DESIGN & CONSTRUCTION GROUP
THE GOVERNOR NELSON A. ROCKEFELLER
EMPIRE STATE PLAZA
ALBANY, NY 12242

ADDENDUM NO. 1 TO PROJECT NO. 47151

HVAC WORK
IMPROVE DEHUMIDIFICATION SYSTEM
NYS POLICE EAST MEADOW
101 MERRICK AVE
EAST MEADOW, NY

February 2, 2022

NOTE: This Addendum forms a part of the Contract Documents. Insert it in the Project Manual. Acknowledge receipt of this Addendum in the space provided on the Bid Form.

HVAC MANUAL APPENDIX

1. RECORD CONTROL SUBMITTAL FOR SECTION 230923: Add the accompanying Document (pages 1-104) to the Project Manual. Note this submittal is for general reference only and may not accurately portray all of the existing system.

END OF ADDENDUM

Erik T. Deyoe, P.E.
Director, Division of Design
Design & Construction

NYS OGS DESIGN AND CONSTRUCTION SUBMITTAL COMMENTS

To:

From: LAKHANI & JORDAN ENGINEERS, P.C.

Contract No.: 44561

Facility:

Reviewed By: priyesh Patel

Contractor: Premier Mechanical Services Inc.

Submittal No.: 230923H-3-0

EIC: Stephen Brix

Submittal Desc: Resubmittal of Product Data-Accessories & Product Data-Actuators & Product Data-Automatically operated dampers & Product Data-Bill of Materials & Product Data-Data and Control (D/C) summary & Product Data-Data Communications & Product Data-DCP and TEC Sof

Disposition: Approved as Noted

Remarks:

In response to your letter of transmittal dated 10/20/2016, the below listed submittal items are marked Approved as Noted. With the understanding that all contract requirements shall be met.

No.	Date of Action	Action	Spec Section	Supplier/Mfr	No. of Dwgs	Drawing No's
1	11/22/2016	AAN	230923H	Johnson Controls		

Item Description:

Remarks: L&J COMMENT:
-See comments and mark-ups inside submittal.

2

Item Description:

Remarks:

3

Item Description:

Remarks:

NEW YORK STATE OF OPPORTUNITY. Office of General Services

Design and Construction
AN ISO 9001:2008 CERTIFIED ORGANIZATION
Division of Construction, 34th Floor, Corning Tower
The Governor Nelson A. Rockefeller Empire State Plaza
Albany, New York 12242
Phone: (518) 474-0331

SUBMITTAL TRANSMITTAL

Project No.: 44561

NOTE: A Transmittal is required for each Specification Section. DO NOT bind together separate submittals from different Specification Sections.

This form is to be used *only* if there are no deviations from the Contract Documents. If there are ANY deviations from the Contract Documents, you must submit the Contract Document Deviation Request Form (BDC 49).

Project Description: *(Project Title, Facility Name and Address)*

44561CEHP - NYS Police Hempstead - Provide State Police Zone Headquarters

DSP

Hempstead, NY

Date: 10/20/2016

TO:

priyesh Patel

LAKHANI & JORDAN ENGINEERS, P.C.

315 Madison Ave, 10th floor

NY, NY 10017

FROM:

Chris Paulicelli

Premier Mechanical Services Inc.

,

SUBMITTAL TYPE:

- ☑ Re-Submittal
- ☐ Information (Waiver)
- ☐ Product Data
- ☐ Shop Drawings
- ☐ Quality Control/Assurance
- ☐ Test Reports
- ☐ Certificate
- ☐ Contract Closeout
- ☐ Design Data
- ☐ Samples
- ☐ Other

Provide a minimum of six (6) copies of Product Data, Shop Drawings, etc. See Specification Section to verify the exact number of copies required and additional submittal requirements.

Specification Number and Title: 230923H 230923H-3-0 Direct Digital Building Control System

Part	Type	Description
		Johnson Controls Control Package Resubmittal

Contractor's Certification:

We have verified that all material or equipment contained in this submittal meets all the requirements specified or shown **(no exceptions)**.

We acknowledge that in accordance with Article 4.7 of the General Conditions a re-evaluation fee can be assessed against our contract if this submittal requires re-submission and review, if the submittal requirements have not been met.

Chris Paulicelli
Contractor/Contractor's Representative *(Print Name)*

Chris Paulicelli
Signature

Johnson Controls, Inc.
6 Aerial Way
Syosset, NY 11791
Tel. 516 822 0490
FAX 516 822 0592

TRANSMITTAL LETTER

TO:	Nick Paulicelli	Date:	October 20, 2016
	Premier Mechanical Services INC	Project Name:	NYS Police HQ
	620 Johnson Avenue STE 5	Project #:	6N710145
	Bohemia, NY 11716	Customer PO#:	

We are sending you: ☒ **Enclosed/Attached** ☐ **Under Separate Cover**

☐ Shop Drawings	☒ Product Data Sheets	☐ Copy of Letter
☐ Plans	☐ Copy of Letter	☒ Submittals
☐ Specifications	☐ Samples	☐ Operations & Maint. Manuals
☐ Damper Schedules	☐ Room Schedules	☐ Device Schedules
☒ Valve Schedules	☐ Door Schedules	☐

This material/information is being sent:

☐ Per your Request.	☐ For your Record and File	☐ For Correction & Resubmittal.
☒ For your Review and Approval.	☐ Approved as Submitted.	☐ For issue to Subcontractors.
☐ For your Review and Comment.	☐ Approved as Noted.	☐ Final Distributions
☐	☐	☐

We have detailed these Submittals based on our interpretation of the contract drawings & specifications

☒ Return 1 Approved Copy
☐ Fabrication Held for Approval & Written Release
☐ Equipment is being fabricated and any changes may create a delay in shipment and a possible increase in price.

Please have your detailing department look carefully at the attached submittals. We cannot be held responsible for any cost or lead time changes incurred for modifications once the equipment has been released for fabrication.

Item	Description / Comments	Document # / Ref	Rev	# of Sets
1	NYS Police HQ	10.20.16		
2				
3				
4				
5				

Message/Comments:

Delivered by: Email Date: 10.20.16
Received by: Date: 10.20.16

CC to:	# of Copies

TRANSMITTED BY:
Peter Tai
Application Engineer

Date: October 20, 2016

BUILDING AUTOMATION SYSTEM

RESUBMITTAL

NYS Police HQ

Submitted To:

Nick Paulicelli
Premier Mechanical Services INC
620 Johnson Avenue
STE 5

Bohemia, NY 11716

Submitted By:

Peter Tai
Application Engineer

JCI Contract: 6N710145

Johnson Controls, Inc.
6 Aerial Way

Syosset, NY 11791
Tel: 516 822 0490
Fax: 516 822 0592

STAMPS

Johnson Controls, Inc.
6 Aerial Way
Syosset, NY 11791
Tel. 516 822 0490
FAX 516 822 0592

Nick Paulicelli
Premier Mechanical Services INC
620 Johnson Avenue STE 5
Bohemia, NY 11716

RE: Comments to the engineer / contractor - NYS Police HQ
JCI Contract #: 6N710145

1. Contractor to confirm and provide BACnet over Ethernet communication protocols to be used as the primary communication network for communications between multi-BAS/EMS vendors systems.

JCI will provide interface capable of both BACnet IP and BACnet MS/TP.

2. BACnet, over MSTP communications protocol shall be used as the communication network between BAS/EMS Vendor Terminal Equipment Controllers (TECs) and secondary network management devices, and between network management devices and future "smart devices and sensors". Secondary communications data protocol shall operate on a peer-to-peer open protocol communication network.

Confirm, all JCI equipment and controls will communicate via BACnet MS/TP.

for any BACnet IP, coordinate with other trades for data drops in advance

3. Provide a DDC system with a new workstation complete with software as described in 230923 (2.02).

Confirm, JCI will provide new workstation (ADS), with metasys software.

4. The HVAC Work Contractor shall integrate the Direct Digital Building Control Work System and the Combustion Control System.

JCI will provide interface capable of both BACnet IP and BACnet MS/TP. Please advise on combustion control system integration requirements.

5. Control contractor to provide all necessary transformer for standard power to low voltage control power for control component. Coordinate with other trades.

N/A

Hot water system setpoints and safety alarms on the boiler system shall be monitored and controlled via BMS

6. Provide PID algorithm for all control programs.

Confirm, JCI controls utilize PID algorithms.

7.All specific system graphics (e.g. HW system, GWHP, CWS, etc.) with point list shall be submitted for review & approval.

Graphics to be provided after approval of controls submittals. Please provide CAD drawings of building for graphics generation. Points list to be provided in controls submittals.

8. All BMS setpoints shall be adjustable type

COORDINATE WITH HVAC CONTRACTOR

Confirm. All JCI BMS setpoints are adjustable. For 3rd party integrations, any writable point will be adjustable.

9. Provide refrigerant sensors for monitoring as per 230923 – 2.209.

Refrigerant monitor is not in JCI scope of work.

10. All control system components shall be installed as per manufacturer written instruction and/or recommendations.

Please provide wiring details for 3rd party equipment and end devices.

11. Highlight all control devices in the catalogs pages provided those are being used on the project.

cooridnate with mechanical contractor

Confirm.

12. Low limit and High limit setpoints in the system shall be verified prior to finalizing it with commissioning engineer.

Limits will be set to JCI standard, will adjust as needed.

L&J COMMENTS:
1. PROVIDE REFRIGERANT MONITORING SYSTEM AS PER 230923 - 2.20
2. CONTRACTOR TO CONFIRM ALL THE VFD WITH BACnet MSTP
3. PROVIDE CONTROL VALVE FOR UH AND CUH. CONTRACTOR TO COORDINATE VALVE PACKAGE WITH CUH/UH AND SEQUENCE WITH BMS CONTRACTOR
4. COORDINATE OPERATOR STATION WITH ARCHITECT AND OTHER TRADES.
5. PROVIDE SPARE PARTS AS PER 2309923-1.12 (B)
6. PROVIDE ENERGY MANAGEMENT SYSTEM APPLICATION PROGRAMS AS PER 230923-2.07 (A) AND (B).
7. THE BMS SHALL BE ABLE TO START/STOP VFDS VIA BMS STATION AND MONITOR THE SPEED.

Response to Engineers Markups

Title Page: Sample graphics will be generated after controls submittal approval. Please provide CAD drawings of reflected floor plans.

001.001: Confirm, will coordinate locations.

002.001: Drawing revised. See submittal.

003.001 & 004.001: S.O.O. revised.

005.001: Unit is not capable of controlling the OAD indepent from RAD as there is only one damper output (accesory output) available. Because of this, the WSHP will not be meet warm-up sequence or be able to let in the specified quantity of outside air on startup. Isolation valve and condensate sensors are factory mounted and wired and will respond to built in internal safeties.

006.001: S.O.O. revised.

007.001: Damper interlock internal to Penn Barry fans. End switch added for damper status.

008.001:

009.001: M-NET is a Mitsubishi System, submitted Split System is Daikin. Please advise. In addition, split system is stand alone. No tie in to BMS. Daikin documentation for interlock and thermostat added.

009.002: Please provide documentation for valves and aqua stat.

Valve Schedule: Valves for CUH, UH not in JCI scope of work.

Damper Schedule: Added. Combustion air damper actuator only. TE-1 : TE-3 and GE-1 come with integrated dampers from fan manufacturer.

Sincerely,

Peter Tai
Application Engineer
Johnson Controls, Inc.

NYS POLICE HQ

Rev	Drawing	Description
1	1.001	NET Network Riser
	1.002	NET MSTP Installation Reference
1	2.001	HWS Boiler Layout
	2.002	HWS Point Schedule & Wiring Details
	2.003	HWS Wiring Details
1	3.001	HX Flow Layout
	3.002	HX Point Schedule & Wiring Details
1	4.001	CWS Flow Layout
	4.002	GPP Flow Layout
	4.003	GPP CWP Point Schedule & Wiring Details
	4.004	GPP CWP Wiring Details
1	5.001	GWHP Flow Layout
	5.002	GWHP Wiring Details
	5.003	GWHP FX-10 Wiring Details
1	005.004 A - D	GWHP Points List
1	6.001	PH-1 Flow Layout
1	7.001	TE-1, 2, 3 Flow Layout
1	8.001	GE-1 Flow Layout
1	9.001	SPLIT SYSTEM Flow Layout
1	9.002	CUH, UH Flow Layout
1		Valve Schedule
1		Damper Schedule

RESUBMITTAL
10.20.16

DISCARD PREVIOUSLY DATED

Johnson Controls

Creating a better climate for business.

