAC power supply

Table 5: Panels – 24 in. x 20 in. 6.5 in. enclosure – NEMA 1 (dimensions in H x W x D)

Product code number	Description
P2BAN-BD001N01	Control panel, 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 165 mm) enclosure, F4-CGM04060-0 General Purpose Controller, 120/24 VAC power supply
P2BAN-BB001N00	Control panel, 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 165 mm) enclosure, F4-CGM09090-0 General Purpose Controller, 120/24 VAC power supply
P2BAN-BB002N00	Control panel, 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 165 mm) enclosure, F4-CGM09090-0 General Purpose Controller, 120/24 VAC power supply with additional 96 VA transformer
P2BAN-BDHE1N01	Control Panel, 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 165 mm) enclosure, F4-CGM04060-0 and F4-XPM04060-0 General Purpose Controller and expansion module, 120/24 VAC power supply
P2BAN-BBHE1N01	Control panel, 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 165 mm) enclosure, F4-CGM09090-0 and F4-XPM04060-0 General Purpose Controller and expansion module
P2BAN-BBHF2N01	Control panel, 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 165 mm) enclosure, F4-CGM09090-0 and F4-XPM09090-0 General Purpose Controller and expansion module, 120/24 VAC power supply with additional 96 VA transformer
P2BAN-BBHG1N01	Control panel, 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 165 mm) enclosure, F4-CGM09090-0 and F4-XPM18000-0 General Purpose Controller and expansion module, 120/24 VAC power supply

Table 6: Panels – 24 in. x 20 in. x 6.5 in. enclosure – NEMA 1 (dimensions in H x W x D) with remote door-mounted display

Product Code Number	Description
P2BAY-BB001N00	Control panel, 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 165 mm) enclosure, F4-CGM09090-0 General Purpose Controller, 120/24 VAC power supply and remote door-mounted display

Table 7: Panels – 24 in. x 20 in. x 6.5 in. enclosure – NEMA 1 (dimensions in H x W x D) with integral display controller

Product Code Number	Description
P2BAN-BF001N00	Control panel, 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 165 mm) enclosure, F4-CGM09090-0H General Purpose Controller with integral display, 120/24 VAC power supply
P2BAN-BFHE1N01	Control panel, 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 165 mm) enclosure, F4-CGM09090-0H and F4-XPM04060-0 General Purpose Controller with integral display, 120/24 VAC power supply
P2BAN-BFHF2N01	Control panel, 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 165 mm) enclosure, F4-CGM09090-0H and F4-XPM09090-0 General Purpose Controller with integral display, 120/24 VAC power supply with additional 96VA transformer
P2BAN-BFHG1N01	Control panel, 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 165 mm) enclosure, F4-CGM09090-0H and F4-XPM18000-0 General Purpose Controller with integral display, 120/24 VAC power supply

Table 8: Panels – 24 in. x 24 in. x 6.5 in. enclosure – NEMA 1 (dimensions in H x W x D)

Product Code Number	Description
P2CAN-BD001Y01	Control panel, 24 in. x 24 in. x 6.5 in. (610 mm x 610 mm x 165 mm) enclosure, F4-CGM04060-0 General Purpose Controller, 120/24 VAC power supply with terminal block
P2CAN-BB001Y00	Control panel, 24 in. x 24 in. x 6.5 in. (610 mm x 610 mm x 165 mm) enclosure, F4-CGM09090-0 General Purpose Controller, 120/24 VAC power supply with terminal block

Table 9: Panels – 36 in. x 24 in. x 6.5 in. enclosure – NEMA 1 (dimensions in H x W x D)

Product code number	Description
P2DAN-BD002N01	Control panel, 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 165 mm) enclosure, F4-CGM04060-0 General Purpose Controller, 120/24 VAC power supply and 96 VA transformer
P2DAN-BDHE2N01	Control panel, 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 165 mm) enclosure, F4-CGM04060-0 and F4-XPM04060-0 General Purpose Controller and expansion module, 120/24 VAC power supply and 96 VA transformer
P2DAN-BDHE2Y01	Control panel, 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 165 mm) enclosure, F4-CGM04060-0 and F4-XPM04060-0 General Purpose Controller and expansion module, 120/24 VAC power supply and 96 VA transformer with terminal block
P2DAN-BB001N00	Control panel, 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 165 mm) enclosure, F4-CGM09090-0 General Purpose Controller, 120/24 VAC power supply
P2DAN-BB001Y00	Control panel, 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 165 mm) enclosure, F4-CGM09090-0 General Purpose Controller, 120/24 VAC power supply with terminal block
P2DAN-BBHF2N01	Control panel, 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 165 mm) enclosure, F4-CGM09090-0 and F4-XPM09090-0 General Purpose Controller and expansion module, 120/24 VAC power supply and 96 VA transformer

Table 9: Panels – 36 in. x 24 in. x 6.5 in. enclosure – NEMA 1 (dimensions in H x W x D)

Product code number	Description
P2DAN-BBHF2Y01	Control panel, 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 165 mm) enclosure, F4-CGM09090-0, F4-XPM09090-0 General Purpose Controller and expansion module, 120/24 VAC power supply, 96 VA transformer, and terminal block
P2DAN-BBHH2N01	Control panel, 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 165 mm) enclosure, F4-CGM09090-0, F4-XPM04060-0 and F4-XPM09090-0 General Purpose Controller and expansion modules , 120/24 VAC power supply and 96 VA transformer

Table 10: Panels – 36 in. x 24 in. x 6.5 in. enclosure – NEMA 1 (dimensions in H x W x D) with remote door-mounted display

Product code number	Description
P2DAY-BB001N00	Control panel, 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 165 mm) enclosure, F4-CGM09090-0 General Purpose Controller, 120/ 24 VAC power supply with remote door-mounted display
P2DAY-BBHF2N01	Control panel, 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 165 mm) enclosure, F4-CGM09090-0 and F4-XPM09090-0 General Purpose Controller and expansion module, 120/ 24 VAC power supply, 96 VA transformer and remote door-mounted display

Table 11: Panels – 36 in. x 24 in. x 6.5 in. enclosure – NEMA 1 (dimensions in H x W x D) with integral display controller

Product code number	Description
P2DAN-BF001N00	Control panel, 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 165 mm) enclosure, F4-CGM09090-0H General Purpose Controller with integral display, 120/24 VAC power supply
P2DAN-BFHF2N01	Control panel, 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 165 mm) enclosure, F4-CGM09090-0H and F4-XPM09090-0 General Purpose Controller with integral display, 120/24 VAC power supply with additional 96VA transformer

Table 12: Panels – 24 in. x 20 in. x 8 in. enclosure – NEMA 3R (dimensions in H x W x D)

Product code number	Description
P2BCN-BBHF2N01	Control panel, 24 in. x 20 in. x 8 in. (610 mm x 508 mm x 203 mm) NEMA 3R enclosure, F4-CGM09090-0 and F4-XPM09090-0 General Purpose Controller and expansion module, 120/ 24 VAC power supply and 96 VA transformer

Table 13: Panels – 36 in. x 24 in. x 8 in. enclosure – NEMA 3R (dimensions in H x W x D)

Product code number	Description
P2DCN-BBHF2N01	Control panel, 36 in. x 24 in. x 8 in. (914 mm x 610 mm x 203 mm) NEMA 3R enclosure, F4-CGM09090-0 and F4-XPM09090-0 General Purpose Controller and expansion module, 120/ 24 VAC power supply and 96 VA Transformer

Table 14: Subpanels — 20 in. x 16 in. enclosure (dimensions in H x W)

Product code number	Description
S2A0N-BB001N00	Subpanel, 20 in. x 16 in. (508 mm x 406 mm), F4-CGM09090-0 General Purpose Controller, 120/24 VAC power supply
S2A0Y-BB001N00	Subpanel, 20 in. x 16 in. (508 mm x 406 mm), F4-CGM09090-0 General Purpose Controller, 120/24 VAC power supply, with door-mounted remote display

Table 15: Subpanels — 24 in. x 20 in. enclosure (dimensions in H x W)

Product code number	Description
S2B0N-BBHE1N01	Subpanel, 24 in. x 20 in. (610 mm x 508 mm), F4-CGM09090-0 and F4-XPM04060-0 General Purpose Controller and expansion module, 120/ 24 VAC power supply
S2B0N-BBHF2N01	Subpanel, 24 in. x 20 in. (610 mm x 508 mm), F4-CGM09090-0 and F4-XPM09090-0 General Purpose Controller and expansion module, 120/ 24 VAC power supply with additional 96 VA transformer
S2B0N-BB001N00	Subpanel, 24 in. x 20 in. (610 mm x 508 mm), F4-CGM09090-0 General Purpose Controller, 120/24 VAC power supply

Table 16: Subpanels — 24 in. x 24 in. enclosure (dimensions in H x W)

Product code number	Description
S2C0N-BB001Y00	Subpanel, 24 in. x 24 in. (610 mm x 610 mm), F4-CGM09090-0 General Purpose Controller, 120/24 VAC power supply, with terminal block

Table 17: Subpanels — 36 in. x 24 in. enclosure (dimensions in H x W)

Product code number	Description
S2D0N-BBHF2N01	Subpanel, 36 in. x 24 in. (914 mm x 610 mm), F4-CGM09090-0 and F4-XPM09090-0 General Purpose Controller and expansion module, 120/ 24 VAC power supply and 96 VA transformer
S2D0N-BB001N00	Subpanel, 36 in. x 24 in. (914 mm x 610 mm), F4-CGM09090-0 General Purpose Controller, 120/24 VAC power supply

Technical specifications

Table 18: Technical specifications

Specification	Description
Terminals	Controller mounted removable screw termination
Wire size	• Ground wire: 14 AWG • Transformer wires: 16 AWG
Enclosure rating	NEMA 1 or NEMA 3R
Enclosure finish	ANSI 61 gray polyester powder coating for the perforated panel and enclosure.
Ambient operating condition	• 32°F to 122°F (0°C to 50°C) • 10% to 90% RH
Dimensions (height x width x depth)	• 20 in. x 16 in. x 6.5 in. (508 mm x 406 mm x 168 mm) • 24 in. x 20 in. x 6.5 in. (610 mm x 508 mm x 168 mm) • 24 in. x 24 in. x 6.5 in. (610 mm x 610 mm x 168 mm) • 36 in. x 24 in. x 6.5 in. (914 mm x 610 mm x 168 mm) • NEMA 3R: 24 in. x 20 in. x 8 in. (610 mm x 508 mm x 203.2 mm) • NEMA 3R: 36 in. x 24 in. x 8 in. (914 mm x 610 mm x 203.2 mm)
Ambient storage conditions	• -40°F to 176°F (-40°C to 80°C) • 5% RH to 95% RH
Agency compliance	• Control Panel: UL 508A Rated (cULus listed); Enclosure UL 50 Rated, cUL-CAN/CSA C22.2 No. 14-05 • HCAI Special Seismic Certification Pre-approval: OSP-0140-10 ⓘ **Note:** Subpanels are not available with seismic certification. • California Building Code (CBC) - 2019, International Building Code (IBC) - 2021 • Seismic Performance Characteristics: $S_{DS}(g) = 2.26$, $z/h = 1.0$, $I_p = 1.5$

Patents

Patents: https://jcipat.com

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Single point of contact

APAC	EU	UK	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS VOLTAWEG 20 6101 XK ECHT THE NETHERLANDS	JOHNSON CONTROLS TYCO PARK GRIMSHAW LANE MANCHESTER M40 2WL UNITED KINGDOM	JOHNSON CONTROLS 5757 N GREEN BAY AVE. GLENDALE, WI 53209 USA

Contact information

Contact your local Johnson Controls representative:
www.johnsoncontrols.com/locations

Contact Johnson Controls:
www.johnsoncontrols.com/contact-us

Description

Figure 1: A70GA-1 Temperature Control

The A70 Series temperature control is a temperature control that incorporates a vapor-charged sensing element. The A70G, A70H, and A70K have a four-wire, two-circuit contact block that contains two isolated sets of contacts.

When the main contact opens, the auxiliary contact closes.

Refer to the *A70, A72 Series Temperature Controls for Refrigeration and Heating Product Bulletin (LIT-125155)* for important product application information.

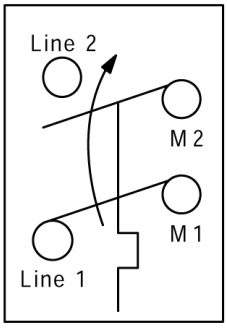
Features

- Long-life snap-acting contacts
- Automatic or manual reset models

Applications

A standard application is to energize an indicator light after a low temperature cutout on a ventilation system.

Figure 2: Action on a temperature increase



Selection charts

Note:

- For models that have a set and sealed cutout stop, you cannot lower the temperature cutout stop. The control only responds to the lowest temperature along any 14 in. to 16 in. section of the entire 20 ft element.
- All models feature a screwdriver slot range adjuster.
- If a model does not include a mounting bracket, use the following brackets:
  - Standard mounting to a vertical surface: Part Number 271-350.
  - Mounting to a horizontal surface with an L bracket: Part Number 271-51.

Table 1: A70 temperature control selection chart

Product code number	Switch action		Range °F (°C)	Differential °F (°C)	Bulb and capillary	Maximum bulb temperature °F (°C)	Includes a mounting bracket
	Main contacts	Auxiliary contacts					
A70GA-1C **Note:** The low cutout stop is set and sealed at 35°F (1.6°C).	Open low	Close low	15 to 55 (-9.4 to 12.8)	5 (2.8), fixed	20 ft (6 m) of 1/8 in. (3.2 mm) O.D. tubing	400 (204.4)	No
A70GA-2C			35 to 80 (1.7 to 26.7)	3 to 30 (-16.1 to -1.1), adjustable	Capillary: 6 ft x 0.093 in. (1.8 m x 2.36 mm) Bulb: 3/8 in. x 3 in (9.50 mm x 76.20 mm)	130 (54.4)	No
A70HA-1C **Note:** The low cutout stop is set and sealed at 35°F (1.6°C).			15 to 55 (-9.4 to 12.8)	5 (2.8), manual reset	20 ft (6 m) of 1/8 in. (3.2 mm) O.D. tubing	400 (204.4)	Yes
A70HA-2C			35 to 80 (1.7 to 26.7)	6 (3.3), manual reset	Capillary: 6 ft x 0.093 in. (1.8 m x 2.36 mm) Bulb: 3/8 in. x 3 in (9.50 mm x 76.20 mm)	130 (54.4)	No
A70HA-14C			15 to 55 (-9.4 to 12.8)	5 (2.8), manual reset	20 ft (6 m) of 1/8 in. (3.2 mm) O.D. tubing	400 (204.4)	Yes
A70HA-16C					40 ft (12 m) of 1/8 in. (3.2 mm) O.D. tubing		Yes
A70KA-1C	Open high	Close high	100 to 170 (37.8 to 76.7)	8 (4.4), manual reset	Capillary: 6 ft x 1/8 in. (1.8 m x 6.35 mm) Bulb: 3/8 in. x 10 in (9.50 mm x 254.00 mm)	240 (116)	No

Table 2: Replacement covers

Product code number	Description
CVR17A-620R	Automatic reset cover
CVR17A-621R	Manual reset cover

Electrical ratings

ⓘ **Note:** 480 VAC and 600 VAC motor ratings are not compressor motor loads.

Table 3: A70GA, A70HA, A70KA electrical ratings

Pole number	LINE-M2 (Main)						LINE-M1 (Auxiliary)			
Motor ratings, VAC	**120**	**208**	**240**	**277**	**480**	**600**	**120**	**208**	**240**	**277**
AC full load, A	16.0	9.2	8.0	—	5.0	4.8	6.0	3.4	3.0	—
AC locked rotor, A	96.0	55.2	48.0	—	30.0	28.8	36.0	20.4	18.0	—
AC non-inductive, A	16.0	9.2	8.0	7.2	—	—	6.0	6.0	6.0	6.0
Pilot duty for both poles	125 VA, 120 VAC to 600 VAC and 57.5 VA, 120 VDC to 300 VDC									

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Single point of contact

APAC	EU	UK	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS VOLTAWEG 20 6101 XK ECHT THE NETHERLANDS	JOHNSON CONTROLS TYCO PARK GRIMSHAW LANE MANCHESTER M40 2WL UNITED KINGDOM	JOHNSON CONTROLS 5757 N GREEN BAY AVE. GLENDALE, WI 53209 USA

Contact information

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Johnson Controls

Cleveland Controls
Division of UniControl Inc.

Model AFS–460

Air Pressure Sensing Switch with Manual Reset Feature

Application

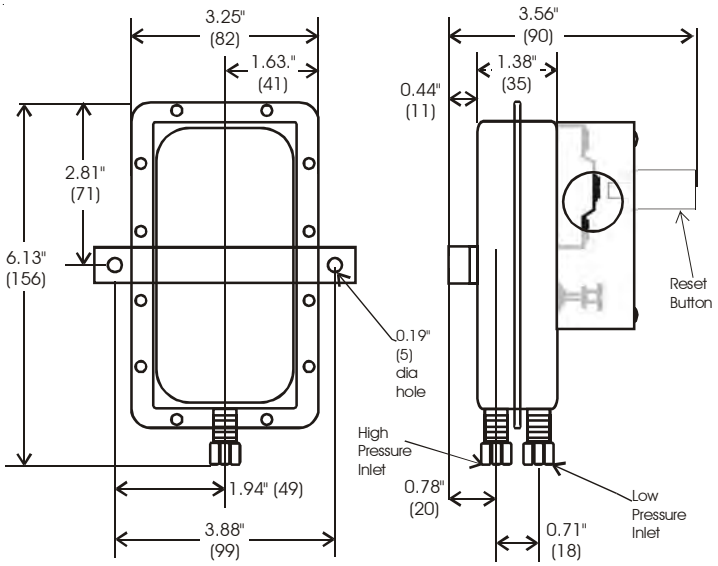
The **Model AFS-460** is a general purpose proving switch designed to require manual operator reset following actuation. It can be used to sense positive, negative, or differential air pressure in HVAC and Energy Management applications which require operator interface.

General Description & Operation

The plated housing contains a diaphragm, a calibration spring and a snap-acting SPST–NC switch with manual reset button.

The sample connections located on each side of the diaphragm accept 0.25" OD metallic tubing via the integral compression ferrule and nut.

An enclosure cover protects the operator from accidental contact with the live switch terminal screws and the set point adjusting screw. The enclosure cover accepts a 0.5" conduit connection.



Dimensions in Inches (Millimeters)

Mounting (see Figure 1)

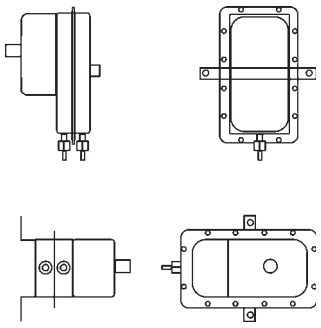
Select a mounting location which is free from vibration. The **AFS-460** must be mounted with the diaphragm in any vertical plane in order to obtain the lowest specified operating set point. Avoid mounting with the sample line connections in the "up" position. Surface mount via the two 3⁄16" diameter holes in the integral mounting bracket. The mounting holes are 3–7⁄8" apart.

Air Sampling Connection (see Figure 2)

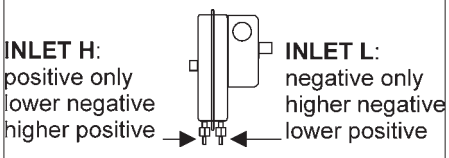
The **AFS-460** is designed to accept firm-wall sample lines of ¼" OD tubing by means of ferrule and nut compression connections. An optional ¼" adapter, suitable for slip-on flexible tubing is available: order part number 18311. For sample lines of up to 10 feet, ¼" OD tubing is acceptable. For lines up to 20 feet, use ¼" ID tubing.

For lines up to 60 feet, use ½" ID tubing. Locate the sampling probe a minimum of 1.5 duct diameters downstream from the air source. Install the sampling probe as close to the center of the airstream as possible. Refer to Figure 2 to identify the high pressure inlet (H) and the low pressure inlet (L). Select one of the five application options listed on page 2, and connect the sample lines as recommended.

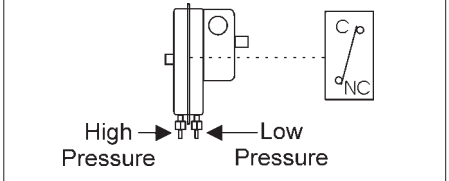
(Figure 1)



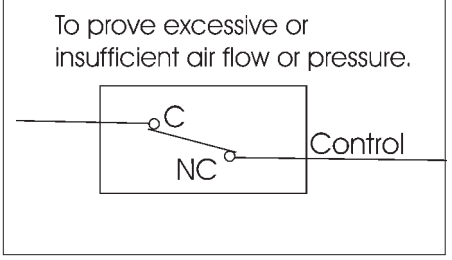
(Figure 2)



(Figure 3)



(Figure 4)



POSITIVE PRESSURE ONLY: Connect the sample line to inlet H; inlet L remains open to the atmosphere.

NEGATIVE PRESSURE ONLY: Connect the sample line to inlet L; inlet H remains open to the atmosphere.

TWO NEGATIVE SAMPLES: Connect the higher negative sample to inlet L. Connect the lower negative sample to inlet H.

TWO POSITIVE SAMPLES: Connect the higher positive sample to inlet H. Connect the lower positive sample to inlet L.

ONE POSITIVE AND ONE NEGATIVE SAMPLE: Connect the positive sample to inlet H. Connect the negative sample to inlet L.

Electrical Connections (see Figure 3)

Before pressure is applied to the diaphragm, the switch contacts will be in the normally closed (NC) position.

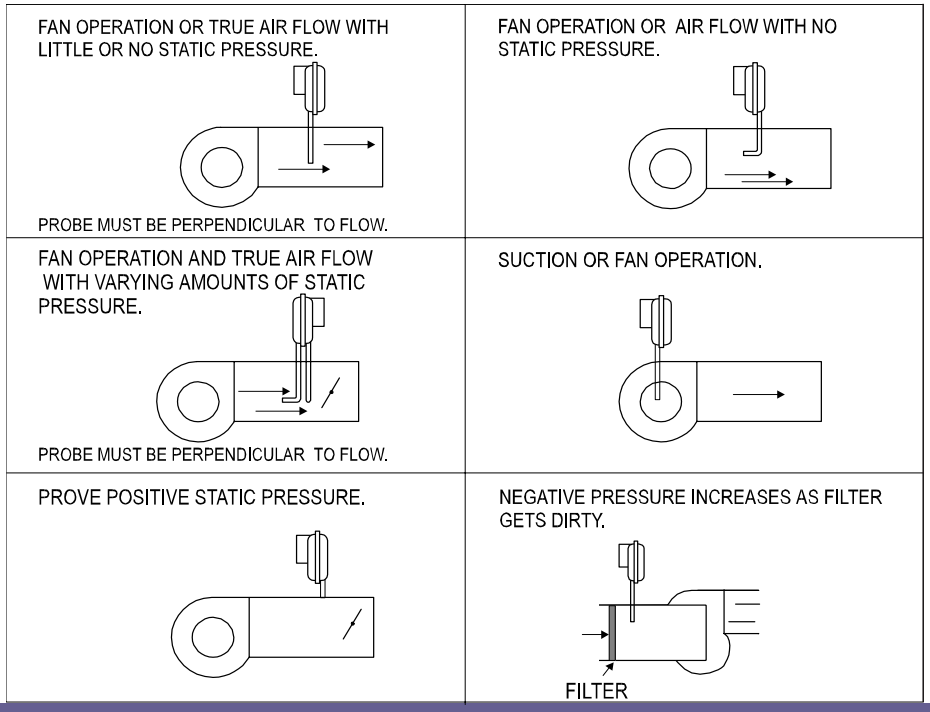
The snap switch has screw top terminals with cup washers. Wire alarm and control applications as shown in **Figure 4**.

Field Adjustment

The adjustment range of an **AFS-460** Air Switch is 0.4" ± 0.02" w.c. to 12.0" w.c. To adjust the set point, turn the adjusting screw counterclockwise until motion has stopped. Next, turn the adjusting screw four complete turns in a clockwise direction to engage the spring. From this point, the next ten turns will be used for the actual calibration. **Each full turn represents approximately 1.16" w.c.**

Please note: To properly calibrate an air switch, a digital manometer or other measuring device should be used to confirm the actual set point.

Location of Sample Lines for Typical Applications



Specifications

Model AFS-460 Air Pressure Sensing Switch with Manual Reset Feature

Sample Media: Air.
Mounting Position (in order to meet lowest operating specifications): Diaphragm in any vertical plane.
Field Adjustable Range: 0.40 ± 0.06"w.c. to 12.0"w.c.
Switch Differential: Progressive, increasing from approximately 0.06± 0.01"w.c. at minimum set point, to approximately 0.8"w.c. at maximum set point.
Maximum Pressure: 0.5 psi (0.03 bar)
Operating Temperature Range: -40 to 180F (-40.0 to 82.2C)
Life: Exceeds UL-recognized mechanical endurance test of 6,000 cycles minimum at 0.5 psi maximum pressure each cycle and at maximum electrical load.
Electrical Rating: @ 60 Hz.
15 amp 125, 250, or 277 VAC
¼ hp 125 V AC, ½Hp 250 VAC,
½ amp 125 V DC,
¼ amp 250 V DC .
Contact Arrangement: SPST–NC (manual reset).
Electrical Connections: Screw top terminals with cup washers.
Sample Line Connections: Ferrule and nut compression type connectors will accept 0.25" OD rigid tubing.
Shipping Weight: 1.2 lbs.
Approval and Recognition: UL, CSA, CE.

Accessories

- P/N 18311 Slip-on ¼" OD Tubing Adapter, suitable for slipping on flexible plastic tubing.
- Sample line probes.
- Orifice plugs (pulsation dampeners).

Pressure Conversion Table

1" H_2O =0.0361 lbs./sq. in. or 0.0736 in. mercury
1" Hg. = 0.491 lbs./sq. in. or 13.6 in. water
1 psi = 27.7 in. water or 2.036 in. Hg.

Cleveland Controls
DIVISION OF UNICONTROL INC.
1111 Brookpark Rd
Cleveland OH 44109

Tel: **216-398-0330**
Fax: **216-398-8558**
Email:**saleshvac@unicontrolinc.com**
Web page: **http://www.clevelandcontrols.com**

AD-1272 Thermal Dispersion Probe Airflow Measuring System Catalog Page

Description

AD-1272 Advanced Thermal Dispersion Airflow and Temperature Measuring System sets a new standard for thermal dispersion airflow and temperature measuring products. The system supports air flow measurements up to 128 sensing points. The AD-1272 provides the most sensing points in the industry.

The AD-1272 Thermal Dispersion Airflow and Temperature Measuring System is capable of measuring a velocity range from 0 fpm to 5,000 fpm (0 mpm to 1,523 mpm) and displays the average flow and temperature at the installation location. The AD-1272 is intended for commercial airflow measurement in any outside, return, exhaust, or supply air application.

Each surface-mount thermistor pair provides a measurement for both velocity and temperature and is protected from the elements by a conformal coating.

A number of sensing points on one or more probes establish a measurement array across the area of the duct or plenum to provide an averaged airflow and temperature output.

Probe-sensing elements are factory tested and calibrated, at 20 points, to obtain the highest accuracy over the entire range of airflows.

Refer to the *AD-1272 Thermal Dispersion Probe Airflow Measuring System Product Bulletin (LIT-12012550)* for important product application information.

Features

- BACnet® and analog output standard—multiple methods to interface with building automation systems.
- Cutting-edge technology—has the lowest power consumption of any commercially available thermal dispersion device.
- Display with surface membrane buttons—provides tool-free setup and configuration.
- Standard communication cabling—does not require the use of proprietary cables.
- Airfoil shaped anodized aluminum sensing probes—lower pressure drop and greater resistance to oxidation.
- Up to 128 sensing points—provides accurate air flow measurements even in non-linear air flow.
- Remote display options—wireless or remote displays with cfm and temperature read-outs on easy to use

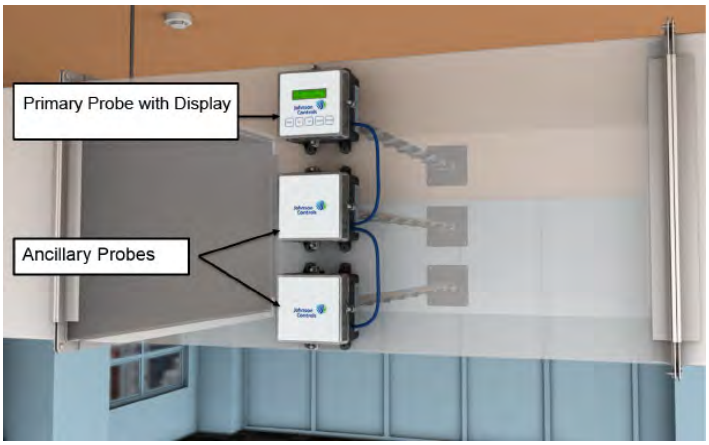
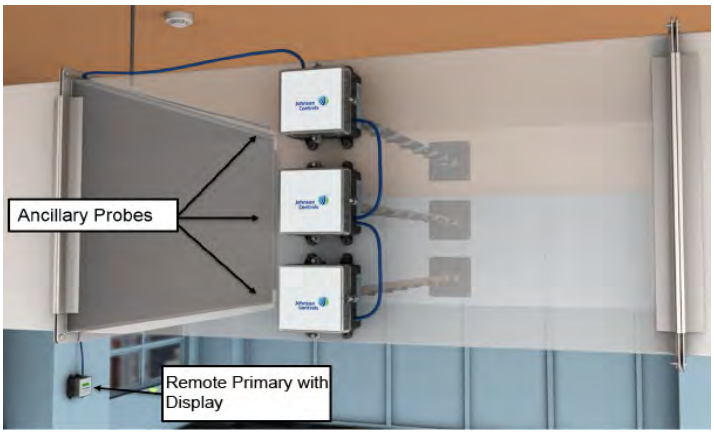
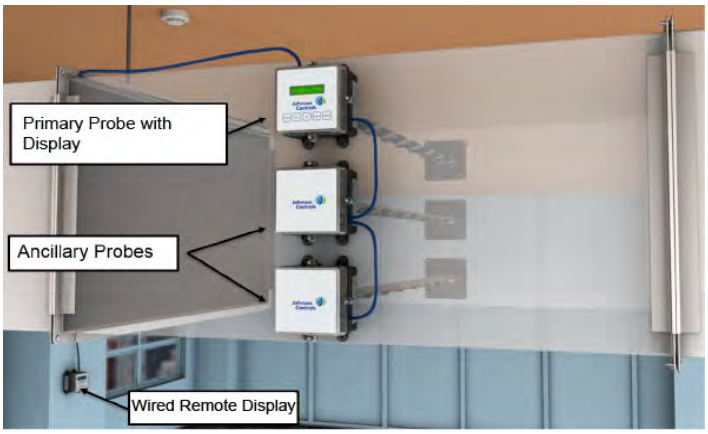
Figure 1: AD-1272 Thermal Dispersion Probe Airflow Measuring System

Repair information

If the AD-1272 Thermal Dispersion Probe Airflow Measuring System fails to operate within its specifications contact the nearest Johnson Controls® representative.

AD-1272 Thermal Dispersion Probe Airflow Measuring System Catalog Page

Table 1: Display options chart

Options	Displays
Primary probe with display, no remote display (order code A)	
Remote primary with display, all probes are ancillary probes (order code C)	
Primary probe with display that includes wired remote display (order code R)	

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AD-1272 Thermal Dispersion Probe Airflow Measuring System Catalog Page

Table 1: Display options chart

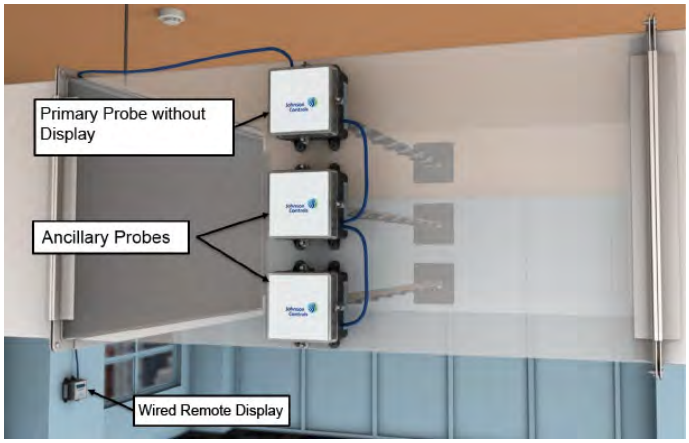
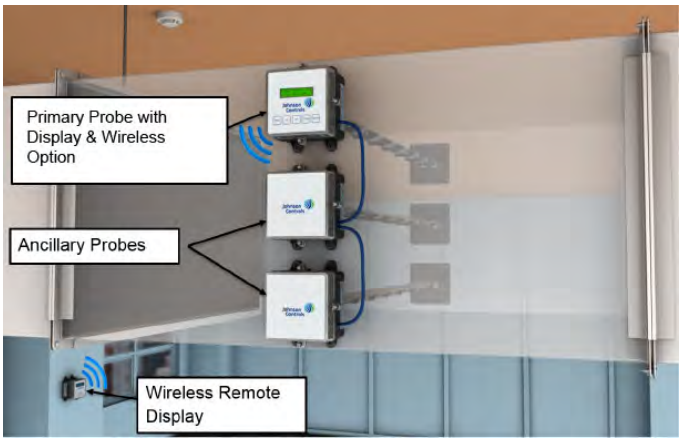
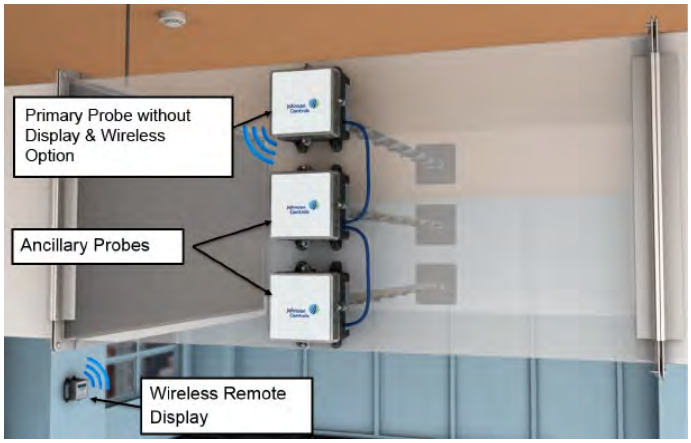
Options	Displays
Primary probe without display that includes wired remote display (order code S)	
Primary probe with display that includes wireless remote display (order code W)	
Primary probe without display that includes wireless remote display (order code Y)	

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Table 2: Selection chart

	Code number/character	Field														
		1	2	3	4	5	6	7	8	9	10	11	12	13	*14*	*15*
Application	**A** = Air Measuring Station	**A**	**N**	**S**	**S**	**A**	**-**	**W**	**W**	**W**	**X**	**h**	**h**	**h**	**-**	**-**
Duct type	**N** = Rectangular															
	R = Round															
	x[1]= Oval (Ruskin01 required)															
Sensor placement	**S** = Standard equal area distribution															
	T = Log-Tchebycheff rule arrangement (Ruskin01 required)															
Mounting options	**S** = Insertion mount with stainless steel mounting hardware															
	T = Standoff mount with stainless steel mounting hardware															
	A = Standoff mount with aluminum hardware (not available or valid with round or oval duct)															
UI options (Pgs 2&3)	**A** = Primary probe with display, no remote display															
	C = Remote primary with display, all probes are ancillary probes															
	R = Primary probe with display that includes wired remote display															
	S = Primary probe without display that includes wired remote display															
	W = Primary probe with display that includes wireless remote display															
	Y = Primary probe without display that includes wireless remote display															
	N[2] = Primary probe without display, UI not included. See Note 2.															
Length dimensions	8 in. to 120 in. (one inch increments)															
Height dimensions	8 in. to 120 in. (one inch increments)															
Options, up to 2	**G** = Cord grip (2) dust tight, waterproof cord entry and exit for installed probe enclosure															
	N = NEMA 4 weather resistant enclosure															
	T = 24 VAC 40 VA transformer															

1. Option is only available through a Ruskin01 special quote at this time.

Option N does not include a UI. Field configuration and adjustments are not possible without a UI.

Table 3: Replacement parts

Code number	Description
DMPR-EAF-001	UI, wired remote display
DMPR-EAF-002	Wireless cards for the remote display and primary probe, required for conversion of wired remote display to wireless
DMPR-EAF-003	One set of NEMA 4 hole plugs for pre-drilled holes in the enclosure, 6 in each set
DMPR-EAF-004	Cord grip and locking nut, dust tight, waterproof cord entry and exit for probe enclosure when installed
DMPR-EAF-005	One set of NEMA 1 nylon dust plugs for knockouts, 6 in each set
DMPR-EAF-006	Replacement captive screw assembly for the lid
DMPR-EAF-007	500 ft roll power/communication cable
DMPR-EAF-008	JCI remote wired primary

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AD-1272 Thermal Dispersion Probe Airflow Measuring System Catalog Page

Table 4: AD-1272 Thermal Dispersion Probe Airflow Measuring System technical specifications

Specification	Description
Probe material	2 in. x 0.75 in. (51 mm x 19 mm) 6063T6 high-yield extruding aluminum with acid-etch, clear anodized finish
Communication bus	2-wire RS-485, BACnet MS/TP 2-wire, RS-485 proprietary bus between the primary transmitter, ancillary probes, and remote display
Thermistor	Thermistor pair in flexible polymide membrane sensor
Size range	8 in. x 8 in. to 120 in. x 120 in. (20 cm x 20 cm to 305 cm x 305 cm)
Brackets	0.080 stainless steel
Sensor accuracy	Airflow: ±2% of reading and ±0.25% repeatability
Repeatability	±0.25%
Measurement units	Imperial (I.P.) or International System of Units (S.I.)
Sensor distribution	Equal area
Calibrated range	0 fpm to 5,000 fpm (0 mpm to 1,523 mpm)
Temperature sensor accuracy	±0.10°F (0.06°C)
Sensor temperature range	-20°F to 120°F (-29°C to 49°C)
Primary probe temperature range	-20°F to 120°F (-29°C to 49°C)[1]
Humidity range	0% RH to 99% RH, noncondensing
Maximum number sensors	128
Power requirement	24 VAC, 15 VA
Power consumption	<10 VA for 2 probes with 8 sensors per probe and LDC display on primary probe
Output signals	4 mA to 20 mA standard, 2 VDC to 10 VDC requires 500 ohm resistor across output terminals.
Display	16 x 2 character LCD (airflow, temperature, setup, and diagnostics) and optional remote display
Velocity requirements	Minimum: 0 fpm (0 mpm) Maximum: 5,000 fpm (1,524 mpm)
Shipping weight	12 lb (5.4 kg) for AD-1272 Airflow Measuring System with two probes

1. Standard LCDs can be difficult to read at low temperatures. If display operation at less than -5°F (-20°F) is expected, consider remote display options.

Measuring stations are tested at an AMCA Certified Laboratory using instrumentation and procedures in accordance with AMCA Standard No. 610-93, Air flow Station Performance.

The performance specifications are nominal and conform to acceptable industry standards. For application 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.

United States emissions compliance

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

Canadian emissions compliance

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Single point of contact

APAC	EU	UK	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS VOLTAWEG 20 6101 XK ECHT THE NETHERLANDS	JOHNSON CONTROLS TYCO PARK GRIMSHAW LANE MANCHESTER M40 2WL UNITED KINGDOM	JOHNSON CONTROLS 507 E MICHIGAN ST MILWAUKEE WI 53202 USA

PreSet Series

Scaled Adjustable Current Switches

Scaled calibration for proof of flow set-point
Split and solid core models to 150A
N.O. 30VAC/DC or 120VAC output
Optional command relay

DESCRIPTION

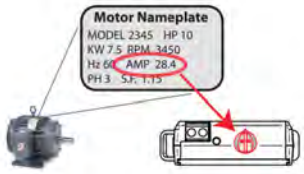
PreSet™ allows for matching sensor set-point to the motor nameplate, eliminating the need to calibrate in energized enclosures and reducing installation time. Sensor will detect motor undercurrent conditions such as belt loss, coupling shear, and mechanical failure on fans and pumps.

APPLICATIONS

- Detecting belt loss, coupling shear, and mechanical failure on fans and pumps
- Monitoring status of industrial processes
- Monitoring status of critical motors

Just set to motor full load amps for proof of flow. Simple and safe.

Optional CR command relay for stop/start/status in a single labor saving device.



Adjust knob on sensor to motor full load amperage (FLA) indicated on nameplate

Never clibrate in live enclosures again. Redicing risk of an arc flash exposure.

No hazardous guesswork. Muli-turn pots are a think of the past.

Proven 1/2 hour savings per install over manually calibrated devices.

FEATURES

- Preset scaled calibration enables set-point adjustment for proof of flow by simply matching dial to motor full load amps (FLA) nameplate
- Safer--eliminates calibration in energized enclosures, reduces arc flash hazard
- Proven to save up to 1/2 hour per install...no need to return to calibrate live
- Prevents call-backs, no multi-turn potentiometers and guesswork to find set-point
- Super low turn-on for compatability with smaller motors
- Solid-state-more reliable than mechanical pressure switches for proof of flow
- Quality backed by 7 year limited warranty
- PATENT PENDING

ORDERING

SPLIT CORE	Min (on) A	Max A	N.O. Output*	Trip LED	Power LED
C-2320-L	0.45A	50A	1.0A@30VAC/DC	•	•
C-2320	0.50A	100A	1.0A@30VAC/DC	•	•
C-2320-H NEW LOWER TURN-ON!	0.50A	150A	1.0A@30VAC/DC	•	•
C-2320HV	0.50A	100A	0.2A@120VAC	•	•
C-2320HV-L	0.45A	50A	0.2A@120VAC	•	•
SPLIT CORE - MINI					
C-2220	1.00A	50A	1.0A@30VAC/DC	•	
SOLID CORE					
C-1320	0.75A	50A	1.0A@30VAC/DC	•	
SOLID CORE - MINI					
C-1220-L	0.75A	5A	1.0A@30VAC/DC	•	
C-1220	0.75A	50A	1.0A@30VAC/DC	•	
C-1220HV-L	0.75A	5A	0.2A@120VAC	•	
C-1220HV	0.75A	50A	0.2A@120VAC	•	

COMMAND RELAY	Contact rating	Coil
CR3-24	N.O. 10A @ 125VAC	24VAC/DC 15mA nom.
CR4-24	N.C. 10A @ 125VAC	24VAC/DC 15mA nom.
CR3-12	N.O. 10A @ 125VAC	9-12VDC 30mA nom.
CR4-12	N.C. 10A @ 125VAC	9-12VDC 30mA nom.

Other coil voltages available—consult factory

Ordering tip: *For best resolution, choose the sensor lowest maximum amperage which accomodates your motor (e.g. 0-50A us -L, 50-100A use standard, 100 to 150A use -H*

DIMENSIONS

SPLIT CORE C-2320

L: 2.5" H: 0.57" W: 2.23"
A: 0.75"x 0.75"

- Mount sensor without removing conductor for installation savings
- Clamp on conductor with iris, or use detachable base to screw or DIN mount
- Larger 0.75" aperture accomodates oversize conductors

OPTIONAL RELAY for additional labor savings

L: .84" H: .72" W: 2.06"

- Add to 2320 series to get start/stop/status in a single device
- Reduces the number of installed components... saves time and space
- Removable relay facilitates service

SPLIT CORE - MINI C-2220

L: 2.00" H: .75" W: 1.75"
A: .040"x 0.32"

- Mount sensor without removing conductor for installation savings
- Fits in small enclosures
- Clamp on conductor with iris, or screw mount detachable base

SOLID CORE C-1320

L: 2.40" H: 1.04" W: 1.6"
A: 0.52" diameter

- Compact design
- Aperture accomodates spade terminals

SOLID CORE - MINI C-1220

L: 1.91" H: .88" W: 1.31"
A: 0.30" diameter

- Super small—fits anywhere
- Low cost

Warning: The datasheet is designed for reference only. Refer to installation instructions that accompany the product and heed all safety instructions. Product improvement is a continuing process at Senva. Changes may occur to products without prior notice

SPECIFICATIONS	
Standard Output Rating	1.0A@30VAC/DC
Line Voltage Output Rating	0.2A@120VAC (-HV ONLY)
Output Type	NO, solid-state FET
Temperature Rating	-15-60 ° C
Insulation Class	600V RMS. For use on insulated conductors only! Use minimum 75 ° C insulated conductor
Sensor Power	Induced
Frequency Range	50/60Hz

** Product improvement is a continual process as Senva and product features and specification may change without prior notice. Refer to instructions that accompany the product for installation and wiring.*

ECMset Series

ECM (Brushless motor) Current Switch

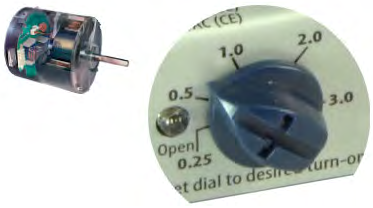
Adjustable minimum turn-on
Prevents false trip due to ECM stand-by current
Split-core operation to 200A
N.O. 30VAC/DC output

DESCRIPTION

ECMSet™ is designed for no/go run detection on electronically commutated motors (ECMs) . ECMs draw a small amount of AC standby current to power their inverter, up to 1A, even when the motor isn't running. The ECMSet features a high resolution adjustable turn-on setpoint to ignore standby current, preventing false ON status indications.

APPLICATIONS

- No/go run detection for EC motors
- On set-point prevents false trips due to EC inverter stand-by current



Turn-on setpoint minimizes false trips due to standby ECM inverter draw.

Optional CR command relay for stop/start/status in a single labor saving device.