- [ ] Environmental Control System
- [x] Facility Management System
- [ ] Air and Water System Balancing
- [ ] Fire Management System
- [ ] Security System
- [ ] Lighting Services
- [ ] Instrumentation System Installation
- [ ] Building Operations Management
- [ ] Energy Conservation Control
- [ ] Training Programs
- [ ] Performance Contracting
- [ ] Planned Service Agreements

Air Conditioning
Heating
Diagnostic Services
Coil Cleaning
Refrigeration
Automatic Temperature Controls
Facility Management Systems
Fire Management
Security Management
Building Operations and Management
Water Treatment
Electrical Equipment
Emergency Generator / Lighting Equipment
Industrial Controls / Recording / Indication Equipment

PROJECT TITLE
NYS Police HQ

ARCHITECT
,
Phone:

ENGINEER
Lakhani & Jordan
50 East 42nd St.
New York, NY 10017
Phone: 212-338-9020

MECHANICAL CONTRACTOR
Premier Mechanical Services INC
620 Johnson Avenue
Bohemia, NY 11716
Phone: 631.956.1112

ELECTRICAL CONTRACTOR
,
Phone:

Rev. Number	ECN	Date	Rev. By	Rev. Description
1			PT	REV PER ENGINEERS COMMENTS
			PT	SUBMITTAL

Johnson Controls

Branch Information
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Phone: 516 822 0490
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SALES ENGINEER	PROJECT MANAGER	DESIGNER	DATE	CONTRACT NUMBER
Mario Lucero	Will Roblin	Peter Tai		6N710145

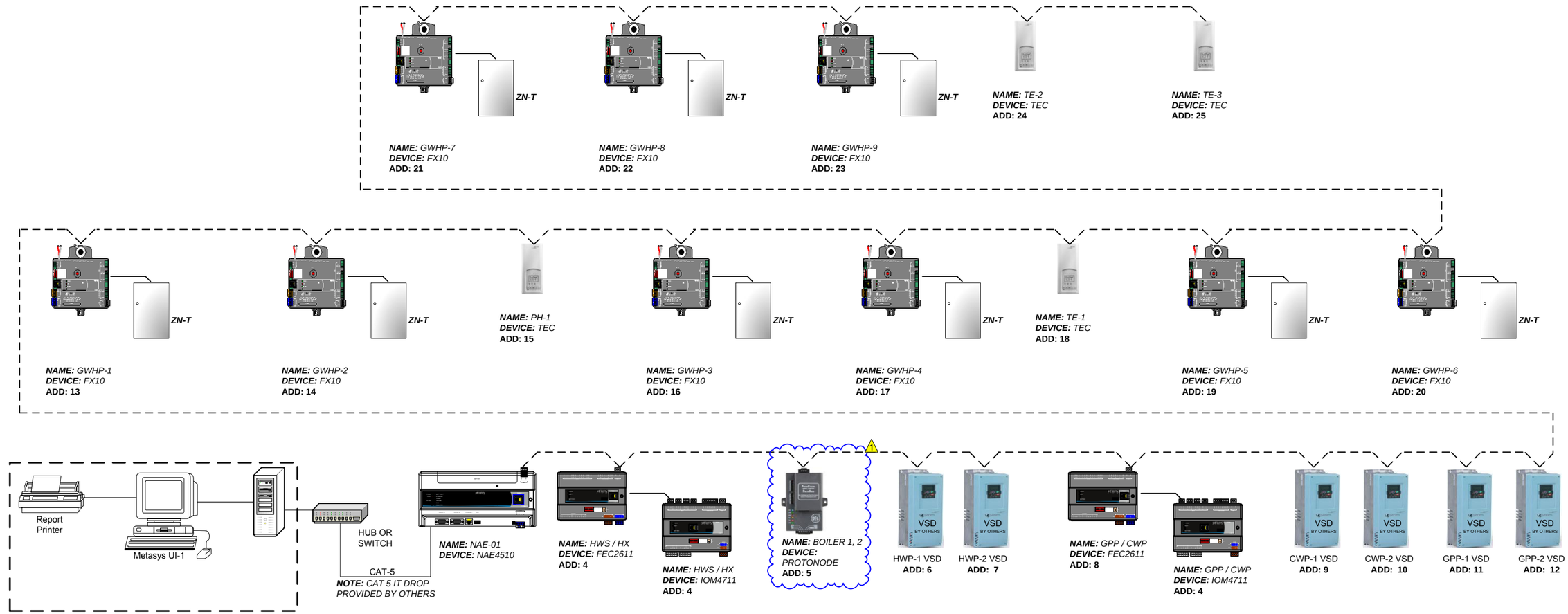
METASYS NETWORK LAYOUT

THIS DRAWING SHOWS THE OVERALL NETWORK LAYOUT. SEE THE INDIVIDUAL NAE/NCE RISER DRAWING(S) FOR MORE SPECIFIC DEVICE DETAILS. IT IS ASSUMED THAT THE ETHERNET SHOWN IS THE CUSTOMERS ETHERNET BACKBONE. NO ADDITIONAL SWITCHES, ROUTERS, FIREWALLS, ETC ARE PROVIDED.

BILL OF MATERIALS

NET, Metasys Extended Architecture.New
Contract Number: 6N710145

Designation	Qty	Part Number	Description
Field Devices:			
COMPUTER	1	ADS05USRPC	ADS WORKSTATION PC TURNKEY
GRAPHICSPLUS	1	MS-GGT-0	MS GGT-0 GRAPHICS
MONITOR	1	MONITOR22INCH	22 INCH LCD MONITOR
NAE-1	1	PAGE00001FC0	PANEL NAE4510 16X20



FIRST FLOOR

WIRING LEGEND

FC BUS – 22 AWG STRANDED, 3-WIRE TWISTED, SHIELDED CABLE

SA BUS – 22 AWG STRANDED, 4-WIRE, 2-TWISTED PAIR, SHIELDED CABLE

Drawing Title
NET Network Riser

Project Title
NYS Police HQ

Rev. Num.	ECN	Date	Rev. By	Rev. Description
			PT	SUBMITTAL

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
Mario Lucero	Will Roblin	Peter Tai				

Johnson Controls

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Contract Number
6N710145

Drawing Number
001.001

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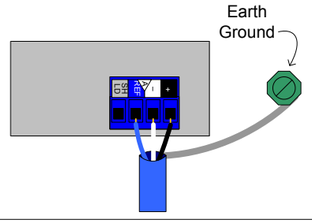
METASYS MSTP NETWORK INSTALLATION DETAILS

The information in this document is not intended to replace the published Technical Product Literature for the Johnson Controls systems and products presented. The Installation Instructions that are packed with products, and the Technical Bulletins and Product Bulletins released with Johnson Controls systems and products supersede the information on this page. It is the responsibility of the product installer and product user to obtain and follow the product installation, operation, and safety procedures provided with the products or project specific information required by specification or local codes.

Category	Rules / Maximums Allowed
General	Typically daisy-chained; branch or star configuration acceptable when repeaters are used. See End of Line Switching and Repeater Guideline graphic.
Number of Devices	**When all of the devices connected on the FC Bus are Metasys FECs, VMAs, and/or IOMs, the device and bus segment limits are:** 100 devices total per FC Bus (maximum) 3 bus segments per FC Bus (maximum) 50 devices per bus segment (maximum, not to exceed 100 devices per FC Bus) **When one or more TEC26xx Series thermostat or third-party MS/TP device is connected on the FC Bus, the device and bus segment limits are:** 64 devices total per FC Bus (maximum) 3 bus segments per FC Bus (maximum) 32 devices per bus segment (maximum, not to exceed 64 devices per FC Bus) **Note:** Metasys MS/TP devices generate less data traffic than third-party MS/TP devices and TEC26xx thermostats. Connecting third-party devices or TEC26xx thermostats to the FC Bus increases data traffic, reduces bus performance, and reduces the number of devices that can be connected to the bus. Bus segments on an FC Bus are connected with repeaters (only). Up to two cascaded repeaters may be applied to an FC Bus (to connect three bus segments).
Line Length and Type	**When all of the devices connected on the FC Bus are Metasys FECs, VMAs, and/or IOMs, the cable length limits are:** Each bus segment can be up to 1520 m (5000 ft) in length (using 22 AWG 3-wire twisted, shielded cable). Each FC Bus can be up to 4750 m (15,000 ft) in length (using 22 AWG 3-wire twisted, shielded cable). **When one or more TEC26xx Series thermostat or third-party MS/TP device is connected on the FC Bus, the device and bus segment limits are:** Each bus segment can be up to 1220 m (4000 ft) in length (using 22 AWG 3-wire twisted, shielded cable) Each FC Bus can be up to 3660 m (12,000 ft) in length (using 22 AWG 3-wire twisted, shielded cable). When using fiber-optic connections: 2,010 m (6,600 ft.) between two fiber modems 22 AWG Stranded, 3-Wire Twisted, Shielded Cable
Cable	22 AWG stranded, 3-wire, twisted shielded cable
EOL Termination	End-of-Line (EOL) termination is required on the FC Bus to reduce signal reflection when data transmissions reach the end of a bus segment and bounce back. EOL termination is built into some Metasys FC devices and is enabled with a switch or jumper on the device. **EOL Termination on NAEs** An EOL switch on an NAE enables EOL termination. For those NAEs with two FC Bus connections, two EOL double-pole switches are provided. Set the EOL switch to the ON (up) position to set the controller as an EOL termination device. **EOL Termination on Switch-Terminating Devices** Some field controllers have an EOL switch or jumper. Such devices include FECs, IOMs, VMAs, ZFR1810s, and repeaters. Set the EOL termination to On for any of these devices when it is the last device on a bus segment. **EOL Termination on Devices Without EOL Provision** For the devices such as TECs and third-party controllers in which no EOL provision is provided, install the MS-BACEOL-0 RS485 End-of-Line Terminator at the device if at the end of the bus segment. **EOL Termination Across the FC Bus** The FC Bus may consist of up to three bus segments. Each bus segment on an FC Bus requires two EOL termination devices, one at each end of the bus segment. All other devices on the FC Bus should have their EOL termination disabled (EOL switches Off) . If only one device on an FC segment has an EOL termination, it must be set to On. **EOL on FC Bus Repeaters** When using repeaters in the FC Bus, set the EOL jumpers based on the position of the repeater in the run.



SHIELD GROUNDING

The shield should be earth grounded at one and only one point for the entire bus segment. (Preferably in the NAE Panel.) The shield screws on the controllers are simply a convenient way to continue the daisy chain of the bus. They are not attached to earth ground. You can use the shield terminal or twist together the shield and tape back at each controller.