FEATURES

- Reliable operation on ECM motors
- Set trip point with easily scaled dial to that sensor only turns on when motor is actually running
- Super low turn-on adjustment scale Maintenance-free—no call backs
- No hazardous guesswork. Multi-turn adjustments are a thing of the past
- Reduce the risk of arc flash; sensor can be set without calibration in live enclosure
- Industry leading 7 year warranty

ORDERING

SPLIT CORE	Min ON Adjustment	Max A	N.O. Output*	Trip LED	Power LED
C-2320-L ECM	0.25A	200A	1.0A@30VAC/DC	•	•

Warning: *Refer to installation instructions that accompany product and heed all safety instructions. Do not rely on current status LED to indicate presence of power.*

COMMAND RELAY	Contact rating	Coil
CR3-24	N.O. 10A @ 125VAC	24VAC/DC 15mA nom.
CR4-24	N.C. 10A @ 125VAC	24VAC/DC 15mA nom.
CR3-12	N.O. 10A @ 125VAC	9-12VDC 30mA nom.
CR4-12	N.C. 10A @ 125VAC	9-12VDC 30mA nom.

DIMENSIONS

L: 2.5" **H:** 0.57" **W:** 2.23"
A: 0.75"x 0.75"

Warning: The datasheet is designed for reference only. Refer to installation instructions that accompany the product and heed all safety instructions. Product improvement is a continuing process at Senva. Changes may occur to products without prior notice

SPECIFICATIONS	
Standard Output Rating	1.0A@30VAC/DC
Output Type	NO, solid-state FET
Temperature Rating	-15-60 ° C
Insulation Class	600V RMS. For use on insulated conductors only! Use minimum 75 ° C insulated conductor
Sensor Power	Induced
Frequency Range	50/60Hz
Compliance	cUL, UL, CE, RoHS

** Product improvement is a continual process as Senva and product features and specification may change without prior notice. Refer to instructions that accompany the product for installation and wiring.*

Autoset Series

Self-calibrating Current Switch

Self-calibrating for proof of flow
Works flawlessly on VFDs and constant volume applcations
0.5-135A range
N.O. 30VAC/DC output
Optional command relay

DESCRIPTION

The AutoSet™ VFD self-calibrates to detect proof of flow on both variable frequency driven and constant volume motors on fans or pumps. The C-2350VFD automatically set the proper threshold, eliminating false alarms associated with varying frequencies. Detects motor undercurrent conditions such as belt loss, coupling shear, and mechanical failure on fans and pumps while reducing installation time. New super low 0.5A turn-on--totally self powered!

APPLICATIONS

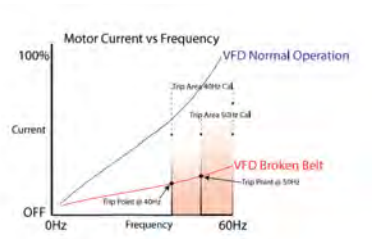
- Detecting belt loss, coupling shear, and mechanical failure on variable frequency drives and constant volume fans and pumps.

Optional CR-XX command relay for stop/start/status in one labor saving device.

Low turn-on of 0.5A for proof of flow status on VFDs. No calibration typically required.

Never clibrate in live enclosures again. Redicing risk of an arc flash.

Proven 1/2 hour savings per install over manually calibrated devices.



Utilizes a algorithm to detect belt loss on motors operated by variable frequency drives

Buy American Act Certified

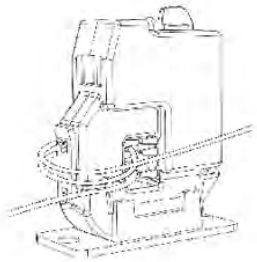
FEATURES

- Self-calibration for proof of flow on both VFD and contstant volume (CV) fans and pump applications
- Works without costly 'training' of sensor - our sensors are just plain smarter!
- No need to open energized enclosures - save on labor as well as improves safety
- Only sensor line capable of functioning on VFDs to 0.5A
- Sensor is always properly adjusted—no call backs
- Push-button and LED for fast learn and go/no modes
- Optional command relay for stop/start/status in unitary device—saves component and installation space/cost
- Solid-state-more reliable than mechanical pressure switches for proof of flow
- Quality backed by 7 year limited warranty!

ORDERING

SPLIT CORE	Min (on)	Max A	Output*	Sensor Power
	0.5A @ 60Hz 1.5A @ 20Hz 2.5A @ 10Hz	135A	1.0A@30VAC/DC	Induced

COMMAND RELAY	Contact rating	Coil (nominal)
CR3-24	N.O. 10A @ 125VAC	24VAC/DC 15mA
CR4-24	N.C. 10A @ 125VAC	24VAC/DC 15mA
CR3-12	N.O. 10A @ 125VAC	9-12VDC 30mA
CR4-12	N.C. 10A @ 125VAC	9-12VDC 30mA

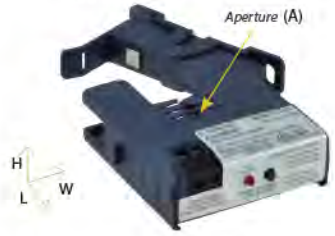


Tech tip for smaller motors and loads

For small motors: If the sensor you have will not turn on due to low amperage, wrap the conductor through the aperture. Each wrap will increase the amperage by 1x. For best resolution, choose the currents sensor that most closely matches your maximum motor or load full load amps (FLA)

DIMENSIONS

SPLIT CORE
C-2350VFD



L: 2.5" H: 0.57" W: 2.23"
A: 0.75"x 0.75"

- Mount sensor without removing conductor for installation savings
- Clamp on conductor with iris, or use detachable base to screw or DIN mount
- Larger 0.75" aperture accomodates oversize conductors

OPTIONAL RELAY

L: 0.84" H: 0.72" W: 2.06"

- Add to 2350VFD series to get start, stop, status in a single device
- Reduces the number of installed components… saves time and space
- Removable relay facilitates service

Warning: The datasheet is designed for reference only. Refer to installation instructions that accompany the product and heed all safety instructions. Product improvement is a continuing process at Senva. Changes may occur to products without prior notice

SPECIFICATIONS

ORDERING INFORMATION

Split Core	Min (on)	Max A	Output*	Sensor Power
C-2350VFD	0.5A	135A	1.0A@30VAC/DC	Induced

Command Relay	Contact rating	Coil
CR3-24	N.O. 10A@125VAC	24VAC/DC, 15mA nom.
CR4-24	N.C. 10A@125VAC	24VAC/DC, 15mA nom.
CR3-12	N.O. 10A@125VAC	9-12VDC, 30mA nom.
CR4-12	N.C. 10A@125VAC	9-12VDC, 30mA nom.

** Product improvement is a continual process as Senva and product features and specification may change without prior notice. Refer to instructions that accompany the product for installation and wiring.*

Differential Pressure Transducer Wet-to-Wet DP110 Series Product Bulletin

LIT-12013726

2021-05-13

Introduction

The Differential Pressure Transducer DP110 Series is Johnson Controls® high accuracy solution to monitor differential pressure in wet-to-wet applications. A single diaphragm design enables a true wet-to-wet differential pressure measurement with superior ±0.25% full-scale (FS) accuracy in comparison to competitive units, which uses two single-point pressure sensors to calculate differential pressure. The stainless steel capacitive sensor provides a highly accurate, linear analog output proportional to the pressure over a wide temperature range. The DP110 is offered with an optional 3-valve or 5-valve machined brass manifold for ease of installation and maintenance.

Figure 1: DP110 transducer

Applications

Use the Differential Pressure Transducer Wet-toWet DP110 Series in the following applications:

- Energy management systems
- Process control systems
- Flow measurement of various gases or liquids
- Liquid level measurement or pressurized vessels
- Pressure drop across filters

Features and benefits

The Differential Pressure Transducer DP110 has a single diaphragm sensor to avoid line pressure, with increased sensor response time, and saves money on time and installation. Features include:

- ±0.25% FS accuracy
- Available to 1 psid with 350 psi line pressure
- No liquid fill diaphragm
- NEMA 4 rated housing
- Low line pressure effect
- Fast response time
- Gas and liquid compatible
- CE and RoHS compliant

Single diaphragm sensor

The DP110 is a true wet-to-wet sensor with a single diaphragm construction. Line pressure does not impact the differential pressure range of a single diaphragm. Dual differential pressure sensors require the individual sensors to measure gauge pressure and compare the outputs to determine the differential pressure.

Sensor response time

The DP110 uses an all stainless steel capacitive sensor that responds 20x faster than oil-filled sensors. The sensor provides conditioned electronic circuitry with a highly accurate, linear analog output proportional to the pressure over a wide temperature range.

Cost-saving installation

When time and project costs are a priority, the DP110 offers an optional 3-valve or 5-valve machined brass manifold for ease of installation and maintenance. The brass body has no internal process connections and eliminates the risk of internal leaks.

Proof pressure specifications

Table 1: Unidirectional proof pressure

Pressure range (psid)	Proof pressure high side (psi)	Proof pressure low side (psi)
0 to 1.0	50	2.5
0 to 2.0	50	5
0 to 5.0	100	12.5
0 to 10.0	100	25
0 to 25.0	350	62.5
0 to 30.0	350	75
0 to 50.0	350	125
0 to 100.0	350	250

Table 2: Bidirectional proof pressure

Pressure range (psid)	Proof pressure high side (psi)	Proof pressure low side (psi)
0 to ±0.5	50	1.25
0 to ±1.0	50	2.5
0 to ±2.5	100	6.35
0 to ±5.0	100	12.5
0 to ±10.0	200	25
0 to ±25.0	350	62.5
0 to 50.0	350	125

Dimensions

The dimensions of the DP110 Transducer are shown in the following figures.

Figure 2: Dimensions of the DP110 Transducer, in. (mm)

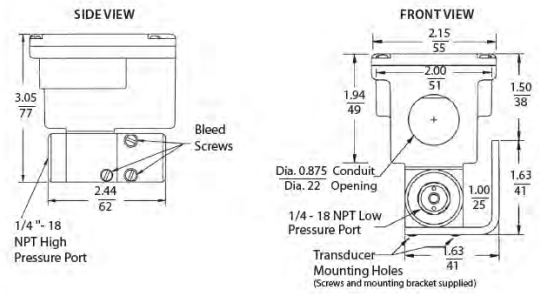
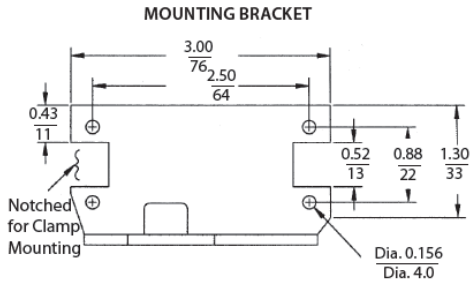


Figure 3: Mounting bracket dimensions, in. (mm)



Dimensions of 3-valve manifold assembly

Figure 4: Optional 3-valve manifold assembly dimensions, in. (mm)

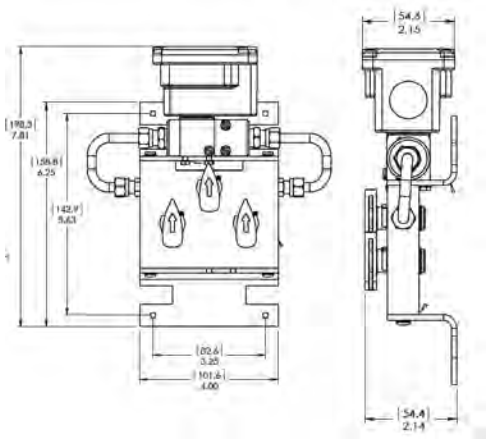
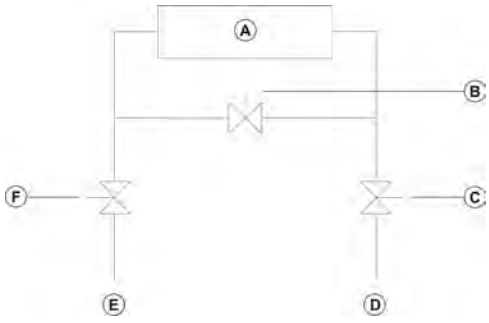


Figure 5: Optional 3-valve manifold assembly



Callout	Description
A	DP110 Differential Pressure Transducer
B	V3 shunt valve
C	V2 shut-off valve
D	Low process, 1/4 in. NPT connection
E	High process, 1/4 in. NPT connection
F	V1 shut-off valve

For differential pressure measurements at high line pressure, maximum of 350 psig, install the pressure sensor with a valve in each line, and a shunt valve across the high and low reference pressure points as shown in Figure 5.

Dimensions of 5-valve manifold assembly

Figure 6: Optional 5-valve manifold assembly dimensions, in. (mm)

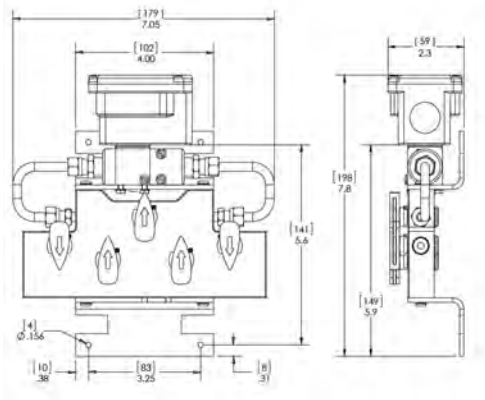
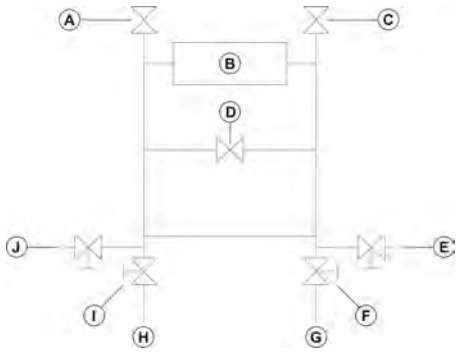


Figure 7: Optional 5-valve manifold assembly



Callout	Description
A	V6 bleed valve. Optional or field-installed.
B	DP110 Differential Pressure Transducer
C	V7 bleed valve. Optional or field-installed.
D	V3 shunt valve
E	V5 low process or commission, 1/4 in. NPT connection
F	V2 shut-off valve
G	Low process 1/4 in. NPT connection
H	High process 1/4 in. NPT connection
I	V1 shut-off valve
J	V4 high process or commission, 1/4 in. NPT connection

For differential pressure measurements at high line pressure, maximum of 350 psig, install the pressure sensor with a valve in each line, and a shunt valve across the high and low reference pressure points as shown in Figure 7.

Note: You do not require the V6 and V7 bleed valves when you use a DP110. Use the bleed screws on the DP110 to bleed the lines of air.

Ordering information

See the following table for ordering options for the DP110 Differential Pressure Transducers. For example, DP110005U2F4V is model DP110, 0 psid to 5 psid, unidirectional range, 1/4 in. NPT fitting, 4 mA to 20 mA output, and Viton seals.

Table 3: Product codes

Product code	Range, in psid	Direction	Fitting	Output	Bleed screw
DP110050U3V4V	0 to 50	Unidirectional	3-valve manifold	4 mA to 20 mA	Viton
DP110050U2F3V	0 to 50	Unidirectional	1/4 in. NPT	0.05 VDC to 10.05 VDC	Viton
DP110050U3V3V	0 to 50	Unidirectional	3-valve manifold	0.05 VDC to 10.05 VDC	Viton
DP110050U2F4V	0 to 50	Unidirectional	1/4 in. NPT	4 mA to 20 mA	Viton
DP110025U3V4V	0 to 25	Unidirectional	3-valve manifold	4 mA to 20 mA	Viton
DP110100U3V4V	0 to 100	Unidirectional	3-valve manifold	4 mA to 20 mA	Viton
DP110100U2F4V	0 to 100	Unidirectional	1/4 in. NPT	4 mA to 20 mA	Viton
DP110100U2F3V	0 to 100	Unidirectional	1/4 in. NPT	0.05 VDC to 10.05 VDC	Viton
DP110025U3V3V	0 to 25	Unidirectional	3-valve manifold	0.05 VDC to 10.05 VDC	Viton
DP110010U3V4V	0 to 10	Unidirectional	3-valve manifold	4 mA to 20 mA	Viton
DP110010U3V3V	0 to 10	Unidirectional	3-valve manifold	0.05 VDC to 10.05 VDC	Viton
DP110100U3V3V	0 to 100	Unidirectional	3-valve manifold	0.05 VDC to 10.05 VDC	Viton

Table 3: Product codes

Product code	Range, in psid	Direction	Fitting	Output	Bleed screw
DP110025U2F4V	0 to 25	Unidirectional	1/4 in. NPT	4 mA to 20 mA	Viton
DP110025U2F3V	0 to 25	Unidirectional	1/4 in. NPT	0.05 VDC to 10.05 VDC	Viton
DP110050B3V4V	±50	Bidirectional	3-valve manifold	4 mA to 20 mA	Viton
DP110005U3V4V	0 to 5	Unidirectional	3-valve manifold	4 mA to 20 mA	Viton
DP110010U2F4V	0 to 10	Unidirectional	1/4 in. NPT	4 mA to 20 mA	Viton
DP110010U2F3V	0 to 10	Unidirectional	1/4 in. NPT	0.05 VDC to 10.05 VDC	Viton
DP110025U5V4V	0 to 25	Unidirectional	5-valve manifold	4 mA to 20 mA	Viton
DP110050U5V3V	0 to 50	Unidirectional	5-valve manifold	0.05 VDC to 10.05 VDC	Viton
DP110005U2F3V	0 to 5	Unidirectional	1/4 in. NPT	0.05 VDC to 10.05 VDC	Viton
DP110005U2F4V	0 to 5	Unidirectional	1/4 in. NPT	4 mA to 20 mA	Viton
DP110050U5V4V	0 to 50	Unidirectional	5-valve manifold	4 mA to 20 mA	Viton
DP110050U3V2V	0 to 50	Unidirectional	3-valve manifold	0.05 VDC to 10.05 VDC	Viton
DP110001U3V4V	0 to 1	Unidirectional	3-valve manifold	4 mA to 20 mA	Viton
DP110025U2F2V	0 to 25	Unidirectional	1/4 in. NPT	0.05 VDC to 10.05 VDC	Viton
DP110050B3V3V	±50	Bidirectional	3-valve manifold	0.05 VDC to 10.05 VDC	Viton
DP110100U5V4V	0 to 100	Unidirectional	5-valve manifold	4 mA to 20 mA	Viton
DP110050U2F2V	0 to 50	Unidirectional	1/4 in. NPT	0.05 VDC to 10.05 VDC	Viton
DP110025B3V4V	±25	Bidirectional	3-valve manifold	4 mA to 20 mA	Viton
DP110005U3V3V	0 to 5	Unidirectional	3-valve manifold	0.05 VDC to 10.05 VDC	Viton
DP110050B2F4V	±50	Bidirectional	1/4 in. NPT	4 mA to 20 mA	Viton
DP110002U3V3V	0 to 2	Unidirectional	3-valve manifold	0.05 VDC to 10.05 VDC	Viton
DP110050B2F3V	±50	Bidirectional	1/4 in. NPT	0.05 VDC to 10.05 VDC	Viton
DP110100U5V3V	0 to 100	Unidirectional	1/4 in. NPT	0.05 VDC to 10.05 VDC	Viton
DP110100U2F2V	0 to 100	Unidirectional	3-valve manifold	0.05 VDC to 10.05 VDC	Viton
DP110025U3V2V	0 to 25	Unidirectional	3-valve manifold	0.05 VDC to 10.05 VDC	Viton
DP110025B2F4V	±25	Bidirectional	1/4 in. NPT	4 mA to 20 mA	Viton
DP110001U2F4V	0 to 1	Unidirectional	1/4 in. NPT	4 mA to 20 mA	Viton
DP110010U3V2V	0 to 10	Unidirectional	3-valve manifold	0.05 VDC to 10.05 VDC	Viton

Technical specifications

Table 4: Differential Pressure Transducer DP110 technical specifications

Description		Specification
Performance data	Accuracy RSS1, at constant temperature	±0.25% FS
	Non-linearity, BFSL	±0.20% FS
	Hysteresis	0.10% FS
	Non-repeatibility	0.05% FS
Thermal effects ⓘ **Note:** Units are calibrated at nominal 70˚F. Maximum thermal error is calculated from this data.	Compensated range	30°F to 150°F (-1°C to +65)
	Zero shift % FS at 100°F (% FS at 50°C)	2.0 (1.8)
	Span shift % FS at 100°F (% FS at 50°C)	2.0 (1.8)
	Line pressure effect	Zero shift ±0.004% FS/PSIG line pressure
	Resolution	Infinite, limited only by output noise level, 0.02% FS
	Static acceleration effect	2% FS per g, most sensitive axis
	Natural frequency	500 Hz in gaseous media
	Warm-up shift	±0.1% FS total
	Response time	30 ms to 50 ms
	Long term stability	0.5% FS per year
	Maximum line pressure	350 psig
Environmental data	Operating temperature ⓘ **Note:** Operating temperature only limits the electronics. Pressure media temperatures may be considerably higher.	0°F to 175°F (-18°C to 80°C)
	Storage temperature	-65°F to 250°F (-54°C to 121°C)
	Vibration	5 g from 5 Hz to 500 Hz
	Acceleration	10 g
	Shock	50 g
Pressure media	Gases or liquids are compatible with 17-4 PH stainless steel, 300 Series Viton O-Rings. ⓘ **Note:** Do not use hydrogen with 17-4 PH stainless steel. Optional Buna-N O'rings are preferred for hydrocarbon applications.	
	3-valve and 5-valve manifold	
	Gases or liquids are compatible with 360 brass, Copper 122, Acetal plug valves, and Nitrile O-rings.	

Table 4: Differential Pressure Transducer DP110 technical specifications

Description		Specification
Physical specifications	Case	Stainless steel or aluminum
	Electrical connections	Barrier strip terminal block with conduit enclosure and 0.875 DIA conduit opening.
	Pressure fittings	1/4 - 18 NPT internal ⓘ **Note:** With 1/4 in. NPT external fittings installed, does not include cavity volume of 1/4 in. NPT external fittings.
	Weight	14.4 oz
	Sensor cavity volume	0.27 $in.^3$ positive port, 0.08 $in.^3$ negative port
3-valve manifold assembly ⓘ **Note:** Order assembled with the DP110 (Code 3V).	Manifold	Brass
	Valves, 3	V1 connects to the positive port V2 connects to the negative port V3 to equalizes pressure
	Valve type	90° On or Off
	Process connections	1/4 - 18 NPT internal thread
	Dimensions (H x W x D)	6.25 in. x 7.05 in. x 2.16 in.
	Weight	<2.5 lbs
5-valve manifold assembly ⓘ **Note:** Order assembled with the DP110 (Code 5V).	Manifold	Brass
	Valves, 5	V1 connects to the positive port V2 connects to the negative port V3 equalizes pressure V4 and V5 connect to external gauge or alternate plumbing configuration
	Valve type	90° On or Off
	Process connections	1/4 - 18 NPT internal thread
	Dimensions (H x W x D)	6.25 in. x 7.05 in. x 2.16 in.
	Weight	<3.8 lbs
Electrical data, voltage	Circuit	3-wire: Exc, Out, Com
	Excitation	9 VDC to 30 VDC for 0 VDC to 5 VDC output, 13 VDC to 30 VDC for 0 VDC to 10 VDC output
	Output ⓘ **Note:** Calibrated into a 50 K ohm load, operable into a 5K ohm load or greater	0 VDC to 5 VDC, 0 VDC to 10 VDC ⓘ **Note:** Zero output factory set to within ±25 mV for 5 VDC output or ±50 mV for 10 VDC output. Span full-scale output factory set to ±25 mV for 5 VDC output or ± 50 mV for 10 VDC output.
	Output impendance	100 ohm

Table 4: Differential Pressure Transducer DP110 technical specifications

Description		Specification
Electrical data, current	Circuit	2-wire
	Output **Note:** Calibrated at factory with a 24 VDC loop supply voltage and a 250 ohm load.	4 mA to 20mA **Note:** Zero output factory set to within ±0.16 mA. Span factory set to within ±0.16 mA
	External load	0 ohm to 1 K ohm
	Minimum supply voltage, VDC	9 + 0.02 x (resistance of receiver plus line).
	Maximum supply voltage, VDC	30 + 0.004 x (resistance of receiver plus line)
CE pliance	CE Mark - Johnson Controls declares that this product is in Compliance with the essential requirements and other relevant provisions of the EMC and RoHS Directives.	

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

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

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Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS	JOHNSON CONTROLS	JOHNSON CONTROLS
C/O CONTROLS PRODUCT MANAGEMENT	WESTENDHOF 3	507 E MICHIGAN ST
NO. 32 CHANGJIJANG RD NEW DISTRICT	45143 ESSEN	MILWAUKEE WI 53202
WUXI JIANGSU PROVINCE 214028	GERMANY	USA
CHINA		

Contact information

Contact your local branch office: www.johnsoncontrols.com/locations
Contact Johnson Controls: www.johnsoncontrols.com/contact-us

Low Differential Pressure Transducer DP 140 Series Product Bulletin

LIT-12013727

2021-05-13

Introduction

The Johnson Controls® Low Differential Pressure Transducer DP140 Series offers an excellent price-to-performance ratio and meets the requirements in all typical HVAC applications. The DP140 is a low differential pressure transducer that uses a dead-ended capacitive sensing element and requires minimal amplification. The DP140 delivers ±1% full-scale (FS) accuracy with ±0.25% and ±0.5% accuracy options with pressure ranges from 0.1 in. W.C. up to ±25 in. W.C. The DP140 has a small footprint and an AC power option.

Figure 1: DP140 Series Transducer

Applications

Use the Low Differential Pressure Transducer DP140 Series in the following applications:

- HVAC systems
- Air flow stations
- Variable Air Volume (VAV) or fan control
- Filter status
- Static duct and cleanroom pressures

Features and benefits

The Low Differential Pressure Transducer DP140 delivers excellent accuracy and longterm stability. Features include:

- Excellent price-to-performance ratio
- Reduced installation costs
- ±0.25%, ±0.5%, ±1% FS accuracy options
- 24 VDC or 24 VAC excitation
- Voltage or milli-amp analog outputs
- Reverse wiring protection
- Internal regulation
- Fire retardant case, UL 94 V-0 approved
- CE and RoHS compliant

High performance

The DP140 is a high-value solution with exceptional features, quality, and performance.

Cost-saving installation

The design of the DP140 reduces installation costs and increases overall operating efficiency. Installation is easy with integral mounting tabs, pressure connections located on the face of the unit, and a screw terminal strip for electrical termination.

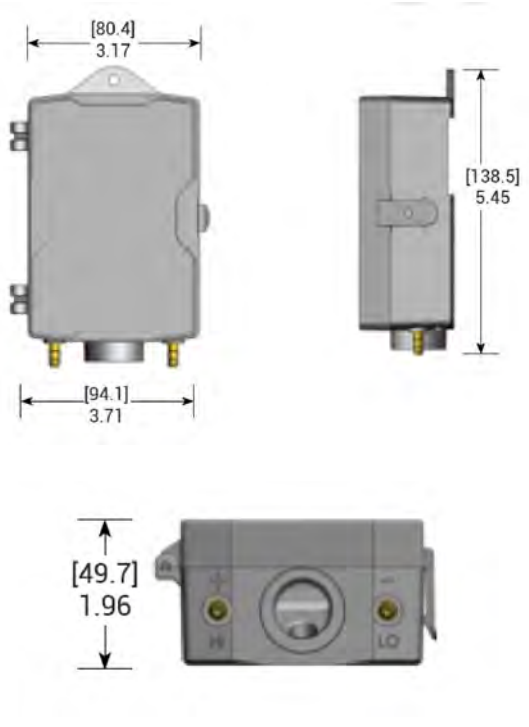
IP67-rated housing

The DP140 housing is a robust IP67-rated design, sealed with a gasket to make it wash-down capable for difficult applications. The DP140 includes a conduit fitting for easy installation and wiring.

Dimensions

The dimensions of the DP140 Transducer are shown in the following figures.

Figure 2: Dimensions of the DP140 Transducer, in. (mm)



Ordering information

See the following table for ordering options for the DP140 Low Differential Pressure Transducers. All units have a 1/2 in. conduit electrical fitting. For example, DP140X25B21F is model DP140, ± 0.25 in. W.C., bidirectional range, 4 mA to 20 mA, 1/2 in. conduit fitting, ±0.25% accuracy.

Table 1: Product codes

Product code	Range, in in. W.C.	Direction	Output	Accuracy
DP140005U21C	0 to 5	Unidirectional	4 mA to 20 mA	±1% FS
DP1402X5U21C	0 to 2.5	Unidirectional	4 mA to 20 mA	±1% FS
DP1402X5U11C	0 to 2.5	Unidirectional	0 VDC to 5 VDC	±1% FS
DP140X25B21C	±0.25	Bidirectional	4 mA to 20 mA	±1% FS
DP140005U21D	0 to 5	Unidirectional	4 mA to 20 mA	±0.5% FS
DP1402X5U21D	0 to 2.5	Unidirectional	4 mA to 20 mA	±0.5% FS
DP140005U11C	0 to 5	Unidirectional	0 VDC to 5 VDC	±1% FS
DP140005U21F	0 to 5	Unidirectional	4 mA to 20 mA	±0.25% FS
DP140025U21D	0 to 25	Unidirectional	4 mA to 20 mA	±0.5% FS
DP140010U21C	0 to 10	Unidirectional	4 mA to 20 mA	±1% FS
DP1400X1B11F	±0.1	Bidirectional	0 VDC to 5 VDC	±0.25% FS
DP140010U21D	0 to 10	Unidirectional	4 mA to 20 mA	±0.5% FS
DP1402X5U21F	0 to 2.5	Unidirectional	4 mA to 20 mA	±0.25% FS
DP140X25B21F	±0.25	Bidirectional	4 mA to 20 mA	±0.25% FS
DP140X25B11C	±0.25	Bidirectional	0 VDC to 5 VDC	±1% FS
DP140001U21F	0 to 1	Unidirectional	4 mA to 20 mA	±0.25% FS
DP140X25U21C	0 to 0.25	Unidirectional	4 mA to 20 mA	±1% FS
DP140010U11D	0 to 10	Unidirectional	0 VDC to 5 VDC	±0.5% FS
DP140001U11F	0 to 1	Unidirectional	0 VDC to 5 VDC	±0.25% FS
DP140001U21C	0 to 1	Unidirectional	4 mA to 20 mA	±1% FS
DP140X25B11F	±0.25	Bidirectional	0 VDC to 5 VDC	±0.25% FS
DP140X25U21D	0 to 0.25	Unidirectional	4 mA to 20 mA	±0.5% FS
DP140001U21D	0 to 1	Unidirectional	4 mA to 20 mA	±0.5% FS
DP1400X5U21C	0 to 0.5	Unidirectional	4 mA to 20 mA	±1% FS
DP140025U11D	0 to 25	Unidirectional	0 VDC to 5 VDC	±0.5% FS
DP1400X5B21C	±0.5	Bidirectional	4 mA to 20 mA	±1% FS
DP1400X5B21D	±0.5	Bidirectional	4 mA to 20 mA	±0.5% FS
DP1400X1B21F	±0.1	Bidirectional	4 mA to 20 mA	±0.25% FS
DP140001U11D	0 to 1	Unidirectional	0 VDC to 5 VDC	±0.5% FS
DP140010U21F	0 to 10	Unidirectional	4 mA to 20 mA	±0.25% FS
DP1400X5B21F	±0.5	Bidirectional	4 mA to 20 mA	±0.25% FS
DP1402X5B21C	±2.5	Bidirectional	4 mA to 20 mA	±1% FS
DP140005B21C	±5	Bidirectional	4 mA to 20 mA	±1% FS
DP140050U21D	0 to 50	Unidirectional	4 mA to 20 mA	±0.5% FS
DP140X25B11D	±0.25	Bidirectional	0 VDC to 5 VDC	±0.5% FS
DP140010U11C	0 to 10	Unidirectional	0 VDC to 5 VDC	±1% FS
DP1400X5U21D	0 to 0.5	Unidirectional	4 mA to 20 mA	±0.5% FS
DP140005U11D	0 to 5	Unidirectional	0 VDC to 5 VDC	±0.5% FS
DP1400X1B11D	±0.1	Bidirectional	0 VDC to 5 VDC	±0.5% FS
DP140025U21F	0 to 25	Unidirectional	4 mA to 20 mA	±0.25% FS
DP1402X5U11F	0 to 2.5	Unidirectional	0 VDC to 5 VDC	±0.25% FS
DP140X25U21F	0 to 0.25	Unidirectional	4 mA to 20 mA	±0.25% FS
DP1400X1B21D	±0.1	Bidirectional	4 mA to 20 mA	±0.5% FS
DP140001U11C	0 to 1	Unidirectional	0 VDC to 5 VDC	±1% FS
DP1400X5B11D	±0.5	Bidirectional	0 VDC to 5 VDC	±0.5% FS
DP1400X1B11C	±0.1	Bidirectional	0 VDC to 5 VDC	±1% FS
DP140X25U11D	0 to 0.25	Unidirectional	0 VDC to 5 VDC	±0.5% FS
DP1400X5U21F	0 to 0.5	Unidirectional	4 mA to 20 mA	±0.25% FS
DP140X25U11C	0 to 0.25	Unidirectional	0 VDC to 5 VDC	±1% FS

Table 1: Product codes

Product code	Range, in in. W.C.	Direction	Output	Accuracy
DP1400X5U11D	0 to 0.5	Unidirectional	0 VDC to 5 VDC	±0.5% FS
DP1402X5B21F	±2.5	Bidirectional	4 mA to 20 mA	±0.25% FS
DP1400X5B11F	±0.5	Bidirectional	0 VDC to 5 VDC	±0.25% FS
DP1402X5B21D	±2.5	Bidirectional	4 mA to 20 mA	±0.5% FS
DP1400X5U11C	0 to 0.5	Unidirectional	0 VDC to 5 VDC	±1% FS
DP140005U11F	0 to 5	Unidirectional	0 VDC to 5 VDC	±0.25% FS
DP140001B21F	±1	Bidirectional	4 mA to 20 mA	±0.25% FS
DP1402X5U11D	0 to 2.5	Unidirectional	0 VDC to 5 VDC	±0.5% FS
DP140001B21D	±1	Bidirectional	4 mA to 20 mA	±0.5% FS
DP140010U11F	0 to 10	Unidirectional	0 VDC to 5 VDC	±0.25% FS
DP1400X5B11C	±0.5	Bidirectional	0 VDC to 5 VDC	±1% FS
DP1400X1U21C	0 to 0.1	Unidirectional	4 mA to 20 mA	±1% FS
DP140001B11D	±1	Bidirectional	0 VDC to 5 VDC	±0.5% FS
DP140X25B21D	±0.25	Bidirectional	4 mA to 20 mA	±0.5% FS
DP140001B21C	±1	Bidirectional	4 mA to 20 mA	±1% FS
DP1400X1U21D	0 to 0.1	Unidirectional	4 mA to 20 mA	±0.5% FS
DP140005B21D	±5	Bidirectional	4 mA to 20 mA	±0.5% FS
DP140005B21F	±5	Bidirectional	4 mA to 20 mA	±0.25% FS
DP140100U11D	0 to 100	Unidirectional	0 VDC to 5 VDC	±0.5% FS
DP140050U11C	0 to 50	Unidirectional	0 VDC to 5 VDC	±1% FS
DP1400X1U11D	0 to 0.1	Unidirectional	0 VDC to 5 VDC	±0.5% FS
DP140001B11C	±1	Bidirectional	0 VDC to 5 VDC	±1% FS
DP1402X5B11F	±2.5	Bidirectional	0 VDC to 5 VDC	±0.25% FS
DP140025U11F	0 to 25	Unidirectional	0 VDC to 5 VDC	±0.25% FS
DP1400X1U21F	0 to 0.1	Unidirectional	4 mA to 20 mA	±0.25% FS
DP1400X1U11C	0 to 0.1	Unidirectional	0 VDC to 5 VDC	±1% FS
DP1400X5U11F	0 to 0.5	Unidirectional	0 VDC to 5 VDC	±0.25% FS
DP140005B11D	±5	Bidirectional	0 VDC to 5 VDC	±0.5% FS
DP140005B11C	±5	Bidirectional	0 VDC to 5 VDC	±1% FS
DP140050U11D	0 to 50	Unidirectional	0 VDC to 5 VDC	±0.5% FS
DP1402X5B11D	±2.5	Bidirectional	0 VDC to 5 VDC	±0.5% FS
DP140X25U11F	0 to 0.25	Unidirectional	0 VDC to 5 VDC	±0.25% FS
DP140001B11F	±1	Bidirectional	0 VDC to 5 VDC	±0.25% FS
DP1400X1U11F	0 to 0.1	Unidirectional	0 VDC to 5 VDC	±0.25% FS
DP140005B11F	±5	Bidirectional	0 VDC to 5 VDC	±0.25% FS
DP140025U21C	0 to 25	Unidirectional	4 mA to 20 mA	±1% FS
DP140050U11F	0 to 50	Unidirectional	0 VDC to 5 VDC	±0.25% FS
DP140025U11C	0 to 25	Unidirectional	0 VDC to 5 VDC	±1% FS
DP140005U31C	0 to 5	Unidirectional	0 VDC to 10 VDC	±1% FS
DP140001U31C	0 to 1	Unidirectional	0 VDC to 10 VDC	±1% FS
DP1402X5U31C	0 to 2.5	Unidirectional	0 VDC to 10 VDC	±1% FS
DP1400X5U31C	0 to 0.5	Unidirectional	0 VDC to 10 VDC	±1% FS
DP140X25U31C	0 to 0.25	Unidirectional	0 VDC to 10 VDC	±1% FS
DP140010U31C	0 to 10	Unidirectional	0 VDC to 10 VDC	±1% FS
DP140X25B31C	±0.25	Bidirectional	0 VDC to 10 VDC	±1% FS
DP1400X5B31C	±0.5	Bidirectional	0 VDC to 10 VDC	±1% FS
DP1400X1B31C	±0.1	Bidirectional	0 VDC to 10 VDC	±1% FS
DP140005B31C	±5	Bidirectional	0 VDC to 10 VDC	±1% FS
DP140001B31C	±1	Bidirectional	0 VDC to 10 VDC	±1% FS
DP1402X5B31C	±2.5	Bidirectional	0 VDC to 10 VDC	±1% FS

Technical specifications

Table 2: Differential Pressure Transducer DP110 technical specifications

Description		Specification
Performance data	Accuracy RSS1, at constant temperature	±1.0% FS, standard ±0.5% FS, ±0.25% FS, optional
	Non-linearity, BFSL	±0.98% FS, standard ±0.38% FS, ±0.22% FS, optional
	Hysteresis	0.10% FS
	Non-repeatibility	0.05% FS
Thermal effects ⓘ **Note:** Units calibrated at nominal 70˚F. Maximum thermal error calculated from this data.	Compensated range	0°F to 150°F (-18°C to 65°C)
	Zero shift % FS at 100°F (% FS at 50°C)	±0.033 (±0.06)
	Span shift % FS at 100°F (% FS at 50°C)	±0.033 (±0.06)
	Maximum line pressure	10 psi, 277 in. W.C.
	Overpressure	Up to 10 psi (277 in. W.C.) range dependent
	Long term stability	0.5% FS per year
	Warm-up shift	0.1% FS total
Environmental data	Operating temperature ⓘ **Note:** Operating temperature limits of the electronics only. Pressure media temperatures may be considerably higher.	0°F to 150°F (-18°C to 65°C)
	Storage temperature	-40°F to 185°F (-40°C to 85°C)
Pressure media	Clean air or similar nonconducting gases	
Physical specifications	Pressure fittings	1/4 in. push-on tube fitting
	Case	Fire retardant glass-filled polyester, UL 94-V approved
	Weight	3 oz
	Electrical connections	Removable terminal block
Position effect	**Range**	**Zero offset (%FS/G)**
	0 to 0.5 in. W.C.	0.60
	0 to 1.0 in. W.C.	0.50
	0 to 2.5 in. W.C.	0.22
	0 to 5.0 in. W.C.	0.14
Electrical data, voltage	Circuit	3-wire: Exc, Out, Com
	Excitation or output ⓘ **Note:** Calibrated into a 50 K ohm load, operable into a 5 K ohm load or greater	9 VDC to 30 VDC or 0 VDC to 5 VDC 9 VAC to 30 VAC or 0 VDC to 5 VDC 12 VAC to 30 VAC or 0 VDC to 10 VDC
	Output impedance	<100 ohm
	Bidirectional output at zero pressure	2.5 V in case of 0 V to 5 V output 5 V in case of 0 V to 10 V output

Table 2: Differential Pressure Transducer DP110 technical specifications

Description		Specification
Electrical data, current	Circuit	2-wire
	Output ⓘ **Note:** Calibrated at factory with a 24 VDC loop supply voltage and a 250 ohm load.	4 mA to 20 mA ⓘ **Note:** Zero and Span FS output factory set to within ±0.16 mA, ±0.08 mA for optional accuracies.
	External load	0 ohm to 800 ohm
	Minimum supply voltage, VDC	9 + 0.02 x (resistance of receiver plus line)
	Maximum supply voltage, VDC	30 + 0.004 x (resistance of receiver plus line
	Bidirectional output at zero pressure	12 mA
Compliance CE	CE Mark - Johnson Controls declares that this product is in Compliance with the essential requirements and other relevant provisions of the EMC and RoHS Directives.	

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

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Software terms

Use of the software that is in (or constitutes) this product, or access to the cloud, or hosted services applicable to this product, if any, is subject to applicable end-user license, open-source software information, and other terms set forth at www.johnsoncontrols.com/techterms. Your use of this product constitutes an agreement to such terms.

Patents

Patents: https://jcipat.com

Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS	JOHNSON CONTROLS	JOHNSON CONTROLS
C/O CONTROLS PRODUCT MANAGEMENT	WESTENDHOF 3	507 E MICHIGAN ST
NO. 32 CHANGJIJANG RD NEW DISTRICT	45143 ESSEN	MILWAUKEE WI 53202
WUXI JIANGSU PROVINCE 214028	GERMANY	USA
CHINA		

Contact information

Contact your local branch office: www.johnsoncontrols.com/locations
Contact Johnson Controls: www.johnsoncontrols.com/contact-us

ALARMS & INDICATION

EMERGENCY OPERATOR STATIONS
ESM SERIES

DESCRIPTION

The **E-Stop ESM Series emergency operator stations** offer a highly visible method to shut down equipment, initiate alarms, or give a controller input during emergency conditions. Operation is with the push of a red 40mm mushroom-head push-button. The button may be reset with a pull or twist of the mushroom head, depending on the button style.

FEATURES

- ***Highly visible yellow/black backGround***
- ***UL listed for Category NISD Emergency Stop Devices, File #E348889***
- ***Various NEMA rated enclosures***
- ***40mm Red Mushroom Operators***
- ***1 N.O. and 1 N.C. contact included***

ESM-M1S-PP0-BS

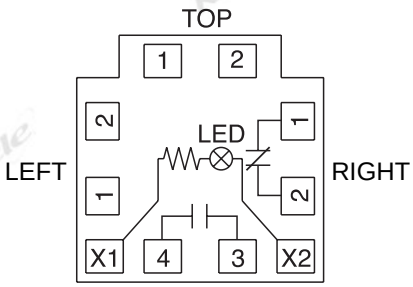
ESM-NXS-PP0-VT

SPECIFICATIONS

Contact Rating	
ES-NO	10A, 600 VAC
ES-NC	2.5A, 600 VDC
Contact Configuration	4 Maintained or 6 Momentary maximum
Mechanical Life	Contact 10 million operations
Contact Type	Self-cleaning silver contacts
Contact Resistance	<25 milli-ohms, closed
Operating Temperature	-13° to 158°F (-25° to 70°C)
Enclosure Rating	NEMA 1, 3R, 4, 4X, 12, 13 availiable
Dimensions	
M1S, M2S	4"H x 4"DW x 3"D (10.2 x 10.2 x 7.6 cm)
NXS	4.45"H x 2.87" W x 3.11"D (10.2 x 7.6 x 7.9 cm)
SXS	3.5"H x 3.25"W x 2.75"D (8.9 x 8.3 x 7.1 cm)
M3S	4"H x 4" W x 4"D (10.2 x 10.2 x 10.2 cm)
M1F	5.5"H x 5.5"W x 3"D (14 x 14 x 7.6 cm)
Weight	
M1S	1.84 lb (0.84 Kg)
NXS	1.93 lb (0.88 Kg)
M2S	2.30 lb (1.04 Kg)
SXS	1.90 lb (0.86 Kg)
M3S	2.95 lb (1.34 Kg)
M1F	2.39 lb (1.03 Kg)
Approvals	UL Listed NISD File# E348889, CSA, NEMA
Warranty	1 year

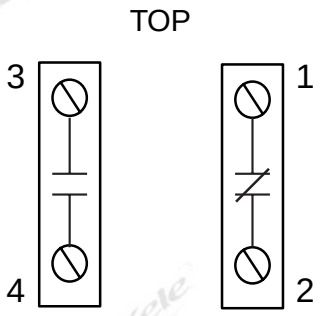
WIRING

PTL24



1 NO-1 NC
Note: Standard contact arrangement

PP0, PT0, PK



1 NO-1 NC
Note: Standard contact arrangement
(4 momentary or 6 maintained total maximum)

ORDERING INFORMATION

Model	Description		
ESM	**Maintained Emergency Operator Station (UL NISD) (1-N.O. & 1-N.C. contact included)**		
	Enclosure		
	M1S	NEMA 1 Metal enclosure, surface mount	
	NXS	NEMA 4X,12 Non-metal enclosure, surface mount	
	M2S	NEMA 12,13 Metal enclosure, surface mount	
	SXS	NEMA 4X Stainless steel enclosure, surface mount	
	M3S	NEMA 3R Metal enclosure, surface mount	
	M1F	NEMA 1 Metal enclosure, flush mount	
		Button Style	
		PP0	Red maintained 40mm mushroom (push-pull)
		PT0	Red maintained 40mm mushroom (push-twist)
		PTL24*	Illuminated 24V red maintained 40mm mushroom (push-twist, lamp included)
		PK0	Red maintained 40mm mushroom (push- key release)
			Legend
			BS Emergency - Boiler Shut-down
			CS Emergency - Chiller Stop
			FN Emergency - Exhaust Fan
			HS Emergency- HVAC Shut-down
			PO Emergency - Power Off
			RP Emergency - Refrigerant Purge
			SD Emergency - Shut Down
			SO Emergency - Shut Off
			ST Emergency - Stop
			VP Emergency - Ventilation Stop
			VT Emergency - Ventilation Start

*Can only be used with M1S or M1F enclosure

**18 character max, no color changes, no font changes, no company logos.

ESM - **M1S** - **PP0** - **CS**

Example: **ESM-M1S-PP0-CS** Maintained Emergency Operator Station, NEMA1 metal enclosure, surface mount, Red maintained 40mm push-pull mushroom, labeled as “Chiller Stop”

ACCESSORIES

ES-KEY	Replacement Key for PK0 option, ESM and ESP series
ES-NC	Normally Closed Contact Block for Non-illuminated ESM, ESB, and ESP Emergency Operator Stations
ES-NO	Normally Open Contact Block for Non-illuminated ESM, ESB, and ESP Emergency Operator Stations

HT1O Series

Outdoor Humidity/Temperature

2% or 3% accuracy (NIST certification options)
0-5V/10V and 4-20mA RH/Temp (thermistors optional)
LCD display with field calibration menu
Field replaceable element

DESCRIPTION

The HO Series is designed to be mounted on the building exterior to provide outside air RH measurement. The HO Series combines excellent stability with reliable operation in 2% or 3% RH accuracy options. Optional temperature transmitters, RTDs and thermistors add further flexibilty when ordering. The standard LCD, gasketed lid and field replaceable elements make the intitial installation and future service a breeze.

APPLICATIONS

- Outdoor humidity and temperature measurement for building control

FEATURES

Versatile

- 2% or 3% Rh versions with field replaceable sensor
- Switch selectable 5V/10V and 4-20mA RH/T transmitter outputs
- Thermistor/RTD output for temperature optional

Easy to maintain

- Field calibration. LCD and push-button menu allows easy adjustment of calibrated RH value as needed to maintain certification
- Replace a sensor without disturbing conduit

Superior RH sensing

- On-board temperature compensation for RH. Eliminates temperature coefficient errors and achieves an excellent measurement accuracy as well as high repeatability and offset stability
- State of the art testing facilities. 8-point calibration certificate available (NIST traceability—consult factory)

Quality

- Industry leading 7-year warranty/ 2-year replaceable element warranty

PROUDLY MADE IN USA

7 year limited warranty

Field replaceable element

- Ideal for harsh environments
- Accurate dual RH/Temp IC sensing

LCD with menu

- Easier commissioning
- Re-scale to field metrics if required

NIST traceable

- 8-point calibration certification options. Consult factory.

ORDERING

HT1O - [ ] [ ] U [ ]

Accuracy

2 = 2%
3 = 3%
N = 2% NIST

Temperature

A = None
B = Transmitter
C = 100Pt (385)
D = 1000Pt (385)
E = 10k type 2
F= 10k type 3
G = 10k type 3 w/11k shunt
H = 3k
I = 2k2
J = 1k8
K = 20k

Output Type

U = Universal (2-wire and 3-wire 4-20mA, 0-5V, 0-10V)

Display (LCD)

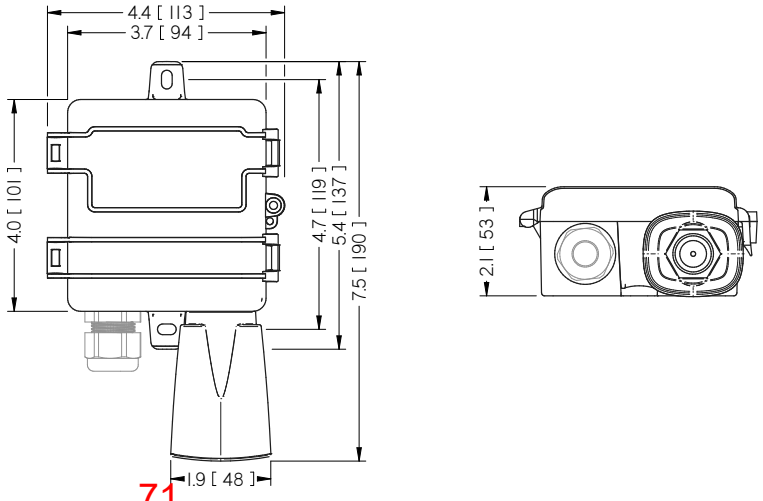
D = Display
X= None

SPECIFICATIONS

Power Supply	3-wire voltage mode (0-5/10V)	12-30VDC/24VAC(1), 15mA max
	2-wire current mode (4-20mA)	12-30VDC, 30mA max.
Outputs	RH and Temperature (option)	3-wire 0-5/10V(4) or 3-wire or 2-wire 4-20mA
Output scaling	RH	0-100% RH
	Temperature	32-122°F (0-50°C) or -40-140°F (-40-60°C)
Thermistor/RTD	Optional	See ordering table
Media filter		Sintered stainless steel
Relative Humidity	Accuracy	2% models, ±2% over 0 to 100% RH Range; ±1.5% typ 3% models, ±3% over 0 to 100% RH Range; ±2% typ
	Resolution	0.01%RH
	Hysteresis	±0.8%RH
	Non-Linearity	Factory linearized <1%RH
	Temperature coefficient	Fully compensated by on-board sensor
	Response time(2)	8s
	Output update rate	0.5s
	Operating range	0 to 100%RH (non-condensing)
	Long term drift	<0.25%RH per year
	Normal Operating conditions (3)	41 to 140°F (5°C to 60°C) @ 20% to 80% RH
Temperature	Accuracy	2% models, <±0.25° C; 0.1° C typ @ 25° C 3% models, <±0.3° C; 0.25° C typ @ 25° C
	Resolution	0.01° C
	Repeatability	0.08° C
	Response time(2)	2s
	Output update rate	0.5s
	Operating range	-40 to 140°F (-40° to 60° C)
Enclosure	Materials	ABS/Polycarbonate
	Unit Temp Rating	-40 to 158°F (-40 to 70°F)
	Enclosure Rating	Nema 1; Add drain holes to enclosure bottom to achieve Nema 3R rating
	Dimensions	4.0"h x 4.4"w x 2.1"d (+2.8" solar shield)

(1) One side of transformer,, secondary is connected to signal common. Dedicated transformer is recommended.
(2) Time for reaching 63% of reading at 25° C and 1 m/s airflow.
(3) Long term exposures to conditions outside normal range at high humidity may temporarily offset the RH reading (+3%RH after 60 hours.)
(4) 15-30VDC/24VAC power supply voltage required for 10 volt ouput.

DIMENSIONS



71

P32 Series Sensitive Pressure Switch Catalog Page

LIT-1927195

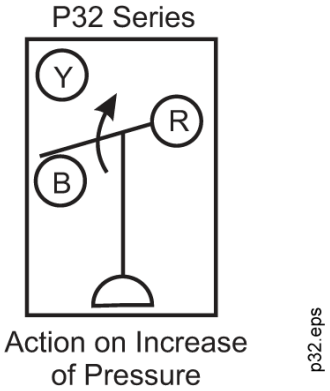
2020-04-22

Description

This differential pressure switch is used to sense pressure/air flow in ducts.

Refer to the *P32 Series Sensitive Differential Pressure Switch Product Bulletin (LIT-125435)* for important product application information.

Figure 1: P28 Action Diagram



Features

- easy-to-read setpoint scale
- versatile mounting options

Applications

- pressure/air flow proving with electric duct heaters, humidifiers, and other equipment
- maximum pressure/air flow control for variable volume systems

- reheat duct powered systems
- clogged filter detection
- detection of icing of air conditioning coils and initiation of defrost cycle
- sensitive pressure settings
- dust-tight snap switch

Repair Information

If the P32 Series Sensitive Pressure Switch fails to operate within its specifications, replace the unit. For a replacement switch, contact the nearest Johnson Controls® representative.

Selection Chart

Table 1: Selection Chart

Product Code Number	Ambient Temperature Min./Max.	Connector	Maximum Overpressure psig (kPa)[1]	Contact Action	Range in. WC(kPa)	Sensitivity at Min.Setpoint in. WC (kPa)	Setpoint	Scale Plate	Mounting Bracket (Included)
P32AC-1C	-40°F (-40°C) min. 167°F (75°C) max.	High Pressure connectors are metal 1/8 in. internal NPT inside, 1/2 in. NPSM outside for mounting Low pressure connectors are molded,1/8 in. internal NPT	1 (6.895)	Single-Pole Double-Throw (SPDT)	0.15 to 12 (0.037 to 2.99)	0.07 (0.017)	Adjustable	Yes	L  BKT182-1
P32AC-2C[2]					0.05 to 5 (0.012 to 1.24)	0.04 (0.01)			U  BKT229-1
P32AF-1C						0.025 (0.006)			L  BKT182-1
P32AF-2C[2]									U  BKT229-1

1 Maximum overpressure at either connection
2 Supplied with 1/4 in. compression fitting, 4 in. extension tube, two mounting screws, and O-gasket (angle barbed fitting installed)

Accessories

The switch can be mounted directly or with the supplied mounting bracket.

Product Code Number	Description
FTG18A-600R	Remote Mounting Kit: 4 in. flanged sensing tube, two barbed fittings, two No. 10 screws, and a gasket

P32 Series Sensitive Pressure Switch Technical Specifications

Table 2: Electrical Ratings

Motor Ratings VAC	120	208	240
Type P32AC (Standard Differential, 1/2 hp)			
AC Full Load A	9.8	5.65	4.9
AC Locked Rotor A	58.8	33.9	29.4
Non-Inductive or Resistive Load	15 A, 24 to 277 VAC		
Pilot Duty	125 VA, 24 VAC; 360 VA, 120 to 277 VAC		
Type P32AF (Close Differential, 1/4 hp)			
AC Full Load A	5.8	3.3	2.9
AC Locked Rotor A	34.8	19.8	17.4
Non-Inductive or Resistive Load	10 A, 24 to 277 VAC		
Pilot Duty	125 VA, 24 VAC; 360 VA, 120 to 277 VAC		

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIJANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS WESTENDHOF 3 45143 ESSEN GERMANY	JOHNSON CONTROLS 507 E MICHIGAN ST MILWAUKEE WI 53202 USA

Contact information

Contact your local branch office:
www.johnsoncontrols.com/locations

Contact Johnson Controls:
www.johnsoncontrols.com/contact-us

Johnson Controls

M9208-xxx-x Series Electric Spring-Return Actuators Catalog Page

LIT-1900562

2020-04-29

Description

The M9208-xxx-x Series Electric Spring-Return Actuators provide control of dampers in HVAC systems. All actuators in this series provide 70 lb·in (8 N·m) rated torque. A mechanical spring-return system provides rated torque with and without power applied to the actuator. The series includes the following control options:

- On/off, 24 V, 120 VAC, 230 VAC power
- On/off and floating point, 24 V power
- Proportional, 24 V power, for 0(2) to 10 VDC or 0(4) to 20 mA control signal

These actuators are configured for direct mounting and do not require a damper linkage. Actuators can be mounted directly to a damper shaft from 5/16 to 5/8 in. (8 to 16 mm) diameter with a universal clamp. For shafts up to 3/4 in. (19 mm) diameter, use the accessory Large Shaft Coupler Kit M9208-600. An accessory crankarm and remote mounting kit are available for applications where the actuator cannot be direct coupled to the damper shaft. Optional line voltage auxiliary switches indicate an end-stop position or perform switching functions within the selected rotation range.

Refer to the *M9208-xxx-x Series Electric Spring-Return Actuators Product Bulletin (LIT-12011480)* for important product application and single point of contact information.

Features

- 70 lb·in (8 N·m) rated torque
- Direct-coupled design
- Reversible mounting
- Electronic stall detection
- Double-insulated construction
- Microprocessor-controlled brushless DC motor(-AGx and -GGx types)
- External mode selection switch(-AGx and -GGx types)
- Locking manual override with auto release and crank storage
- Integral cables with colored and numbered conductors
- Integral connectors for 3/8 in. (10 mm) Flexible Metal Conduit (FMC)
- Optional integrated auxiliary switches
- UL, CE, and C-Tick compliance
- Manufactured under International Standards Organization (ISO) 9001 quality control standards
- 5-year warranty

Accessories and replacement parts

Code number	Description
DMPR-KC003	7 in. (178 mm) blade pin extension (without bracket) for Johnson Controls direct-mount damper applications (quantity 1) ⓘ **Note:** Available with damper and may be ordered separately.
M9000-322	Weather shield kit for damper application of M9203, M9208, VA9104, and VA9308/9310 Series Electric Spring-Return Actuators (quantity 1)
M9000-400	Jackshaft linkage kit. Open-ended design enables clamping onto a jackshaft without requiring access to the ends of the jackshaft. (quantity 1)
M9000-560	Ball valve linkage kit for applying M9203 and M9208 Series Electric Spring-Return Actuators to VG1000 Series Valves (quantity 1)
M9000-604	Replacement anti-rotation bracket kit for M9208, M9210, and M9220 Series Electric Spring-Return Actuators (quantity 1)
M9000-606	Position indicator for damper applications of M9203 and M9208 Series Actuators (quantity 5)
M9200-100	Threaded conduit adapter, 1/2 NPSM, for M9210(20) and M(VA)9208 Series Actuators (quantity 5)
M9208-100	Remote mounting kit, including mounting bracket, M9208-150 Crankarm, ball joint, and mounting fasteners (quantity 1)
M9208-150	Crankarm adapter kit (quantity 1)
M9208-600	Large shaft coupler kit (with locking clip) for mounting M9208 Series Electric Spring-Return Actuators on dampers with round shafts from1/2 in. to 3/4 in. (12 mm to 19 mm) or square shafts from 3/8 in. to 9/16 in. (10 m to 14 mm) (quantity 1)
M9208-601	Replacement standard coupler kit (with locking clip) for mounting M9208 Series Electric Spring-Return Actuators on dampers with round shafts from 5/16 in. to 5/8 in. (8 mm to 16 mm) or square shafts from 1/4 in. to 1/2 in. (6 mm to 12 mm) (quantity 1)
M9208-602	Replacement locking clips for M9208 Series Electric Spring-Return Actuators (quantity 5)
M9208-603	Adjustable stop kit for M9208 Series Electric Spring-Return Actuators (quantity 1)
M9220-604	Replacement manual override cranks for M9208 Series Electric Spring-Return Actuators with long crank radius: 2.83 in. (72 mm) (quantity 5)
M9208-605	Replacement manual override cranks for M9208 Series Electric Spring-Return Actuators with short crank radius: 1.83 in. (46.5 mm) (quantity 5)

Selection chart

Code number	Rotation time (seconds) for 90°		Power requirements				Power consumption			Input signal			Position feedback	Auxiliary switches	Electrical connection		
	Power on (running)	Power off (spring return)	24 VAC +/- 25%, VDC +20%/-10%	24 VAC +/- 20%, VDC +20%/-10%	120 VAC +/- 10%	230 VAC +/- 10%	VA rating, transformer sizing	VA: running (holding)	Amperage: running (holding)	On/off	Floating point	0(2) to 10 VDC 0(4) to 20 mA (with 500 ohm resistor)	0(2) to 10 VDC	2 Single-Pole, Double-Throw (SPDT),5.0 A (2.9 A inductive) at 240 V	48 in. (1.2 m) 18 AWG appliance cable	120 in. (3.05 m) 19 AWG plenum cable	Integral 3/8 in. (10 mm) FMC connectors
M9208-AGA-2	150	17 to 25[1]		■			8	7.9 (5.5)		■	■					■	■
M9208-AGA-3	150	17 to 25		■			8	7.9 (5.5)		■	■				■		■
M9208-AGC-3	150	17 to 25		■			8	7.9 (5.5)		■	■			■	■		■
M9208-BGA-3	55 to 71	13 to 26[2]	■				7	6.1 (1.2)		■					■		■
M9208-BGC-3	55 to 71	13 to 26	■				7	6.1 (1.2)		■				■	■		■
M9208-BAA-3	55 to 71	13 to 26			■				0.05 (0.03)	■					■		■
M9208-BAC-3	55 to 71	13 to 26			■				0.05 (0.03)	■				■	■		■
M9208-BDA-3	55 to 71	13 to 26				■			0.04 (0.03)	■					■		■
M9208-BDC-3	55 to 71	13 to 26				■			0.04 (0.03)	■				■	■		■
M9208-GGA-2	150	17 to 25		■			8	7.9 (5.5)				■	■			■	■
M9208-GGA-3	150	17 to 25		■			8	7.9 (5.5)				■	■		■		■
M9208-GGC-3	150	17 to 25		■			8	7.9 (5.5)				■	■	■	■		■

1 seconds nominal at room temperature and rated load, 94 seconds maximum at rated load and -40°F (-40°C)

2 seconds nominal at room temperature and rated load, 39 seconds maximum at rated load and -4°F (-20°C),108 seconds maximum at 53 lb·in (6 N·m) and -40°F (-40°C)

Technical specifications

M9208-GGx-x Series Proportional Electric Spring-Return Actuator		
Power requirements	-GGx models	AC 24 V (AC 19.2 V to 28.8 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe),7.9 VA running, 5.5 VA holding position DC 24 V (DC 21.6 V to 28.8 V): Class 2 (North America) or SELV (Europe), 3.5 W running, 1.9 W holding position Minimum transformer size: 8 VA per actuator
Input signal/ adjustments	-GGx models	Factory set at DC 0 to 10 V, CW rotation with signal increase; Selectable DC 0 (2) to 10 V or 0 (4) to 20 mA with field furnished 500 ohm, 0.25 W minimum resistor; Switch selectable direct or reverse action with signal increase
Control input impedance	-GGx models	Voltage input: 100,000 ohms Current input: 500 ohms with field furnished 500 ohm resistor
Feedback signal	-GGx models	DC 0 (2) to 10 V for Desired Rotation Range up to 95° Corresponds to Rotation Limits, 0.5 mA at 10 V Maximum
Auxiliary SwitchRating	-xxC models	Two Single-Pole, Double-Throw (SPDT), double-insulated switches with gold over silver contacts: AC 24 V, 50 VA pilot duty AC 120 V, 5.8 A resistive, 1/4 hp, 275 VA pilot duty AC 240 V, 5.0 A resistive, 1/4 hp, 275 VA pilot duty
Spring return		Direction is selectable with mounting position of actuator: Actuator face labeled A is away from damper or valve: CCW spring return Actuator face labeled B is away from damper or valve: CW spring return
Rated Torque	Power on (running)	70 lb·in (8 N·m) all operating temperatures
	Power off (spring returning)	70 lb·in (8 N·m) all operating temperatures
Rotation Range		Maximum full stroke: 95° Adjustable Stop: 35° to 95° Maximum Position
Rotation time for 90 degrees of travel	Power on (running)	150 seconds constant for 0 lb·in to 70 lb·in (8 N·m) Load, at all operating conditions
	Power off (spring returning)	17 to 25 seconds for 0 lb·in to 70 lb·in (8 N·m) load, at room temperature 22 seconds nominal at full rated load 94 seconds maximum with 70 lb·in (8 N·m) load, at -40°F (-40°C)
Life cycles		60,000 full stroke cycles with 70 lb·in (8 N·m) load 1,500,000 repositions with 70 lb·in (8 N·m) load
Audible noise rating	Power on (running)	< 35 dBA at 70 lb·in (8 N·m) load, at a distance of 39-13/32 in. (1 m)
	Power on (holding)	< 20 dBA at a distance of 39-13/32 in. (1 m)
	Power off (spring returning)	< 52 dBA at 70 lb·in (8 N·m) load, at a distance of 39-13/32 in. (1 m)
Electrical connections	Models: GGx-3	48 in. (1.2 m) UL 758 Type AWM halogen-free cable with 18 AWG (0.85 mm²) conductors and 0.25 in. (6 mm) ferrule Ends
	Models: GGA-2	120 in. (3.05 m) UL 444 Type CMP plenum rated cable with 19 AWG (0.75 mm²) conductors and 0.25 in. (6 mm) ferrule ends
	Auxiliary switches (-xxC models)	48 in. (1.2 m) UL 758 Type AWM halogen-free cable with 18 AWG (0.85 mm²) conductors and 0.25 in. (6 mm) ferrule ends
Conduit connections		Integral connectors for 3/8 in. (10 mm) flexible metal conduit
Mechanical connections	Round shafts	Range of sizes: 5/16 in. to 5/8 in. (8 mm to 16 mm)
	Square shafts	Range of sizes: 1/4 in. to 1/2 in. (6 mm to 12 mm)
Enclosure rating		NEMA 2 (IP54) for all mounting directions

M9208-GGx-x Series Proportional Electric Spring-Return Actuator		
Ambient conditions	Standard operating	-40°F to 140°F (-40°C to 60°C); 90% RH maximum, noncondensing
	Storage	-40°F to 185°F (-40°C to 85°C); 95% RH maximum, noncondensing
Dimensions		6.33 in. x 3.90 in. x 2.26 in. (160.7 mm x 99 mm x 57.5 mm)
Compliance	United States	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1,Automatic Electrical Controls for Household and Similar Use; andUL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA:July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All).
CE	Europe	CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and Low Voltage Directive.
	Australia and New Zealand	RCM Mark, Australia/NZ Emissions Compliant (Models: All)
Shipping weight		Models: -GGA: 3.43 lb (1.6 kg) Models: -GGC: 3.8 lb (1.7 kg)

M9208-AGx-x Series On/Off and Floating Point Control Electric Spring-Return Actuator		
Power Requirements	-AGx Models	AC 24 V (AC 19.2 V to 28.8 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 7.9 VA Running, 5.5 VA Holding Position DC 24 V (DC 21.6 V to 28.8 V): Class 2 (North America) or SELV (Europe),3.5 W Running, 1.9 W Holding Position Minimum Transformer Size: 8 VA per Actuator
Input Signal	-AGx Models	AC 19.2 to 28.8 V at 50/60 Hz or DC 24 V +20%/-10%, Class 2 (North America) or SELV (Europe) Minimum Pulse Width: 500 ms
Control Input Impedance	-AGx Models	3,000 Ohm Control Inputs
Auxiliary Switch Rating	-xxC Models	Two SPDT, Double-Insulated Switches with Gold over Silver Contacts: AC 24 V, 50 VA Pilot Duty AC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty AC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
Spring Return		Direction is Selectable with Mounting Position of Actuator: Actuator Face Labeled A is away from Damper or Valve: CCW Spring Return Actuator Face Labeled B is away from Damper or Valve: CW Spring Return
Rated Torque	Power On (Running)	70 lb·in (8 N·m) All Operating Temperatures
	Power Off (Spring Returning)	70 lb·in (8 N·m) All Operating Temperatures
Rotation Range		Maximum Full Stroke: 95° Adjustable Stop: 35° to 95° Maximum Position
Rotation Time for 90 Degrees of Travel	Power On (Running)	150 Seconds Constant for 0 lb·in to 70 lb·in (8·N m) Load,At All Operating Conditions
	Power Off (Spring Returning)	17 to 25 Seconds for 0 lb·in to 70 lb·in (8 N·m) Load, at Room Temperature 22 Seconds Nominal at Full Rated Load 94 Seconds Maximum with 70 lb·in (8 N·m) Load, at -40°F (-40°C)
Life Cycles		60,000 Full Stroke Cycles with 70 lb·in (8 N·m) Load 1,500,000 Repositions with 70 lb·in (8 N·m) Load
Audible Noise Rating	Power On (Running)	< 35 dBA at 70 lb·in (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	Power On (Holding)	< 20 dBA at a Distance of 39-13/32 in. (1 m)
	Power Off (Spring Returning)	< 52 dBA at 70 lb·in (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)

M9208-AGx-x Series On/Off and Floating Point Control Electric Spring-Return Actuator		
Electrical Connections	Models: AGx-3	48 in. (1.2 m) UL 758 Type AWM Halogen-Free Cable with 18 AWG (0.85 mm²) Conductors and 0.25 in. (6 mm) Ferrule Ends
	Models: AGA-2	120 in. (3.05 m) UL 444 Type CMP Plenum Rated Cable with 19 AWG (0.75 mm²) Conductors and 0.25 in. (6 mm) Ferrule Ends
	Auxiliary Switches(-xxC Models)	48 in. (1.2 m) UL 758 Type AWM Halogen-Free Cable with 18 AWG (0.85 mm²) Conductors and 0.25 in. (6 mm) Ferrule Ends
Conduit Connections		Integral Connectors for 3/8 in. (10 mm) Flexible Metal Conduit
Mechanical Connections	Round Shafts	Range of Sizes: 5/16 in. to 5/8 in. (8 mm to 16 mm)
	Square Shafts	Range of Sizes: 1/4 in. to 1/2 in. (6 mm to 12 mm)
Enclosure Rating		NEMA 2 (IP54) for All Mounting Directions
Ambient Conditions	Standard Operating	-40°F to 140°F (-40°C to 60°C); 90% RH Maximum, Noncondensing
	Storage	-40°F to 185°F (-40°C to 85°C); 95% RH Maximum, Noncondensing
Dimensions		6.33 in. x 3.90 in. x 2.26 in. (160.7 mm x 99 mm x 57.5 mm)
Compliance	United States	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1,Automatic Electrical Controls for Household and Similar Use; andUL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA:July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All).
CE	Europe	CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and Low Voltage Directive.
	Australia and New Zealand	RCM Mark, Australia/NZ Emissions Compliant (Models: All)
Shipping Weight		Models: -AGA: 3.43 lb (1.6 kg) Models: -AGC: 3.8 lb (1.7 kg)

M9208-Bxx-3 Series On/Off Electric Spring-Return Actuators		
Power requirements	-BGx models	AC 24 V (AC 18 V to 30 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 6.1 VA Running, 1.2 VA Holding Position DC 24 V (DC 21.6 V to 28.8 V): Class 2 (North America) or SELV (Europe), 3.5 W Running, 0.5 W Holding Position Minimum Transformer Size: 7 VA per Actuator
	-BAx models	AC 120 V (AC 102 V to 132 V) at 60 Hz: 0.05 A Running, 0.03 A Holding Position
	-BDx models	AC 230 V (AC 198 V to 264 V) at 50/60 Hz: 0.04 A Running, 0.03 A Holding Position
Auxiliary switch rating	-xxC models	Two SPDT, Double-Insulated Switches with Gold over Silver Contacts:AC 24 V, 50 VA Pilot DutyAC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot DutyAC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
Spring return		Direction is selectable with mounting position of actuator: Actuator Side A is away from damper or valve: CCW spring return Actuator Side B is away from damper or valve: CW spring return
Rated torque	Power on (running)	70 lb·in (8 N·m) all operating temperatures
	Power off (spring returning)	70 lb·in (8 N·m) at standard operating temperatures 53 lb·in (6 N·m) at extended operating temperatures
Rotation range		Maximum full stroke: 95° Adjustable stop: 35 to 95°, maximum position
Rotation time for 90 degrees of travel	Power on (running)	55 to 71 seconds for 0 lb·in to 70 lb·in (8 N·m) load, at all operating conditions 60 seconds nominal at full rated load (0.25 rpm)
	Power off (spring returning)	13 to 26 seconds for 0 lb·in to 70 lb·in (8 N·m) load, at room temperature 21 seconds nominal at full rated load 39 seconds maximum with 70 lb·in (8 N·m) load at -4°F (-20°C)108 seconds maximum with 53 lb·in (6 N·m) load at -40°F (-40°C)
Life cycles		60,000 full-stroke cycles with 70 lb·in (8 N·m) load

M9208-Bxx-3 Series On/Off Electric Spring-Return Actuators		
Audible noise rating	Power on (running)	< 47 dBA at 70 lb·in (8 N·m) load, at a distance of 39-13/32 in. (1 m)
	Power on (holding)	< 20 dBA at a distance of 39-13/32 in. (1 m)
	Power off (spring returning)	< 52 dBA at 70 lb·in (8 N·m) load, at a distance of 39-13/32 in. (1 m)
Electrical connections	Actuator (all models)	48 in. (1.2 m) UL 758 Type AWM halogen-free cable with 18 AWG (0.85 mm²) conductors and 0.25 in. (6 mm) ferrule ends
	Auxiliary switches (-xxC models)	48 in. (1.2 m) UL 758 Type AWM halogen-free cable with 18 AWG (0.85 mm²) conductors and 0.25 in. (6 mm) ferrule Ends
Conduit connections		Integral connectors for 3/8 in. in. (10 mm) flexible metal conduit
Mechanical connections	Round shafts	Range of sizes: 5/16 in. to 5/8 in. (8 mm to 16 mm)
	Square shafts	Range of sizes: 1/4 in. to 1/2 in. (6 mm to 12 mm)
Ambient conditions	Extended operating	-40°F to -4°F (-40°C to -20°C); 90% RH maximum, noncondensing
	Storage	-40°F to 185°F (-40°C to 85°C); 95% RH maximum, noncondensing
Dimensions		6.33 in. x 3.90 in. x 2.26 in. (160.7 mm x 99 mm x 57.5 mm)
Compliance	United States	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1,Automatic Electrical Controls for Household and Similar Use; andUL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA:July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; andCSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All).
CE	Europe	CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and Low Voltage Directive.
	Australia and New Zealand	RCM Mark, Australia/NZ Emissions Compliant (Models: All)
Shipping weight		Models: -BGC: 3.75 lb (1.7 kg) Models: -BAC and -BDC: 4.15 lb (1.9 kg)

Patents

Patents: http://jcipat.com

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIJANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS WESTENDHOF 3 45143 ESSEN GERMANY	JOHNSON CONTROLS 507 E MICHIGAN ST MILWAUKEE WI 53202 USA

Johnson Controls

M9220 Series Electric Spring-Return Actuators Catalog Page

LIT-1900358

2020-04-29

Description

The M9220-xxx-3 actuators are direct-mount, spring-return electric actuators that operate with these available power options:

- AC 24 V at 50/60 Hz or DC 24 V(AGx, BGx, GGx, HGx)
- AC 120 V at 60 Hz (BAx)
- AC 230 V at 50/60 Hz (BDx)

These bidirectional actuators do not require a damper linkage, and are easily installed on dampers with 1/2 in. to 3/4 in. or 12 mm to 19 mm round shafts, or 3/8 in. and 1/2 in. or 10 mm, 12 mm, and 14 mm square shafts using the standard shaft clamp included with the actuator. An optional M9220-600 Jackshaft Coupler Kit is available for 3/4 in. to 1-1/16 in. or 19 mm to 27 mm round shafts, or 5/8 in. and 3/4 in. or 16 mm, 18 mm, and 19 mm square shafts.

A single M9220-xxx-3 Electric Spring-Return Actuator provides a running and spring-return torque of 177 lb·in (20 N·m). Two or three models mounted in tandem deliver twice or triple the torque. Integral line voltage auxiliary switches are available on the -xxC models to indicate end-stop position or to perform switching functions within the selected rotation range.

Refer to the *M9220-xxx-3 Electric Spring-Return Actuators Product Bulletin (LIT-12011057)* for important product application information and single point of contact information.

Features

- available torques of 177 lb·in (20 N·m) for single actuators, 354 lb·in (40 N·m) for two models, and 531 lb·in (60 N·m) for three models mounted in tandem—offer a selection that is most suitable for the application.
- reversible mounting design—simplifies installation and enables the actuator to spring return in either direction.
- electronic stall detection throughout entire rotation range—extends the life of the actuator by deactivating the actuator motor when an overload condition is detected.
- removable coupler—adapts to a shorter damper shaft.
- integral 48 in. (1.2 m) halogen-free cables with colored and numbered conductors—simplify field wiring.
- integral auxiliary switches (xxC Models)—provide one fixed and one adjustable switch point with line voltage capability.
- NEMA 2 (IP54) rated aluminum enclosure—protects the internal components of the actuator from dirt and moisture.
- easy-to-use locking manual override with auto release and crank storage—allows for manual positioning of the actuator hub.
- integral connectors for 3/8 in. flexible metal conduit—simplify installation and field wiring.
- microprocessor-controlled brushless DC motor (-AGx, -GGx, and -HGx types)—provides constant run-time independent of torque.

Applications

The M9220-xxx-3 Electric Spring-Return Actuators provide reliable control of dampers and valves in HVAC systems. The M9220-xxx-3 Actuators are available for use with on/off, floating, and proportional controllers.

Repair information

If the M9220 Series Electric Actuator fails to operate within its specifications, replace the unit. For a replacement actuator, contact the nearest Johnson Controls® representative.

Selection chart

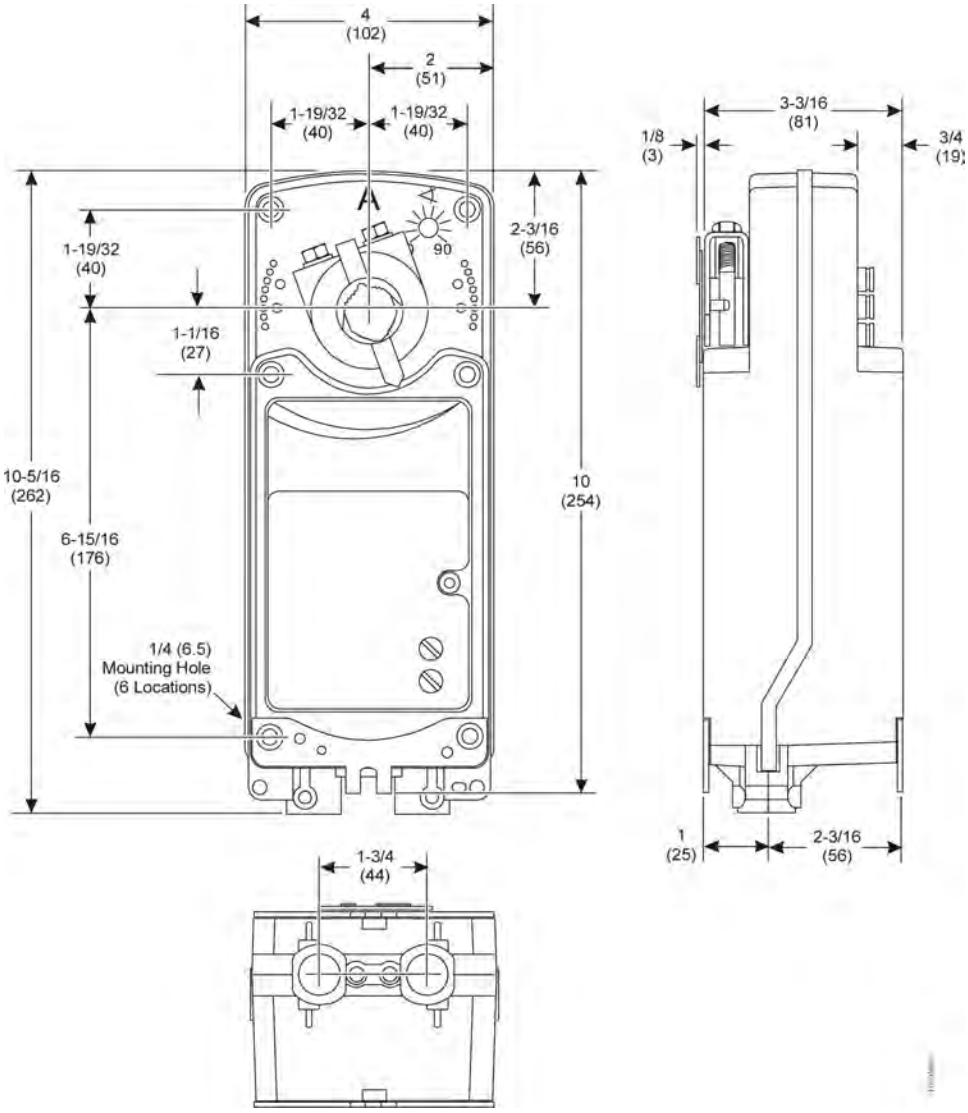
Code number	Control type	Auxiliary switches	Power requirements
M9220-AGA-3	Floating	None	AC 24 V at 50/60 Hz or DC 24 V
M9220-AGC-3	Floating	Two	AC 24 V at 50/60 Hz or DC 24 V
M9220-BAA-3	On/off	None	AC 120 V at 60 Hz
M9220-BAC-3	On/off	Two	AC 120 V at 60 Hz
M9220-BDA-3	On/off	None	AC 230 V at 50/60 Hz
M9220-BDC-3	On/off	Two	AC 230 V at 50/60 Hz
M9220-BGA-3	On/off	None	AC 24 V at 50/60 Hz or DC 24 V
M9220-BGC-3	On/off	Two	AC 24 V at 50/60 Hz or DC 24 V
M9220-GGA-3	Proportional	None	AC 24 V at 50/60 Hz or DC 24 V
M9220-GGC-3	Proportional	Two	AC 24 V at 50/60 Hz or DC 24 V
M9220-HGA-3	Proportional with adjustable zero and span	None	AC 24 V at 50/60 Hz or DC 24 V
M9220-HGC-3	Proportional with adjustable zero and span	Two	AC 24 V at 50/60 Hz or DC 24 V

Accessories

Code number	Description
DMPR-KC003	7 in. (178 mm) blade pin extension (without bracket) for Johnson Controls direct-mount damper applications (quantity 5) ⓘ **Note:** Available with damper and may be ordered separately
M9000-153	Crankarm (quantity 1)
M9000-158	Tandem Mounting Kit used to mount two models of M9220-xxx-3 Series Proportional Electric Spring-Return Actuators (quantity 1)
M9000-170	Remote Mounting Kit, horizontal. Kit includes mounting bracket, M9000-153 crankarm, ball joint, and mounting bolts (quantity 1)
M9000-171	Remote Mounting Kit, Vertical. Kit Includes mounting bracket, M9000-153 crankarm, ball joint, and mounting bolts (quantity 1)
M9000-320	Weather Shield Enclosure - NEMA 3R enclosure for protecting a single M9210/20 Actuator from rain, sleet, or snow (quantity 1)
M9000-400	Jackshaft Linkage Kit. Open-ended design enables clamping onto a jackshaft without requiring access to the ends of the jackshaft (quantity 1)
M9000-519	Valve linkage for mounting M9220 actuator to 2-1/2 to 6 in. flanged ball valves
M9000-604	Replacement Anti-Rotation Bracket Kit (with screws) for M9220-xxx-3 Series Proportional Electric Spring-Return Actuators (quantity 1)
M9200-100	Threaded Conduit Adapter, 1/2 NPSM, for M9210(20) and M(VA)9208 Series Actuators (quantity 5)
M9220-600	1 in. (25 mm) Jackshaft Coupler Kit (with locking clip) for mounting M9220-xxx-3 Proportional Electric Spring-Return Actuators on dampers with 3/4 in. to 1-1/16 in. or 19 mm to 27 mm round shafts, or 5/8 in. and 3/4 in. or 16 mm, 18 mm, and 19 mm square shafts (quantity 1)
M9220-601	Replacement Coupler Kit (with locking clip) for mounting M9220-xxx-3 Proportional Electric Spring-Return Actuators on dampers with1/2 in. to 3/4 in. or 12 mm to 19 mm round shafts, or 3/8 in. and 1/2 in. or 10 mm, 12 mm, and 14 mm square shafts (quantity 1)
M9220-602	Replacement Locking Clips for M9220-xxx-3 Proportional Electric Spring-Return Actuators (five per bag)
M9220-603	Adjustable Stop Kit for M9220-xxx-3 Proportional Electric Spring-Return Actuators (quantity 1)
M9220-604	Replacement Manual Override Cranks for M9220-xxx-3 Proportional Electric Spring-Return Actuators (five per bag)
M9220-610	Replacement Shaft Gripper, 10 mm square shaft with locking clip (quantity 1)
M9220-612	Replacement Shaft Gripper, 12 mm square shaft with locking clip (quantity 1)
M9220-614	Replacement Shaft Gripper, 14 mm square shaft with locking clip (quantity 1)

Dimensions

Figure 1: M9220-xxx-3 Electric Spring-Return Actuator Dimensions, in. (mm)



Technical specifications

M9220 Series Electric Spring-Return Actuators		
Product codes		M9220-AGx-3 models: Floating M9220-Bxx-3 models: On/off M9220-GGx-3 models: Proportional M9220-HGx-3 models: Proportional adjustable
Power requirements	AGx, HGx, GGx models	AC 24 V (19.2 V to 30 V) at 50/60 Hz: Class 2, 15.5 VA running, 7.7 VA holding position; DC 24 V (21.6 V to 26.4 V): Class 2, 6.7 W running, 2.9 W holding position
	BAx models	AC 120 V (AC 102 to 132 V) at 60 Hz: 0.25 A running, 0.13 A holding position
	BDx models	AC 230 V (AC 198 to 264 V) at 50/60 Hz: 0.15 A running, 0.09 A holding position
	BGx models	AC 24 V (19.2 to 30 V) at 50/60 Hz: Class 2, 24.6 VA running, 7.7 VA holding position; DC 24 V (21.6 to 26.4 V): Class 2, 17.6 W running, 2.8 W holding position
Transformer sizing requirements	AGx, HGx, GGx models	20 VA minimum per actuator
	Bxx models	25 VA minimum per actuator
Input signal/adjustments	AGx models	DC 0 (2) to 10 V or 0 (4) to 20 mA with field furnished 500 ohm resistor; Switch selectable direct or reverse action with signal increase, 500 ms minimum pulse width
	GGx models	Factory set DC 0 to 10 V, CW Rotation with signal increase; selectable DC 0 (2) to 10 V or 0 (4) to 20 mA with field furnished 500 ohm, 0.25 W minimum resistor; switch selectable direct or reverse action with signal increase
	HGx models	Factory set DC 0 to 10 V, CW rotation with signal increase; selectable DC 0 to 10 V or 0 to 20 mA with field furnished 500 Ohm, 0.25 W minimum resistor; start point programmable DC 0 to 10 V; span programmable DC 2 to 10 V; switch selectable direct or reverse action with signal increase
Control input impedance	GGx, HGx models	Voltage input: 200,000 ohms; Current input: 500 ohms with field furnished 500 ohm resistor
Feedback signal	GGx models	0 (2) to 10 VDC for desired rotation range up to 90°; corresponds to rotation limits, 1 mA maximum
	HGx models	0 to 10 VDC for desired rotation range up to 90°; corresponds to rotation limits, 1 mA maximum
Auxiliary switch rating	xxC Models	Two Single-Pole, Double-Throw (SPDT), double-insulated switches with gold flash contacts: AC 24 V, 50 VA pilot duty; AC 120 V, 5.8 A resistive, 1/4 hp, 275 VA pilot duty; AC 240 V, 5.0 A resistive, 1/4 hp, 275 VA pilot duty
Spring return		Direction is selectable with mounting position of actuator: Side A, actuator face away from damper for CCW spring return; Side B, actuator face away from damper for CW spring return
Running and spring return torque		177 lb·in (20 N·m) for a single actuator; 354 lb·in (40 N·m) for two models mounted in tandem 531 lb·in (60 N·m) for three models mounted in tandem
Valid tandem combinations		Two M9220-Bxx-3 Three M9220-AGx-3 One M9220-HGx-3 master with one or two M9220-GGX-3 slaves One M9220-GGx-3 master with one or two M9220-GGX-3 slaves

M9220 Series Electric Spring-Return Actuators		
Rotation range		Adjustable from 30° to 90° CW or CCW with optional M9220-603 Adjustable Stop Kit; mechanically limited to 90°
Rotation time Power on (running)	AGx, HGx, GGx models	150 seconds for 0 lb·in to 177 lb·in (0 N·m to 20 N·m) at all operating conditions; independent of load
	BGx models	24 to 57 seconds for 0 lb·in to 177 lb·in (0 N·m to 20 N·m) at all operating conditions; 35 seconds nominal at full rated load
Rotation time Power off (spring returning)	AGx, HGx, GGx models	20 seconds for 0 lb·in to 177 lb·in (0 N·m to 20 N·m) at room temperature
	BGx models	11 to 15 seconds for 0 lb·in to 177 lb·in (0 N·m to 20 N·m) at room temperature; 35 seconds maximum for 0 lb·in to 177 lb·in (0 N·m to 20 N·m) at -22°F (-30°C) 130 seconds maximum for 0 lb·in to 177 lb·in (0 N·m to 20 N·m) at -40°F (-40°C)
Cycles		60,000 full stroke cycles; 1,500,000 repositions
Audible Noise Rating (AGx, HGx, GGx models)	Power on (running)	< 40 dBA at 39-13/32 in. (1 m)
	Power on (holding)	< 20 dBA at 39-13/32 in. (1 m)
	Power off (spring returning)	< 55 dBA at 39-13/32 in. (1 m)
Audible noise rating (BGx models)	Power on (running)	< 66 dBA at 39-13/32 in. (1 m)
	Power on (holding)	< 18 dBA at 39-13/32 in. (1 m)
	Power off (spring returning)	< 66 dBA at 39-13/32 in. (1 m)
Electrical connections	Actuator (all models)	48 in. (1.2 m) halogen-free cable with 18 AWG (0.75 mm^2) wire leads
	Auxiliary switches (xxC models)	48 in. (1.2 m) halogen-free cable with 18 AWG (0.75 mm^2) wire leads
Conduit connections		Integral connectors for 3/8 in. (10 mm) flexible metal conduit
Mechanical connections	Standard shaft clamp included with actuator	1/2 in. to 3/4 in. or 12 mm to 19 mm diameter round shafts, or3/8in. and 1/2 in. or 10 mm, 12 mm, and 14 mm square shafts
	Optional M9220-600 Jackshaft Coupler Kit	3/4 in. to 1-1/16 in. or 19 mm to 27 mm diameter round shafts, or5/8 in. and 3/4 in. or 16 mm, 18 mm, and 19 mm square shafts
Aluminum enclosure		NEMA 2 (IP54) for all mounting orientations
Ambient conditions	Operating	-40°F to 131°F (-40°C to 55°C); 90% RH maximum, noncondensing
	Storage	-85°F to 185°F (-65°C to 85°C); 95% RH maximum, noncondensing
Dimensions		See Dimensions.
Compliance	United States	UL Listed, CCN XAPX, File E27734; to UL 60730-1, Automatic Controls for Household and Similar Use and UL 60730-2-14 Part 2, Particular Requirements for Electric Actuators (Models: All)
	Canada	UL Listed, CCN XAPX7,File E27734; to CAN/CSA E60730-1, Automatic Controls for Household and Similar Use: and CAN/CSA E60730-2-14 Part 2, Particular Requirements for Electric Actuators (Models: All)
CE	Europe	CE Mark - Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and Low Voltage Directive.
	Australia and New Zealand	RCM Mark, Australia/NZ Emission Compliant (ModeIs: All M9220-xGx and M9220-xDx)
Shipping weight	xGx models	6.4 lb (2.9 kg)
	BAx and BDx models	7.6 lb (3.5 kg)

Patents

Patents: http://jcipat.com

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS	JOHNSON CONTROLS	JOHNSON CONTROLS
C/O CONTROLS PRODUCT MANAGEMENT	WESTENDHOF 3	507 E MICHIGAN ST
NO. 32 CHANGJIJANG RD NEW DISTRICT	45143 ESSEN	MILWAUKEE WI 53202
WUXI JIANGSU PROVINCE 214028	GERMANY	USA
CHINA		

Johnson Controls

Description

Figure 1: NS8000 Series Network Sensor models

The NS Series Network Sensors function directly with Metasys® system Field Equipment Controllers (FECs), Metasys Network and Control Engines (NCEs), Advanced Application Field Equipment Controller (FACs), Metasys VAV Box Equipment Controllers (CVM) and General Purpose Application Controllers (CGM), VAV Modular Assembly (VMA16) Controllers, and Facility Explorer™ FX-PC Series Programmable Controllers (FX-PCGs, FX-PCVs, and FX-PCXs). The sensors are also compatible with Verasys® and Johnson Controls® Smart Equipment.