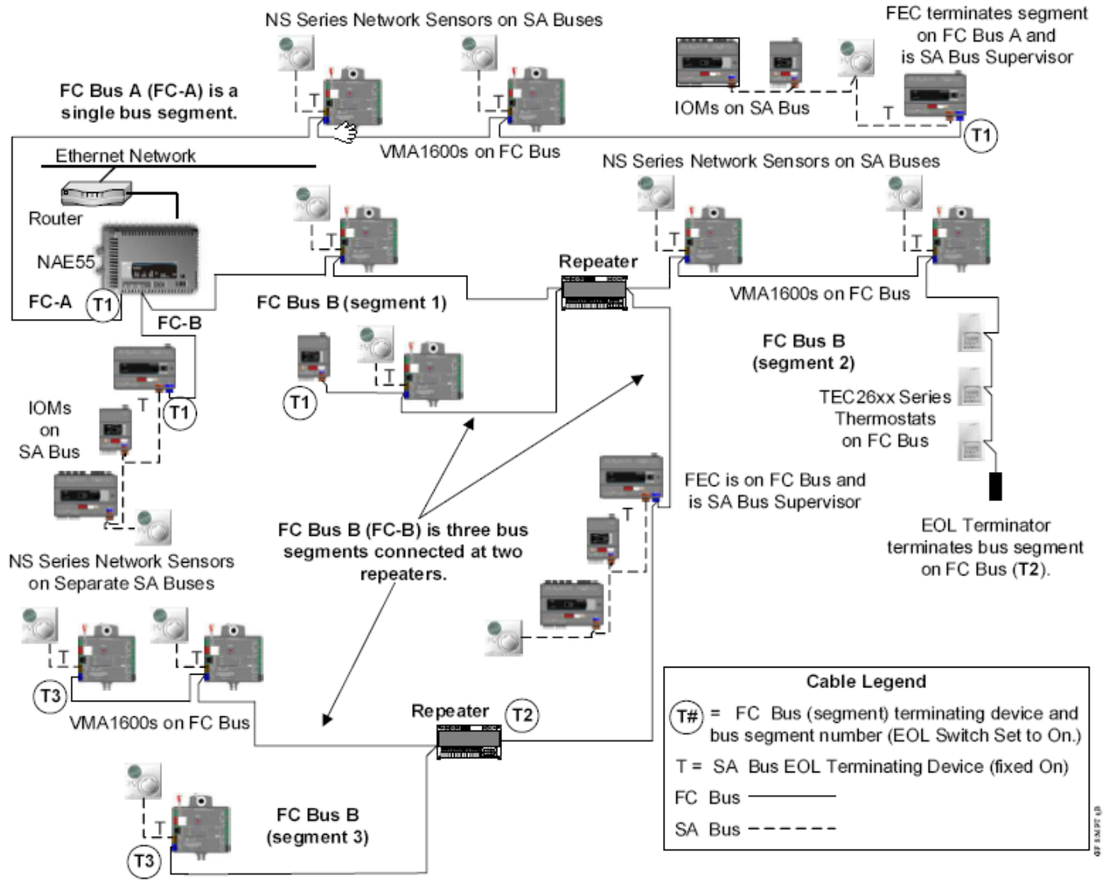
RECOMMENDED MSTP FIELD CONTROLLER BUS CABLE

Type	Typical Usage	Anixter #	Belden #	pF/ft	Area
22/3c Shielded Plenum	Open Plenum Installations. 38400+ Baud RS-485 Communication.	CBL-22/3-FC-PLN	6501FE	25	0.014
22/3c Shielded PVC	EMT (Raceway) Installations. 38400+ Baud RS-485 Communication.	CBL-22/3-FC-PVC	5501FE	31	0.015

RECOMMENDED MSTP SENSOR ACTUATOR BUS CABLE

Type	Typical Usage	Anixter #	Belden #	pF/ft	Area
22/2pr Shielded Plenum	Open Plenum Installations. 38400+ Baud RS-485 Communication.	CBL-22/2P-SA-PLN	6541FE	33	0.033
22/2pr Shielded PVC	EMT (Raceway) Installations. 38400+ Baud RS-485 Communication.	CBL-22/2P-SA-PVC	5541FE	31	0.034

END OF THE LINE SWITCHING AND REPEATER GUIDELINES



Drawing Title: **Network Installation Reference**

Project Title: **NYS Police HQ**

Rev. Num.	ECN	Date	Rev. By	Rev. Description
			PT	SUBMITTAL

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
Mario Lucero	Will Roblin	Peter Tai				

Johnson Controls

Branch Information
Johnson Controls, Inc.
6 Aerial Way
Syosset, NY 11791
Phone: 516 822 0490
Fax: 516 822 0592

Contract Number

Drawing Number: **001.002**

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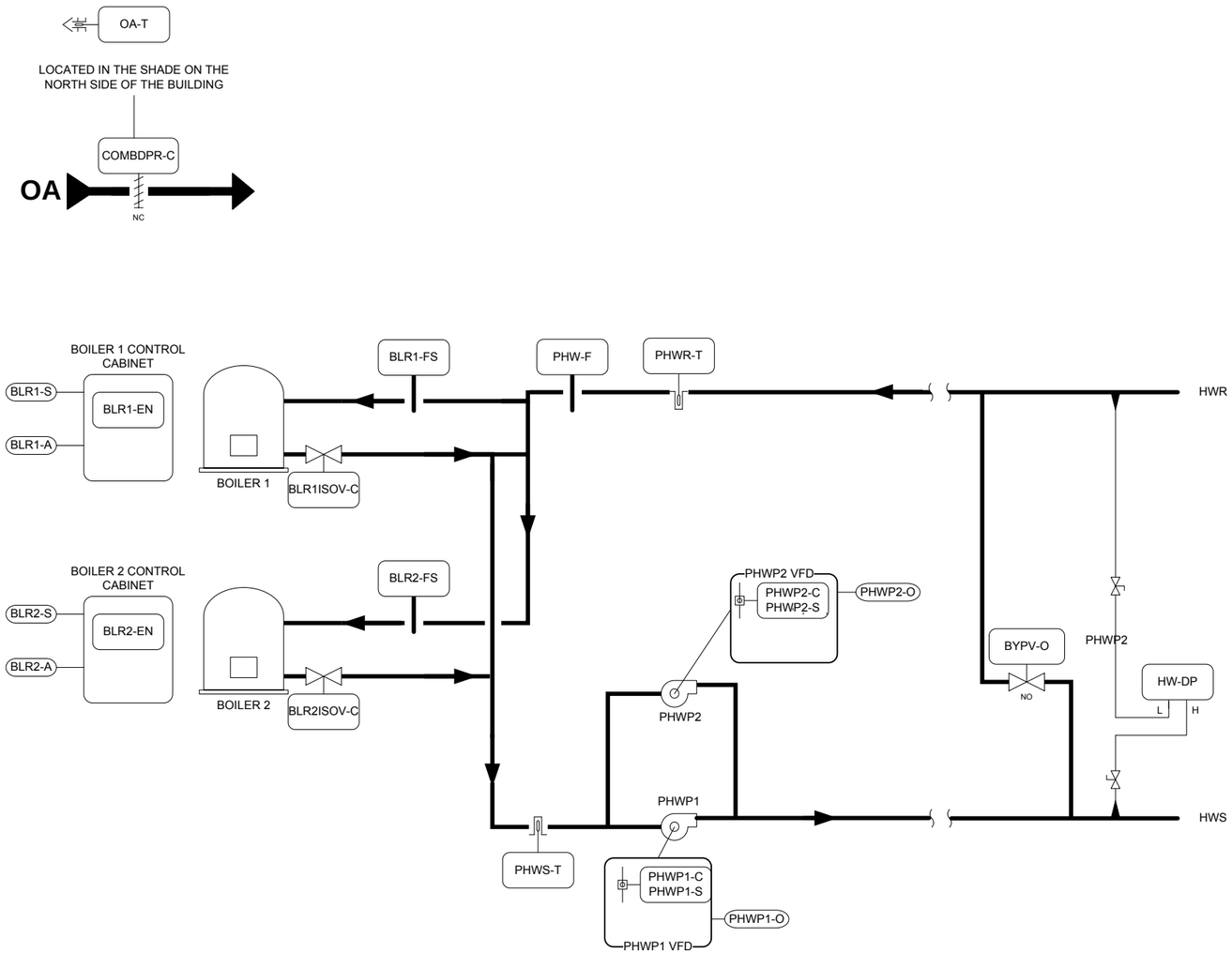
HWS FLOW LAYOUT



BILL OF MATERIALS

HWS, Central Heating
Contract Number: 6N710145

Designation	Qty	Part Number	Description
Field Devices:			
BLRx-EN	2	RIBU1C	SPDT,10A,HC=10-30 VAC/DC,W/LED
BLRx-FS	2	F261MAH-V01C	LIQUID FLOW SWITCH
BLRxISOV-C	2	**********	SEE VALVE SCHEDULE
BYPV-O	1	**********	SEE VALVE SCHEDULE
COMBDPR-C	2	M9220-BGA-3	20NM,SR,DPR ACT,ON-OFF,24 VAC
COMBDPR-Ca	1	RIBU1C	SPDT,10A,HC=10-30 VAC/DC,W/LED
HW-DP	1	DPT2302-050D	PRESS SENS,DP,0-50 PSI,VDC,0.25%
OA-T	1	TE-6313P-1	SENSOR,T-NI,0.1%,3IN OAT
PHW-F	1	F-1210	FLOW METER, DUAL TURBINE, ANA OUT
	1	F-STD-INSTL1	INSTALL KIT, STD, WELDED
PHWPx-C,-S	2	CSD-CA1G1-1	SPLT/ADJ LED 1.25A W/RLY
PHWPx-O	0	**********	BY OTHERS
PHWR-T	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
PHWS-T	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
Panel Devices:			
PANEL	1	PAKGJJ002AH0	FEC2611/IOM4711,20X24

1

SYSTEM ENABLE:

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

BOILER CONTROL / HOT WATER PUMP CONTROL:

Per J&J comment. Boiler Master Control Panel will be responsible for the boiler and hot water pump sequence in order to maintain highest efficiency of the system. JCI will monitor all readable points via ProtoNode provided by boiler manufacturer.

PRIMARY LOOP PRESSURE CONTROL:

When a pump status (PHWPx-S) is verified, the pump will modulated (PHWPx-O) to maintain the system differential pressure (HW-DP) of the system. If the primary flow (PHW-F) below the minimum flow setpoint the system bypass valve (BYPV-O) will modulate open to provide more flow thru the boilers.

COORDINATE THIS WITH BOILER MANUFACTURER

ADDITIONAL POINTS MONITORED BY THE FMS:

- Boiler n Status (BLRn-S)
- Boiler n Alarm (BLRn-A)
- Boiler n Flow Switch (BLRn-FS)
- Primary HW Supply Temperature (PHWS-T)
- Primary HW Return Temperature (PHWR-T)
- Outdoor Air Temperature (OA-T)
- Boiler Isolation Valve Status

VFD NOTE:

JCI to provide hardware device CT for start / stop / status of VFD. Speed feedback and alarm via BACnet integration of VFD drives.

IT WAS CONFIRMED ON11/22/2016 WITH BOILER MANUFACTURER THAT UNIT MOUNTED MASTER CONTROLLER WILL CONTROL THE BOILER AND HOT WATER PUMPS AS INDICATED ON 230923-3.03 (B). ALL THE POINTS LISTED ON THE POINT LIST WILL BE AVAILABLE FOR BMS FOR MONITORING AND CONTROLS.

BOILER NOTE:

Per confirming proposal, manufacturer supplied end devices are installed & wired by others.