The NS Series Network Sensors monitor zone temperature, relative humidity (RH), carbon dioxide (CO_2), motion, and local temperature setpoint adjustments. The sensor transmits this data to a controller on the Sensor/Actuator (SA) bus.

Some NS Series Network Sensors models include an onboard passive infrared (PIR) occupancy sensor that detects motion to determine if a space is occupied. This feature maximizes up to 30% energy savings in high-energy usage environments such as schools, dormitories, offices, hospitals, and hotels by adjusting the temperature of the space based on the occupancy status. In addition, the PIR occupancy sensor facilitates trending of floor space usage in these environments.

Display models of the NS Series Network Sensors are available with a backlit LCD fixed segment display or a full color graphical LCD interface. These models allow the user to view zone temperature, RH, CO_2, and adjust the zone temperature setpoint and fan speed. Graphical models provide a summary of sensor values at the base of the display. Fixed segment models have the capability to set the default display to temperature, RH, or temperature setpoint.

The user can also choose between degrees Fahrenheit (F) and degrees Celsius (C). To prevent tampering with the sensor, display models also include a screen lockout feature. The graphical display enables the user to choose between a light or dark color theme and to set the sleep mode to dim or turn off.

Some models also have a Warmer/Cooler interface to adjust the zone temperature. Instead of a display, these models have two cap touch buttons with seven LED lights that represent the current setpoint.The display models include the following fan speeds: automatic, off, low, medium, or high.

Interaction with the sensor sets the occupancy override function to signal to the controller that the zone is occupied and to override the scheduled mode. The full color graphical LCD models use the

graphical user interface to set a unique BACnet® address for applications that require multiple sensors. Other models have DIP switches to set a unique address for applications that require multiple sensors. All models ship standard with modular phone jacks and screw terminals to terminate wiring connecting the sensors to the controller.

ⓘ **Note:** To connect the NS Series Network Sensor to the same SA bus segment, use only one of the two connection methods, either the modular phone jack or the screw terminals.

Each network sensor includes a SA bus access port, allowing for accessories to connect to the SA bus. Through this connector, the user can use accessories to service or commission the connected controller or gain access to any other controller on the same field controller (FC) bus.

ⓘ **Note:** Device programming for the NS8000 sensor connected to the controller does not include balancing functionality and features.

The NS Series Network Sensors can be surface mounted or vertical wallbox mounted to meet the requirements of the specific application. All display models are optimized for the California Energy Code (Title 24). To suit specific architectural and interior design needs, the models come with either black or white enclosures.

Modern enclosures in black or white design themes are available in the following styles:

- LCD fixed segment and LCD full color graphical displays: view zone temperature, RH, CO_2, occupancy status, and adjust the zone temperature setpoint and fan speed. These models have the capability to set the default display to temperature, RH, or temperature setpoint. On these display models, you can also choose between degrees Fahrenheit (F) and degrees Celsius (C).
- Warmer/Cooler interface: this interface incorporates cap touch buttons with seven LED lights that represent the current setpoint status.
- No display: the NS Series Network Sensors are available in high gloss black or white with or without the Johnson Controls logo.
- All sensors are serialized for quality and warranty purposes. Based on the serial number, the user can obtain factory calibration certificates.

ⓘ **Note:** The LCD full color graphical models are only available in white. See Table 1 through Table 6 for ordering information.

Refer to the *NS 8000 Series Network Sensors Product Bulletin (LIT-12013113)* for important product application and single point of contact information.

Features and benefits

- BACnet MS/TP protocol communication: provides compatibility with Metasys system field controllers, Facility Explorer programmable controllers as well as Verasys and Johnson Controls Smart Equipment in a proven communication network.
- Single and multifunctional sensors: choose temperature, RH, CO_2, and occupancy sensing depending on HVAC needs.
- Large backlit LCD fixed segment display or LCD full color graphical display on some models: provides real-time status of the environment with backlighting activated during user interaction.
- Simple temperature setpoint adjustment or Warmer/Cooler mode available on display models: configure simple setpoint adjustment or Warmer/Cooler mode.
- Onboard occupancy sensor available on PIR models: maximizes up to 30% energy savings in high-energy usage environments, and facilitates trending of floor space usage.
- Temporary occupancy included on all display and Warmer/Cooler models: provides a timed override command, which initiates a temporary occupancy state.
- Field-selectable default display setting on display models: toggle between temperature, RH or temperature setpoint on the display, and set the desired default for continuous viewing.
- Fahrenheit/Celsius (°F/°C) selectable on display models: display temperature in degrees Fahrenheit or degrees Celsius.

- All display models meet California Energy Code (Title 24): displays the required State of California Title 24 economizer fault conditions.
- All display models include a screen lockout: prevents sensor tampering.
- Serialized sensors and calibration certificates: obtain factory calibration certificates for all models.

Repair information

If the NS Series Network Sensor fails to operate within its specifications, replace the unit. For a replacement sensor, contact the nearest Johnson Controls representative.

Ordering information

See Table 1 through Table 6 for the various NS Series Network Sensor models available. See Table 7 for accessories.

Important: The NS Series Network Sensor is intended to provide an input to equipment under normal operating conditions. Where failure or malfunction of the network sensor could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the network sensor.

Note: Keep the Metasys system software up to date as some NS Series Network Sensor features are not supported in previous releases of Metasys, Facility Explorer, Verasys, or Johnson Controls Smart Equipment system software.

Selection charts

Table 1: NS Series Network Sensor ordering information: temperature, humidity and CO_2 models (3% RH)

Product code number	Display and interface information	Johnson Controls logo	Color	PIR occupancy sensor
NSB8BHC040-0	No display	Yes	White	No
NSB8BHC041-0		No	White	No
NSB8BHC042-0		Yes	Black	No
NSB8BHC043-0		No	Black	No
NSB8MHC040-0		Yes	White	Yes
NSB8MHC041-0		No	White	Yes
NSB8MHC042-0		Yes	Black	Yes
NSB8MHC043-0		No	Black	Yes
NSB8BHC240-0	Fixed segment display	Yes	White	No
NSB8BHC241-0		No	White	No
NSB8BHC242-0		Yes	Black	No
NSB8BHC243-0		No	Black	No
NSB8MHC240-0		Yes	White	Yes
NSB8MHC241-0		No	White	Yes
NSB8MHC242-0		Yes	Black	Yes
NSB8MHC243-0		No	Black	Yes
NSB8BHC140-0	Warmer/Cooler interface	Yes	White	No
NSB8BHC141-0		No	White	No
NSB8BHC340-0	Graphical user interface	Yes	White	No
NSB8BHC341-0		No	White	No

Table 2: NS Series Network Sensor ordering information: temperature and humidity models (3% RH)

Product code number	Display and interface information	Johnson Controls logo	Color	PIR occupancy sensor
NSB8BHN240-0	Fixed segment display	Yes	White	No
NSB8BHN241-0		No	White	No
NSB8BHN242-0		Yes	Black	No
NSB8BHN243-0		No	Black	No
NSB8MHN240-0		Yes	White	Yes
NSB8MHN241-0		No	White	Yes
NSB8MHN242-0		Yes	Black	Yes
NSB8MHN243-0		No	Black	Yes
NSB8BHN040-0	No display	Yes	White	No
NSB8BHN041-0		No	White	No
NSB8BHN042-0		Yes	Black	No
NSB8BHN043-0		No	Black	No
NSB8MHN040-0		Yes	White	Yes
NSB8MHN041-0		No	White	Yes
NSB8MHN042-0		Yes	Black	Yes
NSB8MHN043-0		No	Black	Yes
NSB8BHN140-0	Warmer/Cooler interface	Yes	White	No
NSB8BHN141-0		No	White	No
NSB8BHN142-0		Yes	Black	No
NSB8BHN143-0		No	Black	No
NSB8BHN340-0	Graphical user interface	Yes	White	No
NSB8BHN340-1		No	White	No

Table 3: NS Series Network Sensor ordering information: temperature and CO_2 models

Product code number	Display and interface information	Johnson Controls logo	Color	PIR occupancy sensor
NSB8BTC040-0	No display	Yes	White	No
NSB8BTC041-0		No	White	No
NSB8BTC042-0		Yes	Black	No
NSB8BTC043-0		No	Black	No
NSB8MTC040-0		Yes	White	Yes
NSB8MTC041-0		No	White	Yes
NSB8MTC042-0		Yes	Black	Yes
NSB8MTC043-0		No	Black	Yes
NSB8BTC240-0	Fixed segment display	Yes	White	No
NSB8BTC241-0		No	White	No
NSB8BTC242-0		Yes	Black	No
NSB8BTC243-0		No	Black	No
NSB8MTC240-0		Yes	White	Yes
NSB8MTC241-0		No	White	Yes
NSB8MTC242-0		Yes	Black	Yes
NSB8MTC243-0		No	Black	Yes
NSB8BTC340-0	Graphical user interface	Yes	White	No
NSB8BTC340-1		No	White	No

Table 4: NS Series Network Sensor ordering information: temperature only models

Product code number	Display and interface information	Johnson Controls logo	Color	PIR occupancy sensor
NSB8BTN240-0	Fixed segment display	Yes	White	No
NSB8BTN241-0		No	White	No
NSB8BTN242-0		Yes	Black	No
NSB8BTN243-0		No	Black	No
NSB8MTN240-0		Yes	White	Yes
NSB8MTN241-0		No	White	Yes
NSB8MTN242-0		Yes	Black	Yes
NSB8MTN243-0		No	Black	Yes
NSB8BTN040-0	No display	Yes	White	No
NSB8BTN041-0		No	White	No
NSB8BTN042-0		Yes	Black	No
NSB8BTN043-0		No	Black	No
NSB8MTN040-0		Yes	White	Yes
NSB8MTN041-0		No	White	Yes
NSB8MTN042-0		Yes	Black	Yes
NSB8MTN043-0		No	Black	Yes
NSB8BTN140-0	Warmer/Cooler interface	Yes	White	No
NSB8BTN141-0		No	White	No
NSB8BTN142-0		Yes	Black	No
NSB8BTN143-0		No	Black	No
NSB8BTN340-0	Graphical user interface	Yes	White	No
NSB8BTN340-1		No	White	No

Table 5: NS Series Network Sensor ordering information: CO_2 only models without display

Product code number	Johnson Controls logo	Color
NSB8BNC040-0	Yes	White
NSB8BNC041-0	No	White
NSB8BNC042-0	Yes	Black
NSB8BNC043-0	No	Black

Table 6: NS Series Network Sensor ordering information: temperature and humidity models (2% RH)

Product code number	Display and interface information	Johnson Controls logo	Color
NSB8BPN240-0	Fixed segment display	Yes	White
NSB8BPN241-0		No	White
NSB8BPN242-0		Yes	Black
NSB8BPN243-0		No	Black

Table 7: Accessories

Product code number	Description
NS-WALLPLATE-0	Wall plates fit seamlessly around the NS8000 Sensor models and enable you to mount a sensor where a larger one was previously mounted.

NS Sensors with fault code capability error codes

The fault indication comes through the network sensor bus when a network sensor is used in the zone. The LCD indicates the code number for all the required state of California Title 24 economizer fault conditions.

Display text	California Title 24 economizer fault condition	Possible problem
E00	Air temperature sensor failure/fault	Problem with one of the air temperature sensors. Check outdoor air, return air, or supply air sensors.
E01	Not economizing when it should	The economizer is not using outdoor air when it should.
E02	Economizing when it should not	The economizer is allowing outdoor air inside when the conditions are not suitable for economizer operation.
E03	Damper not modulating	The economizer damper is not able to modulate properly. Check damper, linkage to actuator, or the actuator.
E04	Excess outdoor air	The economizer is allowing excess outdoor air inside.

Technical specifications

Table 8: NS8000 Series Network Sensors technical specifications

Supply voltage			9.8 VDC to 16.5 VDC; 15 VDC nominal (from SA bus)
Current consumption	Base current draw (graphical models)	Screen off	18 mA maximum (non-transmitting)
		Screen on	45 mA maximum
	Base current draw (other models)		3 mA maximum (non-transmitting)
	CO_2 models	LCD graphical	13 mA maximum additional current (during measurement)
		Other models	15 mA maximum additional current (during measurement)
	Fixed segment display models - backlight on		10 mA additional current
	Warmer/Cooler models - LEDs on		8 mA additional current
	ⓘ **Note:** The MAP gateway is connected to the SA bus. SA bus applications are limited to a power load of 210 mA. The best practice when configuring an SA bus is to limit the total available operating power consumption to 120 mA or less. This power level enables you to connect a MAP Gateway temporarily or a DIS1710 Local Controller Display to the bus for commissioning, adjusting, and monitoring.		
Terminations			Modular jack and screw terminal block
Network sensor addressing	LCD graphical display models		Configurable through graphical user interface
	Other models		DIP switch set from 199 to 206; factory set at 199
Wire size	Modular jack models		24 AWG or 26 AWG (0.5 mm or 0.4 mm diameter); three twisted pair (six conductors)
	Screw terminal block models		18 AWG to 22 AWG (1 mm to 0.6 mm diameter); 22 AWG (0.6 mm diameter)
Communication rate			Auto-detect: 9.6 kbps, 19.2 kbps, 38.4 kbps, or 76.8 kbps
Temperature measurement range			32°F/0°C to 104°F/40°C
Temperature sensor type			Digital temperature sensor
Humidity sensor type			Thin film capacitive sensor
Ambient Conditions	Operating		32°F to 122°F (0°C to 50°C); 10% RH to 90% RH, noncondensing; 85°F (29°C) maximum dew point
	Storage	Display models	-40°F to 122°F (-40°C to 50°C); 5% RH to 95% RH, noncondensing
		Non-display models	-40°F to 185°F (-40°C to 70°C); 5% RH to 95% RH, noncondensing
Temperature resolution			±0.5°F/±0.5°C

Table 8: NS8000 Series Network Sensors technical specifications

Temperature accuracy	NS Series Network Zone Sensor	±1°F/±0.6°C
	Temperature element only	±0.36°F/±0.2°C at 70°F/21°C
Humidity element accuracy	NSB8BPN24x-0 models	±2% RH for 20% to 80% RH at 50°F to 95°F (10°C to 35°C)±4% RH for 10% to 20% and 80% to 90% RH at 50°F to 95°F (10°C to 35°C)
	NSB8BHxxxx-0 models	±3% RH for 20% to 80% RH at 50°F to 95°F (10°C to 35°C)±6% RH for 10% to 20% and 80% to 90% RH at 50°F to 95°F (10°C to 35°C)
CO_2 measurement range	0 ppm to 2000 ppm	
CO_2 sensor accuracy	Accuracy	±30 ppm ±3% of CO_2 reading at 77°F (25°C) and 978 hPa (1,000 ft/300m)
	Temperature dependence	±1.4 ppm/°F (± 2.5 ppm/°C)
	Pressure dependence	Refer to the *NS8000 Series Network Sensors Installation Guide (24-11256-00007)* for CO_2 altitude compensation.
CO_2 sensor operation range		32°F to 122°F (0°C to 50°C)
Time constant		10 minutes nominal at 10 fpm airflow
Default temperature setpoint adjustment range		50°F/10°C to 86°F/30°C in 0.5° increments
CO_2 sensor lifespan		10 years under standard operating conditions
LCD lifespan for graphical display models		Screen timeout set to off > 10 years
		Screen timeout set to dim At least 6 years
PIR occupancy sensor motion detection		Minimum 94 angular degrees up to a distance of 26 ft (8m); Based on clear line of sight
Compliance	United States	UL Listed, File E107041, CCN PAZX,Under UL 60730-1, Energy Management Equipment
		FCC Compliant to CFR 47, Part 15, Subpart B, Class B
	Canada	cUL Listed, File E107041, CCN PAZX7,Under CAN/CSA E60730-1, Signal Equipment
		Industry Canada, ICES-003
CE	Europe	CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and RoHS Directive.
	Australia and New Zealand	RCM Mark, Australia/NZ Emissions Compliant
	China	RoHS2
Dimensions (H x W x D)		3.4 in. x 5 in. x 1.1 in. (85.3 mm x 127.55 mm x 26.8 mm)
Shipping weight		0.4 lb/0.18 kg

The performance specifications are nominal and conform to acceptable industry standard. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Software terms

Use of the software that is in (or constitutes) this product, or access to the cloud, or hosted services applicable to this product, if any, is subject to applicable end-user license, open-source software information, and other terms set forth at www.johnsoncontrols.com/techterms. Your use of this product constitutes an agreement to such terms.

Patents

Patents: https://jcipat.com

Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS	JOHNSON CONTROLS	JOHNSON CONTROLS
C/O CONTROLS PRODUCT MANAGEMENT	VOLTAWEG 20	507 E MICHIGAN ST
NO. 32 CHANGJIANG RD NEW DISTRICT	6101 XK ECHT	MILWAUKEE WI 53202
WUXI JIANGSU PROVINCE 214028	THE NETHERLANDS	USA
CHINA		

Contact information

Contact your local branch office: www.johnsoncontrols.com/locations

Contact Johnson Controls: www.johnsoncontrols.com/contact-us

Functional Devices, Inc.
310 South Union Street
Russiaville, IN 46979

Office 765.883.5538
Sales 800.888.5538
Fax 765.883.7505

www.FunctionalDevices.com
sales@functionaldevices.com

RIBMNLB-6/-4/-2

FAN SAFETY ALARM CIRCUIT

2.75˝ Track Mount AHU Fan Safety Alarm and General Purpose Logic Circuit, 24 Vac Power

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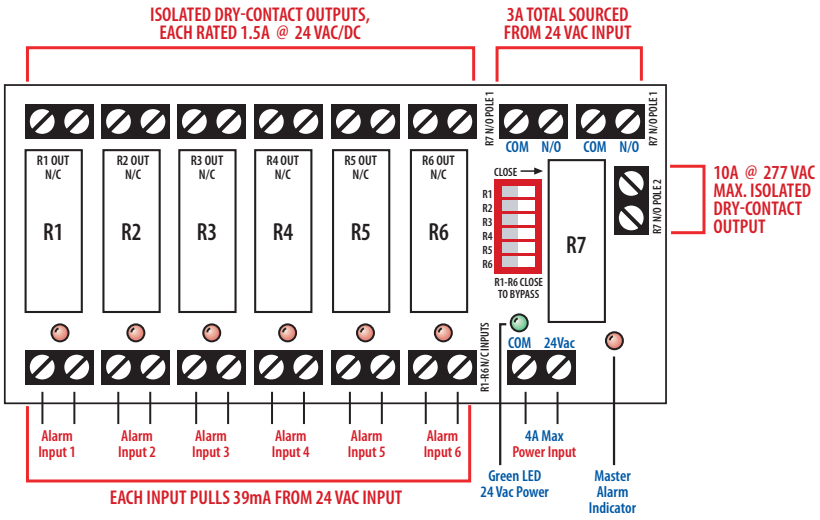
CE

MADE IN USA



Note: RIBMNLB-4 and RIBLB-4 have four Alarm Inputs and one Master Alarm. RIBMNLB-2 and RIBLB-2 have two Alarm Inputs and one Master Alarm.

SPECIFICATIONS

Expected Relay Life: 10 million cycles minimum mechanical
Operating Temperature: -30 to 140° F
Operate Time: 8mS
Power Input: 4 Amp @ 24 Vac ; 50-60 Hz
Alarm Status: LED On = Activated
Dimensions: 6.000˝ x 2.750˝ x 1.750˝ (RIBMNLB-6)
3.200˝ x 2.750˝ x 1.750˝ (RIBMNLB-4)
4.740˝ x 2.750˝ x 1.750˝ (RIBMNLB-2)
Track Mount: MT212-6 Mounting Track Provided
Approvals: UL Listed, UL916, UL864, C-UL, CE
Gold Flash: No
Override Switch: No

RIBLB-6/-4/-2

Coming Soon – Consult Factory

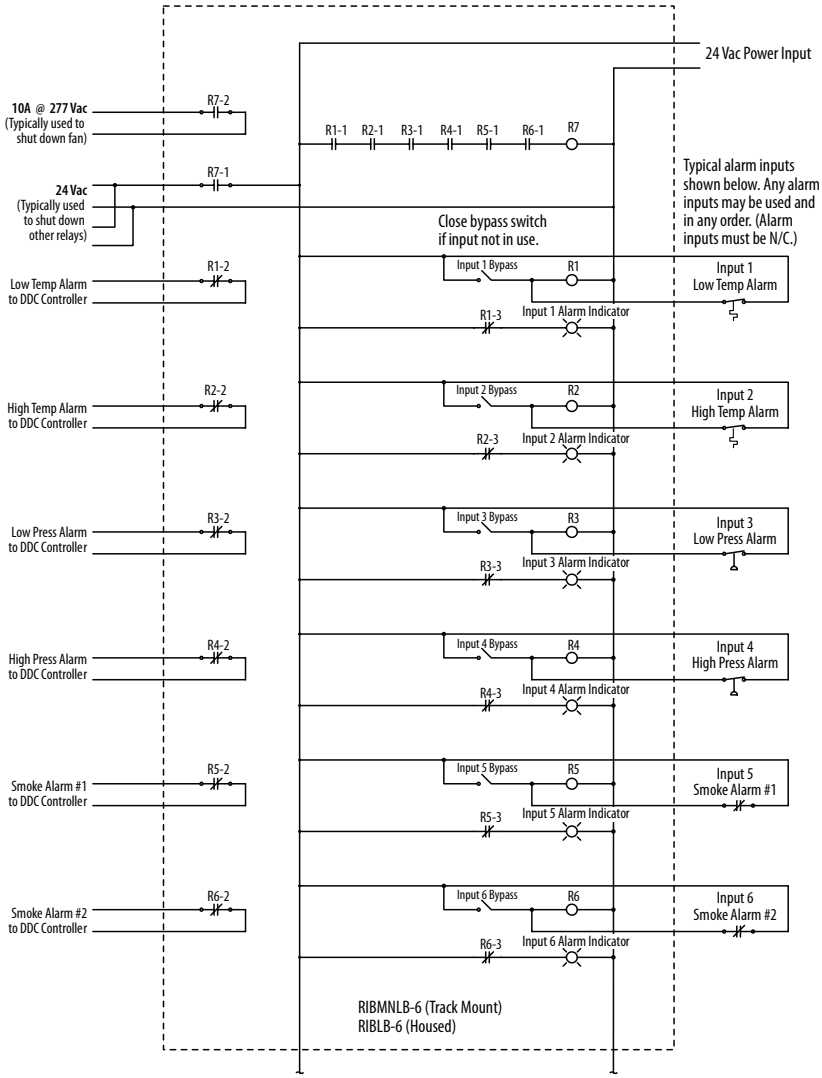
SPECIFICATIONS

Dimensions: 4.28˝ x 7.00˝ x 2.00˝ with .75˝ NPT Nipple
Housing Rating: UL Listed, Nema 1, C-UL, CE Approved,
Also available NEMA 4 / 4X in Summer 2007

Models RIBMNLB-6, RIBMNLB-4, and RIBMNLB-2; and RIBLB-6, RIBLB-4, and RIBLB-2 are simply devices that combine a common relay-logic function into a small, easy-to-install, and less expensive form.

A master relay will open if any one of the normally-closed (N/C) inputs opens. There are six, four, or two inputs depending on the model chosen. LED status of all inputs, the master relay, and power input is provided. Bypass of un-used inputs is also provided. The RIBMNLB series is provided with mounting track for mounting in user-provided electrical enclosures. The RIBLB series is enclosed in a NEMA-1, 4˝ x 7˝ enclosure with a clear lid to allow viewing of the status LEDs. The master relay has three general-purpose outputs: two 24 Vac output terminals and one dry-contact output rated up to 10 Amp 277 Vac (terminals on RIBMNLB series, wires on RIBLB series.)

The most common application is an Air Handling Unit (AHU) fan-safety-shutdown where the master relay is used to shutdown the fan. Contact closure outputs are provided so that a DDC controller can determine the cause of a shutdown.



SELECTION GUIDE

MODEL #	INPUTS	
RIBMNLB-6	6	MT212 Mounting Track
RIBMNLB-4	4	MT212 Mounting Track
RIBMNLB-2	2	MT212 Mounting Track
RIBLB-6	6	PE6020 Enclosure
RIBLB-4	4	PE6020 Enclosure
RIBLB-2	2	PE6020 Enclosure

TE-6300 Series Temperature Sensors Catalog Page

LIT-1900217

2020-10-13

Description

The TE-6300 Temperature Sensor line provides economical solutions for a wide variety of temperature sensing needs, including wall-mount, outdoor-air, duct, strap-mount, well-insertion, duct-averaging, and VAV Modular Assembly (VMA) flange-mount duct-probe applications. The TE-6300 line offers both a metal and a plastic enclosure for the most popular models.

Sensors are available in the following types:

- 1k ohm thin-film nickel
- 1k ohm nickel averaging
- 1k ohm thin-film platinum
- 100 ohm platinum equivalent averaging
- 1k ohm platinum equivalent averaging
- 2.2k (2,252) ohm thermistor
- 10k ohm thermistor, Johnson Controls® Type II

Refer to the *TE-6300 Series Temperature Sensors Product Bulletin (LIT-216320)* for important product application information.

Features and Benefits

Each sensor is packaged with the necessary mounting accessories to maximize ordering and installation ease and to reduce both commissioning time and cost.

- Full Line of Versatile Sensors—Supports all your temperature sensing needs from a single supplier: wall-mount, outdoor-air, duct, duct-averaging, strap-mount, well-insertion, and flange-mount duct-probe.
- Single Assembly Ordering—Simplifies ordering; provides a complete assembly in one box.
- Models Featuring an Integral National Pipe Thread (NPT) Adaptor—Increase sensor connection strength, which eliminates the need for a special adaptor.
- Models with a Stainless Steel Sensor Probe—Protect the sensor while increasing corrosion resistance.
- Metal Enclosure (TE-63xxE, TE-63xxM, and TE-63xxV Models)—Meets plenum requirements.
- Models Featuring a Retainer for the Sensor Holder—Allow you to lock the sensor holder into the conduit box.
- Brushed Stainless Steel Mounting Plate—Offers a durable, aesthetically pleasing design.
- Low Profile Flush Mount Design (TE-63xxF Models)—Provides a tamper-proof installation ideally suited for schools, sporting complexes, retailers, prisons, and more.

All TE-6300 Series Temperature Sensors are two-wire, passive, resistance-output devices.

TE-63xxA Models

The TE-63xxA (adjustable length) models:

- provide a thermoplastic mounting flange and gland nut to adjust the length of the probe
- include two hex-head self-drilling screws for mounting
- come equipped with a 10 ft (3 m)plenum-rated cable with 1/4 in. (6.35 mm) internal thread insulated quick-connect terminations on leads

TE-63xxE Models

The TE-63xxE (economizer mount) models:

- provide a stainless steel mounting flange
- include two hex-head self-drilling screws for mounting
- meet UL 1995 plenum use requirements

TE-63xxF Models

The TE-63xxF (flush mount) models:

- provide a low profile when installed in an electrical box
- thermally isolate sensor from the wall with a foam pad
- offer a rugged stainless steel cover
- provide 22 AWG (0.6 mm diameter) lead wires with low voltage installation

TE-63xxM Models

The TE-63xxM (metal enclosure) models:

- come with a corrosion-protected steel enclosure with a 0.88 in. (22 mm) hole for a 1/2 in. (12.7 mm) conduit fitting
- include two hex-head self-drilling screws for mounting the duct and duct-averaging models
- offer either a direct-mount or 1/2-14 NPT threaded well sensor holder for mounting in TE-6300W Series Thermowells (well models; order the thermowell separately)
- provide optional well sensor holders (order separately) to mount duct models in thermowells
- meet UL 1995 plenum use requirements
- offer optional accessory kit (order separately) to replace plastic hole plug and wiring bushing to meet International Mechanical Code (IMC) requirements

TE-63xxP Models

The TE-63xxP (plastic enclosure) models:

- provide a thermoplastic conduit box with1/2-14 internal NPT for connecting to conduit
- provide aluminum mounting plate and1/2-14 internal NPT hub mounting options for the duct and duct-averaging models
- use the 1/2-14 internal NPT to mount the outdoor air models directly to rigid conduit
- include sensor holders to mount duct models in thermowells (order thermowell separately)
- offer an optional accessory metal cover and gasket kit (order separately) to replace the plastic cover to meet UL 1995 plenum use requirements
- include a replaceable sensing probe on duct-probe, outdoor-air, and well-insertion models

TE-63x4P Wall Mount Models

The TE-63x4P (plastic enclosure) models:

- come with a white thermoplastic ventilated cover with a brushed aluminum face plate and a steel mounting plate for surface mounting
- include faceplates for both horizontal and vertical mounting
- offer an accessory mounting kit for mounting to a standard electrical box
- offer optional covers

TE-63xS Models

The TE-63xS (strap-mount) models:

- provide a 1/4 in. (6.35 mm) diameter stainless steel probe without an enclosure
- include three cable ties for mounting to pipe up to 2-5/8 in. (67 mm) in diameter
- come equipped with a 10 ft (3 m)plenum-rated cable
- meet UL 1995 plenum use requirements
- offer an accessory mounting kit for mounting to a pipe up to 11 in. (280 mm) in diameter

TE-63xxV Models

The TE-63xxV (VAV flange mount) models:

- provide a stainless steel mounting flange with two hex-head self-drilling mounting screws
- come equipped with a 10 ft (3 m) plenum-rated cable with 1/4 in. (6.35 mm) internal thread insulated quick-connect terminations on leads
- meet UL 1995 plenum use requirements

Repair Information

If the TE-6300 Series Temperature Sensor fails to operate within its specifications, replace the unit. For information on replacement temperature sensors and replacement sensor probes, refer to the TE-6300 Series Temperature Sensors Product Bulletin (LIT-216320).

Selection Chart

Table 1: TE-6300 Temperature Sensor Models

Sensor	Mounting Style	Probe Length in. (mm)	Product CodeNumber
Nickel (1k ohm)	Adjustable	8 (203)	TE-6311A-1
	Averaging[1]	8 ft (2.4 m)	TE-6315M-1
			TE-6315P-1
			TE-6315V-2
		17 ft (5.2 m)	TE-6316M-1
			TE-6316P-1
			TE-6316V-2
	Duct	4 (102)	TE-631GM-1
		8 (203)	TE-6311M-1
			TE-6311P-1
		18 (457)	TE-631JM-1
	Flange (VAV)	4 (102)	TE-631GV-2
		8 (203)	TE-6311V-2
	Flush	N/A	TE-6310F-0
			TE-6310F-1
	Outdoor air	3 (76)	TE-6313P-1
	Strap-mount	3 (76)	TE-631S-1
	Wall[2]	N/A	TE-6314P-1
	Well	6 (152)	TE-631AM-1[3]
			TE-631AM-2
			TE-631AP-1
		8 (203)	TE-6312M-1
			TE-6312P-1
Platinum (1k ohm)	Adjustable	8 (203)	TE-6351A-1
	Duct	4 (102)	TE-635GM-1
		8 (203)	TE-6351M-1
			TE-6351P-1
		18 (457)	TE-635JM-1
	Flange (VAV)	4 (102)	TE-635GV-2
		8 (203)	TE-6351V-2
	Flush	N/A	TE-6350F-0
			TE-6350F-1
	Outdoor air	3 (76)	TE-6353P-1
	Strap-mount	3 (76)	TE-635S-1
	Wall[2]	N/A	TE-6324P-1
	Well	6 (152)	TE-635AM-1[3]
			TE-635AM-2
			TE-635AP-1
		8 (203)	TE-6352M-1
			TE-6352P-1
Platinum Equivalent	1k ohmAveraging[1]	10 ft (3 m)	TE-6327P-1
		20 ft (6.1 m)	TE-6328P-1
	100 ohmAveraging[1]	10 ft (3 m)	TE-6337P-1
		20 ft (6.1 m)	TE-6338P-1
Thermistor (2.2k ohm)	Adjustable	8 (203)	TE-6341A-1
	Duct	8 (203)	TE-6341P-1
	Flange (VAV)	4 (102)	TE-634GV-2
		8 (203)	TE-6341V-2
	Outdoor Air	3 (76)	TE-6343P-1
	Wall[2]	N/A	TE-6344P-1
	Well	6 (152)	TE-634AM-2
		8 (203)	TE-6342M-1

Table 1: TE-6300 Temperature Sensor Models

Sensor	Mounting Style	Probe Length in. (mm)	Product CodeNumber
Thermistor (10k ohm) Type II	Adjustable	8 (203)	TE-6361A-1
	Duct	4 (102)	TE-636GM-1
		8 (203)	TE-6361M-1
			TE-6361P-1
		18 (457)	TE-636JM-1
	Flange (VAV)	4 (102)	TE-636GV-2
		8 (203)	TE-6361V-2
	Flange (economizer)	2 (51)	TE-6369E-2
		6 (152)	TE-636ME-2
		8 (203)	TE-6361E-2
		12 (305)	TE-636NE-2
	Flush	N/A	TE-6360F-0
			TE-6360F-1
	Outdoor air	3 (76)	TE-6363P-1
	Strap-mount	3 (76)	TE-636S-1
	Well	6 (152)	TE-636AM-1[3]
			TE-636AM-2
		8 (203)	TE-6362M-1

1 Two TE-6001-8 Element Holders come with the platinum equivalent averaging sensors. Order separately to use with a nickel averaging sensor.
2 Order the TE-1800-9600 Mounting Hardware separately to mount the wall unit to a wallbox.
3 TE-631AM-1, TE-635AM-1, and TE-636AM-1 include TE-6300-612 Threadless Brass Sensor Holder/Well Adaptor for retrofit toTE-6300W-103 or WZ-1000-5 Thermowells.

Table 2: Optional Accessories

Product Code Number	Description
F-1000-182	Thermal conductive grease for element wells (8 oz. [0.23 kg])
T-4000-119	Allen head tool for wall mount cover screws (order in multiples of 30)
TE-1800-9600	Mounting hardware for mounting the wall-mount unit to a wall box
TE-6001-8	Averaging sensor mounting bracket (order in multiples of ten)
TE-6001-13	Metal cover and gasket kit (order in multiples of five)
TE-6300-101	12 in. (305 mm) 1k ohm nickel probe (cut to an appropriate length)[1]
TE-6300-103	1/2-14 NPT plastic sensor holder without retainer (order in multiples of ten)
TE-6300-105	12 in. (305 mm) 1k ohm platinum Class A probe (cut to an appropriate length)[2]
TE-6300-601	8 in. (203 mm) 1k ohm nickel probe
TE-6300-603	3 in. (76 mm) 1k ohm nickel probe
TE-6300-605	1/2-14 NPT threaded plastic sensor holder/well adaptor with retainer (order in multiples of ten)
TE-6300-606	8 in. (203 mm) 2.2k ohm thermistor probe
TE-6300-607	3 in. (76 mm) 2.2k ohm thermistor probe
TE-6300-611	1/2-14 NPT threaded brass sensor holder/well adaptor (order in multiples of ten)
TE-6300-612	Threadless brass sensor holder/well adaptor (order in multiples of ten)
TE-6300-613	IMC kit with metal plugs and clamp connector (order in multiples of ten)
TE-6300-614	Cable tie mounting kit, 0.50 to 2.625 in. (12.7 to 66.7 mm) bundle diameter (order in multiples of ten)
TE-6300-615	Cable tie mounting kit, 11 in. (280 mm) maximum bundle diameter
TE-6300-616	8 in. (203 mm) 1k ohm platinum Class A probe
TE-6300-617	3 in. (76 mm) 1k ohm platinum Class A probe
TQ-6000-1	4 to 20 mA output transmitter for use with the 100 ohm platinum sensor
TE-6300W-101[2]	Thermowell, brass with copper bulb, 2.38 in. (60.5 mm) immersion depth, with thermal grease, direct mount, no adaptor required, for use with 6 in. (150 mm) probe model TE-63xAM-2
TE-6300W-102[2]	Thermowell, stainless steel, 2.38 in. (60.5 mm) immersion depth, without thermal grease, direct mount, no adaptor required, for use with 6 in. (150 mm) probe model TE-63xAM-2
TE-6300W-103	Thermowell, brass with copper bulb, 2.38 in. (60.5 mm) immersion depth, with thermal grease, threadless adaptor required, for use with 6 in. (150 mm) probe models TE-63xAM-1 (adaptor included) and TE-63xAP-1 (adaptor included)
TE-6300W-110	Thermowell, stainless steel, 4.50 in. (114.3 mm) immersion depth, without thermal grease, 1/2-14 NPT adaptor required, for use with 8 in. (200 mm) probe models TE-63x2M-1 (adaptor included) and TE-63x2P-1 (adaptor included)

1 Cut 12 in. (305 mm) probes to a minimum of 3 in. (76 mm).
2 Direct-mount thermowells TE-6300W-101 and TE-6300W-102 can be used only with the TE-6300M Sensors.

Table 3: T-4000 Covers Available for the Wall Mount TE-63x4P Series

Product Code Number	Horizontal Johnson Controls Logo	Vertical Johnson Controls Logo	Thermometer,with °F/°C Scale	Faceplate/Cover Color
T-4000-2138[1]				Brushed aluminum/beige
T-4000-2139	▪			
T-4000-2140	▪		▪	
T-4000-2144		▪		
T-4000-2639	▪			Brown and gold/beige
T-4000-2640	▪		▪	
T-4000-2644		▪		
T-4000-3139	▪			Brushed aluminum/white
T-4000-3140	▪		▪	
T-4000-3144		▪		

1 Without Johnson Controls logo

Technical Specifications

Table 4: TE-6300 Series Temperature Sensors technical specifications

Specification		Description
Sensor Reference Resistance	1k ohm nickel	1k ohms at 70 °F (21°C)
	1k ohm nickel averaging	
	1k ohm platinum	1k ohms at 32°F (0°C)
	100 ohm platinum averaging	100 ohms at 32°F (0°C)
	1k ohm platinum averaging	1k ohms at 32°F (0°C)
	2.2k ohm thermistor	2,252 ohms at 77°F (25°C)
	10k ohm thermistor	10.0k ohms at 77°F (25°C)
Sensor Accuracy	1k ohm nickel	±0.34F° at 70°F (±0.19C° at 21°C)
	1k ohm nickel averaging	±3.4F° at 70°F (±1.9C° at 21°C)
	1k ohm platinum Class A (TE-635xx)	EN 60751 Class A, ± [0.15 + 0.002 * | T °C |], ±0.19C° at 21°C (±0.35F° at 70°F)
	100 ohm platinum Class A	
	1k ohm platinum Class B (TE-632xx)	EN 60751 Class B, ± [0.30 + 0.005 * | T °C |], ±0.41C° at 21°C (±0.73F° at 70°F)
	100 ohm platinum averaging	±1.0°Fat 70°F (± 0.58°C at 21°C)
	1k ohm platinum averaging	
	2.2k ohm thermistor	± 0.36°F (± 0.2°C) in the range: 32 to 158°F (0 to 70°C)
	10k ohm thermistor	± 0.9°F (± 0.5°C) in the range: 32 to 158°F (0 to 70°C)
Sensor Temperature Coefficient	1k ohm nickel	Approximately 3 ohms/F° (5.4 ohms/C°)
	1k ohm nickel averaging	
	1k ohm platinum	Approximately 2 ohms/F° (3.9 ohms/C°) 3,850 ppm/K
	100 ohm platinum averaging	Approximately 0.2 ohms/F° (0.39 ohms/C°)
	1k ohm platinum averaging	Approximately 2 ohms/F° (3.9 ohms/C°)
	2.2k ohm thermistor	Nonlinear, negative temperature coefficient (NTC)
	10k ohm thermistor	Nonlinear NTC, Johnson Controls Type II

Table 4: TE-6300 Series Temperature Sensors technical specifications

Specification		Description
Electrical Connection	TE-63xxE	22 AWG (0.6 mm diameter) x 6 in. (152 mm) long
	TE-63xxM	
	TE-63xxP	
	TE-63xxF	22 AWG (0.6 mm diameter) x 12 ft (3 m) braided-copper wires, low voltage insulation, half-stripped ends
	TE-63xxP nickel averaging	18 AWG (1.0 mm diameter) x 6 in. (152 mm) long
	TE-63xS	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable
	TE-63xxA	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable, with 2-position plug terminal block for 1/4 in. (6.35 mm) external tab terminals on 0.197 in. (5 mm) centers
	TE-63xxV	
Materials	Probes	Nickel averaging: 0.094 in. (2.4 mm) outside diameter (O.D.) copper tubing Nickel averaging adaptor: 0.25 in. (6.35 mm) O.D. brass Platinum averaging probe: 0.19 in. (4.8 mm) aluminum tubing All others: 0.25 in. (6.35 mm) O.D. stainless steel
	TE-63xxA	Mounting adaptor plate and gland: thermoplastic
	TE-63xxF	Flush mount: stainless steel
	TE-63xxM	Enclosure: corrosion-protected steel Well sensor holder: 0.875 in. (22.2 mm) hex brass
	TE-63xxP	Conduit box and shield: rigid thermoplastic Mounting plate : aluminum Sensor holder: rigid thermoplastic Wall mount base plate: corrosion-protected steel Wall mount cover: rigid thermoplastic (white) Wall mount face plate: brushed aluminum
	TE-63xxE	Mounting flange: stainless steel
	TE-63xxV	
Operating Conditions	TE-63xxA	-50 to 140°F (-46 to 60°C)
	TE-63xxF	32 to 104°F (0 to 40°C)
	TE-63xxE	-50 to 220°F (-46 to 104°C)
	TE-63xxM	
	TE-63xxP	Enclosure: -50 to 122°F (-46 to 50°C) Sensor probe: -50 to 220°F (-46 to 104°C)
	TE-63xS	Sensor probe: -50 to 220°F (-46 to 104°C) Wire harness: -50 to 122°F (-46 to 50°C)
	TE-63xxV	
Shipping Weight	TE-63xxA	0.2 lb (0.09 kg)
	TE-63xxE	
	TE-63xxF	0.25 lb (113.4 kg)
	TE-63xxM	Duct averaging: 0.9 lb (0.41 kg) Duct mount: 0.4 lb (0.18 kg) Well insertion: 0.5 lb (0.23 kg)
	TE-63xxP	Duct averaging: 0.5 lb (0.23 kg) Duct mount: 0.4 lb (0.18 kg) Outdoor air: 0.5 lb (0.23 kg) Wall mount: 0.2 lb (0.09 kg) Well insertion: 0.35 lb (0.16 kg)
	TE-63xS	Strap mount: 0.2 lb (0.09 kg)
	TE-63xxV	Duct averaging: 0.7 lb (0.32 kg) Duct mount: 0.2 lb (0.09 kg)
Dimensions (H x W x D)	TE-63xxA	2.17 in. (55 mm) diameter plus 4 or 8 in. (102 or 203 m) element
	TE-63xxE	Duct mount: 2.5 x 1.50 in. (57 x 38 mm) plus 2, 6, 8, or 12 in. (51, 152, 203, or 305 mm) element
	TE-63xxF	Flush mount: 4-1/2 x 2-3/4 in. (114 x 70 mm)
	TE-63xxM	Duct averaging: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 8 or 17 ft (2.4 or 5.2 m) element Duct mount: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 4, 8, or 18 in. (102, 203, or 457 mm) element Well insertion: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 6 or 8 in. (152 or 203 mm) element
	TE-63xxP	Duct averaging: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 8, 10, 17, or 20 ft (2.4, 3.0, 5.2, or 6.1 m) element Duct mount: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe Outdoor air: 5.97 x 3.47 x 4.46 in. (152 x 88 x 113 mm) Wall mount: 2.09 x 3.12 x 1.80 in. (53 x 79 x 46 mm) Well insertion: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe
	TE-63xS	Strap mount: 0.25 in. (6.4 mm) diameter x 3.00 in. (76 mm) long
	TE-63xxV	Duct averaging: 2.25 x 1.50 in. (57 x 38 mm) plus 8 or 17 ft (2.4 or 5.2 m) element Duct mount: 2.25 x 1.50 in. (57 x 38 mm) plus 4 or 8 in. (102 or 203 mm) element

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Software terms

Use of the software that is in (or constitutes) this product, or access to the cloud, or hosted services applicable to this product, if any, is subject to applicable end-user license, open-source software

information, and other terms set forth at www.johnsoncontrols.com/techterms. Your use of this product constitutes an agreement to such terms.

Patents

Patents: https://jcipat.com

Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS	JOHNSON CONTROLS	JOHNSON CONTROLS
C/O CONTROLS PRODUCT MANAGEMENT	WESTENDHOF 3	507 E MICHIGAN ST
NO. 32 CHANGJIJANG RD NEW DISTRICT	45143 ESSEN	MILWAUKEE WI 53202
WUXI JIANGSU PROVINCE 214028	GERMANY	USA
CHINA		

Contact information

Contact your local branch office: www.johnsoncontrols.com/locations

Contact Johnson Controls: www.johnsoncontrols.com/contact-us

BELIMO

Chrome Plated Brass Ball and Nickel Plated Brass Stem

Technical data sheet B208B

5-year warranty

Technical data

Functional data	Valve Size	0.5" [15]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	0.46
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	chrome plated brass
Suitable actuators	Non-Spring	TR LRB(X)

Safety notes

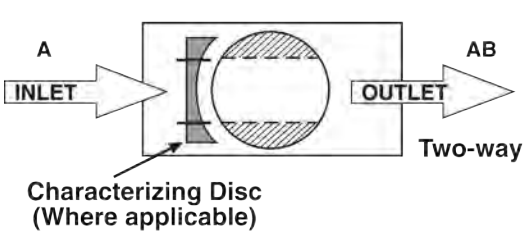
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

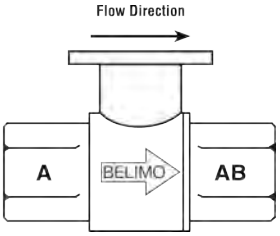
Product features

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.

Flow/Mounting details

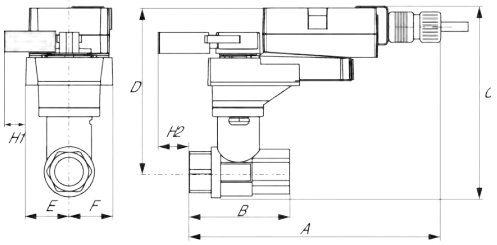




Dimensions

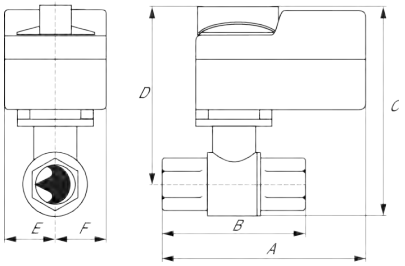
Dimensional drawings

LRB, LRX



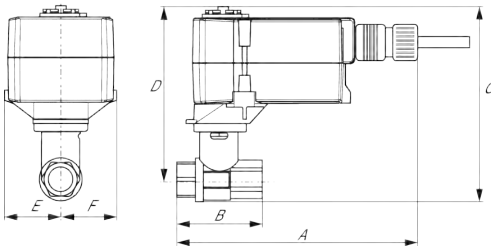
A	B	C	D	E	F	H1	H2
9.4" [239]	2.4" [60]	5.2" [132]	4.6" [117]	1.3" [33]	1.3" [33]	1.2" [30]	1.1" [28]

TR



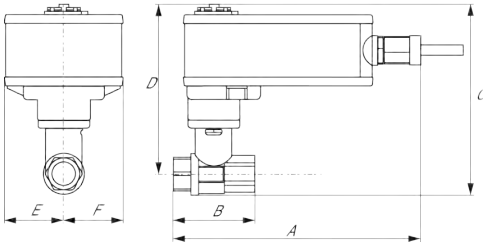
A	B	C	D	E	F
3.7" [95]	2.4" [60]	4.8" [122]	4.2" [107]	1.3" [33]	1.3" [33]

TFRB, TFRX



A	B	C	D	E	F
6.6" [167]	2.4" [60]	4.9" [124]	4.3" [110]	1.5" [39]	1.5" [39]

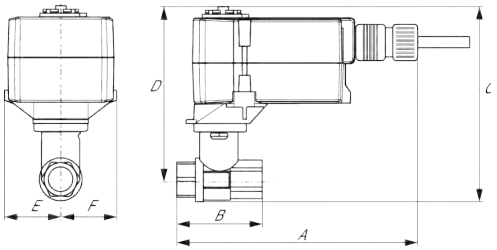
LF



A	B	C	D	E	F
7.9" [200]	2.4" [60]	5.7" [146]	5.1" [129]	1.8" [46]	1.8" [46]

A	B	C	D	E	F
7.9" [200]	2.4" [60]	5.7" [146]	5.1" [129]	1.8" [46]	1.8" [46]

TFRB, TFRX



A	B	C	D	E	F
6.6" [167]	2.4" [60]	4.9" [124]	4.3" [110]	1.5" [39]	1.5" [39]

BELIMO

Modulating, Non-Spring Return, 24 V, for DC 2...10 V or 4...20 mA

Technical data sheet TR24-SR-T US

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	0.5 W
	Transformer sizing	1 VA (class 2 power source)
	Electrical Connection	Screw terminal (for 26 to 14 GA wire)
	Overload Protection	electronic throughout full rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
	Direction of motion motor	selectable with switch
	Manual override	push down handle
	Angle of rotation	90°
	Running Time (Motor)	90 s / 90°
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP40
	Degree of protection NEMA/UL	NEMA 1 UL Enclosure Type 1
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	0.61 lb [0.28 kg]

Safety notes

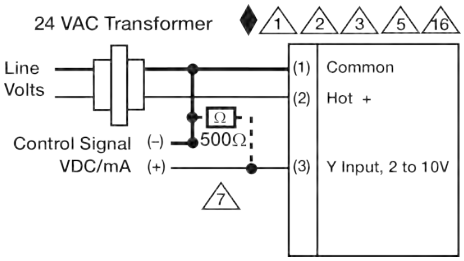
- NEMA 4X, 316L stainless steel enclosure.
- Battery Back Up System for SY(7~10)-110
- ZS-300 without brackets.
- NEMA 4X, 304 stainless steel enclosure.
- MFT95 resistor kit for 4 to 20 mA control applications.

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.
3 Actuators may also be powered by 24 VDC.
5 Only connect common to negative (-) leg of control circuits.
7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.
16 Actuators are provided with a numbered screw terminal strip instead of a cable.
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.



2...10 V / 4...20 mA Control

BELIMO

Chrome Plated Brass Ball and Nickel Plated Brass Stem

Technical data sheet B209B

5-year warranty

Technical data

Functional data	Valve Size	0.5" [15]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	0.8
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	chrome plated brass
Suitable actuators	Non-Spring	TR LRB(X)

Safety notes

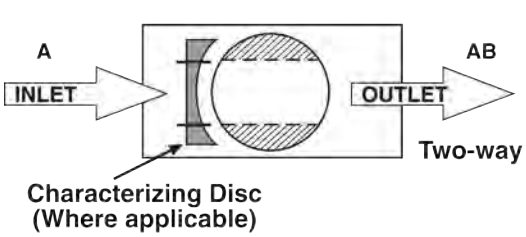
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

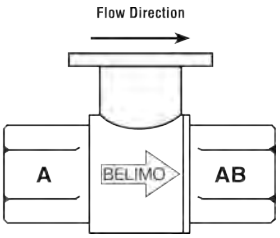
Product features

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.

Flow/Mounting details

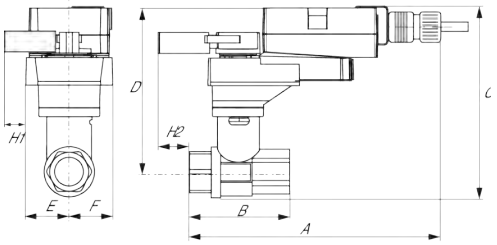




Dimensions

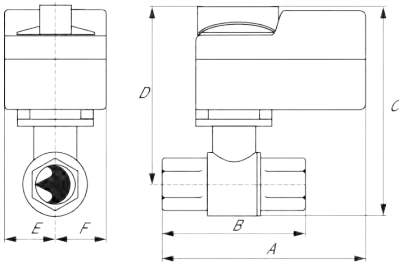
Dimensional drawings

LRB, LRX



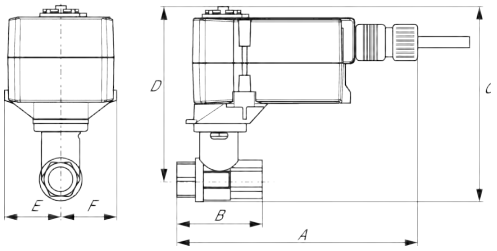
A	B	C	D	E	F	H1	H2
9.4" [239]	2.4" [60]	5.2" [132]	4.6" [117]	1.3" [33]	1.3" [33]	1.2" [30]	1.1" [28]

TR



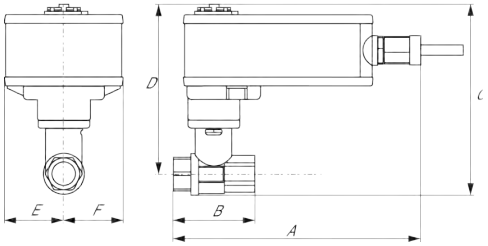
A	B	C	D	E	F
3.7" [95]	2.4" [60]	4.8" [122]	4.2" [107]	1.3" [33]	1.3" [33]

TFRB, TFRX



A	B	C	D	E	F
6.6" [167]	2.4" [60]	4.9" [124]	4.3" [110]	1.5" [39]	1.5" [39]

LF



A	B	C	D	E	F
7.9" [200]	2.4" [60]	5.7" [146]	5.1" [129]	1.8" [46]	1.8" [46]

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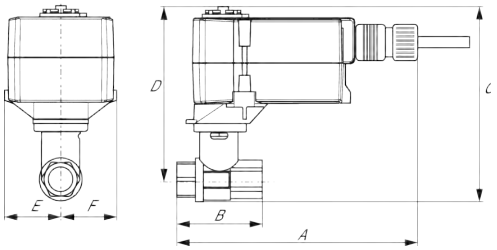
TFRB, TFRX



A	B	C	D	E	F
6.6" [167]	2.4" [60]	4.9" [124]	4.3" [110]	1.5" [39]	1.5" [39]

BELIMO

Modulating, Non-Spring Return, 24 V, for DC 2...10 V or 4...20 mA

Technical data sheet TR24-SR-T US

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	0.5 W
	Transformer sizing	1 VA (class 2 power source)
	Electrical Connection	Screw terminal (for 26 to 14 GA wire)
	Overload Protection	electronic throughout full rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
	Direction of motion motor	selectable with switch
	Manual override	push down handle
	Angle of rotation	90°
	Running Time (Motor)	90 s / 90°
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP40
	Degree of protection NEMA/UL	NEMA 1 UL Enclosure Type 1
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	0.61 lb [0.28 kg]

Safety notes

- NEMA 4X, 316L stainless steel enclosure.
- Battery Back Up System for SY(7~10)-110
- ZS-300 without brackets.
- NEMA 4X, 304 stainless steel enclosure.
- MFT95 resistor kit for 4 to 20 mA control applications.

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.
3 Actuators may also be powered by 24 VDC.
5 Only connect common to negative (-) leg of control circuits.
7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.
16 Actuators are provided with a numbered screw terminal strip instead of a cable.
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live Electrical Components!
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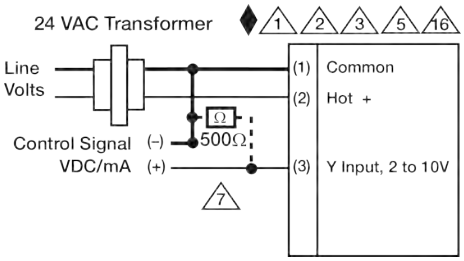


2...10 V / 4...20 mA Control

BELIMO

Chrome Plated Brass Ball and Nickel Plated Brass Stem

Technical data sheet B210B

5-year warranty

Technical data

Functional data	Valve Size	0.5" [15]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	1.2
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	chrome plated brass
Suitable actuators	Non-Spring	TR LRB(X)

Safety notes

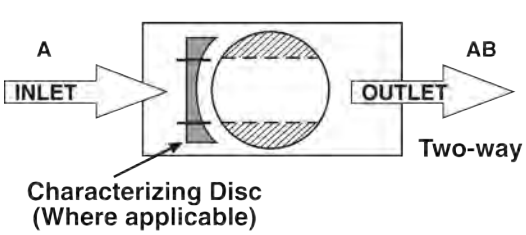
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

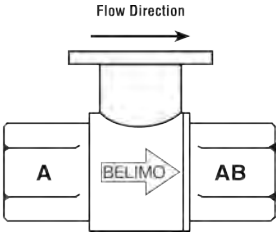
Product features

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.

Flow/Mounting details

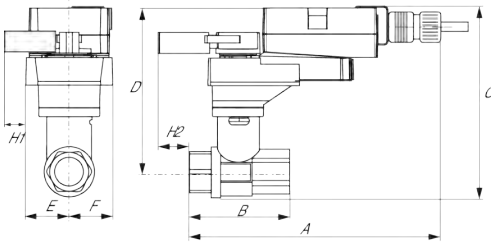




Dimensions

Dimensional drawings

LRB, LRX



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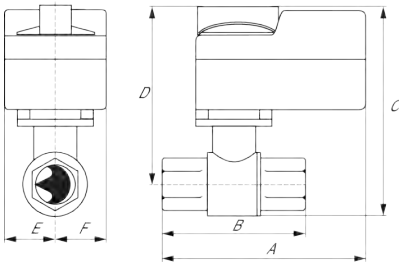
9.4" [239]	2.4" [60]	5.2" [132]	4.6" [117]	1.3" [33]	1.3" [33]	1.2" [30]	1.1" [28]

TR



A	B	C	D	E	F
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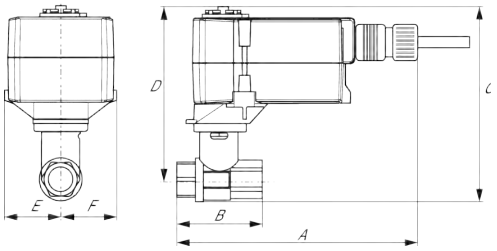
TFRB, TFRX



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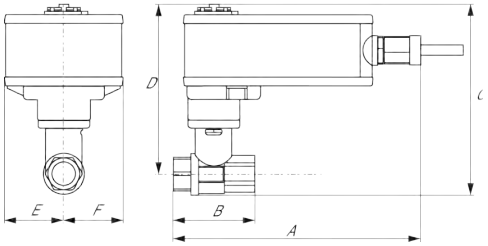

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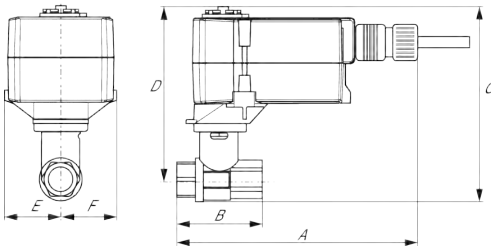

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BELIMO

Modulating, Non-Spring Return, 24 V, for DC 2...10 V or 4...20 mA

Technical data sheet TR24-SR-T US

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	0.5 W
	Transformer sizing	1 VA (class 2 power source)
	Electrical Connection	Screw terminal (for 26 to 14 GA wire)
	Overload Protection	electronic throughout full rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
	Direction of motion motor	selectable with switch
	Manual override	push down handle
	Angle of rotation	90°
	Running Time (Motor)	90 s / 90°
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP40
	Degree of protection NEMA/UL	NEMA 1 UL Enclosure Type 1
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	0.61 lb [0.28 kg]

Safety notes

- NEMA 4X, 316L stainless steel enclosure.
- Battery Back Up System for SY(7~10)-110
- ZS-300 without brackets.
- NEMA 4X, 304 stainless steel enclosure.
- MFT95 resistor kit for 4 to 20 mA control applications.

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.
3 Actuators may also be powered by 24 VDC.
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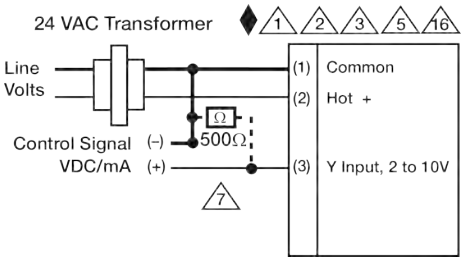


2...10 V / 4...20 mA Control

BELIMO

Chrome Plated Brass Ball and Nickel Plated Brass Stem

Technical data sheet B211B

5-year warranty

Technical data

Functional data	Valve Size	0.5" [15]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	1.9
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	chrome plated brass
Suitable actuators	Non-Spring	TR LRB(X)

Safety notes

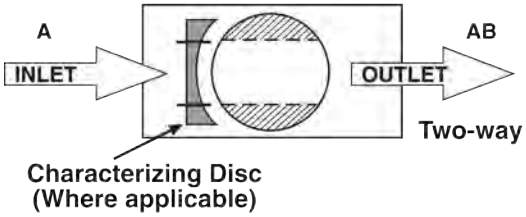
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

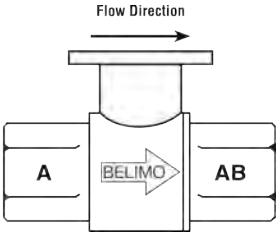
Product features

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.

Flow/Mounting details



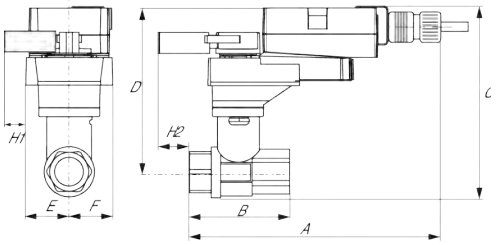


121

Dimensions

Dimensional drawings

LRB, LRX



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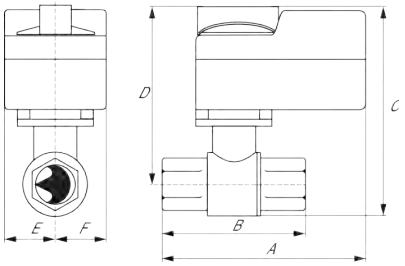
TR



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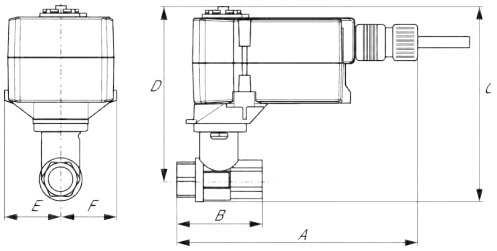
TFRB, TFRX



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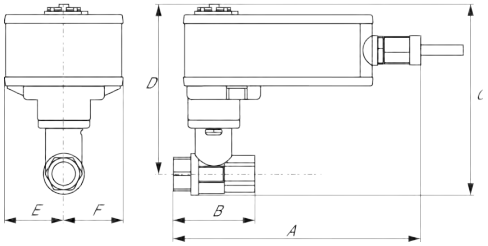

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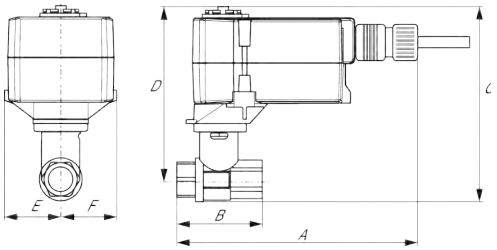

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BELIMO

Modulating, Non-Spring Return, 24 V, for DC 2...10 V or 4...20 mA

Technical data sheet TR24-SR-T US

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	0.5 W
	Transformer sizing	1 VA (class 2 power source)
	Electrical Connection	Screw terminal (for 26 to 14 GA wire)
	Overload Protection	electronic throughout full rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
	Direction of motion motor	selectable with switch
	Manual override	push down handle
	Angle of rotation	90°
	Running Time (Motor)	90 s / 90°
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP40
	Degree of protection NEMA/UL	NEMA 1 UL Enclosure Type 1
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	0.61 lb [0.28 kg]

Safety notes

- NEMA 4X, 316L stainless steel enclosure.
- Battery Back Up System for SY(7~10)-110
- ZS-300 without brackets.
- NEMA 4X, 304 stainless steel enclosure.
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Electrical installation

INSTALLATION NOTES

123

1 Provide overload protection and disconnect as required.
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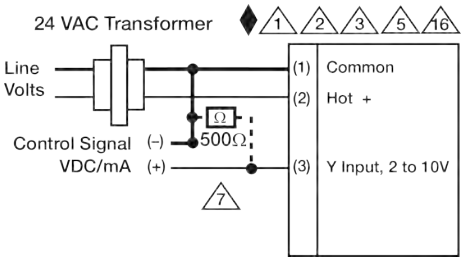

2...10 V / 4...20 mA Control

BELIMO

Chrome Plated Brass Ball and Nickel Plated Brass Stem

Technical data sheet B212B

5-year warranty

Technical data

Functional data	Valve Size	0.5" [15]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	3
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	chrome plated brass
Suitable actuators	Non-Spring	TR LRB(X)

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Product features

Application

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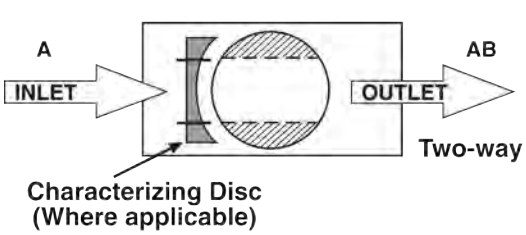
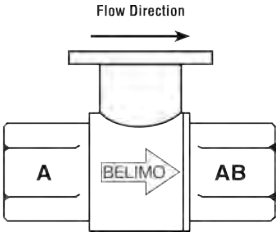
Flow/Mounting details

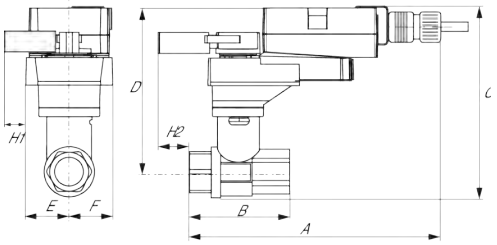




Dimensions

Dimensional drawings

LRB, LRX



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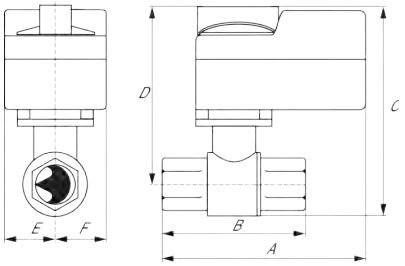

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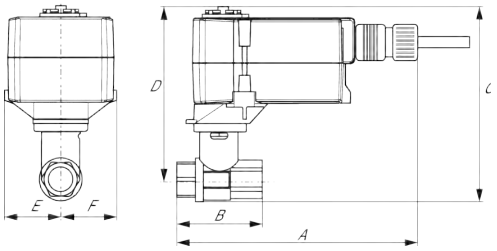
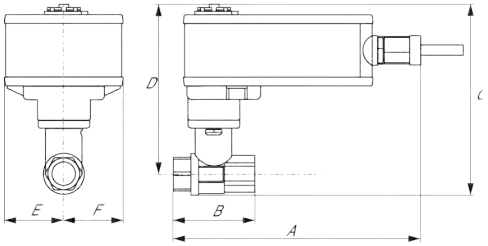


A	B	C	D	E	F
6.6" [167]	2.4" [60]	5.5" [139]	4.7" [120]	1.5" [39]	1.5" [39]

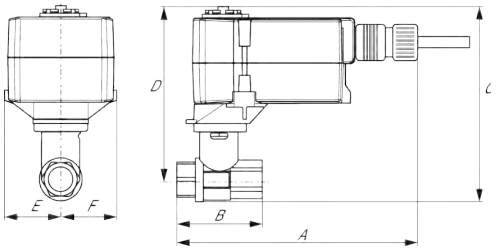
LF



A	B	C	D	E	F
7.9" [200]	2.4" [60]	6.1" [154]	5.5" [140]	1.8" [46]	1.8" [46]

A	B	C	D	E	F
7.9" [200]	2.4" [60]	6.1" [154]	5.5" [140]	1.8" [46]	1.8" [46]

TFRB, TFRX



A	B	C	D	E	F
6.6" [167]	2.4" [60]	5.5" [139]	4.7" [120]	1.5" [39]	1.5" [39]

BELIMO

Modulating, Non-Spring Return, 24 V, for DC 2...10 V or 4...20 mA

Technical data sheet TR24-SR-T US

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	0.5 W
	Transformer sizing	1 VA (class 2 power source)
	Electrical Connection	Screw terminal (for 26 to 14 GA wire)
	Overload Protection	electronic throughout full rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
	Direction of motion motor	selectable with switch
	Manual override	push down handle
	Angle of rotation	90°
	Running Time (Motor)	90 s / 90°
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP40
	Degree of protection NEMA/UL	NEMA 1 UL Enclosure Type 1
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	0.61 lb [0.28 kg]

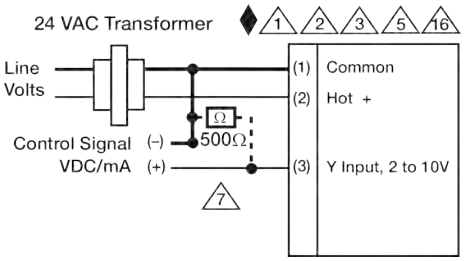
Safety notes

- NEMA 4X, 316L stainless steel enclosure.
- Battery Back Up System for SY(7~10)-110
- ZS-300 without brackets.
- NEMA 4X, 304 stainless steel enclosure.
- MFT95 resistor kit for 4 to 20 mA control applications.

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.
3 Actuators may also be powered by 24 VDC.
5 Only connect common to negative (-) leg of control circuits.
7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.
16 Actuators are provided with a numbered screw terminal strip instead of a cable.
◆ 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.



2...10 V / 4...20 mA Control

BELIMO

Chrome Plated Brass Ball and Nickel Plated Brass Stem

Technical data sheet B217B

5-year warranty

Technical data

Functional data	Valve Size	0.75" [20]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	4.7
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	chrome plated brass
Suitable actuators	Non-Spring	TR LRB(X)

Safety notes

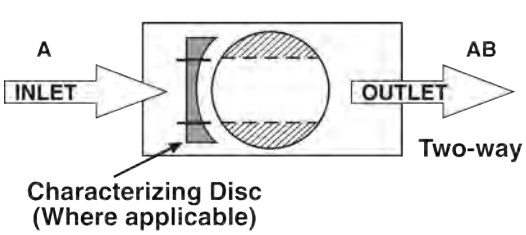
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

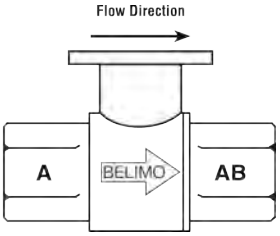
Product features

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.

Flow/Mounting details

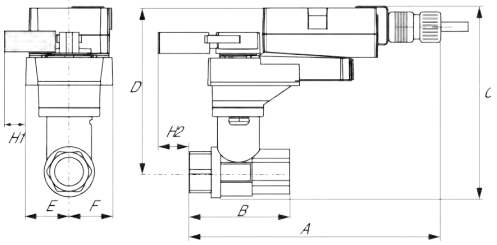




Dimensions

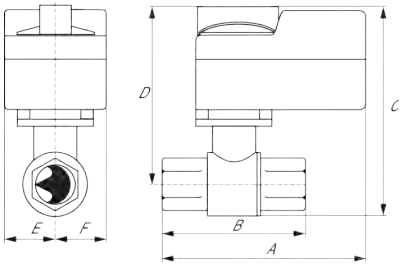
Dimensional drawings

LRB, LRX



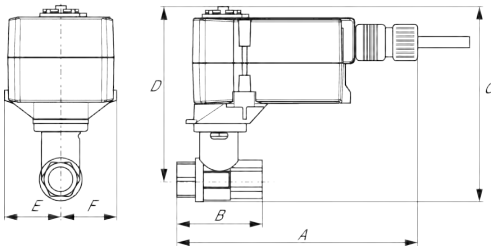
A	B	C	D	E	F	H1	H2
9.4" [239]	2.7" [69]	5.8" [147]	5.1" [129]	1.3" [33]	1.3" [33]	1.2" [30]	1" [25]

TR



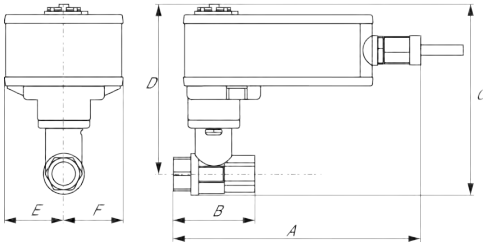
A	B	C	D	E	F
4.0" [102]	2.7" [69]	5.4" [137]	4.7" [120]	1.3" [33]	1.3" [33]

TFRB, TFRX



A	B	C	D	E	F
7.0" [178]	2.7" [69]	5.5" [139]	4.8" [122]	1.5" [39]	1.5" [39]

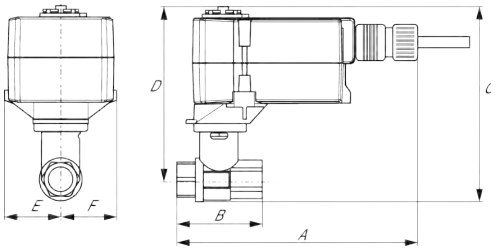
LF



A	B	C	D	E	F
8.6" [218]	2.7" [69]	6.3" [159]	5.6" [142]	1.8" [46]	1.8" [46]

A	B	C	D	E	F
8.6" [218]	2.7" [69]	6.3" [159]	5.6" [142]	1.8" [46]	1.8" [46]

TFRB, TFRX



A	B	C	D	E	F
7.0" [178]	2.7" [69]	5.5" [139]	4.8" [122]	1.5" [39]	1.5" [39]

BELIMO

Modulating, Non-Spring Return, 24 V, for DC 2...10 V or 4...20 mA

Technical data sheet TR24-SR-T US

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	0.5 W
	Transformer sizing	1 VA (class 2 power source)
	Electrical Connection	Screw terminal (for 26 to 14 GA wire)
	Overload Protection	electronic throughout full rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
	Direction of motion motor	selectable with switch
	Manual override	push down handle
	Angle of rotation	90°
	Running Time (Motor)	90 s / 90°
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP40
	Degree of protection NEMA/UL	NEMA 1 UL Enclosure Type 1
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	0.61 lb [0.28 kg]

Safety notes

- NEMA 4X, 316L stainless steel enclosure.
- Battery Back Up System for SY(7~10)-110
- ZS-300 without brackets.
- NEMA 4X, 304 stainless steel enclosure.
- MFT95 resistor kit for 4 to 20 mA control applications.

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.
3 Actuators may also be powered by 24 VDC.
5 Only connect common to negative (-) leg of control circuits.
7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.
16 Actuators are provided with a numbered screw terminal strip instead of a cable.
◆ Meets cULus requirements without the need of an electrical ground connection.

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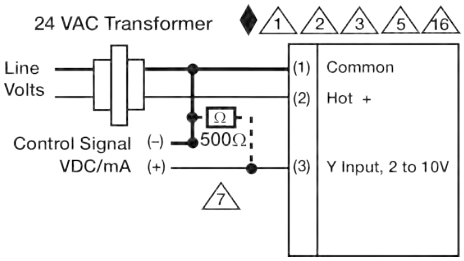


2...10 V / 4...20 mA Control

BELIMO

Chrome Plated Brass Ball and Nickel Plated Brass Stem

Technical data sheet B218B

5-year warranty

Technical data

Functional data	Valve Size	0.75" [20]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	7.4
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	chrome plated brass
Suitable actuators	Non-Spring	TR LRB(X)

Safety notes

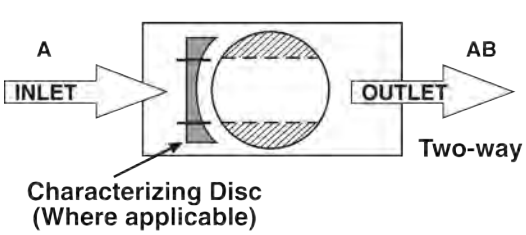
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

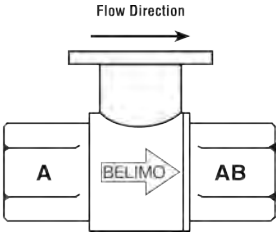
Product features

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.

Flow/Mounting details



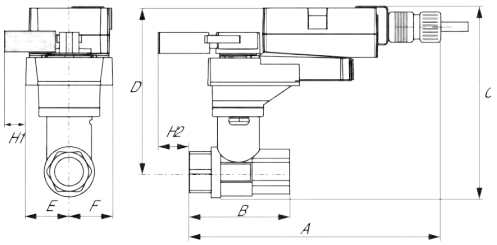


133

Dimensions

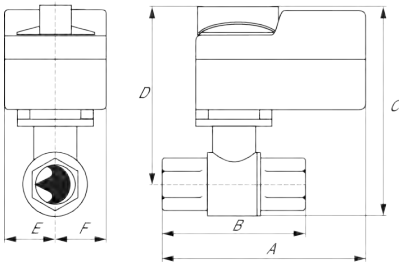
Dimensional drawings

LRB, LRX



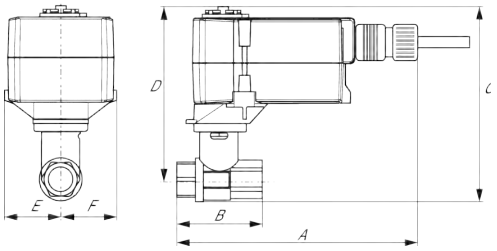
A	B	C	D	E	F	H1	H2
9.4" [239]	2.7" [69]	5.8" [147]	5.1" [129]	1.3" [33]	1.3" [33]	1.2" [30]	1" [25]

TR



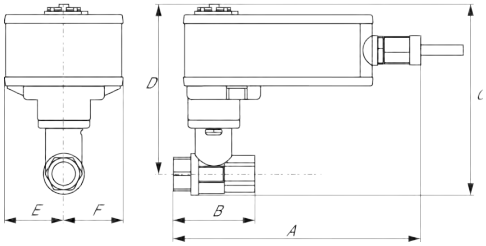
A	B	C	D	E	F
4.0" [102]	2.7" [69]	5.4" [137]	5.1" [129]	1.3" [33]	1.3" [33]

TFRB, TFRX



A	B	C	D	E	F
7.0" [178]	2.7" [69]	5.5" [139]	4.8" [122]	1.5" [39]	1.5" [39]

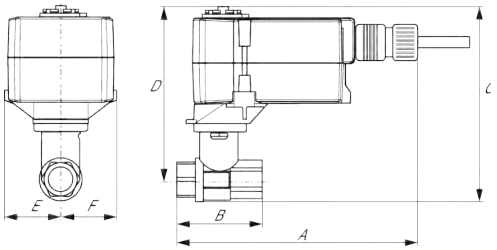
LF



A	B	C	D	E	F
8.6" [218]	2.7" [69]	6.3" [159]	5.6" [142]	1.8" [46]	1.8" [46]

A	B	C	D	E	F
8.6" [218]	2.7" [69]	6.3" [159]	5.6" [142]	1.8" [46]	1.8" [46]

TFRB, TFRX



A	B	C	D	E	F
7.0" [178]	2.7" [69]	5.5" [139]	4.8" [122]	1.5" [39]	1.5" [39]

BELIMO

Modulating, Non-Spring Return, 24 V, for DC 2...10 V or 4...20 mA

Technical data sheet TR24-SR-T US

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	0.5 W
	Transformer sizing	1 VA (class 2 power source)
	Electrical Connection	Screw terminal (for 26 to 14 GA wire)
	Overload Protection	electronic throughout full rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
	Direction of motion motor	selectable with switch
	Manual override	push down handle
	Angle of rotation	90°
	Running Time (Motor)	90 s / 90°
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP40
	Degree of protection NEMA/UL	NEMA 1 UL Enclosure Type 1
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	0.61 lb [0.28 kg]

Safety notes

- NEMA 4X, 316L stainless steel enclosure.
- Battery Back Up System for SY(7~10)-110
- ZS-300 without brackets.
- NEMA 4X, 304 stainless steel enclosure.
- MFT95 resistor kit for 4 to 20 mA control applications.

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.
3 Actuators may also be powered by 24 VDC.
5 Only connect common to negative (-) leg of control circuits.
7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.
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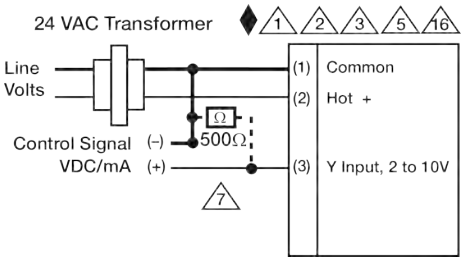


2...10 V / 4...20 mA Control

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B222

5-year warranty

Technical data

Functional data	Valve Size	1" [25]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	7.4
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	LRB(X) NR

Safety notes

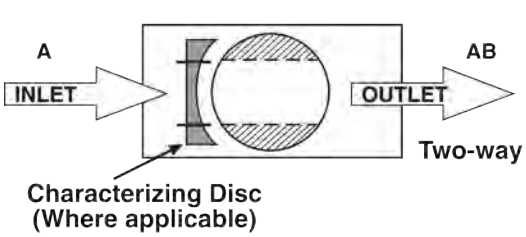
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

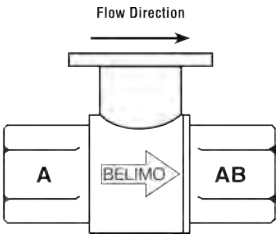
Product features

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.

Flow/Mounting details

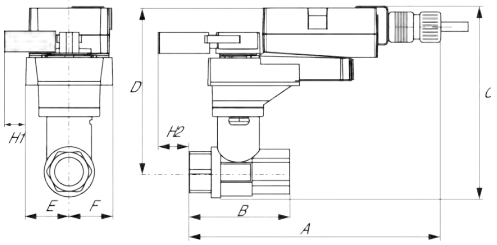




Dimensions

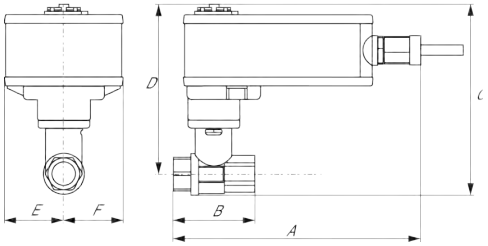
Dimensional drawings

LRB, LRX



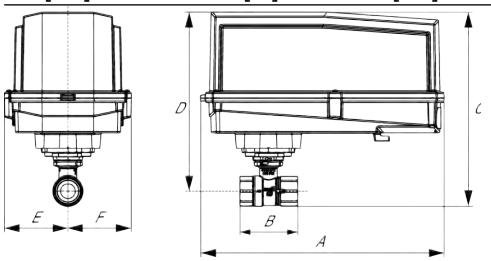
A	B	C	D	E	F	H1	H2
9.4" [239]	3.1" [78]	7.2" [184]	6.3" [161]	1.3" [33]	1.3" [33]	1.2" [30]	0.9" [23]

LF



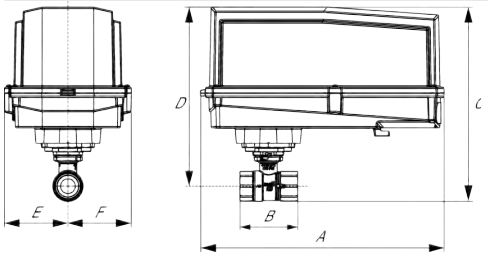
A	B	C	D	E	F
8.1" [206]	3.1" [78]	6.5" [165]	5.6" [142]	1.8" [46]	1.8" [46]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	3.1" [78]	7.8" [199]	7.1" [181]	3.1" [80]	3.1" [80]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	3.1" [78]	7.8" [199]	7.1" [181]	3.1" [80]	3.1" [80]

BELIMO

Modulating, Non-Spring Return, 24 V, Multi-Function Technology®

Technical data sheet LRX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	2.5 W
	Power consumption in rest position	1.2 W
	Transformer sizing	5 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for DC 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM and On/Off
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	default 150 s, variable 35...150 s
	Running time motor variable	35...150 s
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	1.5 lb [0.70 kg]

Safety notes

- Cable for ZIP-RS232 US and ZIP-USB-MP US to Belimo gateways.
- Classic GM to GMB(X) retrofit bracket.
- Battery Back Up System for SY(7~10)-110
- 120 to 24 VAC, 40 VA transformer.
- 12VDC 1.2 AH battery (2 required).
- 50% voltage divider kit (resistors with wires).
- PC Tool computer programming interface, serial port.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to LonWorks	UK24LON
	Gateway MP to Modbus RTU	UK24MOD

Service tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

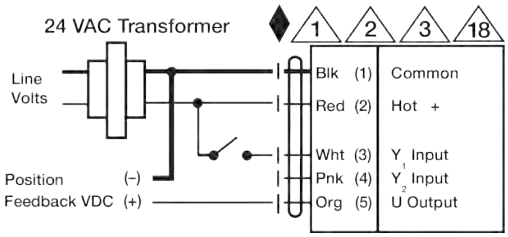
12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

18 Actuators with plenum cable do not have numbers; use color codes instead.

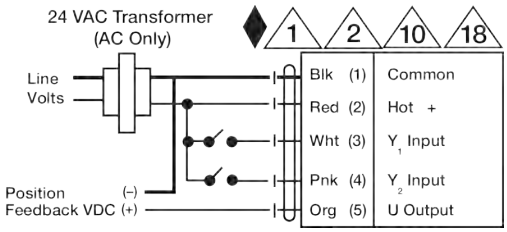
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live Electrical Components!

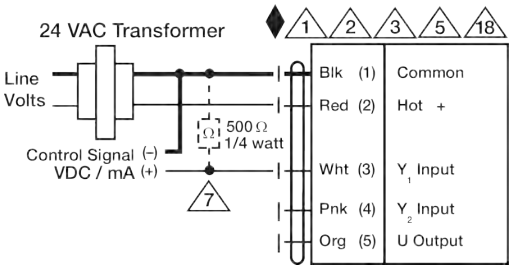
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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



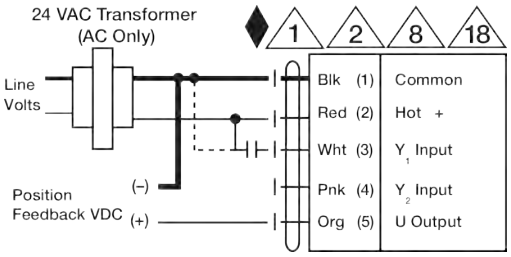
On/Off



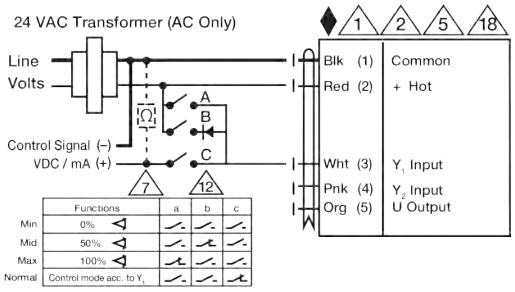
Floating Point



VDC/mA Control



PWM Control



Override Control

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B222

5-year warranty

Technical data

Functional data	Valve Size	1" [25]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	7.4
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	LRB(X) NR

Safety notes

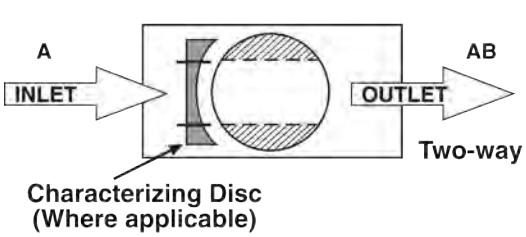
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

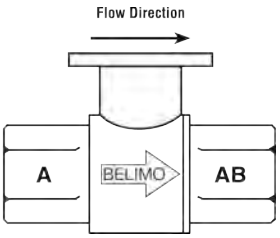
Product features

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.