Drawing Title: **HWS Flow Layout**

Project Title: **NYS Police HQ**

Rev. Num.	ECN	Date	Rev. By	Rev. Description
1			PT	REV PER ENGINEERS COMMENTS
			PT	SUBMITTAL

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
Mario Lucero	Will Roblin	Peter Tai				

Johnson Controls
Branch Information
Johnson Controls, Inc.
6 Aerial Way
Syosset, NY 11791
Phone: 516 822 0490
Fax: 516 822 0592

Contract Number: **6N710145**

Drawing Number: **002.001**

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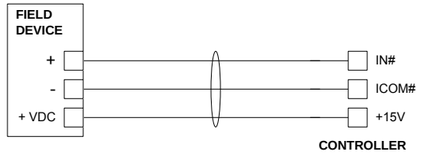
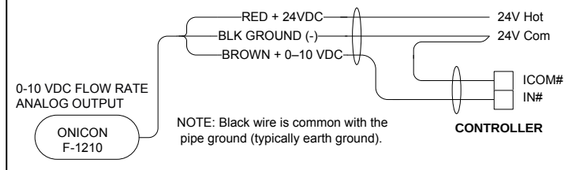
Electrician/Fitter		Point Information			Controller Information						Panel Information			Intermediate Device				Field Device				
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Termination Out	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Wiring /Tubing	Termination In	Device	Ref Detail Shape	Comment
		HWS HX			FEC 26xx																	Power to Controller
		HWS HX			FEC 26xx	MS/TP	1	4			0											BacNet FC Bus
	UI IN-1	HWS HX	CWS-T	Condenser Water Supply Temp	FEC 26xx	MS/TP	1	4		IN1, ICOM1	0		4-UI IN-1					2/22	2-Wire	TE	F131	
	UI IN-2	HWS HX	CWR-F	Condenser Water Return Flow	FEC 26xx	MS/TP	1	4		IN2, ICOM2, 24V	0		4-UI IN-2					3/22	BRN,BLK, RED	Flow Meter F-1x10 (Vdc)	F117	
	UI IN-3	HWS HX	HW-DP	Hot Water Differential Pressure	FEC 26xx	MS/TP	1	4	HW-DP	IN3, ICOM3, +15V	0		4-UI IN-3					3/22	OUT,COM,EXC	DPT2xxx (Vdc)	F102	
	UI IN-4	HWS HX	OA-T	Outdoor Air Temperature	FEC 26xx	MS/TP	1	4	OA-T	IN4, ICOM4	0		4-UI IN-4					2/22	2-Wire	TE	F131	
	UI IN-5	HWS HX	PHW-F	Primary HW Flow	FEC 26xx	MS/TP	1	4	PHW-F	IN5, ICOM5, 24V	0		4-UI IN-5					3/22	BRN,BLK, RED	Flow Meter F-1x10 (Vdc)	F117	
	UI IN-6	HWS HX	PHWR-T	Primary HW Return Temperature	FEC 26xx	MS/TP	1	4	PHWR-T	IN6, ICOM6	0		4-UI IN-6					2/22	2-Wire	TE	F131	
	BI IN-7	HWS HX	BLR1-A	Boiler 1 Alarm	FEC 26xx	MS/TP	1	4	BLR1-A	IN7, ICOM7	0		4-BI IN-7					2/22	See Boiler Panel Detail	Boiler Control Panel (NO or NC)		
	BI IN-8	HWS HX	BLR1-FS	Boiler 1 Flow Switch	FEC 26xx	MS/TP	1	4	BLR1-FS	IN8, ICOM8	0		4-BI IN-8					2/22	See wiring detail	Dry Contact	F301	
	BO OUT-1	HWS HX	BLR1-EN	Boiler 1 Enable	FEC 26xx	MS/TP	1	4	BLR1-EN	OUT1, 24V COM	0		4-BO OUT-1	2/22	COIL-,COIL+	Relay	COM, NO	2/14	See wiring detail	Boiler Control Panel (Sw Hi, EXT Src)	F1001	
	BO OUT-2	HWS HX	BLR1ISOV-C	Boiler 1 Isolation Valve Command	FEC 26xx	MS/TP	1	4	BLR1ISOV-C	OUT2, 24V COM	0		4-BO OUT-2	2/22	COIL+,COIL-	Relay	COM,NO	2/22	RED, BLK	M92xx-BGx-x (On-Off) (Sw Hi, EXT Source)	F578	
	BO OUT-3	HWS HX	BLR2-EN	Boiler 2 Enable	FEC 26xx	MS/TP	1	4	BLR2-EN	OUT3, 24V COM	0		4-BO OUT-3	2/22	COIL-,COIL+	Relay	COM, NO	2/14	See wiring detail	Boiler Control Panel (Sw Hi, EXT Src)	F1001	
	CO OUT-4	HWS HX	BYPV-O	Bypass Valve Output	FEC 26xx	MS/TP	1	4	BYPV-O	OUT4, OCOM4,24VAC ,C	0		4-CO OUT-4					2/22 / 2/18	Gray, Black, Red	VA9310-HGA-2 (Vdc) (Ext Source)	F268	
	CO OUT-5	HWS HX	PHWP1-O	Primary HW Pump 1 Output	FEC 26xx	MS/TP	1	4	PHWP1-O	OUT5, OCOM5	0		4-CO OUT-5					2/22	See VFD Detail	VFD Speed Control (Vdc)		
	CO OUT-6	HWS HX	PHWP2-O	Primary HW Pump 2 Output	FEC 26xx	MS/TP	1	4	PHWP2-O	OUT6, OCOM6	0		4-CO OUT-6					2/22	See VFD Detail	VFD Speed Control (Vdc)		
	CO OUT-7	HWS HX	BLR2ISOV-C	Boiler 2 Isolation Valve Command	FEC 26xx	MS/TP	1	4	BLR2ISOV-C	OUT7, 24V COM	0		4-CO OUT-7	2/22	COIL+,COIL-	Relay	COM,NO	2/22	RED, BLK	M92xx-BGx-x (On-Off) (Sw Hi, EXT Source)	F978	
	AO OUT-8	HWS HX	HXMV-O	HX Mixing Valve Output	FEC 26xx	MS/TP	1	4		OUT8, OCOM8,24VAC, C	0		4-AO OUT-8					2/22 / 2/18	GRY, BLK/BLK, RED	M92xx-GGx-x (Vdc) (Ext Source)	F267	
	AO OUT-9	HWS HX			FEC 26xx	MS/TP	1	4			0		4-AO OUT-9									
		HWS HX			IOM 4710																	Power to Controller
		HWS HX			IOM 4710	SA Bus	1	4			0											BacNet SA Bus
	UI IN-1	HWS HX	PHWS-T	Primary HW Supply Temperature	IOM 4710	SA Bus	1	4	PHWS-T	IN1, ICOM1	0		4-UI IN-1					2/22	2-Wire	TE	F131	
	UI IN-2	HWS HX	BLR2-FS	Boiler 2 Flow Switch	IOM 4710	SA Bus	1	4	BLR2-FS	IN2, ICOM2	0		4-UI IN-2					2/22	See wiring detail	Dry Contact	F301	
	UI IN-3	HWS HX	BLR2-S	Boiler 2 Status	IOM 4710	SA Bus	1	4	BLR2-S	IN3, ICOM3	0		4-UI IN-3					2/22	See Boiler Panel Detail	Boiler Control Panel (NO or NC)		
	UI IN-4	HWS HX	PHWP1-S	Primary HW Pump 1 Status	IOM 4710	SA Bus	1	4	PHWP1-S	IN4, ICOM4	0		4-UI IN-4	2/22	OUT, COM	Current Relay	Motor Lead	Motor Lead	See wiring detail	Motor Status (Contact)	F301	
	UI IN-5	HWS HX	PHWP2-S	Primary HW Pump 2 Status	IOM 4710	SA Bus	1	4	PHWP2-S	IN5, ICOM5	0		4-UI IN-5	2/22	OUT, COM	Current Relay	Motor Lead	Motor Lead	See wiring detail	Motor Status (Contact)	F301	
	UI IN-6	HWS HX			IOM 4710	SA Bus	1	4			0		4-UI IN-6									
	BI IN-7	HWS HX	BLR1-S	Boiler 1 Status	IOM 4710	SA Bus	1	4	BLR1-S	IN7, ICOM7	0		4-BI IN-7					2/22	See Boiler Panel Detail	Boiler Control Panel (NO or NC)		
	BI IN-8	HWS HX	BLR2-A	Boiler 2 Alarm	IOM 4710	SA Bus	1	4	BLR2-A	IN8, ICOM8	0		4-BI IN-8					2/22	See Boiler Panel Detail	Boiler Control Panel (NO or NC)		
	BO OUT-1	HWS HX	COMBDPR-C	Combustion Damper Command	IOM 4710	SA Bus	1	4	COMBDPR-C	OUT1, 24V COM	0		4-BO OUT-1	2/22	COIL+,COIL-	Relay	COM,NO	2/22	RED, BLK	M92xx-BGx-x (On-Off) (Sw Hi, EXT Source)	F578	
	BO OUT-2	HWS HX	PHWP1-C	Primary HW Pump 1 Command	IOM 4710	SA Bus	1	4	PHWP1-C	OUT2, 24V COM	0		4-BO OUT-2	2/22	COIL-,COIL+	Relay	COM, NO	2/14	See wiring detail	Starter (w/o Safeties) (Sw Hi, EXT)	F1015	
	BO OUT-3	HWS HX	PHWP2-C	Primary HW Pump 2 Command	IOM 4710	SA Bus	1	4	PHWP2-C	OUT3, 24V COM	0		4-BO OUT-3	2/22	COIL-,COIL+	Relay	COM, NO	2/14	See wiring detail	Starter (w/o Safeties) (Sw Hi, EXT)	F1015	
	CO OUT-4	HWS HX	HXISOV-C	HX Isolation Valve Command	IOM 4710	SA Bus	1	4		OUT4, 24V COM	0		4-CO OUT-4	2/22	COIL+,COIL-	Relay	COM,NO	2/22	RED, BLK	M92xx-BGx-x (On-Off) (Sw Hi, EXT Source)	F978	
	CO OUT-5	HWS HX			IOM 4710	SA Bus	1	4			0		4-CO OUT-5									
	CO OUT-6	HWS HX			IOM 4710	SA Bus	1	4			0		4-CO OUT-6									
	CO OUT-7	HWS HX			IOM 4710	SA Bus	1	4			0		4-CO OUT-7									
	AO OUT-8	HWS HX			IOM 4710	SA Bus	1	4			0		4-AO OUT-8									
	AO OUT-9	HWS HX			IOM 4710	SA Bus	1	4			0		4-AO OUT-9									

NOTE: Highlighted points are related to HX system.

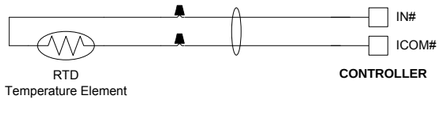
DETAIL F102 VOLTAGE INPUT - INTERNAL SOURCE



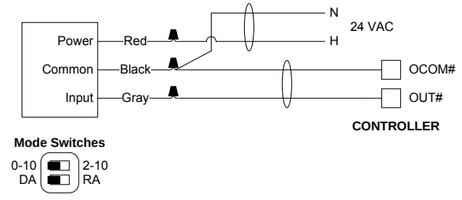
DETAIL F117 ONICON Model F1x10 Flow Sensor With 0-10 VDC OUTPUT



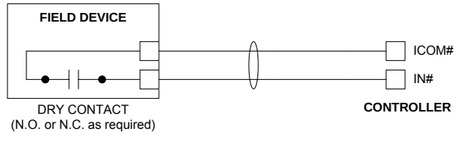
DETAIL F131 TEMPERATURE SENSOR INPUT



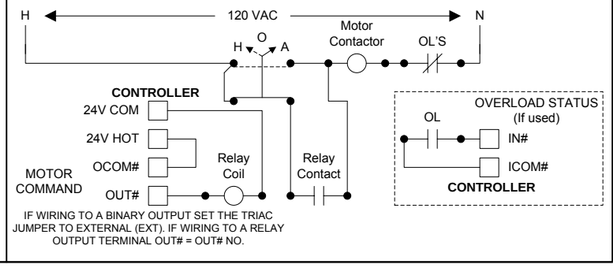
DETAIL F268 0-10VDC OUTPUT to M9310-HGA-2 AND VA9310-HGA-2



DETAIL F301 BINARY INPUT (DRY CONTACT)



DETAIL F1015 Starter without Safeties Wiring



Drawing Title
HWS Point Schedule & Wiring Details

Project Title
NYS Police HQ

Rev. Num.	ECN	Date	Rev. By	Rev. Description
			PT	SUBMITTAL

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
Mario Lucero	Will Roblin	Peter Tai				

Johnson Controls

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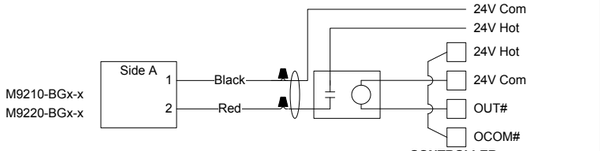
Contract Number **6N710145**

Drawing Number **002.002**

C:\project\6N710145\Drawings\HWS Point Schedule & Wiring Details.vsd

DETAIL F578

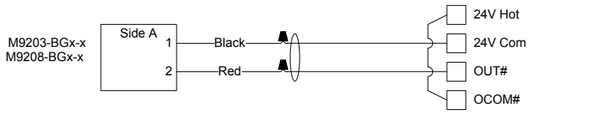
ON-OFF CONTROL to M92xx-BGx-x and VA92xx-BGx-x (Switch High, EXT Sourced)



CONTROLLER

SET TRIAC JUMPER TO EXTERNALLY SOURCED (EXT) FOR ASSOCIATED BINARY OUTPUT(S).