Flow/Mounting details



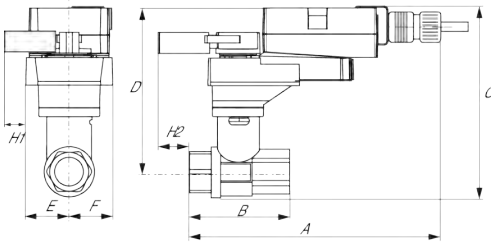


142

Dimensions

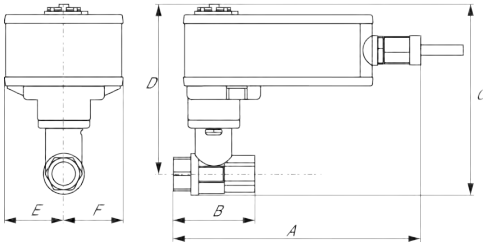
Dimensional drawings

LRB, LRX



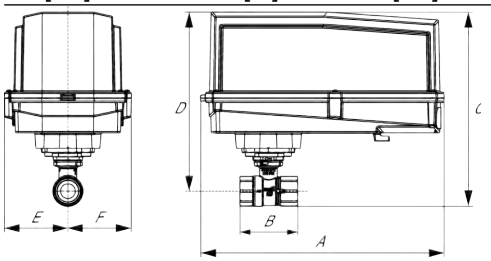
A	B	C	D	E	F	H1	H2
9.4" [239]	3.1" [78]	7.2" [184]	6.3" [161]	1.3" [33]	1.3" [33]	1.2" [30]	0.9" [23]

LF



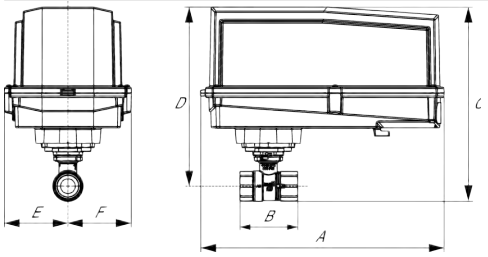
A	B	C	D	E	F
8.1" [206]	3.1" [78]	6.5" [165]	5.6" [142]	1.8" [46]	1.8" [46]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	3.1" [78]	7.8" [199]	7.1" [181]	3.1" [80]	3.1" [80]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	3.1" [78]	7.8" [199]	7.1" [181]	3.1" [80]	3.1" [80]

BELIMO

Modulating, Non-Spring Return, 24 V, Multi-Function Technology®

Technical data sheet LRX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	2.5 W
	Power consumption in rest position	1.2 W
	Transformer sizing	5 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for DC 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM and On/Off
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	default 150 s, variable 35...150 s
	Running time motor variable	35...150 s
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	1.5 lb [0.70 kg]

Safety notes

- Cable for ZIP-RS232 US and ZIP-USB-MP US to Belimo gateways.
- Classic GM to GMB(X) retrofit bracket.
- Battery Back Up System for SY(7~10)-110
- 120 to 24 VAC, 40 VA transformer.
- 12VDC 1.2 AH battery (2 required).
- 50% voltage divider kit (resistors with wires).
- PC Tool computer programming interface, serial port.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to LonWorks	UK24LON
	Gateway MP to Modbus RTU	UK24MOD

Service tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

18 Actuators with plenum cable do not have numbers; use color codes instead.

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

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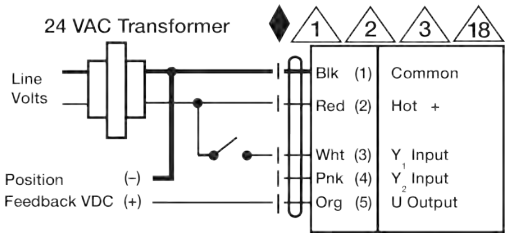
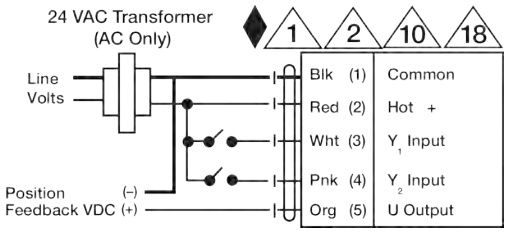
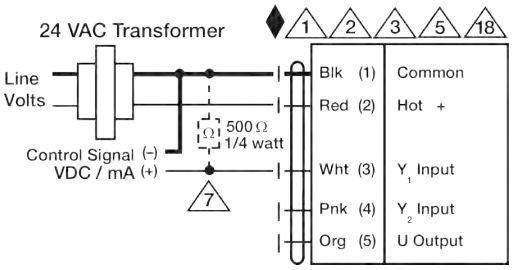


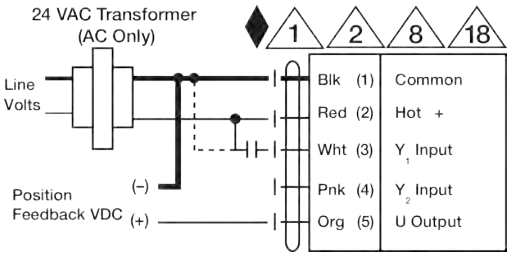
On/Off



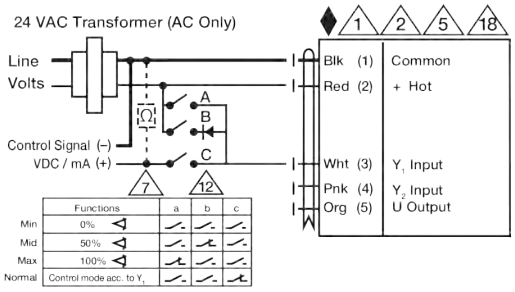
Floating Point



VDC/mA Control



PWM Control



Override Control

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B229

5-year warranty

Technical data

Functional data	Valve Size	1.25" [32]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	10
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	LRB(X) NR

Safety notes

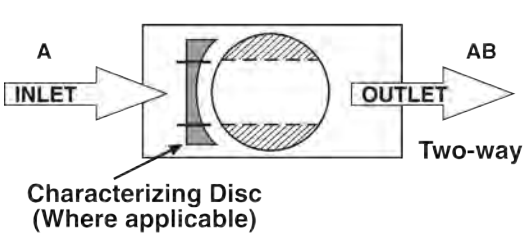
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

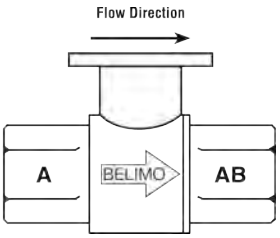
Product features

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.

Flow/Mounting details



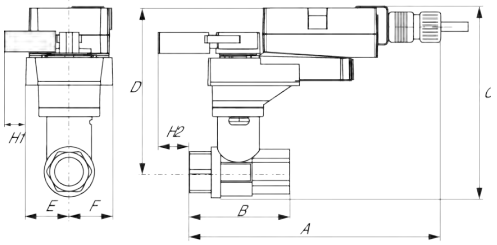


147

Dimensions

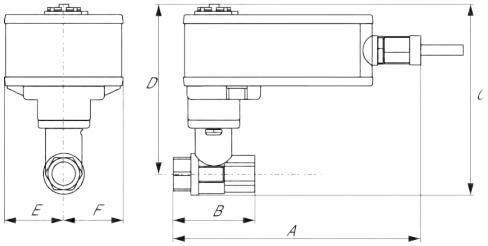
Dimensional drawings

LRB, LRX



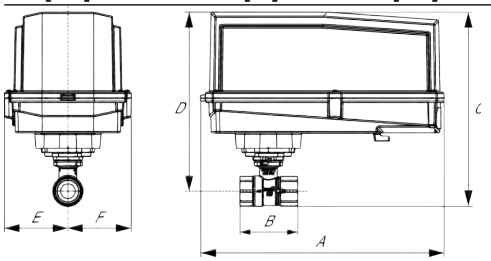
A	B	C	D	E	F	H1	H2
9.4" [239]	3.7" [95]	7.2" [184]	6.3" [161]	1.3" [33]	1.3" [33]	1.2" [30]	0.6" [15]

LF



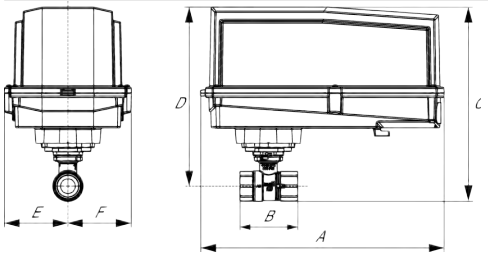
A	B	C	D	E	F
8.3" [211]	3.7" [95]	6.6" [167]	5.6" [142]	1.8" [46]	1.8" [46]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	3.7" [95]	7.8" [199]	7.1" [181]	3.1" [80]	3.1" [80]

ARB N4, ARX N4, NRB N4, NRX N4



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11.4" [289]	3.7" [95]	7.8" [199]	7.1" [181]	3.1" [80]	3.1" [80]

BELIMO

Modulating, Non-Spring Return, 24 V, Multi-Function Technology®

Technical data sheet LRX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	2.5 W
	Power consumption in rest position	1.2 W
	Transformer sizing	5 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for DC 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM and On/Off
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	default 150 s, variable 35...150 s
	Running time motor variable	35...150 s
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	1.5 lb [0.70 kg]

Safety notes

- Cable for ZIP-RS232 US and ZIP-USB-MP US to Belimo gateways.
- Classic GM to GMB(X) retrofit bracket.
- Battery Back Up System for SY(7~10)-110
- 120 to 24 VAC, 40 VA transformer.
- 12VDC 1.2 AH battery (2 required).
- 50% voltage divider kit (resistors with wires).
- PC Tool computer programming interface, serial port.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to LonWorks	UK24LON
	Gateway MP to Modbus RTU	UK24MOD

Service tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

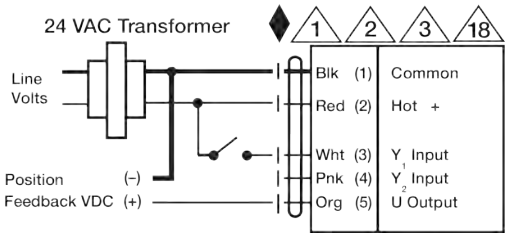
12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

18 Actuators with plenum cable do not have numbers; use color codes instead.

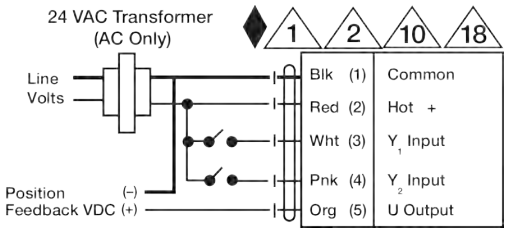
◆ Meets cULus requirements without the need of an electrical ground connection.

! **Warning! Live Electrical Components!**

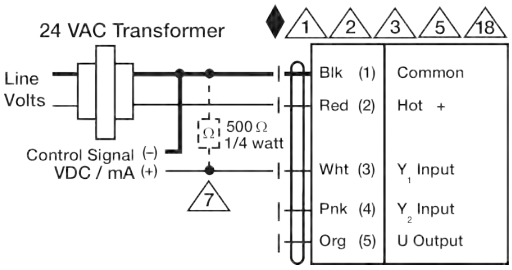
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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



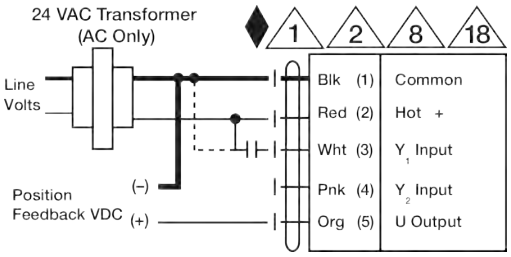
On/Off



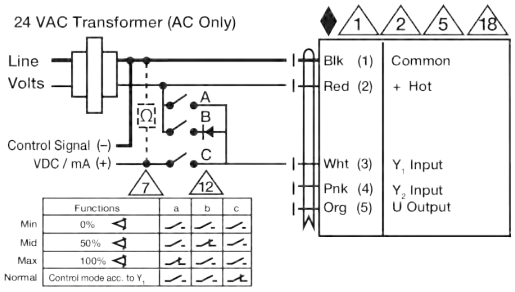
Floating Point



VDC/mA Control



PWM Control



Override Control

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B229

5-year warranty

Type overview

Type	DN
B229	32

Technical data

Functional data	Valve size	1.25" [32]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	10
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem	stainless steel
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Characterized disc	TEFZEL®
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	LRB(X) NR
	Spring	LF

Safety notes

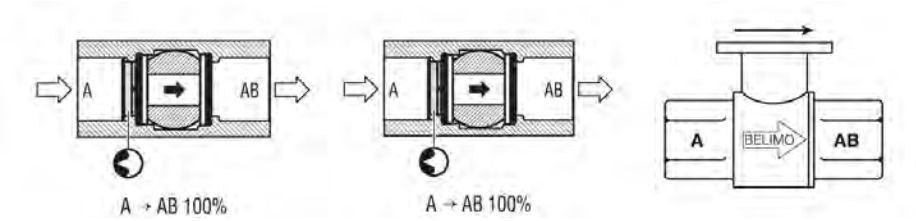
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

Product features

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.

Flow/Mounting details



Two-way valves should be installed with the disc upstream.

Product features

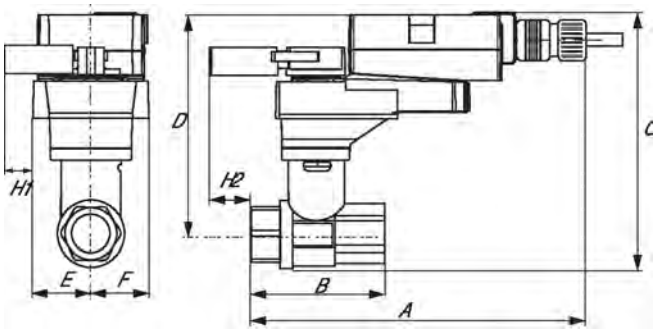
Mode of operation

Local Control SY2~12, 24vac on/off

Dimensions

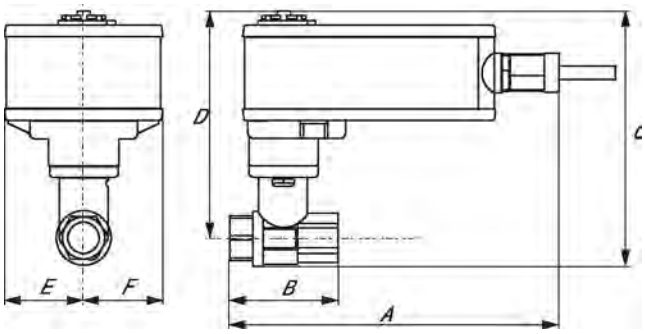
Type	DN
B229	32

LRB, LRX



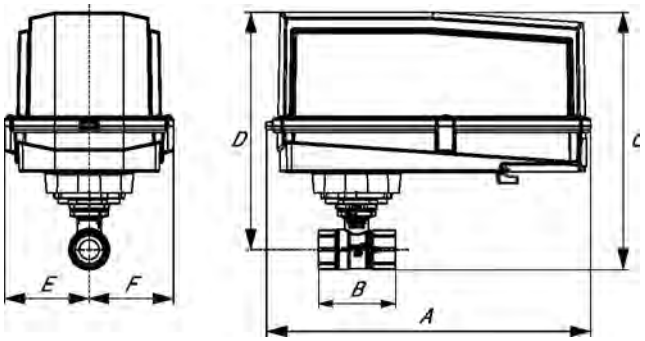
A	B	C	D	E	F	H1	H2
9.4" [239]	3.7" [95]	6.4" [163]	5.4" [137]	1.3" [33]	1.3" [33]	1.2" [30]	0.6" [15]

LF



A	B	C	D	E	F
8.3" [211]	3.7" [95]	6.6" [167]	5.6" [142]	1.8" [46]	1.8" [46]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	3.7" [95]	7.8" [199]	7.1" [181]	3.1" [80]	3.1" [80]

BELIMO

NEMA 4X, Modulating Control, Non-Spring Return, 24 V, Multi-Function Technology®

Technical data sheet NRX24-MFT-T N4

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	3.5 W
	Power consumption in rest position	1.3 W
	Transformer sizing	6 VA (class 2 power source)
	Electrical Connection	Screw terminal (for 26 to 14 GA wire), 1/2" conduit connector
	Overload Protection	electronic throughout 0...95° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for DC 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM and On/Off
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, PWM, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	Max. 90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	150 s / 90°
	Running time motor variable	45...150 s
	Noise level, motor	45 dB(A)
	Position indication	pointer
Safety data	Degree of protection IEC/EN	IP66/67
	Degree of protection NEMA/UL	NEMA 4X
	Enclosure	UL Enclosure Type 4X
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Ambient temperature note	-40...50°C for actuator with integrated heating
	Storage temperature	-22...122°F [-30...50°C]
	Ambient humidity	Max. 100% RH
	Servicing	maintenance-free
Materials	Housing material	Die cast aluminium and plastic casing

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

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to Modbus RTU	UK24MOD
	Gateway MP to LonWorks	UK24LON

Electrical accessories	Description	Type
	Battery backup system, for non-spring return models	NSV24 US
	Battery, 12 V, 1.2 Ah (two required)	NSV-BAT
	Auxiliary switch 1 x SPDT add-on	S1A
	Auxiliary switch 2 x SPDT add-on	S2A
	Feedback potentiometer 140 Ω add-on, grey	P140A GR
	Feedback potentiometer 1 kΩ add-on, grey	P1000A GR
	Feedback potentiometer 10 kΩ add-on, grey	P10000A GR
	Feedback potentiometer 2.8 kΩ add-on, grey	P2800A GR
	Feedback potentiometer 500 Ω add-on, grey	P500A GR
	Feedback potentiometer 5 kΩ add-on, grey	P5000A GR

Service tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for programmable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by DC 24 V.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

16 Actuators are provided with a numbered screw terminal strip instead of a cable.

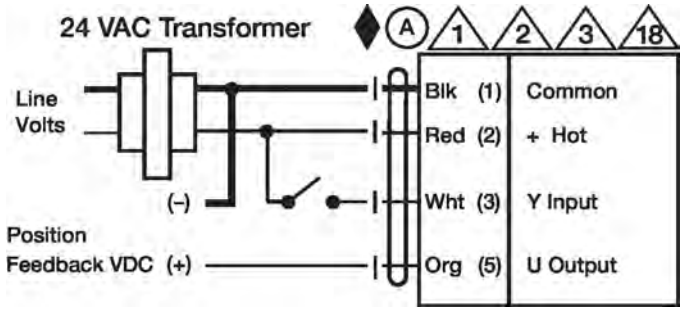
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live electrical components!

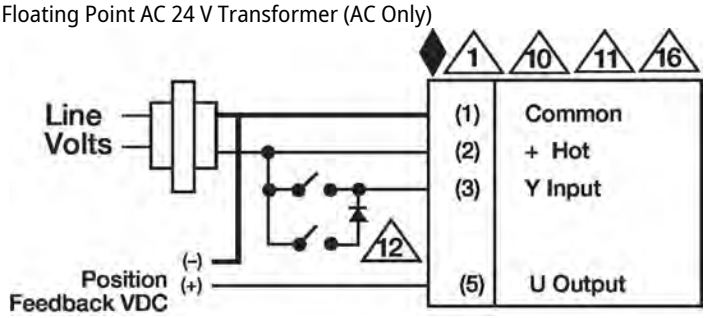
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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

Wiring diagrams

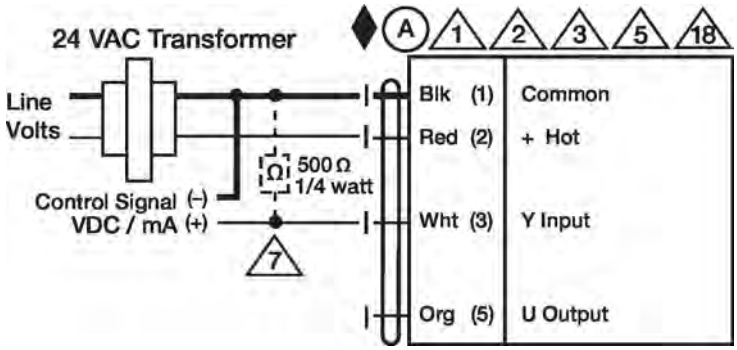
On/Off



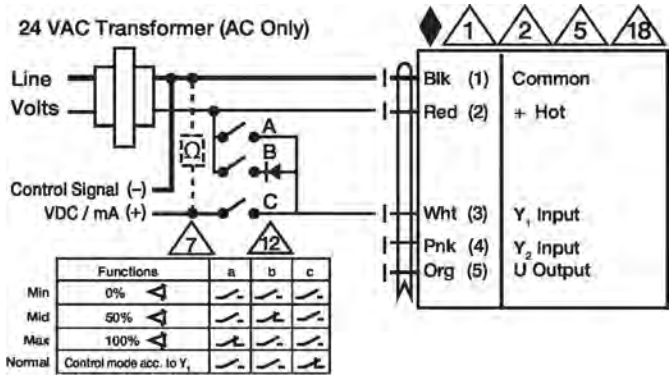
Floating Point AC 24 V Transformer (AC Only)



VDC/mA Control



Override Control



Dimensions

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B230

5-year warranty

Technical data

Functional data	Valve Size	1.25" [32]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	19
	Body pressure rating note	600 psi
	No Characterized Disc	TRUE
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	LRB(X) NR

Safety notes

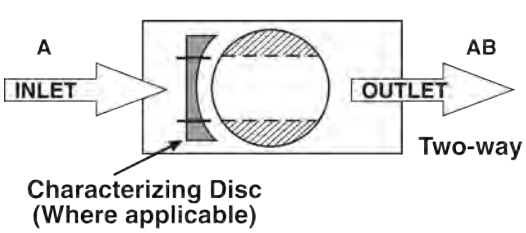
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

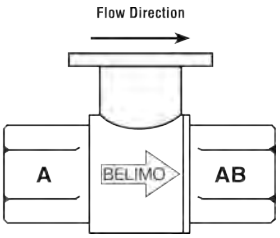
Product features

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.

Flow/Mounting details

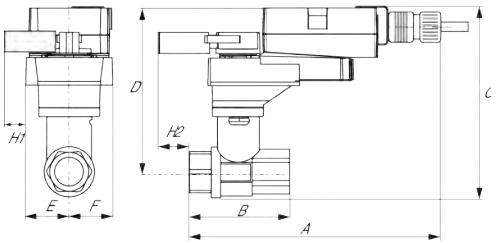




Dimensions

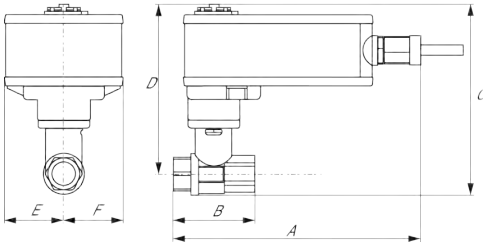
Dimensional drawings

LRB, LRX



A	B	C	D	E	F	H1	H2
9.4" [239]	3.7" [95]	7.2" [184]	6.3" [161]	1.3" [33]	1.3" [33]	1.2" [30]	0.6" [15]

LF



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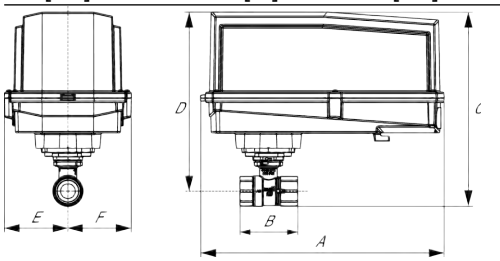
8.3" [211]	3.7" [95]	6.6" [167]	5.6" [142]	1.8" [46]	1.8" [46]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
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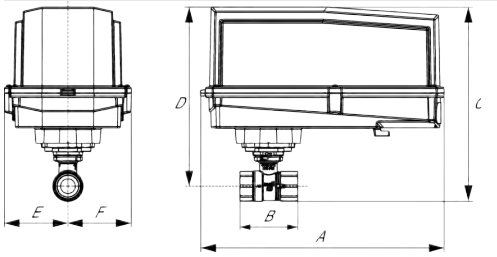
ARB N4, ARX N4, NRB N4, NRX N4



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11.4" [289]	3.7" [95]	7.8" [199]	7.1" [181]	3.1" [80]	3.1" [80]

BELIMO

Modulating, Non-Spring Return, 24 V, Multi-Function Technology®

Technical data sheet LRX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	2.5 W
	Power consumption in rest position	1.2 W
	Transformer sizing	5 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for DC 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM and On/Off
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	default 150 s, variable 35...150 s
	Running time motor variable	35...150 s
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	1.5 lb [0.70 kg]

Safety notes

- Cable for ZIP-RS232 US and ZIP-USB-MP US to Belimo gateways.
- Classic GM to GMB(X) retrofit bracket.
- Battery Back Up System for SY(7~10)-110
- 120 to 24 VAC, 40 VA transformer.
- 12VDC 1.2 AH battery (2 required).
- 50% voltage divider kit (resistors with wires).
- PC Tool computer programming interface, serial port.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to LonWorks	UK24LON
	Gateway MP to Modbus RTU	UK24MOD

Service tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

18 Actuators with plenum cable do not have numbers; use color codes instead.

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

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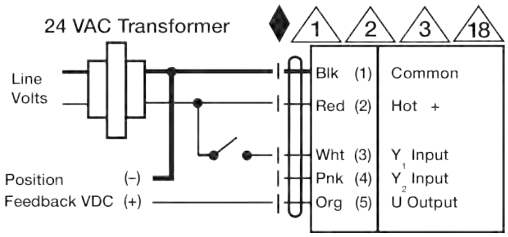
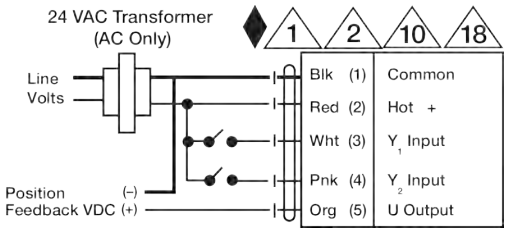
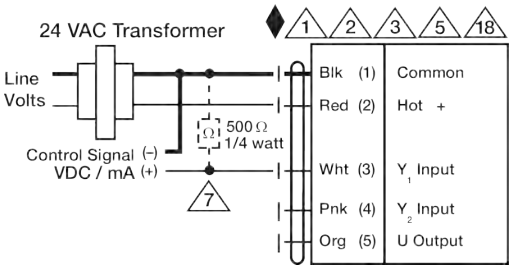


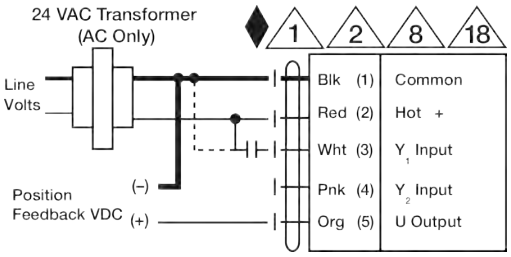
On/Off



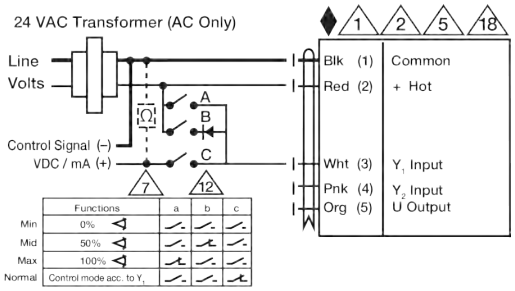
Floating Point



VDC/mA Control



PWM Control



Override Control

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B230

5-year warranty

Technical data

Functional data	Valve Size	1.25" [32]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	19
	Body pressure rating note	600 psi
	No Characterized Disc	TRUE
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	LRB(X) NR

Safety notes

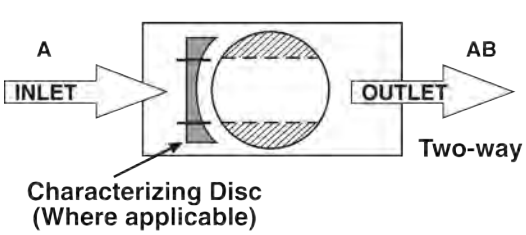
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

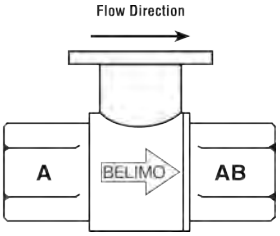
Product features

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.

Flow/Mounting details

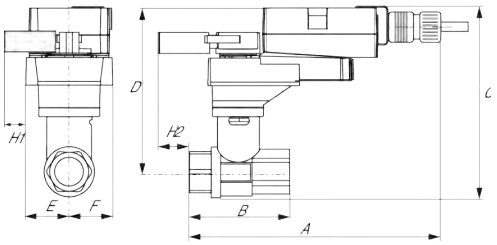




Dimensions

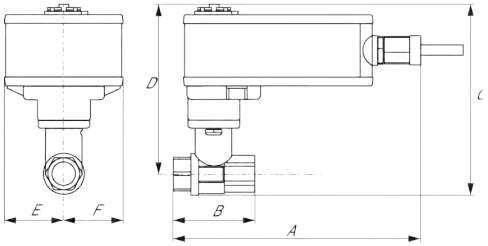
Dimensional drawings

LRB, LRX



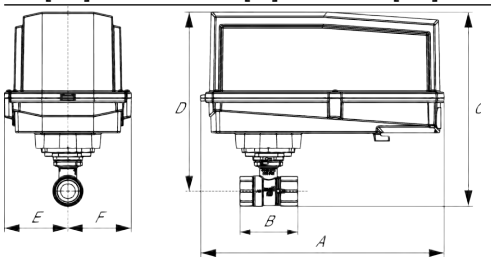
A	B	C	D	E	F	H1	H2
9.4" [239]	3.7" [95]	7.2" [184]	6.3" [161]	1.3" [33]	1.3" [33]	1.2" [30]	0.6" [15]

LF



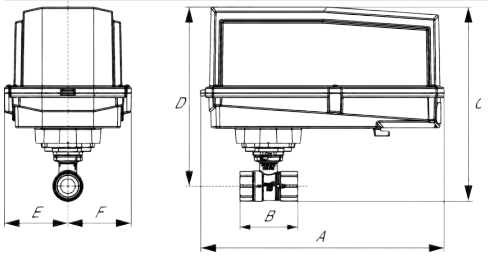
A	B	C	D	E	F
8.3" [211]	3.7" [95]	6.6" [167]	5.6" [142]	1.8" [46]	1.8" [46]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	3.7" [95]	7.8" [199]	7.1" [181]	3.1" [80]	3.1" [80]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	3.7" [95]	7.8" [199]	7.1" [181]	3.1" [80]	3.1" [80]

BELIMO

Modulating, Non-Spring Return, 24 V, Multi-Function Technology®

Technical data sheet LRX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	2.5 W
	Power consumption in rest position	1.2 W
	Transformer sizing	5 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for DC 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM and On/Off
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	default 150 s, variable 35...150 s
	Running time motor variable	35...150 s
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	1.5 lb [0.70 kg]

Safety notes

- Cable for ZIP-RS232 US and ZIP-USB-MP US to Belimo gateways.
- Classic GM to GMB(X) retrofit bracket.
- Battery Back Up System for SY(7~10)-110
- 120 to 24 VAC, 40 VA transformer.
- 12VDC 1.2 AH battery (2 required).
- 50% voltage divider kit (resistors with wires).
- PC Tool computer programming interface, serial port.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to LonWorks	UK24LON
	Gateway MP to Modbus RTU	UK24MOD

Service tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

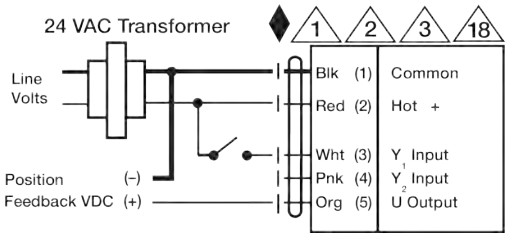
12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

18 Actuators with plenum cable do not have numbers; use color codes instead.

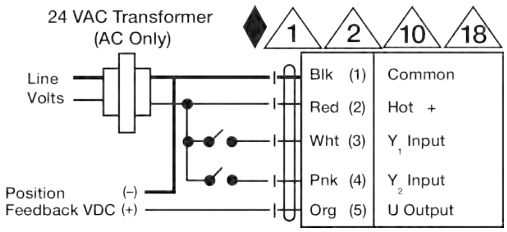
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live Electrical Components!

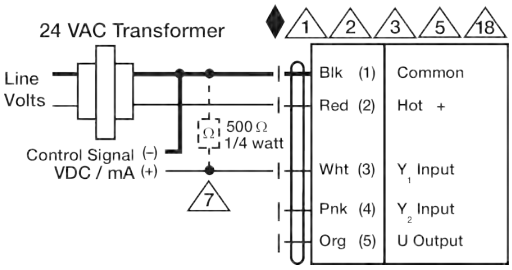
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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



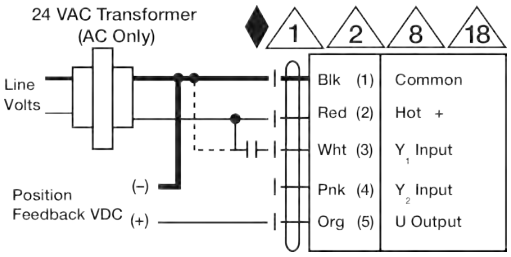
On/Off



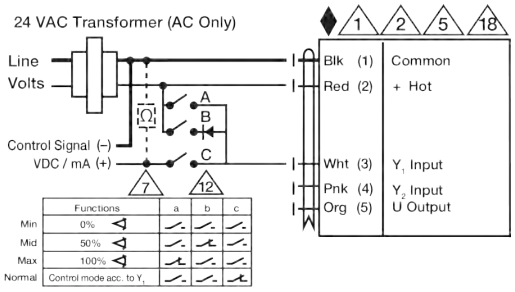
Floating Point



VDC/mA Control



PWM Control



Override Control

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B230

5-year warranty

Technical data

Functional data	Valve Size	1.25" [32]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	19
	Body pressure rating note	600 psi
	No Characterized Disc	TRUE
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	LRB(X) NR

Safety notes

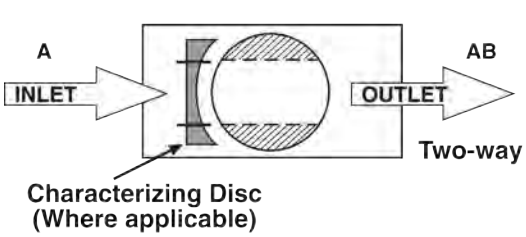
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

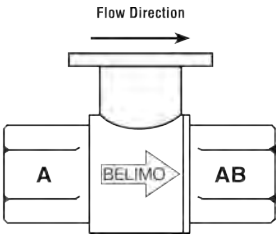
Product features

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.

Flow/Mounting details

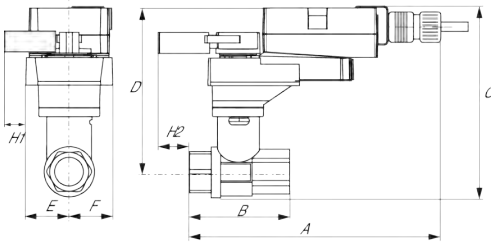




Dimensions

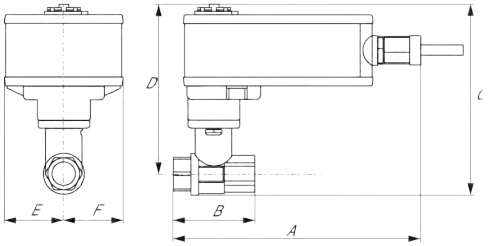
Dimensional drawings

LRB, LRX



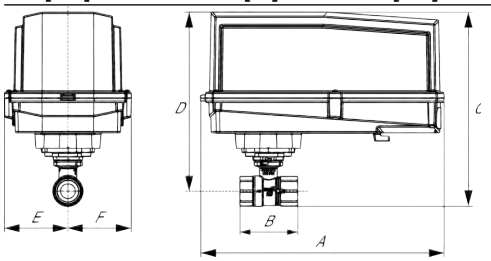
A	B	C	D	E	F	H1	H2
9.4" [239]	3.7" [95]	7.2" [184]	6.3" [161]	1.3" [33]	1.3" [33]	1.2" [30]	0.6" [15]

LF



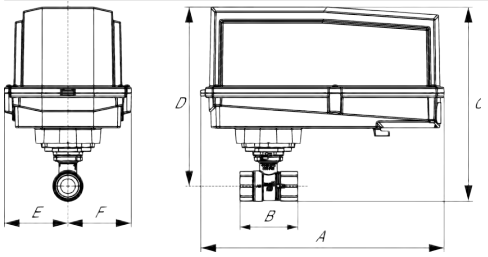
A	B	C	D	E	F
8.3" [211]	3.7" [95]	6.6" [167]	5.6" [142]	1.8" [46]	1.8" [46]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	3.7" [95]	7.8" [199]	7.1" [181]	3.1" [80]	3.1" [80]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	3.7" [95]	7.8" [199]	7.1" [181]	3.1" [80]	3.1" [80]

BELIMO

Technical data sheet LRX24-SR-T

Modulating, Non-Spring Return, 24 V, for DC 2...10 V or 4...20 mA

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	1.5 W
	Power consumption in rest position	0.2 W
	Transformer sizing	3 VA (class 2 power source)
	Electrical Connection	Screw terminal (for 26 to 14 GA wire)
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
	Position feedback U	2...10 V
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	90 s
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	1.1 lb [0.50 kg]

Safety notes

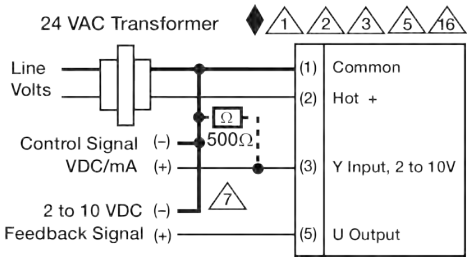
- 3/8"-16 shaft clevis for AHK/AH.
- Battery Back Up System for SY(7~10)-110
- 5/16" shaft clevis for LH.
- Cable to ZIP-RS232 US to diagnostic/programming socket.
- MFT95 resistor kit for 4 to 20 mA control applications.

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.
2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.
3 Actuators may also be powered by 24 VDC.
5 Only connect common to negative (-) leg of control circuits.
7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.
16 Actuators are provided with a numbered screw terminal strip instead of a cable.
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.



2...10 V / 4...20 mA Control

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B231

5-year warranty

Technical data

Functional data	Valve Size	1.25" [32]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	400 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	25
	Body pressure rating note	400 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	ARB(X) NRQB(X)

Safety notes

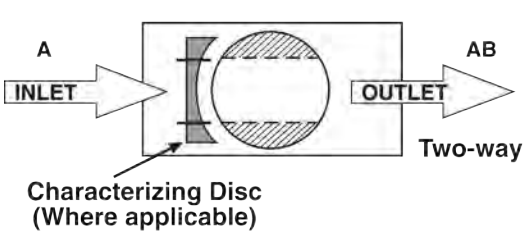
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

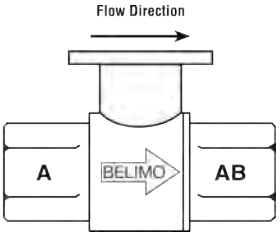
Product features

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.

Flow/Mounting details

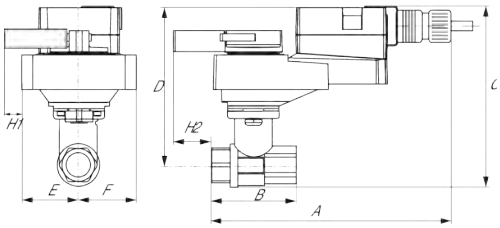




Dimensions

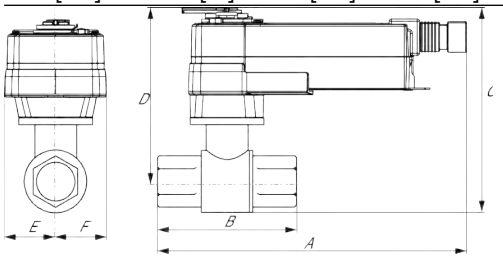
Dimensional drawings

ARB, ARX



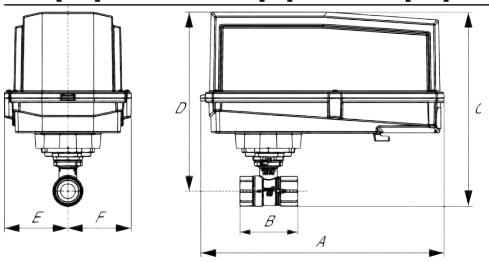
A	B	C	D	E	F	H1	H2
11.0" [280]	3.7" [95]	6.3" [159]	5.9" [150]	1.7" [44]	1.7" [44]	1.2" [30]	0.8" [20]

AFRB, AFRX



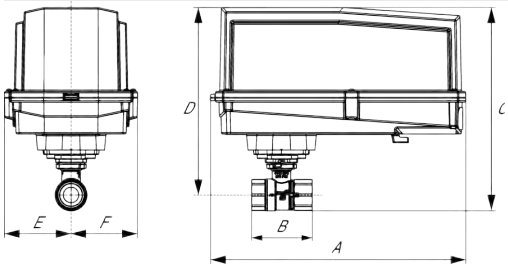
A	B	C	D	E	F
10.5" [267]	3.7" [95]	6.3" [159]	5.3" [134]	2.0" [51]	2.0" [51]

ARB N4, ARX N4, NRB N4, NRX N4



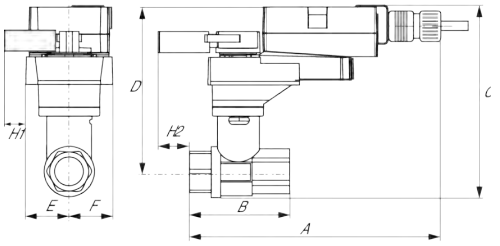
A	B	C	D	E	F
11.4" [289]	3.7" [95]	8.3" [211]	7.3" [185]	3.1" [80]	3.1" [80]

AFRB N4, AFRX N4



A	B	C	D	E	F
13.0" [330]	3.7" [95]	10.3" [262]	8.3" [212]	3.4" [86]	3.4" [86]

NRQB, NRQX



A	B	C	D	E	F
11.0" [280]	3.7" [95]	6.3" [159]	5.9" [150]	1.7" [44]	1.7" [44]

BELIMO

Modulating, Non-Spring Return, 24 V, Multi-Function Technology®

Technical data sheet ARX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	3.5 W
	Power consumption in rest position	1.3 W
	Transformer sizing	6 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM, On/Off and Floating point
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	default 150 s, variable 90...150 s
	Running time motor variable	90...150 s
	Noise level, motor	45 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	2.6 lb [1.2 kg]

Safety notes

- PVC W'Shld for GV w/UGLK (GM)
- Battery Back Up System for SY(7~10)-110
- 120 to 24 VAC, 40 VA transformer.
- Cable for ZTH US to actuators w/o diagnostics socket.
- 50% voltage divider kit (resistors with wires).
- PC Tool computer programming interface, serial port.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to LonWorks	UK24LON
	Gateway MP to Modbus RTU	UK24MOD

Service tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

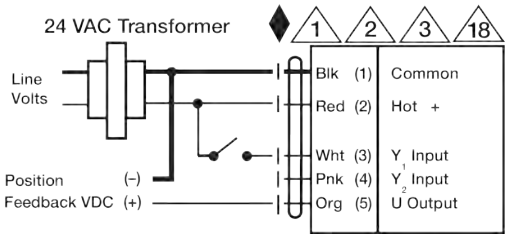
12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

18 Actuators with plenum cable do not have numbers; use color codes instead.

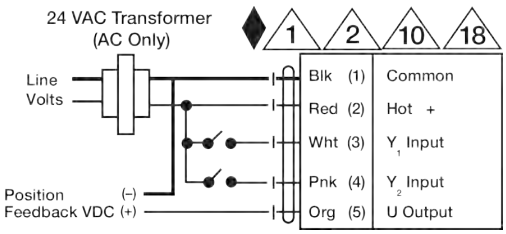
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live Electrical Components!

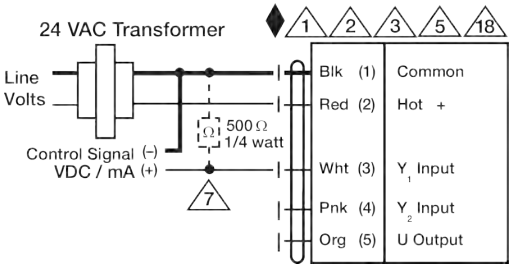
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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



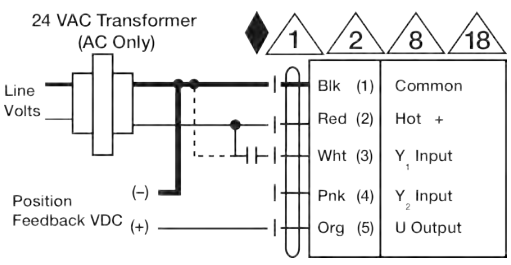
On/Off



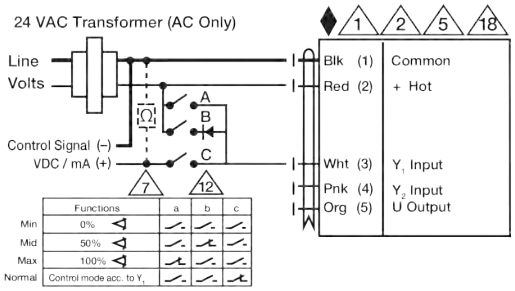
Floating Point



VDC/mA Control



PWM Control



Override Control

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B231

5-year warranty

Type overview

Type	DN
B231	32

Technical data

Functional data	Valve size	1.25" [32]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	400 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	25
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem	stainless steel
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Characterized disc	TEFZEL®
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	ARB(X) NRQB(X)
	Spring	AFRB(X)

Safety notes

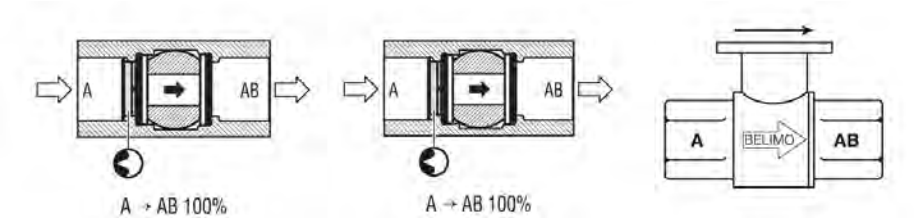
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

Product features

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.

Flow/Mounting details



Two-way valves should be installed with the disc upstream.

Product features

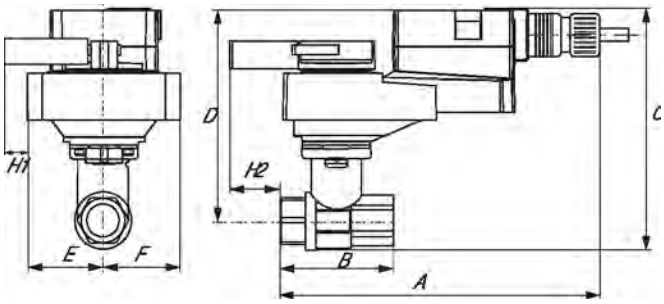
Mode of operation

Local Control SY2~12, 110vac Mod

Dimensions

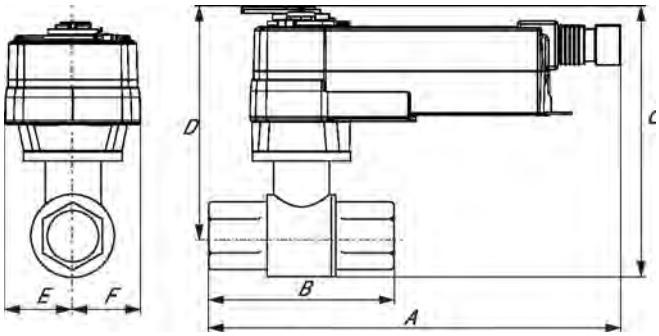
Type	DN
B231	32

ARB, ARX



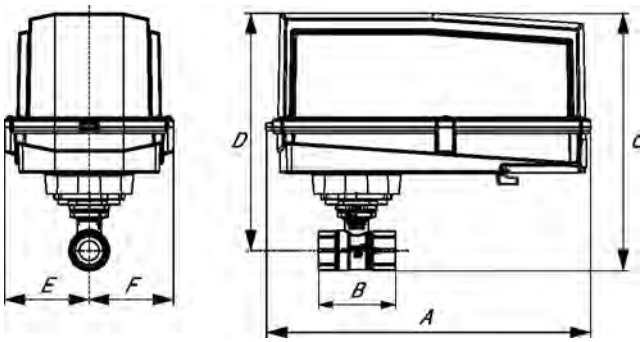
A	B	C	D	E	F	H1	H2
11.0" [280]	3.7" [95]	6.3" [159]	5.9" [150]	1.7" [44]	1.7" [44]	1.2" [30]	0.8" [20]

AFRB, AFRX



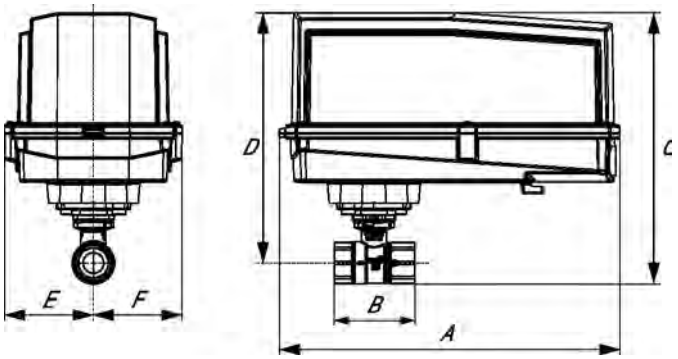
A	B	C	D	E	F
10.5" [267]	3.7" [95]	6.3" [159]	5.3" [134]	2.0" [51]	2.0" [51]

ARB N4, ARX N4, NRB N4, NRX N4



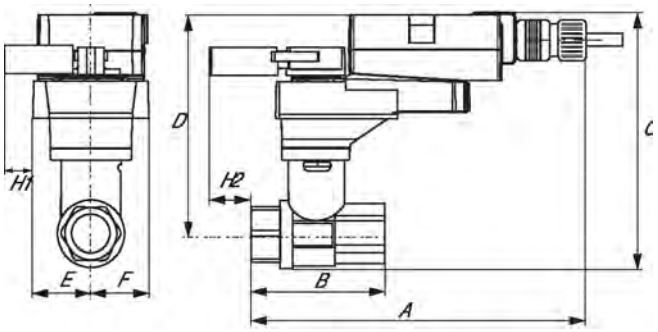
A	B	C	D	E	F
11.4" [289]	3.7" [95]	8.3" [211]	7.3" [185]	3.1" [80]	3.1" [80]

AFRB N4, AFRX N4



A	B	C	D	E	F
13.0" [330]	3.7" [95]	10.3" [262]	8.3" [212]	3.4" [86]	3.4" [86]

NRQB, NRQX



A	B	C	D	E	F
11.0" [280]	3.7" [95]	6.3" [159]	5.9" [150]	1.7" [44]	1.7" [44]

BELIMO

NEMA 4, Modulating Control, Non-Spring Return, Direct Coupled, 24 V, Multi-Function Technology®

Technical data sheet ARX24-MFT-T N4

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	3.5 W
	Power consumption in rest position	1.3 W
	Transformer sizing	6 VA (class 2 power source)
	Electrical Connection	Terminal blocks
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM, On/Off and Floating point
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	under cover
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	150 s / 90°
	Running time motor variable	90...150 s
	Noise level, motor	45 dB(A)
	Position indication	pointer
Safety data	Degree of protection IEC/EN	IP66/67
	Degree of protection NEMA/UL	NEMA 4X
	Enclosure	UL Enclosure Type 4X
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Ambient temperature note	-40...50°C for actuator with integrated heating
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	Max. 100% RH
	Servicing	maintenance-free
Materials	Housing material	Die cast aluminium and plastic casing

Footnotes †Rated Impulse Voltage 800V, Type of action 1, Control Pollution Degree 4.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to Modbus RTU	UK24MOD
	Gateway MP to LonWorks	UK24LON

Electrical accessories	Description	Type
	Battery backup system, for non-spring return models	NSV24 US
	Battery, 12 V, 1.2 Ah (two required)	NSV-BAT
	Service Tool, with ZIP-USB function, for programmable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Service tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for programmable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by DC 24 V.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

16 Actuators are provided with a numbered screw terminal strip instead of a cable.

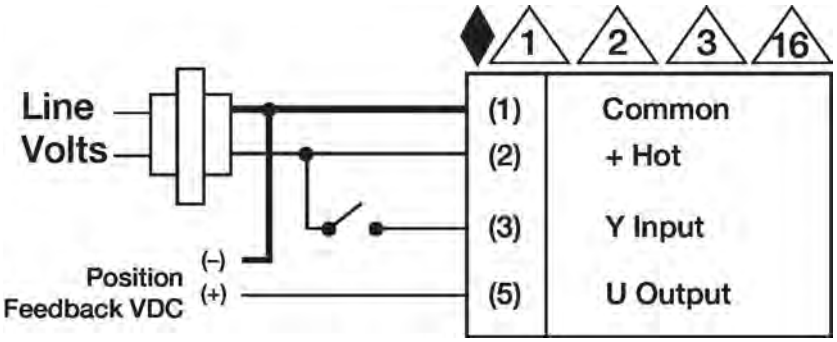
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live electrical components!

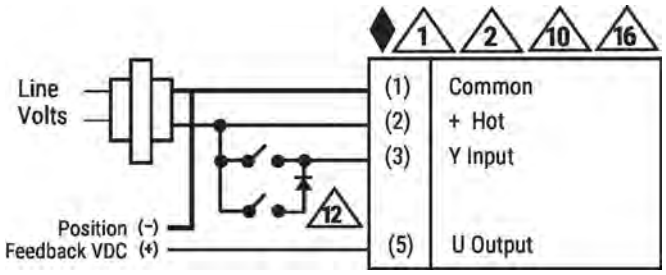
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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

Wiring diagrams

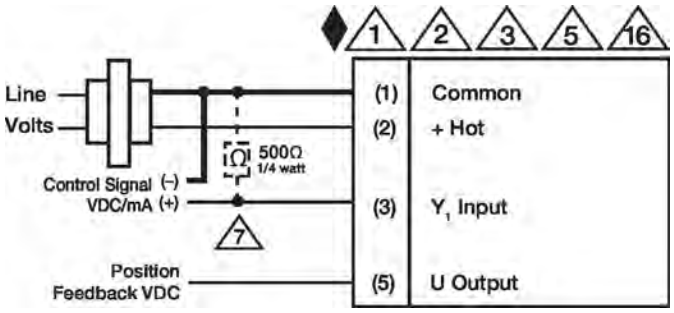
On/Off AC 24 V Transformer



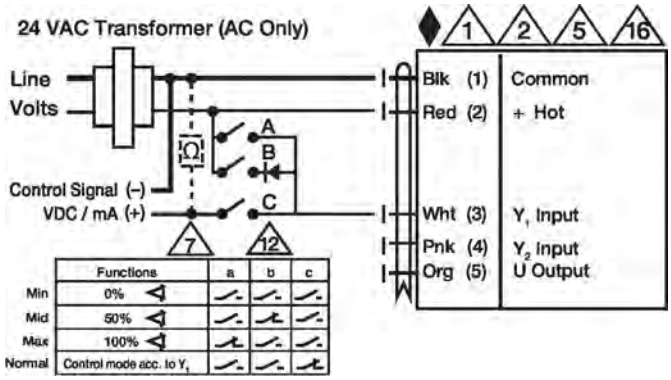
Floating Point AC 24 V Transformer (AC Only)



V/mA Control AC 24 V Transformer



Override Control



Dimensions

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B239

5-year warranty

Technical data

Functional data	Valve Size	1.5" [40]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	400 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	29
	Body pressure rating note	400 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	ARB(X) NRQB(X)

Safety notes

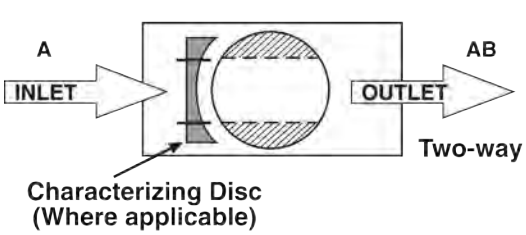
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

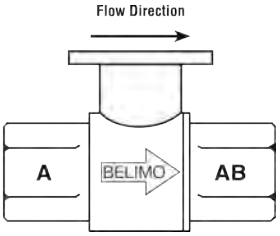
Product features

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.

Flow/Mounting details



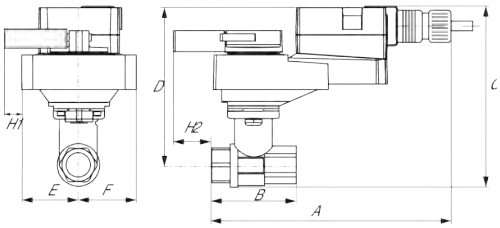


183

Dimensions

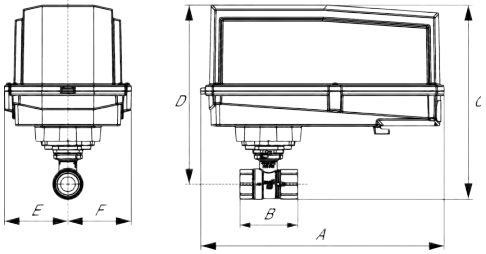
Dimensional drawings

ARB, ARX



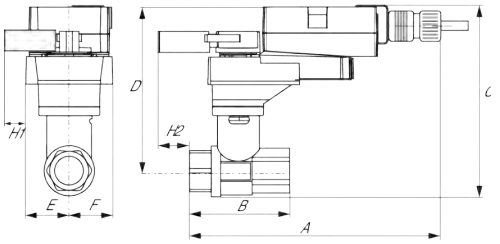
A	B	C	D	E	F	H1	H2
11.0" [280]	3.9" [100]	6.4" [163]	5.3" [134]	1.7" [44]	1.7" [44]	1.2" [30]	0.6" [15]

ARB N4, ARX N4, NRB N4, NRX N4



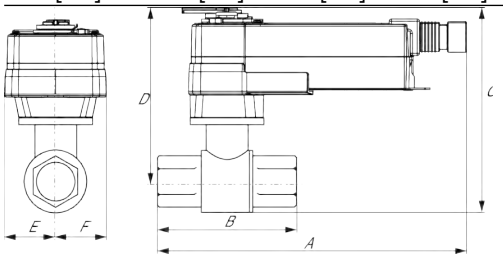
A	B	C	D	E	F
11.4" [289]	3.9" [100]	8.5" [217]	7.3" [185]	3.1" [80]	3.1" [80]

NRQB, NRQX



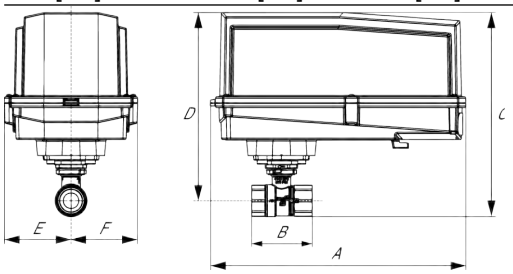
A	B	C	D	E	F	H1	H2
11.0" [280]	3.9" [100]	7.1" [181]	6.0" [152]	1.7" [44]	1.7" [44]	1.4" [34]	0.6" [15]

AFRB, AFRX



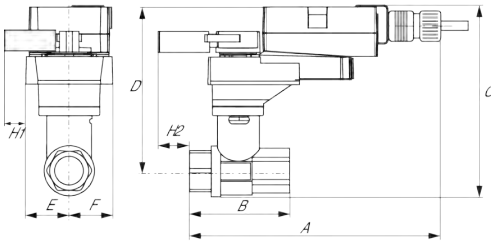
A	B	C	D	E	F
10.8" [275]	3.9" [100]	9.0" [229]	7.8" [198]	2.0" [51]	2.0" [51]

AFRB N4, AFRX N4



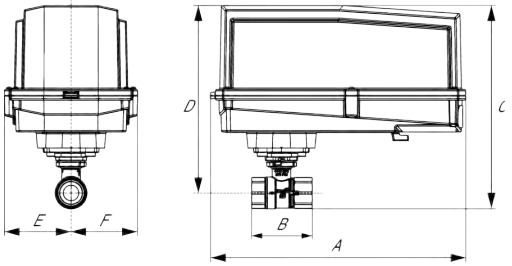
A	B	C	D	E	F
13.0" [330]	3.9" [100]	10.3" [262]	8.5" [216]	3.4" [86]	3.4" [86]

NRQB, NRQX



A	B	C	D	E	F	H1	H2
11.0" [280]	3.9" [100]	7.1" [181]	6.0" [152]	1.7" [44]	1.7" [44]	1.4" [34]	0.6" [15]

AFRB N4, AFRX N4



A	B	C	D	E	F
13.0" [330]	3.9" [100]	10.3" [262]	8.5" [216]	3.4" [86]	3.4" [86]

BELIMO

Modulating, Non-Spring Return, 24 V, Multi-Function Technology®

Technical data sheet ARX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	3.5 W
	Power consumption in rest position	1.3 W
	Transformer sizing	6 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM, On/Off and Floating point
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	default 150 s, variable 90...150 s
	Running time motor variable	90...150 s
	Noise level, motor	45 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	2.6 lb [1.2 kg]

Safety notes

- PVC W'Shld for GV w/UGLK (GM)
- Battery Back Up System for SY(7~10)-110
- 120 to 24 VAC, 40 VA transformer.
- Cable for ZTH US to actuators w/o diagnostics socket.
- 50% voltage divider kit (resistors with wires).
- PC Tool computer programming interface, serial port.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to LonWorks	UK24LON
	Gateway MP to Modbus RTU	UK24MOD
Service tools	**Description**	**Type**
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

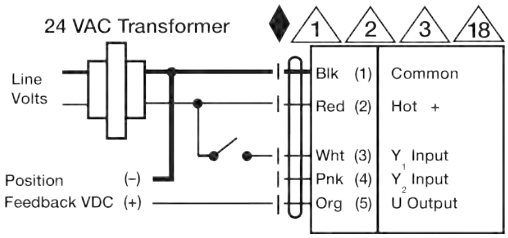
12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

18 Actuators with plenum cable do not have numbers; use color codes instead.

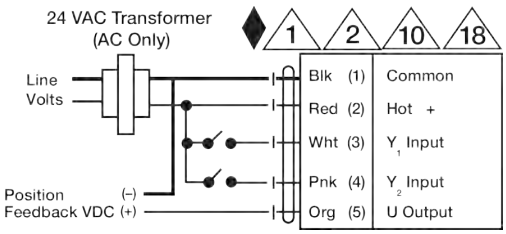
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live Electrical Components!

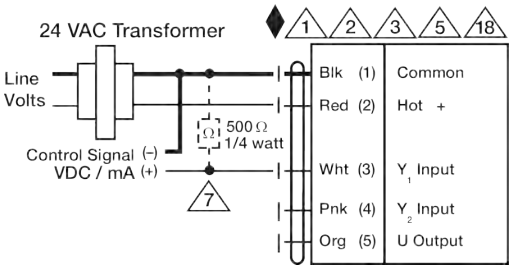
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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



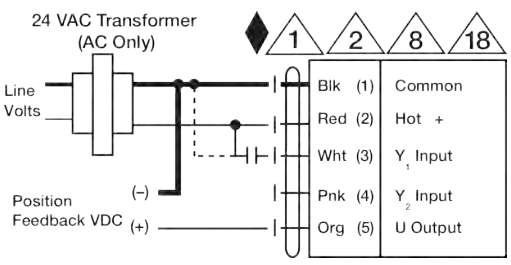
On/Off



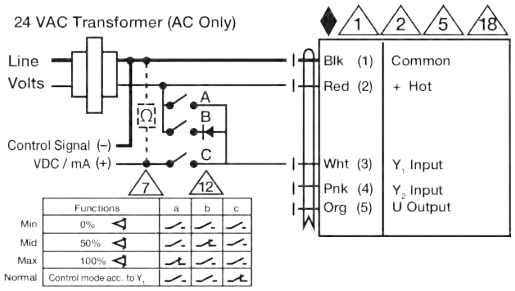
Floating Point



VDC/mA Control



PWM Control



Override Control

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B240

5-year warranty

Technical data

Functional data	Valve Size	1.5" [40]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	400 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	37
	Body pressure rating note	400 psi
	No Characterized Disc	TRUE
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	ARB(X) NRQB(X)

Safety notes

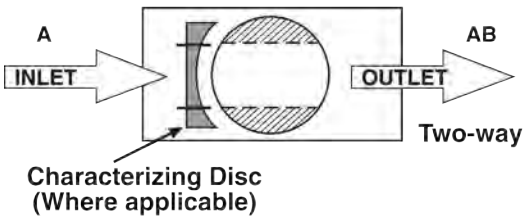
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

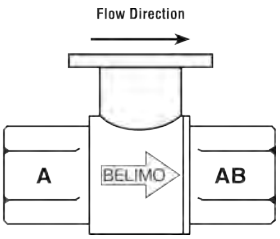
Product features

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.

Flow/Mounting details

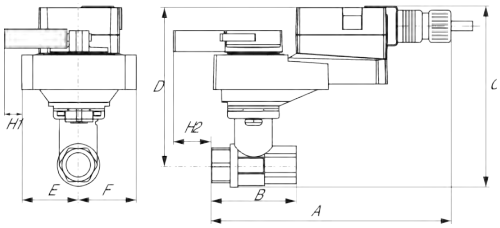




Dimensions

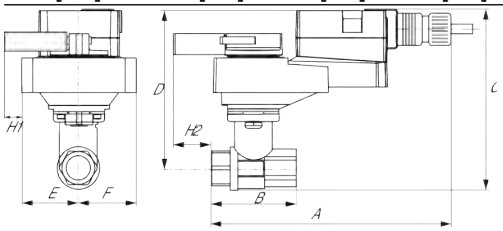
Dimensional drawings

ARB, ARX



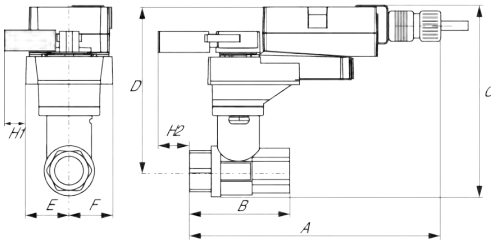
A	B	C	D	E	F	H1	H2
11.0" [280]	3.9" [100]	6.4" [163]	5.3" [134]	1.7" [44]	1.7" [44]	1.2" [30]	0.6" [15]

ARB, ARX 120-3, 120-SR, MFT



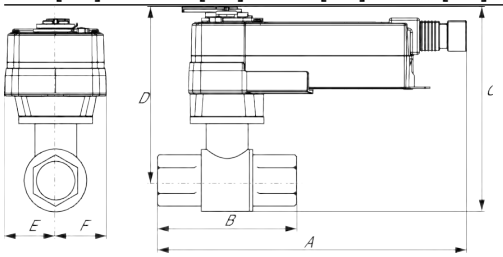
A	B	C	D	E	F	H1	H2
11.0" [280]	3.9" [100]	6.4" [163]	5.3" [134]	1.7" [44]	1.7" [44]	1.2" [30]	0.6" [15]

NRQB, NRQX



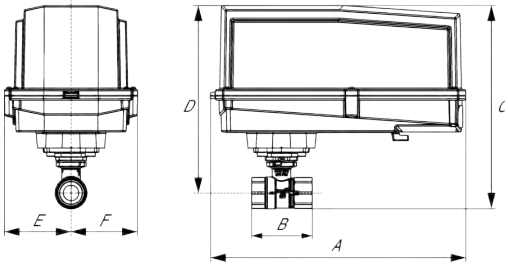
A	B	C	D	E	F	H1	H2
11.0" [280]	3.9" [100]	7.1" [181]	6.0" [152]	1.7" [44]	1.7" [44]	1.4" [34]	0.6" [15]

AFRB, AFRX



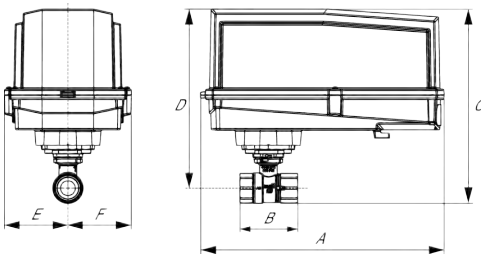
A	B	C	D	E	F
10.8" [275]	3.9" [100]	9.0" [229]	7.8" [198]	2.0" [51]	2.0" [51]

AFRB N4, AFRX N4



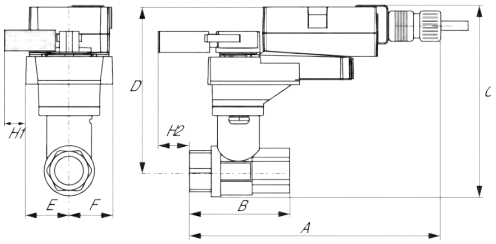
A	B	C	D	E	F
13.0" [330]	3.9" [100]	10.3" [262]	8.5" [216]	3.4" [86]	3.4" [86]

ARB N4, ARX N4, NRB N4, NRX N4



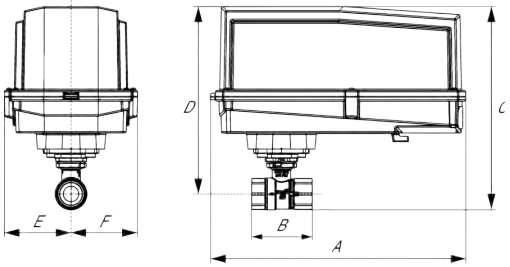
A	B	C	D	E	F
11.4" [289]	3.9" [100]	8.5" [217]	7.3" [185]	3.1" [80]	3.1" [80]

NRQB, NRQX



A	B	C	D	E	F	H1	H2
11.0" [280]	3.9" [100]	7.1" [181]	6.0" [152]	1.7" [44]	1.7" [44]	1.4" [34]	0.6" [15]

AFRB N4, AFRX N4



A	B	C	D	E	F
13.0" [330]	3.9" [100]	10.3" [262]	8.5" [216]	3.4" [86]	3.4" [86]

BELIMO

Modulating, Non-Spring Return, 24 V, Multi-Function Technology®

Technical data sheet ARX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	3.5 W
	Power consumption in rest position	1.3 W
	Transformer sizing	6 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM, On/Off and Floating point
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	default 150 s, variable 90...150 s
	Running time motor variable	90...150 s
	Noise level, motor	45 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	2.6 lb [1.2 kg]

Safety notes

- PVC W'Shld for GV w/UGLK (GM)
- Battery Back Up System for SY(7~10)-110
- 120 to 24 VAC, 40 VA transformer.
- Cable for ZTH US to actuators w/o diagnostics socket.
- 50% voltage divider kit (resistors with wires).
- PC Tool computer programming interface, serial port.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to LonWorks	UK24LON
	Gateway MP to Modbus RTU	UK24MOD

Service tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

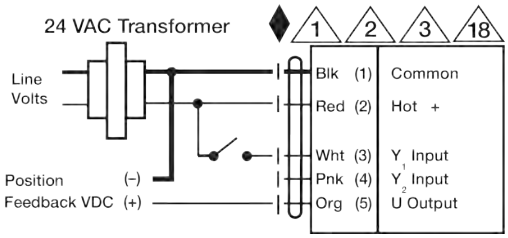
12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

18 Actuators with plenum cable do not have numbers; use color codes instead.

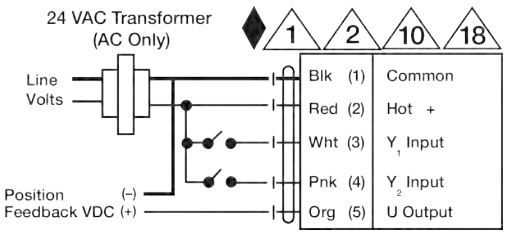
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live Electrical Components!

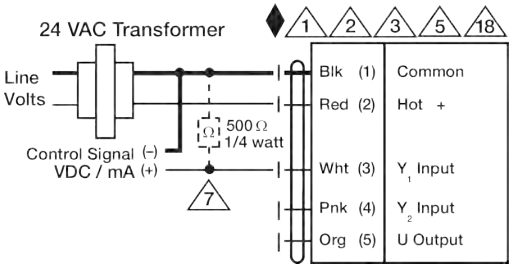
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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



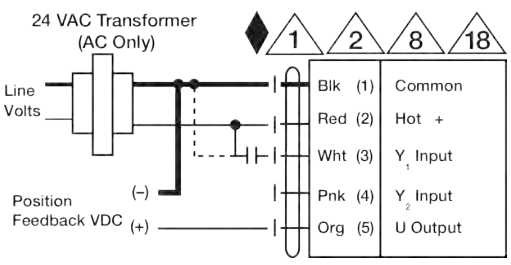
On/Off



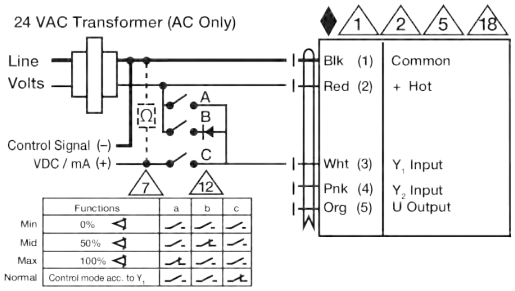
Floating Point



VDC/mA Control



PWM Control



Override Control

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B248

5-year warranty

Technical data

Functional data	Valve Size	2" [50]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	400 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	29
	Body pressure rating note	400 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	ARB(X)

Safety notes

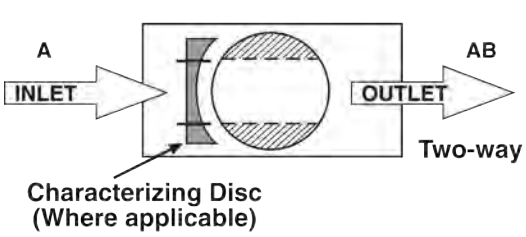
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

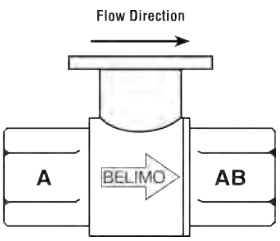
Product features

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.

Flow/Mounting details

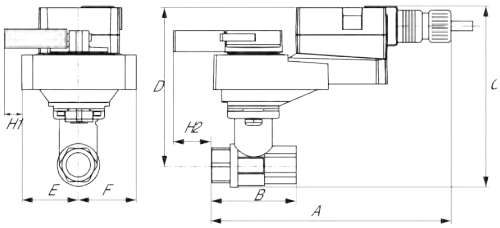




Dimensions

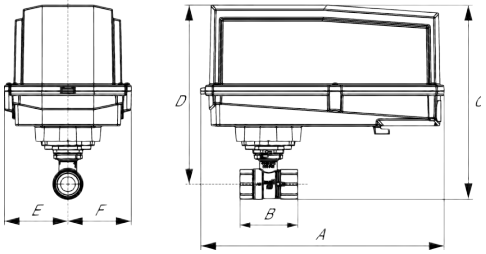
Dimensional drawings

ARB, ARX



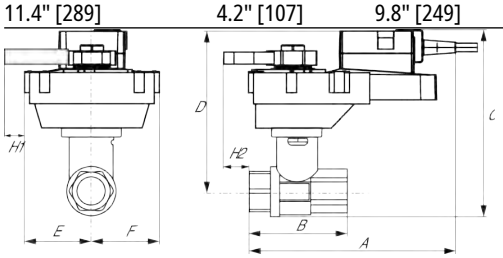
A	B	C	D	E	F	H1	H2
11.0" [280]	4.2" [107]	6.9" [175]	5.5" [140]	1.7" [44]	1.7" [44]	1.2" [30]	0.6" [15]

ARB N4, ARX N4, NRB N4, NRX N4



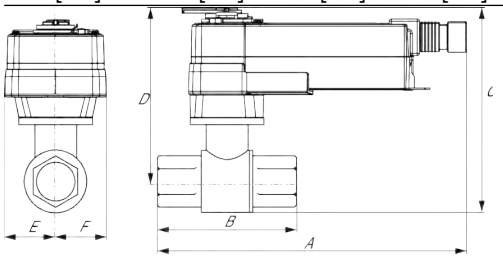
A	B	C	D	E	F
11.4" [289]	4.2" [107]	9.8" [249]	7.6" [194]	3.1" [80]	3.1" [80]

ARQB, ARQX



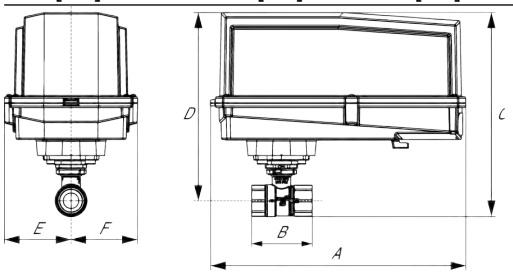
A	B	C	D	E	F	H1	H2
11.0" [280]	4.2" [107]	7.5" [191]	6.1" [155]	2.3" [58]	2.3" [58]	0.8" [20]	0.6" [15]

AFRB, AFRX



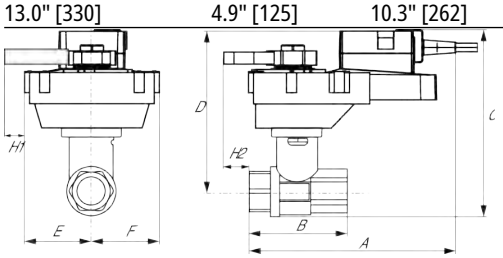
A	B	C	D	E	F
10.8" [275]	4.2" [107]	9.5" [241]	8.1" [206]	2.0" [51]	2.0" [51]

AFRB N4, AFRX N4



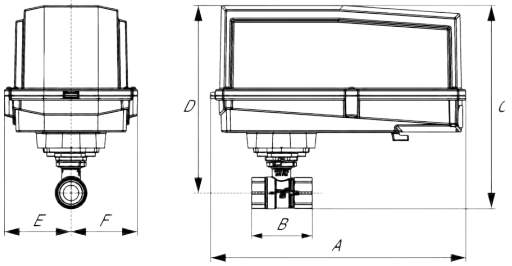
A	B	C	D	E	F
13.0" [330]	4.9" [125]	10.3" [262]	9.3" [235]	3.4" [86]	3.4" [86]

ARQB, ARQX



A	B	C	D	E	F	H1	H2
11.0" [280]	4.2" [107]	7.5" [191]	6.1" [155]	2.3" [58]	2.3" [58]	0.8" [20]	0.6" [15]

AFRB N4, AFRX N4



A	B	C	D	E	F
13.0" [330]	4.9" [125]	10.3" [262]	9.3" [235]	3.4" [86]	3.4" [86]

BELIMO

Modulating, Non-Spring Return, 24 V, Multi-Function Technology®

Technical data sheet ARX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	3.5 W
	Power consumption in rest position	1.3 W
	Transformer sizing	6 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM, On/Off and Floating point
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	default 150 s, variable 90...150 s
	Running time motor variable	90...150 s
	Noise level, motor	45 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	2.6 lb [1.2 kg]

Safety notes

- PVC W'Shld for GV w/UGLK (GM)
- Battery Back Up System for SY(7~10)-110
- 120 to 24 VAC, 40 VA transformer.
- Cable for ZTH US to actuators w/o diagnostics socket.
- 50% voltage divider kit (resistors with wires).
- PC Tool computer programming interface, serial port.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to LonWorks	UK24LON
	Gateway MP to Modbus RTU	UK24MOD
Service tools	**Description**	**Type**
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

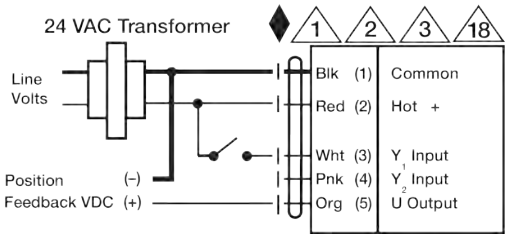
12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

18 Actuators with plenum cable do not have numbers; use color codes instead.

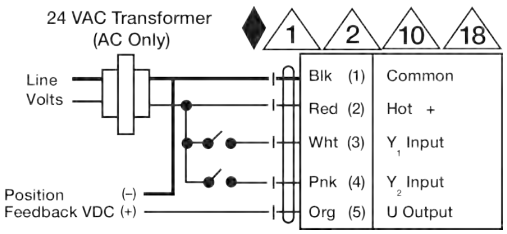
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live Electrical Components!

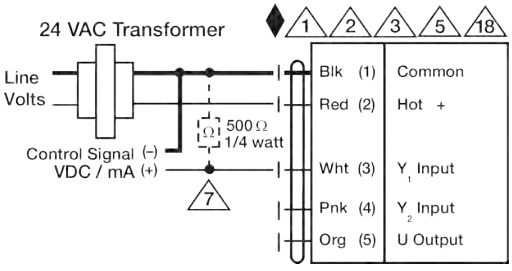
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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



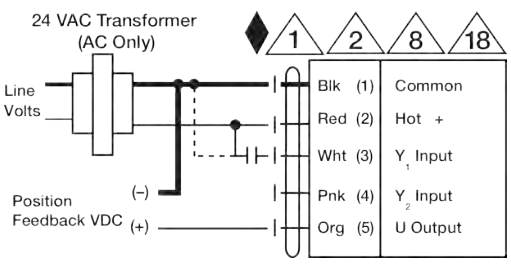
On/Off



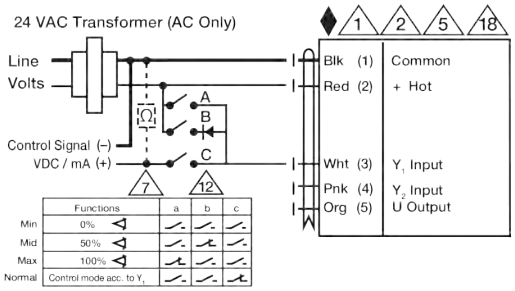
Floating Point



VDC/mA Control



PWM Control



Override Control

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B249

5-year warranty

Technical data

Functional data	Valve Size	2" [50]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	400 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	46
	Body pressure rating note	400 psi
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	ARB(X)

Safety notes

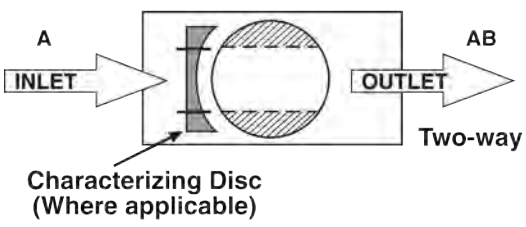
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

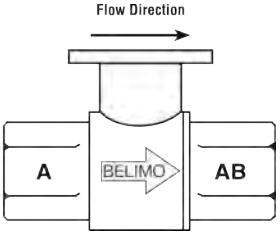
Product features

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.

Flow/Mounting details

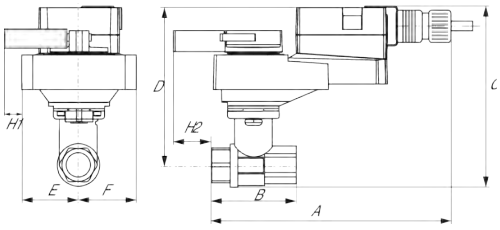




Dimensions

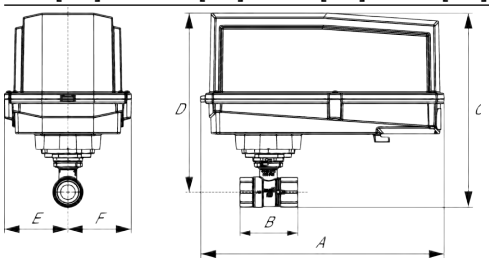
Dimensional drawings

ARB, ARX



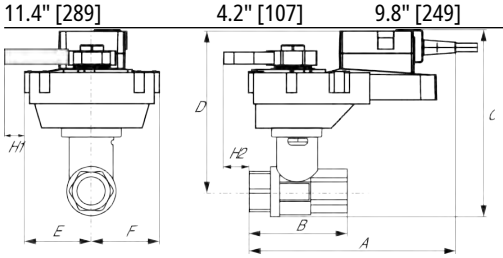
A	B	C	D	E	F	H1	H2
11.0" [280]	4.2" [107]	6.9" [175]	5.5" [140]	1.7" [44]	1.7" [44]	1.2" [30]	0.6" [15]

ARB N4, ARX N4, NRB N4, NRX N4



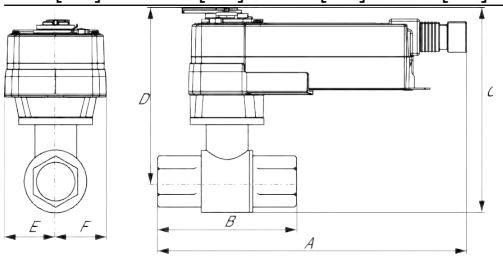
A	B	C	D	E	F
11.4" [289]	4.2" [107]	9.8" [249]	7.6" [194]	3.1" [80]	3.1" [80]

ARQB, ARQX



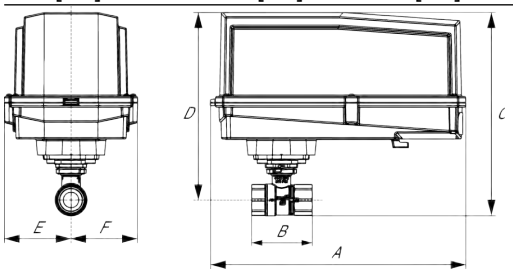
A	B	C	D	E	F	H1	H2
11.0" [280]	4.2" [107]	7.5" [191]	6.1" [155]	2.3" [58]	2.3" [58]	0.8" [20]	0.6" [15]

AFRB, AFRX



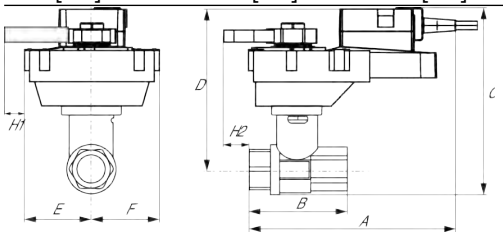
A	B	C	D	E	F
10.8" [275]	4.2" [107]	9.5" [241]	8.1" [206]	2.0" [51]	2.0" [51]

AFRB N4, AFRX N4



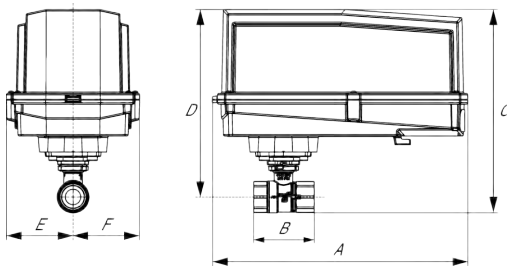
A	B	C	D	E	F
13.0" [330]	4.9" [125]	10.3" [262]	9.3" [235]	3.4" [86]	3.4" [86]

ARQB, ARQX



A	B	C	D	E	F	H1	H2
11.0" [280]	4.2" [107]	7.5" [191]	6.1" [155]	2.3" [58]	2.3" [58]	0.8" [20]	0.6" [15]

AFRB N4, AFRX N4



A	B	C	D	E	F
13.0" [330]	4.9" [125]	10.3" [262]	9.3" [235]	3.4" [86]	3.4" [86]

BELIMO

Modulating, Non-Spring Return, 24 V, Multi-Function Technology®

Technical data sheet ARX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	3.5 W
	Power consumption in rest position	1.3 W
	Transformer sizing	6 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM, On/Off and Floating point
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	default 150 s, variable 90...150 s
	Running time motor variable	90...150 s
	Noise level, motor	45 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	2.6 lb [1.2 kg]

Safety notes

- PVC W'Shld for GV w/UGLK (GM)
- Battery Back Up System for SY(7~10)-110
- 120 to 24 VAC, 40 VA transformer.
- Cable for ZTH US to actuators w/o diagnostics socket.
- 50% voltage divider kit (resistors with wires).
- PC Tool computer programming interface, serial port.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to LonWorks	UK24LON
	Gateway MP to Modbus RTU	UK24MOD

Service tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

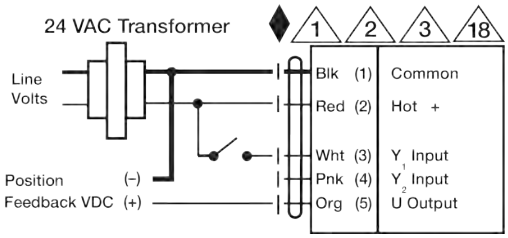
12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

18 Actuators with plenum cable do not have numbers; use color codes instead.

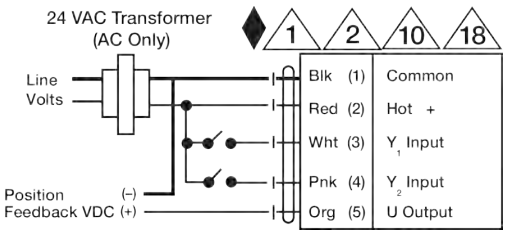
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live Electrical Components!

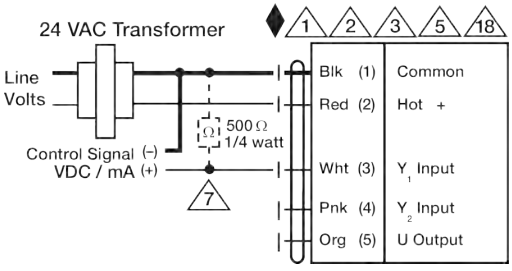
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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



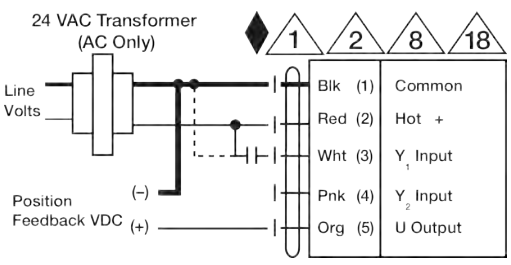
On/Off



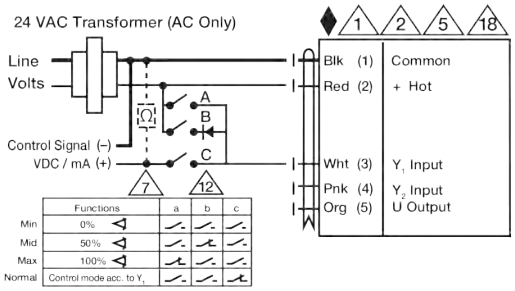
Floating Point



VDC/mA Control



PWM Control



Override Control

BELIMO

Stainless Steel Ball and Stem

Technical data sheet B261

5-year warranty

Technical data

Functional data	Valve Size	2.5" [65]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...212°F [-18...100°C]
	Body Pressure Rating	400 psi
	Close-off pressure Δps	100 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	60
	Body pressure rating note	400 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	ARB(X)

Safety notes

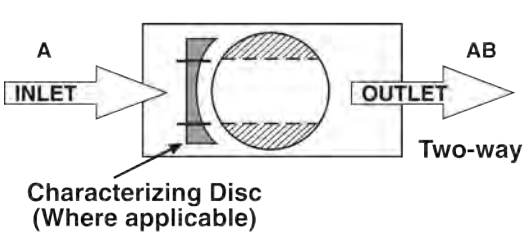
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

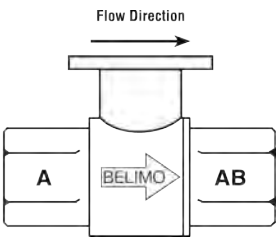
Product features

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.