To change the spring return direction to CW, mount the actuator to the damper shaft so that Side B of the actuator is away from the damper. With power applied, the actuator now drives CCW from the 0° position, and spring returns CW.

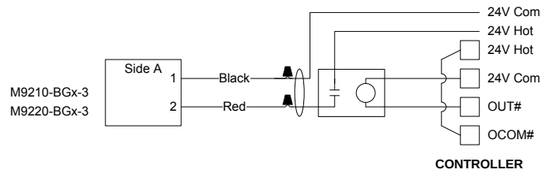


CONTROLLER

SET TRIAC JUMPER TO EXTERNALLY SOURCED (EXT) FOR ASSOCIATED BINARY OUTPUT(S).

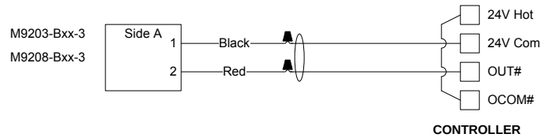
DETAIL F978

ON-OFF CONTROL to M92xx-BGx-x and VA92xx-BGx-x (Switch High, EXT Sourced)



CONTROLLER

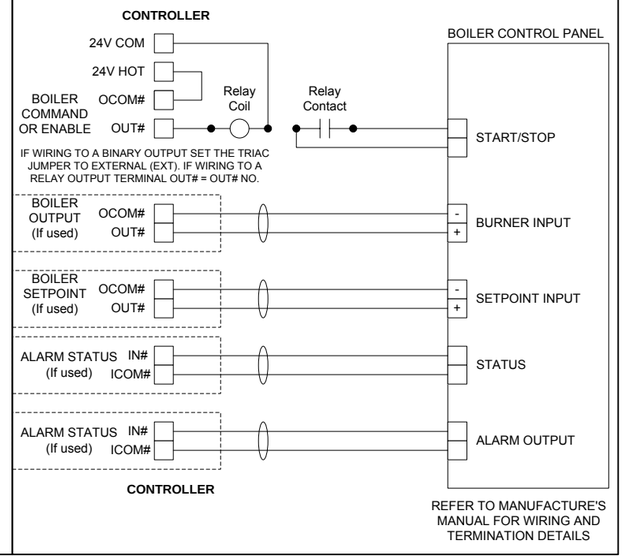
To change the spring return direction to CW, mount the actuator to the damper shaft so that Side B of the actuator is away from the damper. With power applied, the actuator now drives CCW from the 0° position, and spring returns CW.



CONTROLLER

DETAIL F1001

Boiler Control Wiring Detail



Drawing Title: **HWS Wiring Details**										
				PT	SUBMITTAL					
	Rev. Num.	ECN	Date	Rev. By	Rev. Description					
Project Title: **NYS Police HQ**	Account Executive: Mario Lucero		Project Owner: Will Roblin		System Designer: Peter Tai		Drawn By	Drawing Date	Approved By	Approval Date

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Contract Number: **6N710145**

Drawing Number: **002.003**

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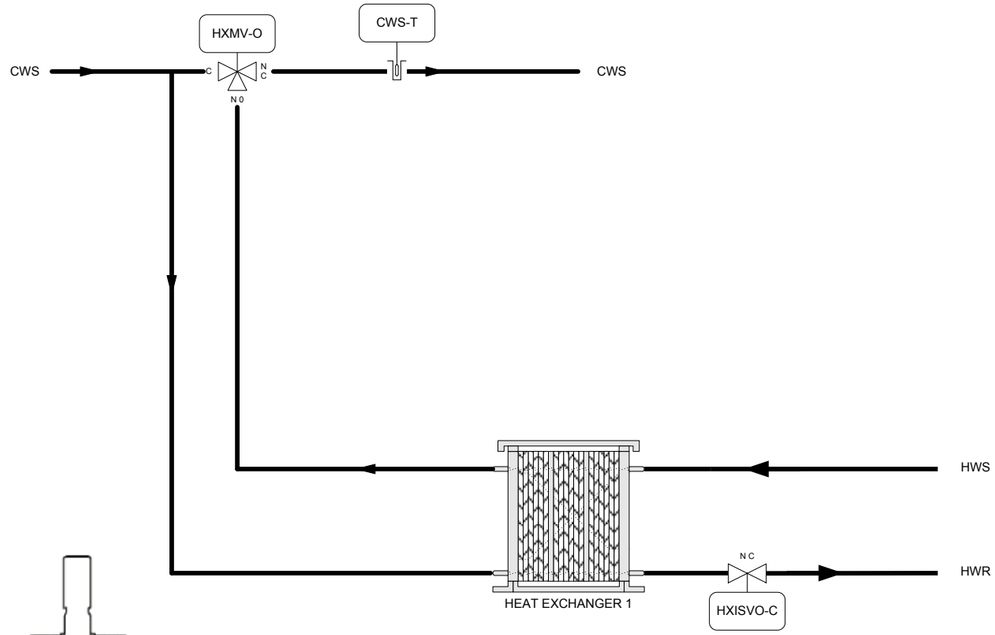
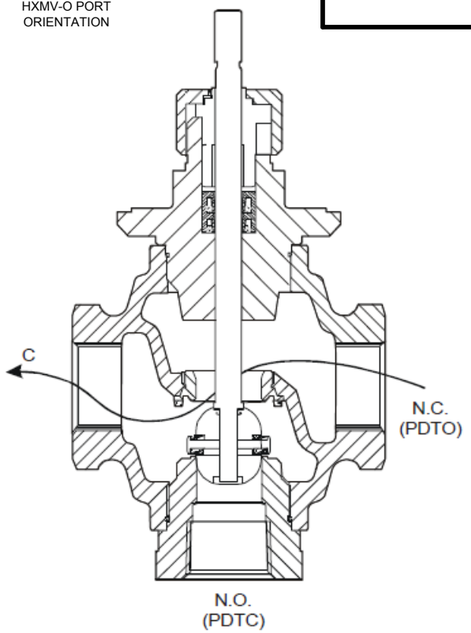
HEAT EXCHANGER FLOW LAYOUT



HXMV-O PORT ORIENTATION



Stem Down Position
With the stem in the down position, the inline port (N.C.) is open to the Common port (C).

BILL OF MATERIALS

HX,
Contract Number: 6N710145

Designation	Qty	Part Number	Description
Field Devices:			
CWS-T	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
HXISOV-C	1	VG1245FT+958BGC	2" 2W BALL VALVE 73.7CV
HXMV-O	1	VG2831TM+94NGGC	2-1/2", 3W,FLANGED, 54CV,

HEAT EXCHANGER CONTROL:

This system consists of one hot water heat exchanger. It is normally in stand-by mode.

In stand-by mode the 3-way valve (HXMV-O) will be closed to the heat exchanger and the 2-way valve (HXISOV-C) in the hot water return will be closed.

1

When the condenser supply water temperature (CWS-T) drops to 30*F (adj.) the 2 way valve (HXISOV-C) will open and 3-way mixing valve (HXMV-O) will modulate to maintain the condenser supply temperature (CWS-T) delivered to the building.

When the condenser supply water temperature (CWS-T) rises to above 40*F (adj.) the system will return to stand-by mode.

ADDITIONAL POINTS MONITORED BY THE FMS:

- Condenser water return flow (CWR-F)
- Primary hot water return flow (PHWR-F)
- Condenser water return temperature (CWR-T)

Note: Some points will reside on other controllers, all will be visible from the BMS system.

Drawing Title: **HX Flow Layout**

Project Title: **NYS Police HQ**

Rev. Num.	ECN	Date	Rev. By	Rev. Description
1			PT	REV PER ENGINEERS COMMENTS
			PT	SUBMITTAL

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
Mario Lucero	Will Roblin	Peter Tai				

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Contract Number: **6N710145**