Flow/Mounting details

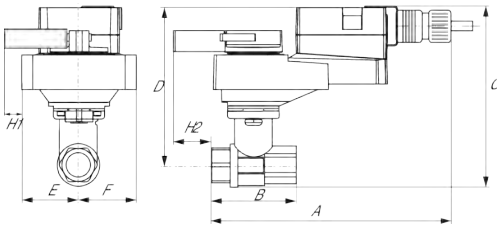




Dimensions

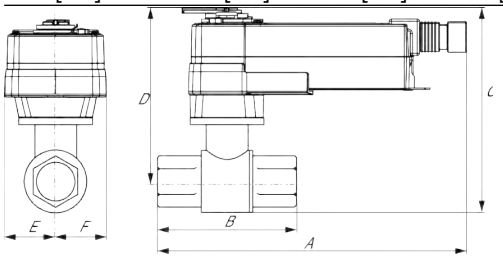
Dimensional drawings

ARB, ARX



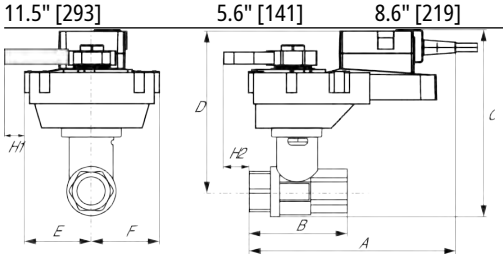
A	B	C	D	E	F	H1
10.1" [257]	5.6" [141]	8.0" [203]	6.0" [152]	2.8" [71]	2.8" [71]	1.9" [48]

AFRB, AFRX



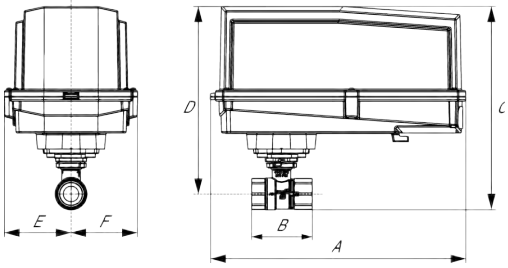
A	B	C	D	E	F
11.5" [293]	5.6" [141]	8.6" [219]	6.6" [168]	2.0" [51]	2.0" [51]

ARQB, ARQX



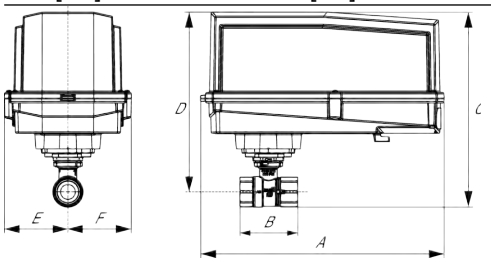
A	B	C	D	E	F	H1	H2
9.9" [251]	4.2" [107]	8.1" [206]	6.1" [155]	2.3" [58]	2.3" [58]	0.8" [20]	0.6" [15]

AFRB N4, AFRX N4



A	B	D	E	F
11.4" [289]	5.6" [141]	8.0" [203]	2.4" [62]	2.4" [62]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	D	E	F
11.4" [289]	5.6" [141]	8.0" [203]	3.1" [80]	3.1" [80]

A	B	C	D	E	F	H1	H2
9.9" [251]	4.2" [107]	8.1" [206]	6.1" [155]	2.3" [58]	2.3" [58]	0.8" [20]	0.6" [15]

A	B	D	E	F
11.4" [289]	5.6" [141]	8.0" [203]	3.1" [80]	3.1" [80]

BELIMO

Modulating, Non-Spring Return, 24 V, Multi-Function Technology®

Technical data sheet ARX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	3.5 W
	Power consumption in rest position	1.3 W
	Transformer sizing	6 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable with 1/2" conduit connector, degree of protection NEMA 2 / IP54, 3 ft [1 m] 10 ft [3 m] and 16ft [5 m]
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM, On/Off and Floating point
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	default 150 s, variable 90...150 s
	Running time motor variable	90...150 s
	Noise level, motor	45 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	2.6 lb [1.2 kg]

Safety notes

- PVC W'Shld for GV w/UGLK (GM)
- Battery Back Up System for SY(7~10)-110
- 120 to 24 VAC, 40 VA transformer.
- Cable for ZTH US to actuators w/o diagnostics socket.
- 50% voltage divider kit (resistors with wires).
- PC Tool computer programming interface, serial port.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to LonWorks	UK24LON
	Gateway MP to Modbus RTU	UK24MOD

Service tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

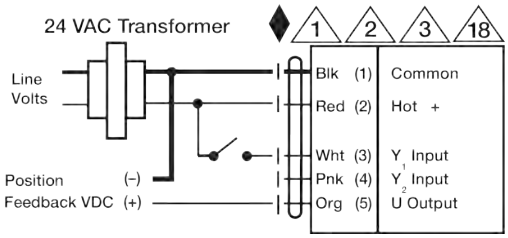
12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

18 Actuators with plenum cable do not have numbers; use color codes instead.

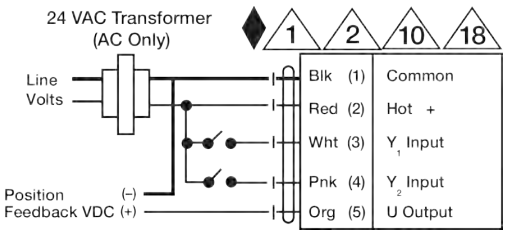
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live Electrical Components!

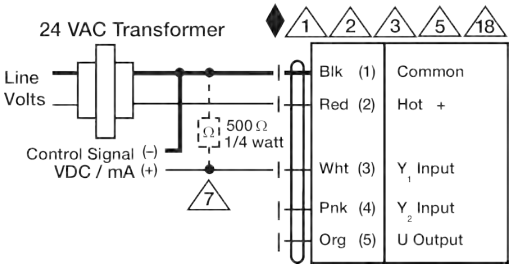
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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



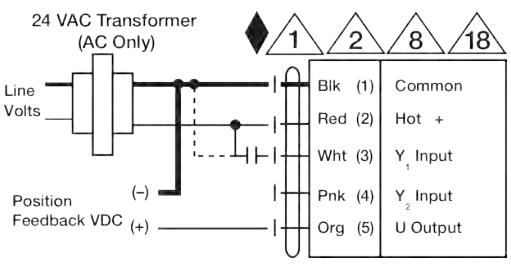
On/Off



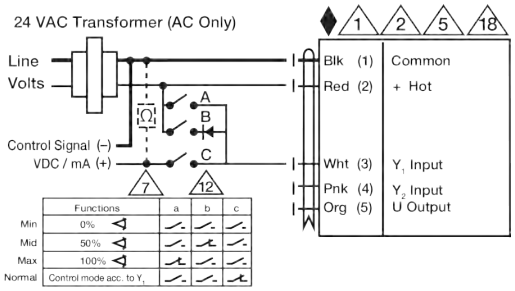
Floating Point



VDC/mA Control



PWM Control



Override Control

BELIMO

Technical data sheet F6150HD

Butterfly Valve with Lug types

- Disc 304 stainless steel
- Bubble tight shut-off
- Resilient seat
- Valve face-to-face dimensions comply with API 609 & MSS-SP-67
- Completely assembled and tested, ready for installation

5-year warranty

Type overview

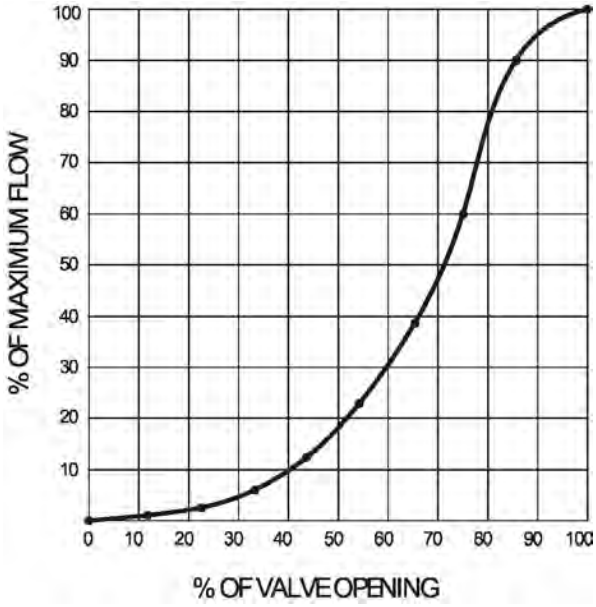
Type	DN
F6150HD	150

Technical data

Functional data	Valve size [mm]	6" [150]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	-22...250°F [-30...120°C]
	Body Pressure Rating	ANSI Class Consistent with 125, 232 psi CWP
	Close-off pressure Δps	200 psi
	Flow characteristic	modified equal percentage
	Leakage rate	0% leakage, leakage rate A
	Servicing	maintenance-free
	Flow Pattern	2-way
	Controllable flow range	90° rotation
	Cv	1579
	Maximum Velocity	12 FPS
	Lug threads	3/4-10 UNC
Materials	Valve body	Ductile cast iron ASTM A536
	Body finish	epoxy powder coating (blue RAL 5002)
	Stem	416 stainless steel
	Stem seal	EPDM (lubricated)
	Seat	EPDM
	Pipe connection	for use with ANSI class 125/150 flanges
	Bearing	RPTFE
	Disc	304 stainless steel
	Gear operator materials	Gears - hardened steel
Suitable actuators	Non-Spring	PRB(X)
	Electrical fail-safe	PKRB(X)

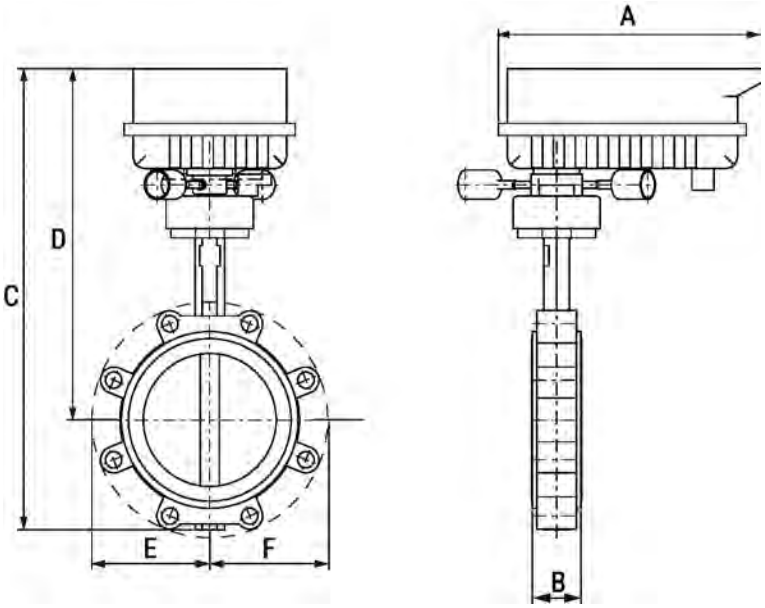
Product features

Flow/Mounting details



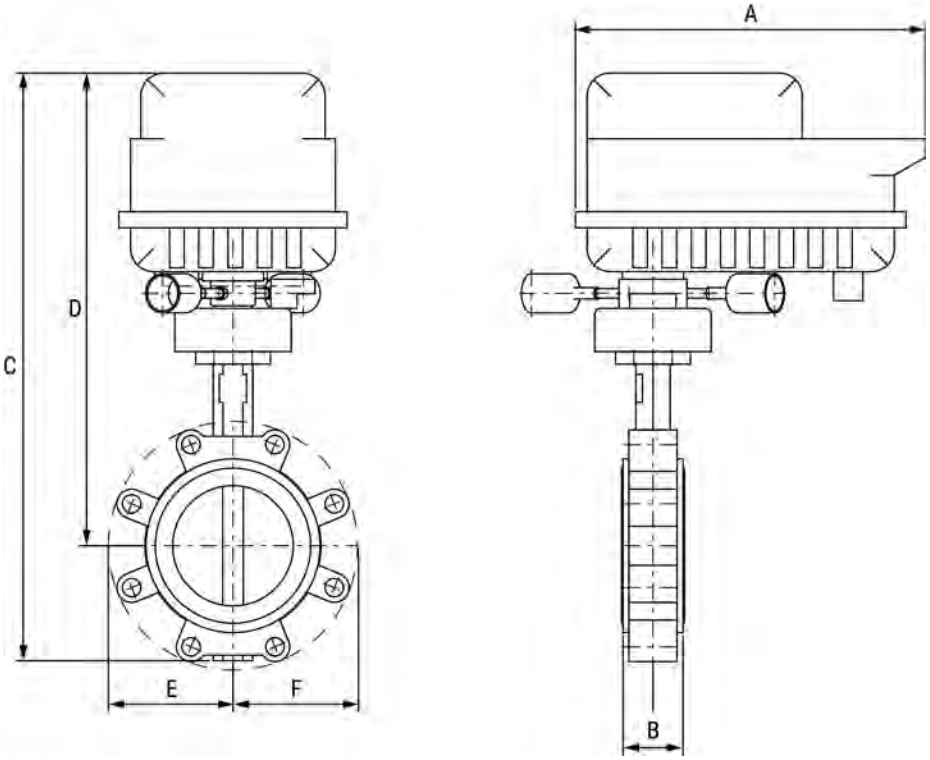
Dimensions

Type	DN	Weight
F6150HD	150	19 lb [8.6 kg]



Valve with PRB(X) Actuator

A	B	C	D	E	F	Number of Bolt Holes
12.0" [304]	2.3" [58]	21.0" [533]	16.0" [406]	5.4" [137]	5.4" [137]	8



Valve with PKR Actuator

A	B	C	D	E	F	Number of Bolt Holes
12.0" [304]	2.2" [56]	23.3" [591]	18.3" [464]	5.4" [137]	5.4" [137]	8

BELIMO

On/Off, Floating Point, Non Fail-Safe, 24...240 V, NEMA 4X

Technical data sheet PRXUP-3-T

5-year warranty

Technical data

Electrical data	Nominal voltage	AC 24...240 V / DC 24...125 V
	Nominal voltage frequency	50/60 Hz
	Nominal voltage range	AC 19.2...264 V / DC 19.2...137.5 V
	Power consumption in operation	20 W
	Power consumption in rest position	6 W
	Transformer sizing	with 24 V 20 VA / with 240 V 52 VA
	Auxiliary switch	2 x SPDT, 1 mA...3 A (0.5 A inductive), DC 5 V...AC 250 V (II, reinforced insulation), 1 x 10° / 1 x 0...90° (default setting 85°)
	Switching capacity auxiliary switch	1 mA...3 A (0.5 A inductive), DC 5 V...AC 250 V (II, reinforced insulation)
	Electrical Connection	Terminal blocks, (PE) Ground-Screw
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Direction of motion motor	reversible with app
	Manual override	7 mm hex crank, supplied
	Angle of rotation	90°
	Running Time (Motor)	35 s / 90°
	Running time motor variable	30...120 s
	Noise level, motor	68 dB(A)
	Position indication	integral pointer
Safety data	Power source UL	Class 2 Supply
	Degree of protection IEC/EN	IP66/67
	Degree of protection NEMA/UL	NEMA 4X
	Enclosure	UL Enclosure Type 4X
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU
	Quality Standard	ISO 9001
	Ambient humidity	Max. 100% RH
	Ambient temperature	-22...122°F [-30...50°C]
	Servicing	maintenance-free
Weight	Weight	13 lb [5.9 kg]
Materials	Housing material	Die cast aluminium and plastic casing

Product features

Application

PR Series valve actuators are designed with an integrated linkage and visual position indicators. For outdoor applications, the installed valve must be mounted with the actuator at or above horizontal. For indoor applications the actuator can be in any location including directly under the valve.

Operation

The PR series actuator provides 90° of rotation and a visual indicator shows the position of the valve. The PR Series actuator uses a low power consumption brushless DC motor and is electronically protected against overload. A universal power supply is furnished to connect supply voltage in the range of AC 24...240 V and DC 24...125 V. Included is a smart heater with thermostat to eliminate condensation. Two auxiliary switches are provided; one set at 10° open and the other is field adjustable. Running time is field adjustable from 30...120 seconds by using the Near Field Communication (NFC) app and a smart phone.

†Use 60°C/75°C copper wire size range 12...28 AWG, stranded or solid. Use flexible metal conduit. Push the listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuators input wiring with listed flexible conduit. Properly terminate the conduit in a suitable junction box. Rated impulse Voltage 4000 V. Type of action 1. Control pollution degree 3.

Accessories

Mechanical accessories	Description	Type
	Hand crank for PR, PKR, PM	ZG-HND PR UFLKP014

Electrical installation

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

UP Universal Power Supply (UP) models can be supplied with 24 VAC up to 240 VAC, or 24 VDC up to 125 VDC.

Disconnect power.

1 Provide overload protection and disconnect as required.

4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.

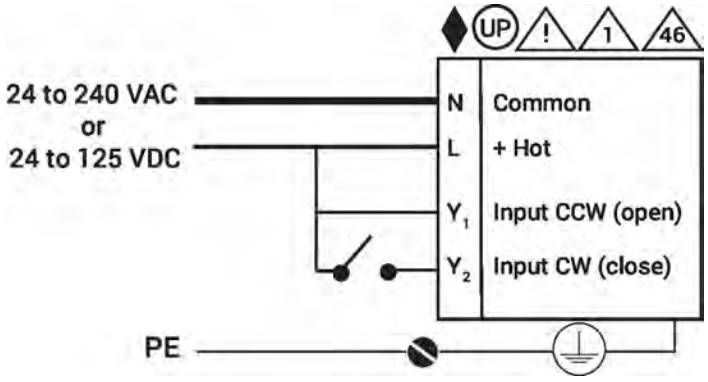
4&6 Actuators may be controlled in parallel. Current draw and input impedance must be observed.

! **Warning! Live electrical components!**

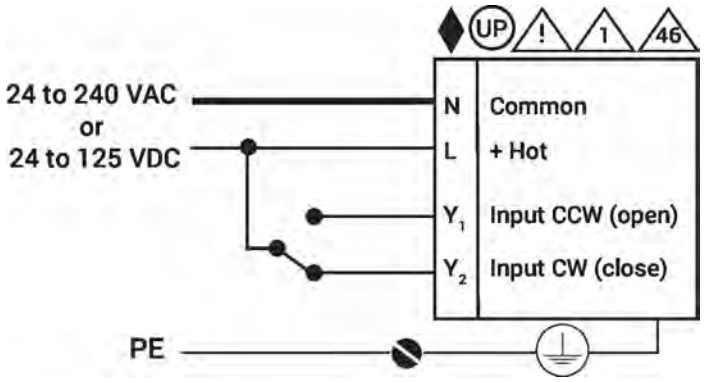
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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

Wiring diagrams

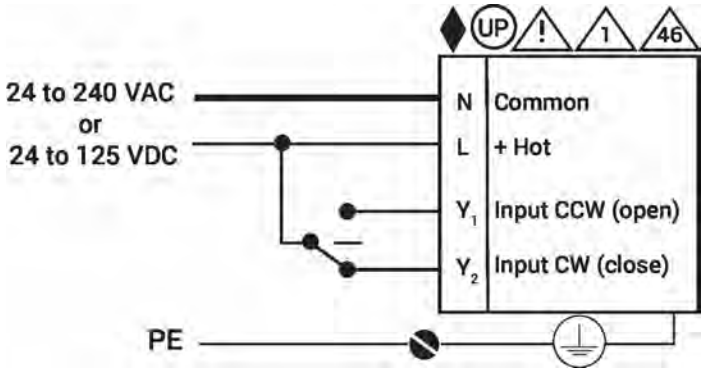
On/Off



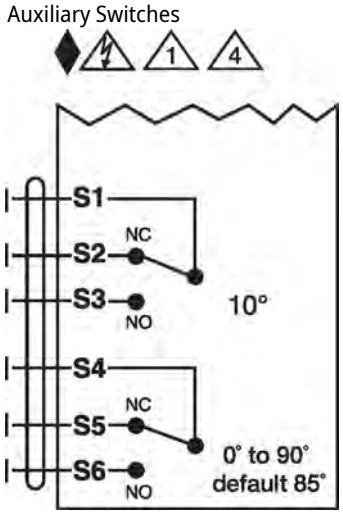
On/Off



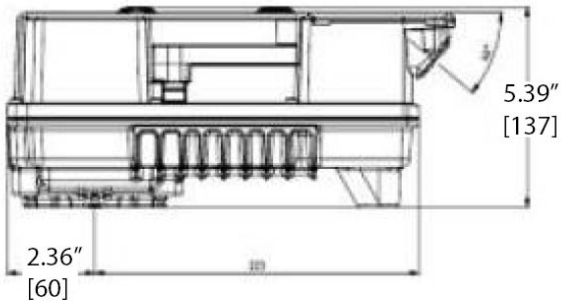
Floating Point

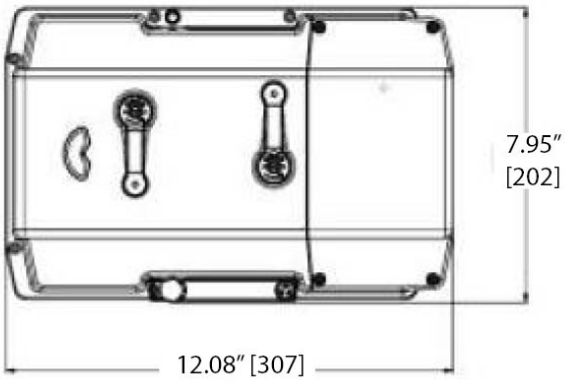


Auxiliary Switches



Dimensions





5-year warranty

Type overview

Type	DN
G225B-K	25

Technical data

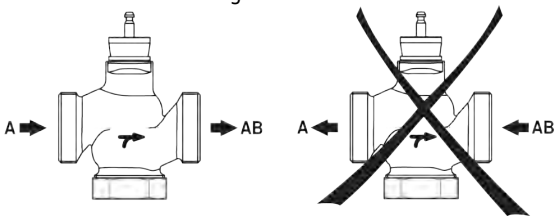
Functional data	Valve Size	1" [25]
	Fluid	chilled or hot water, up to 60% glycol, steam
	Fluid Temp Range (water)	20...280°F [-7...138°C]
	Body Pressure Rating	ANSI Class 250, up to 400 psi below 150°F
	Flow characteristic	modified equal percentage
	Servicing	repack kits available
	Rangeability Sv	100:1
	Max Differential Pressure (Steam)	20 psi [103 kPa]
	Flow Pattern	2-way
	Leakage rate	ANSI Class VI
	Controllable flow range	stem up - open A – AB
	Cv	10
	Maximum Inlet Pressure (Steam)	35 psi [241 kPa]
	ANSI Class	250
	Body pressure rating note	up to 400 psi below 150°F
Materials	Valve body	Bronze
	Valve plug	brass
	Stem	stainless steel
	Stem seal	EPDM O-ring
	Seat	Bronze
	Pipe connection	NPT female ends
Suitable actuators	Non-Spring	LVB(X)
	Electronic fail-safe	LVKB(X)

Safety notes

- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov
- The valve has been designed for use in stationary heating, ventilation and air-conditioning systems and must not be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- Only authorised specialists may carry out installation. All applicable legal or institutional installation regulations must be complied during installation.
- The valve does not contain any parts that can be replaced or repaired by the user.
- When determining the flow rate characteristic of controlled devices, the recognised directives must be observed.

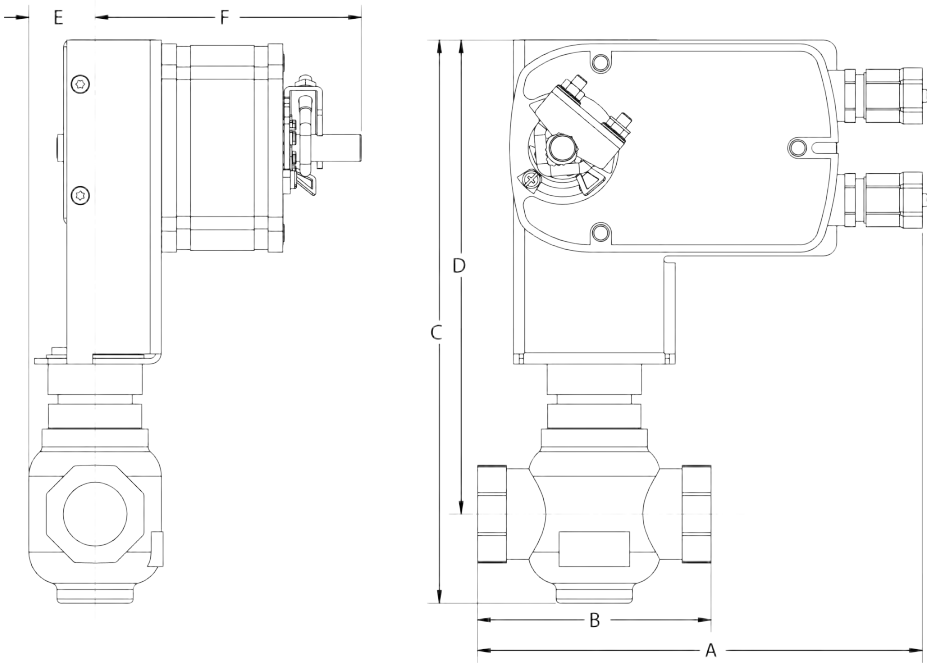
Installation notes

Flow direction The direction of flow, specified by an arrow on the housing, is to be complied with, since otherwise the valve could become damaged.



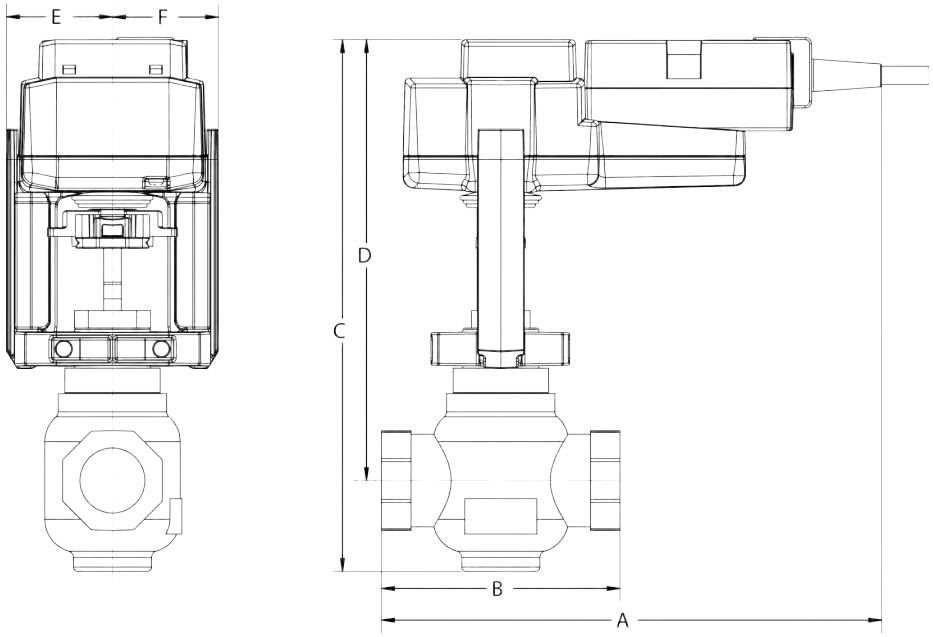
Dimensions

Dimensional drawings



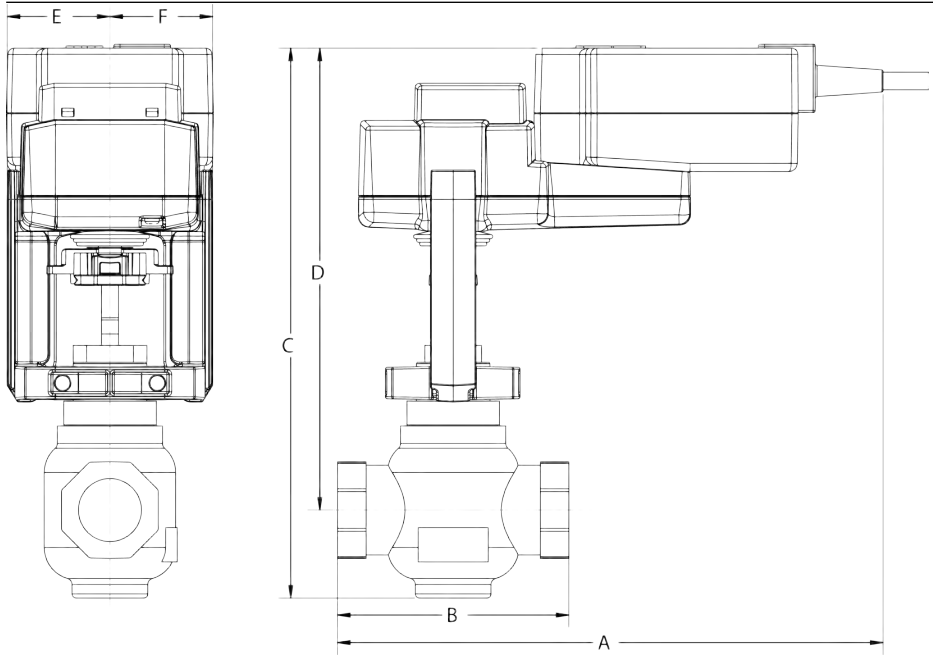
LF

A	B	C	D	E	F
8.3" [211]	4.4" [112]	9.5" [241]	7.6" [194]	1.2" [30]	4.9" [125]



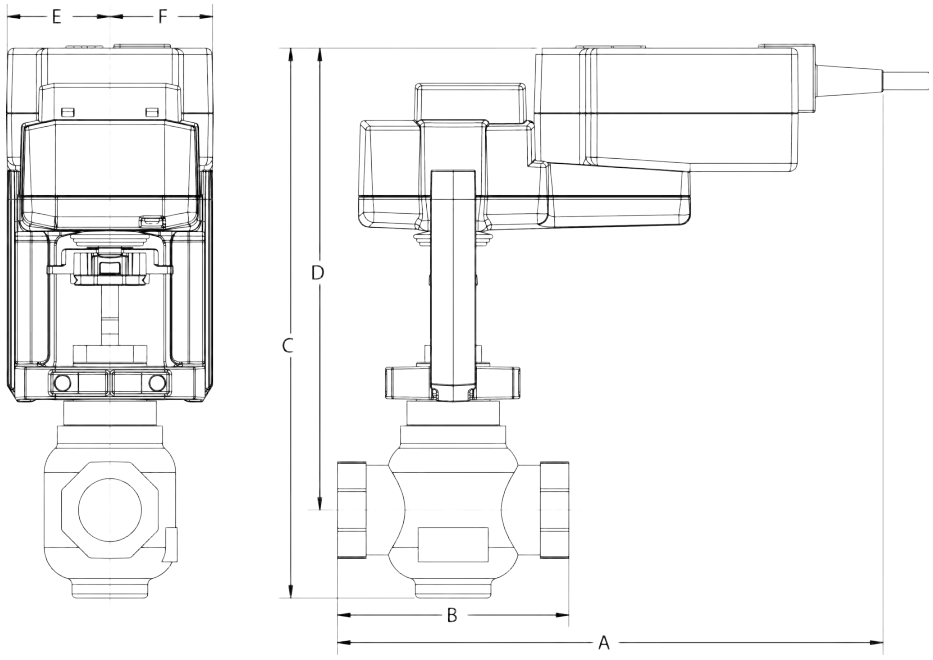
LV

A	B	C	D	E	F
9.1" [231]	4.4" [112]	9.6" [244]	8.0" [203]	1.9" [48]	1.9" [48]



LVK

A	B	C	D	E	F
10.2" [260]	4.4" [112]	9.4" [240]	8.6" [218]	1.9" [48]	1.9" [48]



LVK

A	B	C	D	E	F
10.2" [260]	4.4" [112]	9.4" [240]	8.6" [218]	1.9" [48]	1.9" [48]

BELIMO

Modulating, Non-Spring Return, Linear, 24 V,
Multi-Function Technology®

Technical data sheet LVX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	2.5 W
	Power consumption in rest position	1.5 W
	Transformer sizing	4 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable, 3 ft [1 m], with 1/2" conduit connector, degree of protection NEMA 2 / IP54
	Overload Protection	electronic throughout full stroke
	Electrical Protection	actuators are double insulated
Functional data	Actuating force motor	115 lbf [500 N]
	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM, On/Off and Floating point
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, PWM, on/off, floating point)
	Position feedback U	2...10 V
	Direction of motion motor	selectable with switch 0/1
	Manual override	4 mm hex crank (shipped w/actuator)
	Stroke	0.75" [19 mm]
	Running Time (Motor)	default 90 s, variable 90...150 s
	Running time motor variable	90...150 s
	Noise level, motor	55 dB(A)
	Position indication	Mechanically, with pointer
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	2.87 lb [1.3 kg]
Materials	Housing material	Die cast aluminium and plastic casing

Safety notes

- PVC W'Shld for GV w/UGLK (GM)
- Battery Back Up System for SY(7~10)-110
- 120 to 24 VAC, 40 VA transformer.
- 50% voltage divider kit (resistors with wires).
- PC Tool computer programming interface, serial port.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to LonWorks	UK24LON
	Gateway MP to Modbus RTU	UK24MOD

Service tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by 24 VDC.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

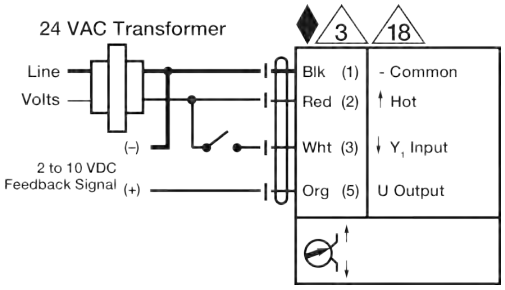
9 For triac sink the common connection from the actuator must be connected to the hot connection of the controller. Contact closures A & B also can be triacs. A & B should both be closed for the triac source and open for triac sink.

18 Actuators with plenum cable do not have numbers; use color codes instead.

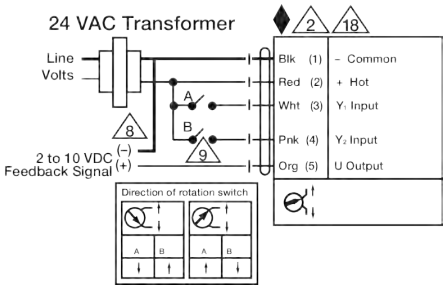
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live Electrical Components!

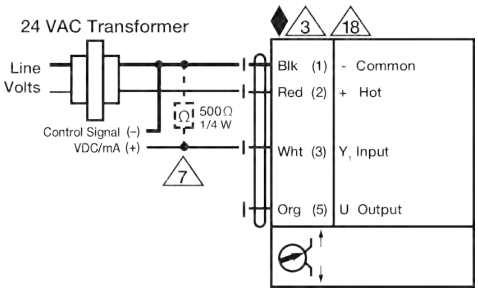
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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



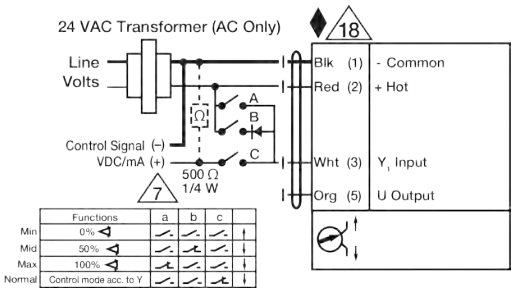
On/Off



Floating Point



VDC / 4 to 20 mA



Override Control Min, Mid, Max Positions

5-year warranty

Type overview

Type	DN
G6100C	100

Technical data

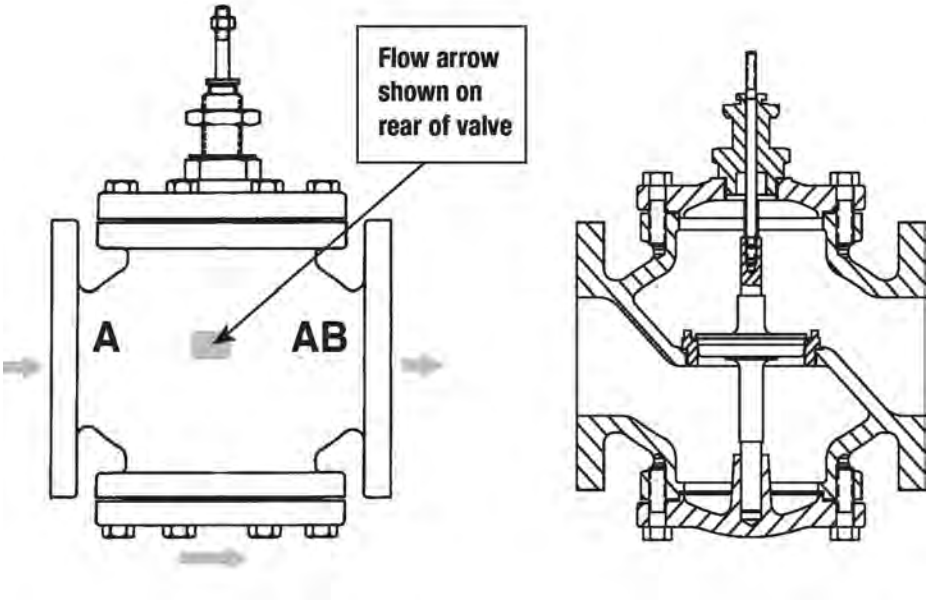
Functional data	Valve size [mm]	4" [100]
	Fluid	chilled or hot water, up to 60% glycol, steam
	Fluid Temp Range (water)	32...338°F [0...138°C]
	Fluid Temp Range (steam)	32...280°F [0...138°C]
	Body Pressure Rating	ANSI Class 125, up to 175 psi below 150°F
	Flow characteristic	equal percentage
	Servicing	repack/rebuild kits available
	Rangeability Sv	98:1
	Max Differential Pressure (Steam)	15 psi [103 kPa]
	Flow Pattern	2-way
	Leakage rate	ANSI Class III
	Controllable flow range	stem up - open A – AB
	Cv	170
	Maximum Inlet Pressure (Steam)	35 psi [241 kPa]
Materials	Valve body	Cast iron - ASTM A126 Class B
	Valve plug	brass
	Stem	stainless steel
	Stem seal	NLP EPDM (no lip packing)
	Seat	Stainless steel AISI 316
	Pipe connection	125 lb flanged
Suitable actuators	Non-Spring	EVB(X)
	Spring	(2*AFB(X))
	Electrical fail-safe	AVKB(X)

Safety notes

- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov
- The valve has been designed for use in stationary heating, ventilation and air-conditioning systems and must not be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- Only authorized specialists may carry out installation. All applicable legal or institutional installation regulations must be complied during installation.
- The valve does not contain any parts that can be replaced or repaired by the user.
- When determining the flow rate characteristic of controlled devices, the recognised directives must be observed.

Product features

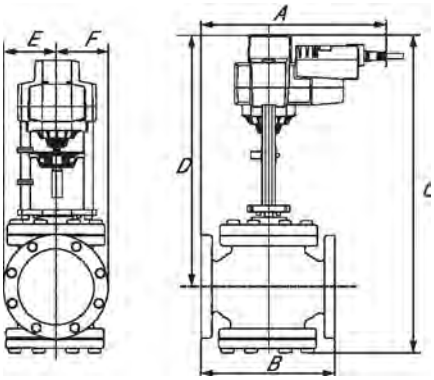
Flow/Mounting details



Dimensions

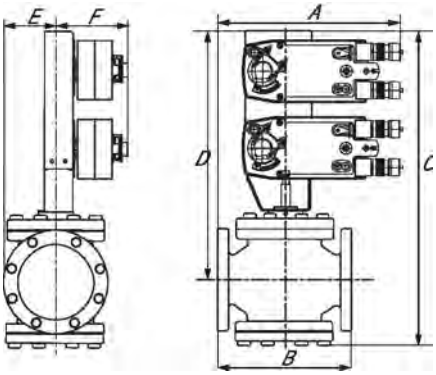
Type	DN	Weight
G6100C	100	125.69 lb [57 kg]

EVB, EVX, RVB, RVX



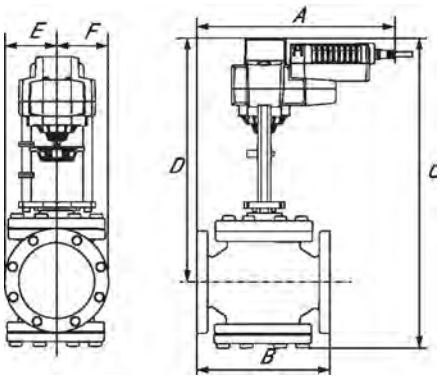
A	B	C	D	E	F	Number of Bolt Holes
13.7" [349]	13.0" [330]	26.6" [676]	19.8" [502]	4.5" [114]	4.5" [114]	8

2*AFB, 2*AFX



A	B	C	D	E	F	Number of Bolt Holes
13.7" [349]	13.0" [330]	30.0" [762]	23.2" [590]	4.5" [114]	5.3" [135]	8

AVKB, AVKX



A	B	C	D	E	F	Number of Bolt Holes
13.7" [349]	13.0" [330]	26.6" [676]	19.8" [502]	4.5" [114]	4.5" [114]	8

BELIMO

Modulating, Non-Spring Return, Linear, 24 V, Multi-Function Technology®

Technical data sheet EVX24-MFT

5-year warranty

Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Nominal voltage range	AC 19.2...28.8 V / DC 21.6...28.8 V
	Power consumption in operation	5 W
	Power consumption in rest position	1.5 W
	Transformer sizing	7.5 VA
	Electrical Connection	18 GA plenum cable, 1 m, with 1/2" conduit connector, degree of protection NEMA 2 / IP54
	Overload Protection	electronic throughout full stroke
	Electrical Protection	actuators are double insulated
Functional data	Actuating force motor	2500 N [560 lbf]
	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM, On/Off and Floating point
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Operating modes optional	variable (VDC, PWM, on/off, floating point)
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	5 mm hex crank (3/16" Allen), supplied
	Stroke	2" [50 mm]
	Running Time (Motor)	90 s /
	Running time motor variable	90...150 s
	Noise level, motor	60 dB(A)
	Position indication	Mechanically, with pointer
Safety data	Power source UL	Class 2 Supply
	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2
	Enclosure	UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02 CE acc. to 2014/30/EU and 2014/35/EU
	Quality Standard	ISO 9001
	UL 2043 Compliant	Suitable for use in air plenums per Section 300.22(C) of the NEC and Section 602 of the IMC
	Ambient humidity	Max. 95% RH, non-condensing

Safety data	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Servicing	maintenance-free
Weight	Weight	5.73 lb [2.6 kg]
Materials	Housing material	Die cast aluminium and plastic casing

Footnotes † Use flexible metal conduit. Push the listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuators input wiring with listed flexible conduit. Properly terminate the conduit in a suitable junction box. Rated impulse Voltage 800V. Type of action 1. Control pollution degree 3.

Accessories

Gateways	Description	Type
	Gateway MP to BACnet MS/TP	UK24BAC
	Gateway MP to Modbus RTU	UK24MOD
	Gateway MP to LonWorks	UK24LON

Electrical accessories	Description	Type
	Belimo PC-Tool, Software for adjustments and diagnostics	MFT-P
	Auxiliary switch 2 x SPDT for NG GV Actuators	S2A-GV
	Service Tool, with ZIP-USB function, for programmable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Tools	Description	Type
	Connection cable 10 ft [3 m], A: RJ11 6/4 ZTH EU, B: 3-pin Weidmüller and supply connection	ZK4-GEN
	Service Tool, with ZIP-USB function, for programmable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH US

Electrical installation

INSTALLATION NOTES

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuators may also be powered by DC 24 V.

7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.

9 For triac sink the common connection from the actuator must be connected to the hot connection of the controller. Contact closures A & B also can be triacs. A & B should both be closed for the triac source and open for triac sink.

18 Actuators with plenum cable do not have numbers; use color codes instead.

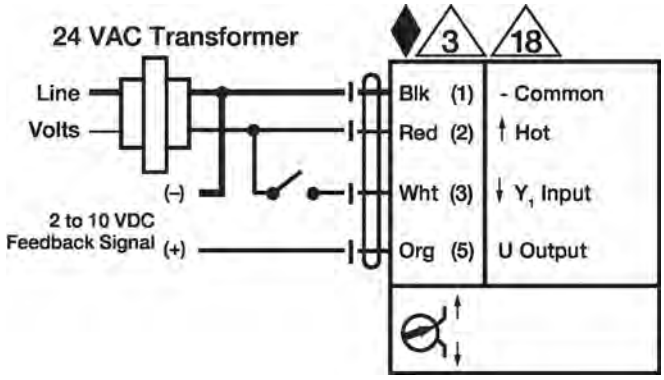
Meets cULus requirements without the need of an electrical ground connection.

Warning! Live electrical components!

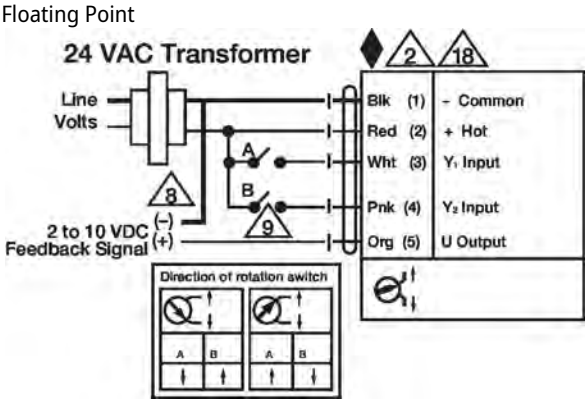
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow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

Wiring diagrams

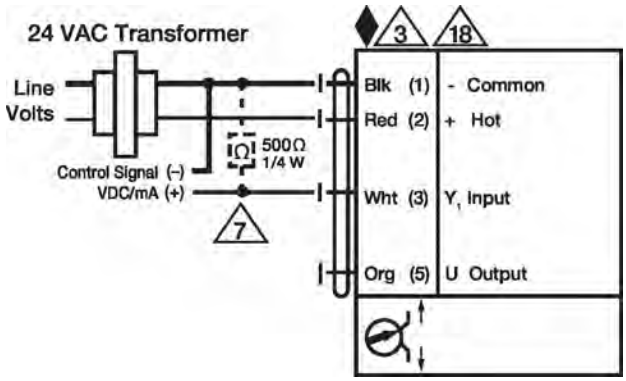
On/Off



Floating Point



VDC / 4 to 20 mA



Override Control Min, Mid, Max Positions