Drawing Number: **003.001**

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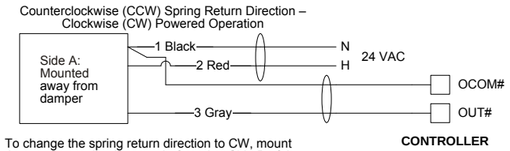
Electrician/Fitter		Point Information			Controller Information						Panel Information			Intermediate Device				Field Device				
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Termination Out	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Wiring /Tubing	Termination In	Device	Ref Detail Shape	Comment
		HWS HX			FEC 26xx																	Power to Controller
		HWS HX			FEC 26xx	MS/TP	1	4			0											BacNet FC Bus
	UI IN-1	HWS HX	CWS-T	Condenser Water Supply Temp	FEC 26xx	MS/TP	1	4		IN1, ICOM1	0		4-UI IN-1					2/22	2-Wire	TE	F131	
	UI IN-2	HWS HX	CWR-F	Condenser Water Return Flow	FEC 26xx	MS/TP	1	4		IN2, ICOM2, 24V	0		4-UI IN-2					3/22	BRN,BLK, RED	Flow Meter F-1x10 (Vdc)	F117	
	UI IN-3	HWS HX	HW-DP	Hot Water Differential Pressure	FEC 26xx	MS/TP	1	4	HW-DP	IN3, ICOM3, +15V	0		4-UI IN-3					3/22	OUT,COM,EXC	DPT2xxx (Vdc)	F102	
	UI IN-4	HWS HX	OA-T	Outdoor Air Temperature	FEC 26xx	MS/TP	1	4	OA-T	IN4, ICOM4	0		4-UI IN-4					2/22	2-Wire	TE	F131	
	UI IN-5	HWS HX	PHW-F	Primary HW Flow	FEC 26xx	MS/TP	1	4	PHW-F	IN5, ICOM5, 24V	0		4-UI IN-5					3/22	BRN,BLK, RED	Flow Meter F-1x10 (Vdc)	F117	
	UI IN-6	HWS HX	PHWR-T	Primary HW Return Temperature	FEC 26xx	MS/TP	1	4	PHWR-T	IN6, ICOM6	0		4-UI IN-6					2/22	2-Wire	TE	F131	
	BI IN-7	HWS HX	BLR1-A	Boiler 1 Alarm	FEC 26xx	MS/TP	1	4	BLR1-A	IN7, ICOM7	0		4-BI IN-7					2/22	See Boiler Panel Detail	Boiler Control Panel (NO or NC)		
	BI IN-8	HWS HX	BLR1-FS	Boiler 1 Flow Switch	FEC 26xx	MS/TP	1	4	BLR1-FS	IN8, ICOM8	0		4-BI IN-8					2/22	See wiring detail	Dry Contact	F301	
	BO OUT-1	HWS HX	BLR1-EN	Boiler 1 Enable	FEC 26xx	MS/TP	1	4	BLR1-EN	OUT1, 24V COM	0		4-BO OUT-1	2/22	COIL-,COIL+	Relay	COM, NO	2/14	See wiring detail	Boiler Control Panel (Sw Hi, EXT Src)	F1001	
	BO OUT-2	HWS HX	BLR1ISOV-C	Boiler 1 Isolation Valve Command	FEC 26xx	MS/TP	1	4	BLR1ISOV-C	OUT2, 24V COM	0		4-BO OUT-2	2/22	COIL+,COIL-	Relay	COM,NO	2/22	RED, BLK	M92xx-BGx-x (On-Off) (Sw Hi, EXT Source)	F578	
	BO OUT-3	HWS HX	BLR2-EN	Boiler 2 Enable	FEC 26xx	MS/TP	1	4	BLR2-EN	OUT3, 24V COM	0		4-BO OUT-3	2/22	COIL-,COIL+	Relay	COM, NO	2/14	See wiring detail	Boiler Control Panel (Sw Hi, EXT Src)	F1001	
	CO OUT-4	HWS HX	BYPV-O	Bypass Valve Output	FEC 26xx	MS/TP	1	4	BYPV-O	OUT4, OCOM4,24VAC ,C	0		4-CO OUT-4					2/22 / 2/18	Gray, Black, Red	VA9310-HGA-2 (Vdc) (Ext Source)	F268	
	CO OUT-5	HWS HX	PHWP1-O	Primary HW Pump 1 Output	FEC 26xx	MS/TP	1	4	PHWP1-O	OUT5, OCOM5	0		4-CO OUT-5					2/22	See VFD Detail	VFD Speed Control (Vdc)		
	CO OUT-6	HWS HX	PHWP2-O	Primary HW Pump 2 Output	FEC 26xx	MS/TP	1	4	PHWP2-O	OUT6, OCOM6	0		4-CO OUT-6					2/22	See VFD Detail	VFD Speed Control (Vdc)		
	CO OUT-7	HWS HX	BLR2ISOV-C	Boiler 2 Isolation Valve Command	FEC 26xx	MS/TP	1	4	BLR2ISOV-C	OUT7, 24V COM	0		4-CO OUT-7	2/22	COIL+,COIL-	Relay	COM,NO	2/22	RED, BLK	M92xx-BGx-x (On-Off) (Sw Hi, EXT Source)	F978	
	AO OUT-8	HWS HX	HXMV-O	HX Mixing Valve Output	FEC 26xx	MS/TP	1	4		OUT8, OCOM8,24VAC, C	0		4-AO OUT-8					2/22 / 2/18	GRY, BLK/BLK, RED	M92xx-GGx-x (Vdc) (Ext Source)	F267	
	AO OUT-9	HWS HX			FEC 26xx	MS/TP	1	4			0		4-AO OUT-9									
		HWS HX			IOM 4710																	Power to Controller
		HWS HX			IOM 4710	SA Bus	1	4			0											BacNet SA Bus
	UI IN-1	HWS HX	PHWS-T	Primary HW Supply Temperature	IOM 4710	SA Bus	1	4	PHWS-T	IN1, ICOM1	0		4-UI IN-1					2/22	2-Wire	TE	F131	
	UI IN-2	HWS HX	BLR2-FS	Boiler 2 Flow Switch	IOM 4710	SA Bus	1	4	BLR2-FS	IN2, ICOM2	0		4-UI IN-2					2/22	See wiring detail	Dry Contact	F301	
	UI IN-3	HWS HX	BLR2-S	Boiler 2 Status	IOM 4710	SA Bus	1	4	BLR2-S	IN3, ICOM3	0		4-UI IN-3					2/22	See Boiler Panel Detail	Boiler Control Panel (NO or NC)		
	UI IN-4	HWS HX	PHWP1-S	Primary HW Pump 1 Status	IOM 4710	SA Bus	1	4	PHWP1-S	IN4, ICOM4	0		4-UI IN-4	2/22	OUT, COM	Current Relay	Motor Lead	Motor Lead	See wiring detail	Motor Status (Contact)	F301	
	UI IN-5	HWS HX	PHWP2-S	Primary HW Pump 2 Status	IOM 4710	SA Bus	1	4	PHWP2-S	IN5, ICOM5	0		4-UI IN-5	2/22	OUT, COM	Current Relay	Motor Lead	Motor Lead	See wiring detail	Motor Status (Contact)	F301	
	UI IN-6	HWS HX			IOM 4710	SA Bus	1	4			0		4-UI IN-6									
	BI IN-7	HWS HX	BLR1-S	Boiler 1 Status	IOM 4710	SA Bus	1	4	BLR1-S	IN7, ICOM7	0		4-BI IN-7					2/22	See Boiler Panel Detail	Boiler Control Panel (NO or NC)		
	BI IN-8	HWS HX	BLR2-A	Boiler 2 Alarm	IOM 4710	SA Bus	1	4	BLR2-A	IN8, ICOM8	0		4-BI IN-8					2/22	See Boiler Panel Detail	Boiler Control Panel (NO or NC)		
	BO OUT-1	HWS HX	COMBDPR-C	Combustion Damper Command	IOM 4710	SA Bus	1	4	COMBDPR-C	OUT1, 24V COM	0		4-BO OUT-1	2/22	COIL+,COIL-	Relay	COM,NO	2/22	RED, BLK	M92xx-BGx-x (On-Off) (Sw Hi, EXT Source)	F578	
	BO OUT-2	HWS HX	PHWP1-C	Primary HW Pump 1 Command	IOM 4710	SA Bus	1	4	PHWP1-C	OUT2, 24V COM	0		4-BO OUT-2	2/22	COIL-,COIL+	Relay	COM, NO	2/14	See wiring detail	Starter (w/o Safeties) (Sw Hi, EXT)	F1015	
	BO OUT-3	HWS HX	PHWP2-C	Primary HW Pump 2 Command	IOM 4710	SA Bus	1	4	PHWP2-C	OUT3, 24V COM	0		4-BO OUT-3	2/22	COIL-,COIL+	Relay	COM, NO	2/14	See wiring detail	Starter (w/o Safeties) (Sw Hi, EXT)	F1015	
	CO OUT-4	HWS HX	HXISOV-C	HX Isolation Valve Command	IOM 4710	SA Bus	1	4		OUT4, 24V COM	0		4-CO OUT-4	2/22	COIL+,COIL-	Relay	COM,NO	2/22	RED, BLK	M92xx-BGx-x (On-Off) (Sw Hi, EXT Source)	F978	
	CO OUT-5	HWS HX			IOM 4710	SA Bus	1	4			0		4-CO OUT-5									
	CO OUT-6	HWS HX			IOM 4710	SA Bus	1	4			0		4-CO OUT-6									
	CO OUT-7	HWS HX			IOM 4710	SA Bus	1	4			0		4-CO OUT-7									
	AO OUT-8	HWS HX			IOM 4710	SA Bus	1	4			0		4-AO OUT-8									
	AO OUT-9	HWS HX			IOM 4710	SA Bus	1	4			0		4-AO OUT-9									

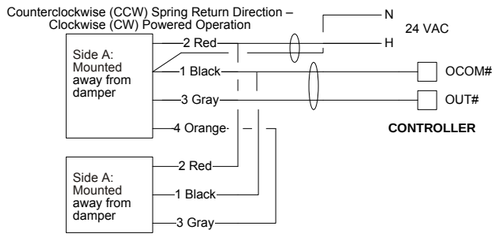
NOTE: Highlighted points are related to HX system. Points are mapped to the HWS Panel.

DETAIL F267 — 0-10VDC OUTPUT to M92xx-GGx and HGx or VA92xx-GGx and HGx

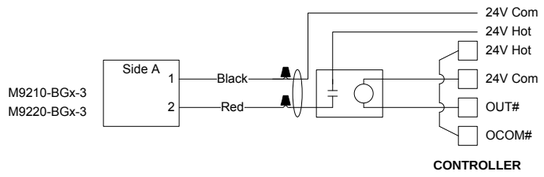


To change the spring return direction to CW, mount the actuator to the damper shaft so that Side B of the actuator is away from the damper. With power applied, the actuator now drives CCW from the 0° position, and spring returns CW.

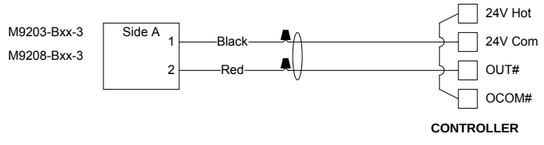
Master-Slave Application



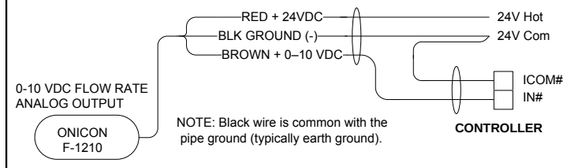
DETAIL F978 — ON-OFF CONTROL to M92xx-BGx-x and VA92xx-BGx-x (Switch High, EXT Sourced)



To change the spring return direction to CW, mount the actuator to the damper shaft so that Side B of the actuator is away from the damper. With power applied, the actuator now drives CCW from the 0° position, and spring returns CW.

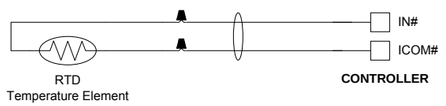


DETAIL F117 — ONICON Model F1x10 Flow Sensor With 0-10 VDC OUTPUT



NOTE: Black wire is common with the pipe ground (typically earth ground).

DETAIL F131 — TEMPERATURE SENSOR INPUT



Drawing Title: **HX Point Schedule & Wiring Details**						
					PT	SUBMITTAL
Project Title: **NYS Police HQ**	Rev. Num.	ECN	Date	Rev. By	Rev. Description	
	Account Executive: Mario Lucero	Project Owner: Will Roblin	System Designer: Peter Tai	Drawn By	Drawing Date	Approved By / Approval Date

Johnson Controls

Branch Information
Johnson Controls, Inc.
6 Aerial Way
Syosset, NY 11791
Phone: 516 822 0490
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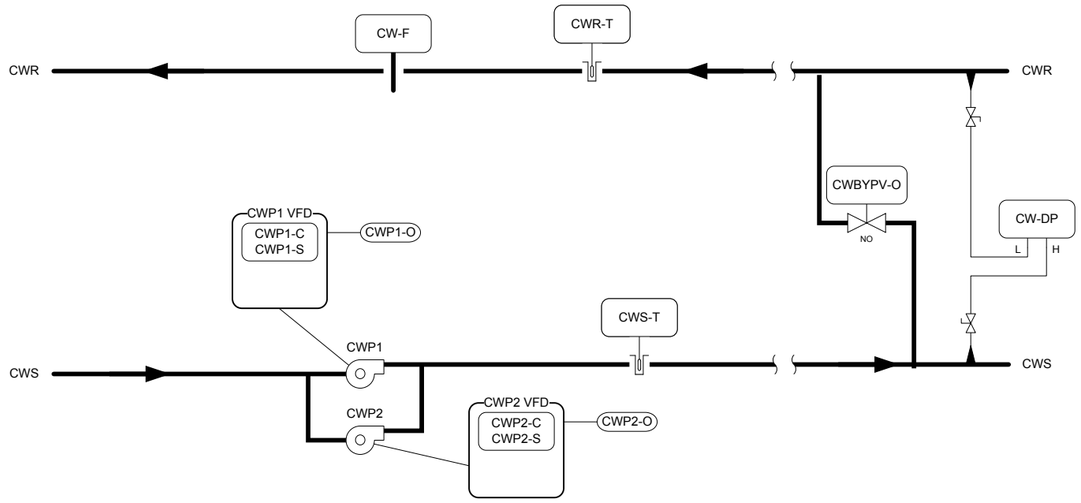
Contract Number: **6N710145**

Drawing Number: **003.002**

C:\project\6N710145\Drawings\HX Point Schedule & Wiring Details.vsd

CWS FLOW LAYOUT



BILL OF MATERIALS

GPP CWP, Central Heating
Contract Number: 6N710145

Designation	Qty	Part Number	Description
Field Devices:			
CW-DP	1	DPT2302-050D-V	PRESS SENS,DP,0-50 PSI,VDC,0.25%,3-VLV
CW-F	1	F-1210	FLOW METER, DUAL TURBINE, ANA OUT
	1	F-STD-INSTL1	INSTALL KIT, STD, WELDED
CWBYPV-O	1	VG1241EP+910HGC	2W 1-1/2 NPT CV19 2SPDT
CWPx VFD	0	**********	VFD BY OTHERS
CWPx-C,-S	2	CSD-CA1G1-1	SPLT/ADJ LED 1.25A W/RLY
CWR-T	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
CWS-T	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
GFWS-F	1	F-1210	FLOW METER, DUAL TURBINE, ANA OUT
GPP-1-C,-S	1	CSD-CA1G1-1	SPLT/ADJ LED 1.25A W/RLY
GPP-1-O	0	**********	VFD BY OTHERS
GPP-2-C,-S	1	CSD-CA1G1-1	SPLT/ADJ LED 1.25A W/RLY
GPP-2-O	0	**********	VFD BY OTHERS
GPWR-T	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
GPWS-T	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
Panel Devices:			
PANEL	1	PAKGJJ002AH0	FEC2611/IOM4711,20X24

CONDENSER WATER LOOP PUMPING:

The lead condenser water pump, chosen by the BMS (CWPx-C) will be started when the system is enabled. The lead pump variable frequency drive (CWPx-O) will be modulated to maintain loop pressure (CW-DP) (adj.). A bypass valve (BYPV-O) will be modulated to maintain differential pressure setpoint (CWDP-SP) in the condenser water loop when the pump (CWPx-O) output is commanded to minimum speed. When lead pump cannot satisfy the differential pressure setpoint, it will shut down and the lag pump will start. An alarm signal will be generated. The lead and lag pumps will be rotated on a weekly runtime basis.

ADDITIONAL POINTS MONITORED BY THE FMS:

- Condenser Water Supply Temperature (CWS-T)
- Condenser Water Return Temperature (CWR-T)
- Condeser Water Flow (CW-F)

VFD NOTE:

JCI to provide hardware device CT for start / stop / status of VFD. Speed feedback and alarm via BACnet integration of VFD drives.

Drawing Title: **CWS Flow Layout**

Project Title: **NYS Police HQ**

Rev. Num.	ECN	Date	Rev. By	Rev. Description
1			PT	REV PER ENGINEERS COMMENTS
			PT	SUBMITTAL

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
Mario Lucero	Will Roblin	Peter Tai				

Johnson Controls

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Contract Number: **6N710145**

Drawing Number: **004.001**

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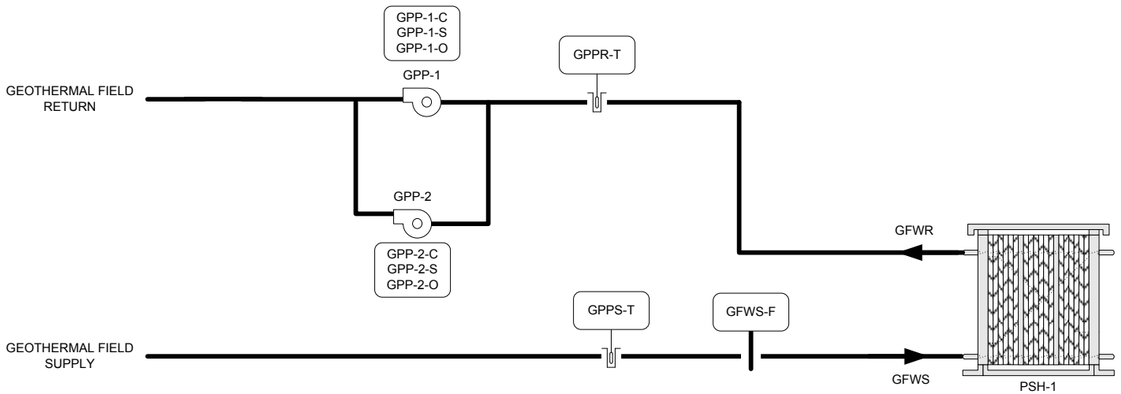
GPP FLOW LAYOUT



BILL OF MATERIALS

GPP CWP, Central Heating
Contract Number: 6N710145

Designation	Qty	Part Number	Description
Field Devices:			
CW-DP	1	DPT2302-050D-V	PRESS SENS,DP,0-50 PSI,VDC,0.25%,3-VLV
CW-F	1	F-1210	FLOW METER, DUAL TURBINE, ANA OUT
	1	F-STD-INSTL1	INSTALL KIT, STD, WELDED
CWBYPV-O	1	VG1241EP+910HGC	2W 1-1/2 NPT CV19 2SPDT
CWPx VFD	0	**********	VFD BY OTHERS
CWPx-C,-S	2	CSD-CA1G1-1	SPLT/ADJ LED 1.25A W/RLY
CWR-T	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
CWS-T	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
GFWS-F	1	F-1210	FLOW METER, DUAL TURBINE, ANA OUT
GPP-1-C,-S	1	CSD-CA1G1-1	SPLT/ADJ LED 1.25A W/RLY
GPP-1-O	0	**********	VFD BY OTHERS
GPP-2-C,-S	1	CSD-CA1G1-1	SPLT/ADJ LED 1.25A W/RLY
GPP-2-O	0	**********	VFD BY OTHERS
GPWR-T	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
GPWS-T	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
Panel Devices:			
PANEL	1	PAKGJJ002AH0	FEC2611/IOM4711,20X24

GEOTHERMAL LOOP CONTROL:

The lead geothermal water pump, chosen by the BMS (GPP-x-C) will be started when the system is enabled. BMS will enable the pump with the lowest total runtime. The lead pump variable frequency drive (GPP-x-O) will be modulated to maintain the geothermal return water temperature (GPPR-T). If the lead pump cannot maintain the temperature, it will shut down and the lag pump will start. If the pump status (GPP-x-S) does not match the command (GPP-x-C), an alarm will be generated and the pump will be stopped. Upon loss of status (GPP-x-S), the pump (GPP-x-C) will restart after the system reset (SYS-RESET) is manually activated.

VFD NOTE:

JCI to provide hardware device CT for start / stop / status of VFD. Speed feedback and alarm via BACnet integration of VFD drives.

Drawing Title: **GPP Flow Layout**

Project Title: **NYS Police HQ**

Rev. Num.	ECN	Date	Rev. By	Rev. Description
			PT	SUBMITTAL

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
Mario Lucero	Will Roblin	Peter Tai				

Johnson Controls

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Contract Number: **6N710145**

Drawing Number: **004.002**

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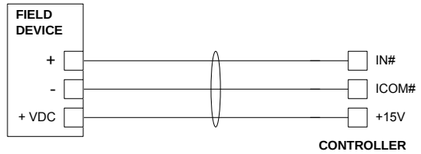
Electrician/Fitter		Point Information			Controller Information						Panel Information			Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Termination Out	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		GPP CWP			FEC 26xx																		Power to Controller
		GPP CWP			FEC 26xx	MS/TP	1	4			0												BacNet FC Bus
	UI IN-1	GPP CWP	CW-DP	Condenser Water Differential Pressure	FEC 26xx	MS/TP	1	4	CW-DP	IN1, ICOM1, +15V	0		4-UI IN-1					3/22	OUT,COM,EXC	DPT2xxx (Vdc)		F102	CWS
	UI IN-2	GPP CWP	CWR-F	Condenser Water Return Flow	FEC 26xx	MS/TP	1	4	CWR-F	IN2, ICOM2, 24V	0		4-UI IN-2					3/22	BRN,BLK, RED	Flow Meter F-1x10 (Vdc)		F117	CWS
	UI IN-3	GPP CWP	CWR-T	Condenser Water Return Temperature	FEC 26xx	MS/TP	1	4	CWR-T	IN3, ICOM3	0		4-UI IN-3					2/22	2-Wire	TE		F131	CWS
	UI IN-4	GPP CWP	CWS-T	Condenser Water Supply Temperature	FEC 26xx	MS/TP	1	4	CWS-T	IN4, ICOM4	0		4-UI IN-4					2/22	2-Wire	TE		F131	CWS
	UI IN-5	GPP CWP			FEC 26xx	MS/TP	1	4	ZN1-DP		0		4-UI IN-5										
	UI IN-6	GPP CWP	GFWS-F	Geothermal Supply Flow	FEC 26xx	MS/TP	1	4	GFWS-F	IN6, ICOM6, 24V	0		4-UI IN-6					3/22	BRN,BLK, RED	Flow Meter F-1x10 (Vdc)		F117	GWS
	BI IN-7	GPP CWP			FEC 26xx	MS/TP	1	4			0		4-BI IN-7										
	BI IN-8	GPP CWP			FEC 26xx	MS/TP	1	4			0		4-BI IN-8										
	BO OUT-1	GPP CWP			FEC 26xx	MS/TP	1	4			0		4-BO OUT-1										
	BO OUT-2	GPP CWP			FEC 26xx	MS/TP	1	4			0		4-BO OUT-2										
	BO OUT-3	GPP CWP			FEC 26xx	MS/TP	1	4			0		4-BO OUT-3										
	CO OUT-4	GPP CWP	CWP2-O	Condenser Water Pump 2 Output	FEC 26xx	MS/TP	1	4	CWP2-O	OUT4, OCOM4	0		4-CO OUT-4					2/22	See VFD Detail	VFD Speed Control (Vdc)			CWS
	CO OUT-5	GPP CWP	GPP-1-O	GPP-1 Pump Output	FEC 26xx	MS/TP	1	4	GPP-1-O	OUT5, OCOM5	0		4-CO OUT-5					2/22	See VFD Detail	VFD Speed Control (Vdc)			GWS
	CO OUT-6	GPP CWP	GPP-2-O	GPP-2 Pump Output	FEC 26xx	MS/TP	1	4	GPP-2-O	OUT6, OCOM6	0		4-CO OUT-6					2/22	See VFD Detail	VFD Speed Control (Vdc)			GWS
	CO OUT-7	GPP CWP			FEC 26xx	MS/TP	1	4			0		4-CO OUT-7										
	AO OUT-8	GPP CWP	CWBYPV-O	Condenser Water Bypass Valve Output	FEC 26xx	MS/TP	1	4	CWBYPV-O	OUT8, OCOM8,24V/	0		4-AO OUT-8					2/22 / 2/18	Gray, Black, Red	VA9310-HGA-2 (Vdc) (Ext Source)		F268	CWS
	AO OUT-9	GPP CWP	CWP1-O	Condenser Water Pump 1 Output	FEC 26xx	MS/TP	1	4	CWP1-O	OUT9, OCOM9	0		4-AO OUT-9					2/22	See VFD Detail	VFD Speed Control (Vdc)			CWS
		GPP CWP			IOM 4710																		Power to Controller
		GPP CWP			IOM 4710	SA Bus	1	4			0												BacNet SA Bus
	UI IN-1	GPP CWP	GFWR-T	Ground Water Return Temperature	IOM 4710	SA Bus	1	4	GFWR-T	IN1, ICOM1	0		4-UI IN-1					2/22	2-Wire	TE		F131	GWS
	UI IN-2	GPP CWP	GFWS-T	Ground Water Supply Temperature	IOM 4710	SA Bus	1	4	GFWS-T	IN2, ICOM2	0		4-UI IN-2					2/22	2-Wire	TE		F131	GWS
	UI IN-3	GPP CWP	GPP-1-S	GPP-1 Pump Status	IOM 4710	SA Bus	1	4	GPP-1-S	IN3, ICOM3	0		4-UI IN-3	2/22	OUT, COM	Current Relay	Motor Lead	Motor Lead	See wiring detail	Motor Status (Contact)		F301	GWS
	UI IN-4	GPP CWP	GPP-2-S	GPP-2 Status	IOM 4710	SA Bus	1	4	GPP-2-S	IN4, ICOM4	0		4-UI IN-4	2/22	OUT, COM	Current Relay	Motor Lead	Motor Lead	See wiring detail	Motor Status (Contact)		F301	GWS
	UI IN-5	GPP CWP			IOM 4710	SA Bus	1	4			0		4-UI IN-5										
	UI IN-6	GPP CWP			IOM 4710	SA Bus	1	4			0		4-UI IN-6										
	BI IN-7	GPP CWP	CWP1-S	Condenser Water Pump 1 Status	IOM 4710	SA Bus	1	4	CWP1-S	IN7, ICOM7	0		4-BI IN-7	2/22	OUT, COM	Current Relay	Motor Lead	Motor Lead	See wiring detail	Motor Status (Contact)		F301	CWS
	BI IN-8	GPP CWP	CWP2-S	Condenser Water Pump 2 Status	IOM 4710	SA Bus	1	4	CWP2-S	IN8, ICOM8	0		4-BI IN-8	2/22	OUT, COM	Current Relay	Motor Lead	Motor Lead	See wiring detail	Motor Status (Contact)		F301	CWS
	BO OUT-1	GPP CWP			IOM 4710	SA Bus	1	4			0		4-BO OUT-1										
	BO OUT-2	GPP CWP			IOM 4710	SA Bus	1	4			0		4-BO OUT-2										
	BO OUT-3	GPP CWP	CWP1-C	Condenser Water Pump 1 Command	IOM 4710	SA Bus	1	4	CWP1-C	OUT3, 24V COM	0		4-BO OUT-3	2/22	COIL-,COIL+	Relay	COM, NO	2/14	See wiring detail	VFD (w/o Safety w/Byp) (Sw Hi, EXT)		F1047	CWS
	CO OUT-4	GPP CWP	CWP2-C	Condenser Water Pump 2 Command	IOM 4710	SA Bus	1	4	CWP2-C	OUT4, 24V COM	0		4-CO OUT-4	2/22	COIL-,COIL+	Relay	COM, NO	2/14	See wiring detail	VFD (w/o Safety w/Byp) (Sw Hi, EXT)		F1047	CWS
	CO OUT-5	GPP CWP	GPP-1-C	GPP-1 Command	IOM 4710	SA Bus	1	4	GPP-1-C	OUT5, 24V COM	0		4-CO OUT-5	2/22	COIL-,COIL+	Relay	COM, NO	2/14	See wiring detail	Starter (w/o Safeties) (Sw Hi, EXT)		F1015	GWS
	CO OUT-6	GPP CWP	GPP-2-C	GPP-2 Command	IOM 4710	SA Bus	1	4	GPP-2-C	OUT6, 24V COM	0		4-CO OUT-6	2/22	COIL-,COIL+	Relay	COM, NO	2/14	See wiring detail	Starter (w/o Safeties) (Sw Hi, EXT)		F1015	GWS
	CO OUT-7	GPP CWP			IOM 4710	SA Bus	1	4			0		4-CO OUT-7										
	AO OUT-8	GPP CWP			IOM 4710	SA Bus	1	4			0		4-AO OUT-8										
	AO OUT-9	GPP CWP			IOM 4710	SA Bus	1	4			0		4-AO OUT-9										

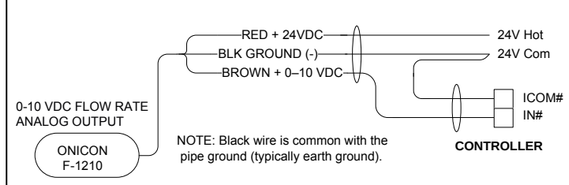
NOTE: See comments column to see which points are related to CWS and GWS

pump speed shall be shown from VFD signal

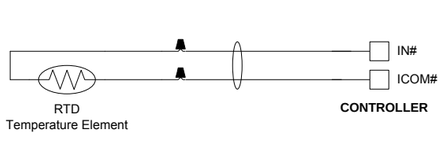
DETAIL F102 VOLTAGE INPUT - INTERNAL SOURCE



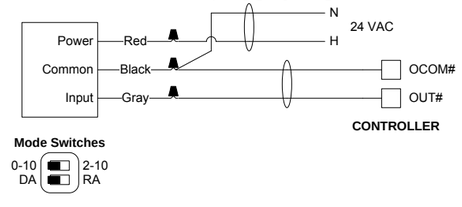
DETAIL F117 ONICON Model F1x10 Flow Sensor With 0-10 VDC OUTPUT



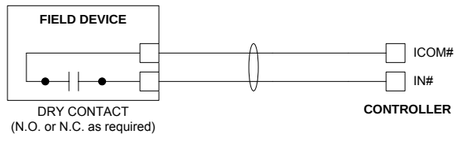
DETAIL F131 TEMPERATURE SENSOR INPUT



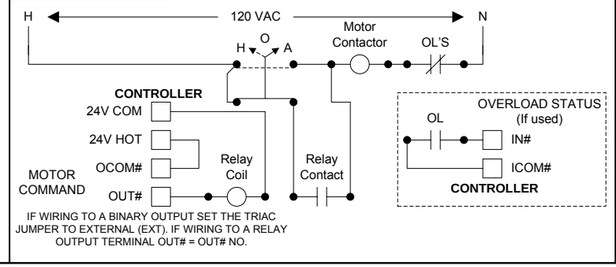
DETAIL F268 0-10VDC OUTPUT to M9310-HGA-2 AND VA9310-HGA-2



DETAIL F301 BINARY INPUT (DRY CONTACT)



DETAIL F1015 Starter without Safeties Wiring



Drawing Title
GPP CWP Point Schedule & Wiring Details

Project Title
NYS Police HQ

Rev. Num.	ECN	Date	Rev. By	Rev. Description
			PT	SUBMITTAL

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
Mario Lucero	Will Roblin	Peter Tai				

Johnson Controls

Branch Information
Johnson Controls, Inc.
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Fax: 516 822 0592

Contract Number **6N710145**

Drawing Number **004.003**

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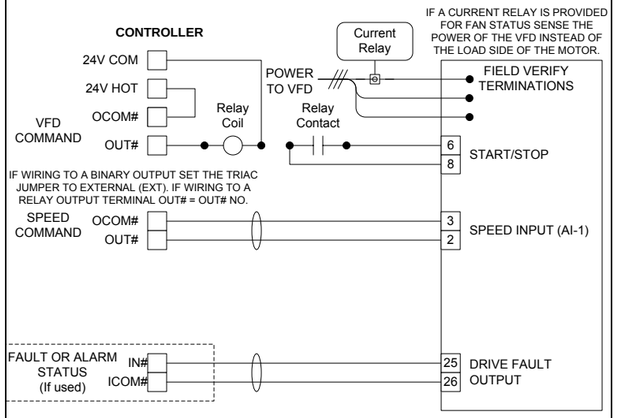
DETAIL F1047 VFD Bypass without Safeties Wiring



Variable Speed Enclosed IntelliPass/IntelliDisconnect Drives

Drawing Title					
GPP CWP Wiring Details					
				PT	SUBMITTAL
	Rev. Num.	ECN	Date	Rev. By	Rev. Description

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
Mario Lucero	Will Roblin	Peter Tai				

Project Title
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Contract Number
6N710145

Drawing Number
004.004

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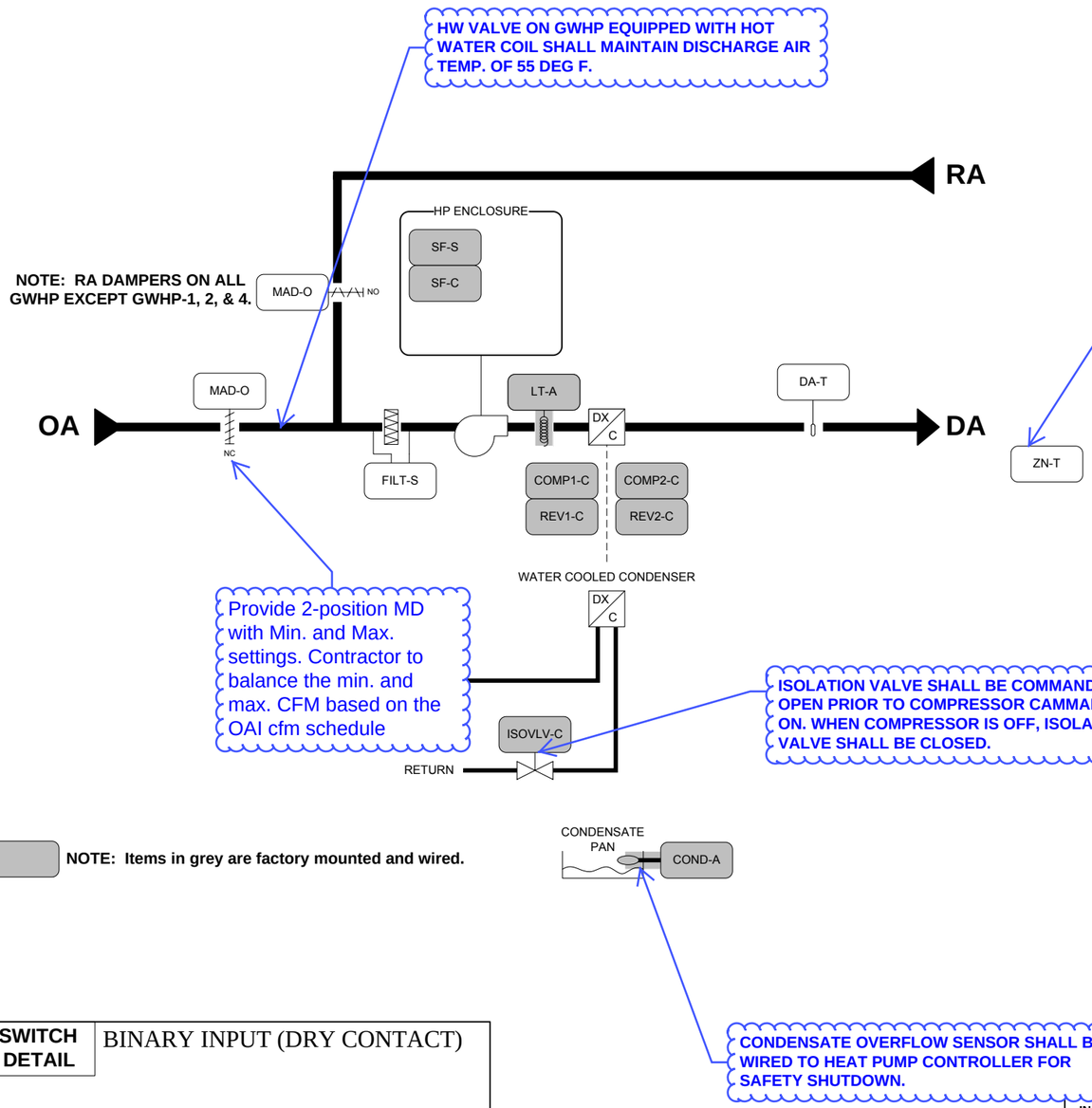
GWHP FLOW LAYOUT



NOTE: Items in grey are factory mounted and wired.

BILL OF MATERIALS

GWHP, Heat Pumps (9)
Contract Number: 6N710145

Designation	Qty	Part Number	Description
Field Devices:			
COND-A	0	**********	SPDT FLOAT SWITCH **FACTORY MTD & WIRED**
CONTROLLER	0	**********	FX10 **FACTORY MTD & WIRED**
DA-T	1	A99DY-200C	DISCHARGE TEMPERATURE SENSOR
FILT-S	1	FTG18A-600R	REMOTE MTD PROBE
	1	P32AC-2C	DIF,0.05 - 5 INWC,DIF=0.04-0.2 INWC,SPDT
ISOVLV-C	0	**********	**INTERNAL TO UNIT. FACTORY MTD & WIRED**
MAD-O	2	M9208-BGA-3	ACT ROTARY ON/OFF 24 (GWHP-3, 5 – 9)
MAD-O	1	M9208-BGA-3	ACT ROTARY ON/OFF 24 (GWHP-1, 2, 4)
SF-S, C	0	**********	**INTERNAL TO UNIT. FACTORY MTD & WIRED**
ZN-T	1	TAXXJ02	ZONE TEMPERATURE SENSOR

SUPPLY FAN CONTROL:
The supply fan will be started and stopped by the packaged FX10 controller.

HEAT PUMP CONTROL:
When the zone temperature (ZN-T) falls below the zone temperature setpoint (ZN-SP) the reversing valve (s) (REVx-H) will be indexed to provide heating when the compressor is running. When the zone temperature (ZN-T) rises above the zone temperature setpoint (ZN-SP) the reversing valve (s) (REVx-C) will be indexed to provide cooling when the compressor is running. Upon a call for the compressor (COMPx-C) an isolation valve (ISOVLV-C) for the water cooled condenser will open. After a time delay (20 Seconds), the compressor will start.

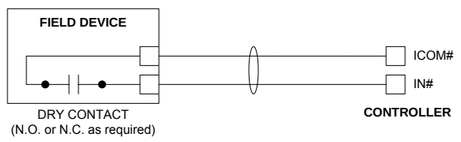
TEMPERATURE CONTROL:
The unit will control to maintain the zone temperature setpoint (ZN-SP) as sensed by the zone temperature sensor (ZN-T).

OCCUPIED MODE:
The unit will always be in an occupied mode. When the condensate float switch is in "Alarm" (COND-A), the cooling control sequence will be disabled.

DAMPERS:
Dampers will be wired to accessory output 2 (BO-8) on the FX-10 controller. This output will be energized with the blower output (BO-1). When the corresponding compressor output is turned off the accessory output will be deactivated. The outputs are selectable for N/O or N/C operation via MUI or via BMS.

ADDITIONAL POINTS MONITORED BY THE FMS:
- Discharge Air Temperature (DA-T)
- Filter Status (FILT-S)
- Supply Fan Status (SF-S)

FILTER SWITCH WIRING DETAIL BINARY INPUT (DRY CONTACT)



Drawing Title: **GWHP Flow Layout**

Project Title: **NYS Police HQ**

Rev. Num.	ECN	Date	Rev. By	Rev. Description
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Contract Number: **6N710145**
Drawing Number: **005.001**

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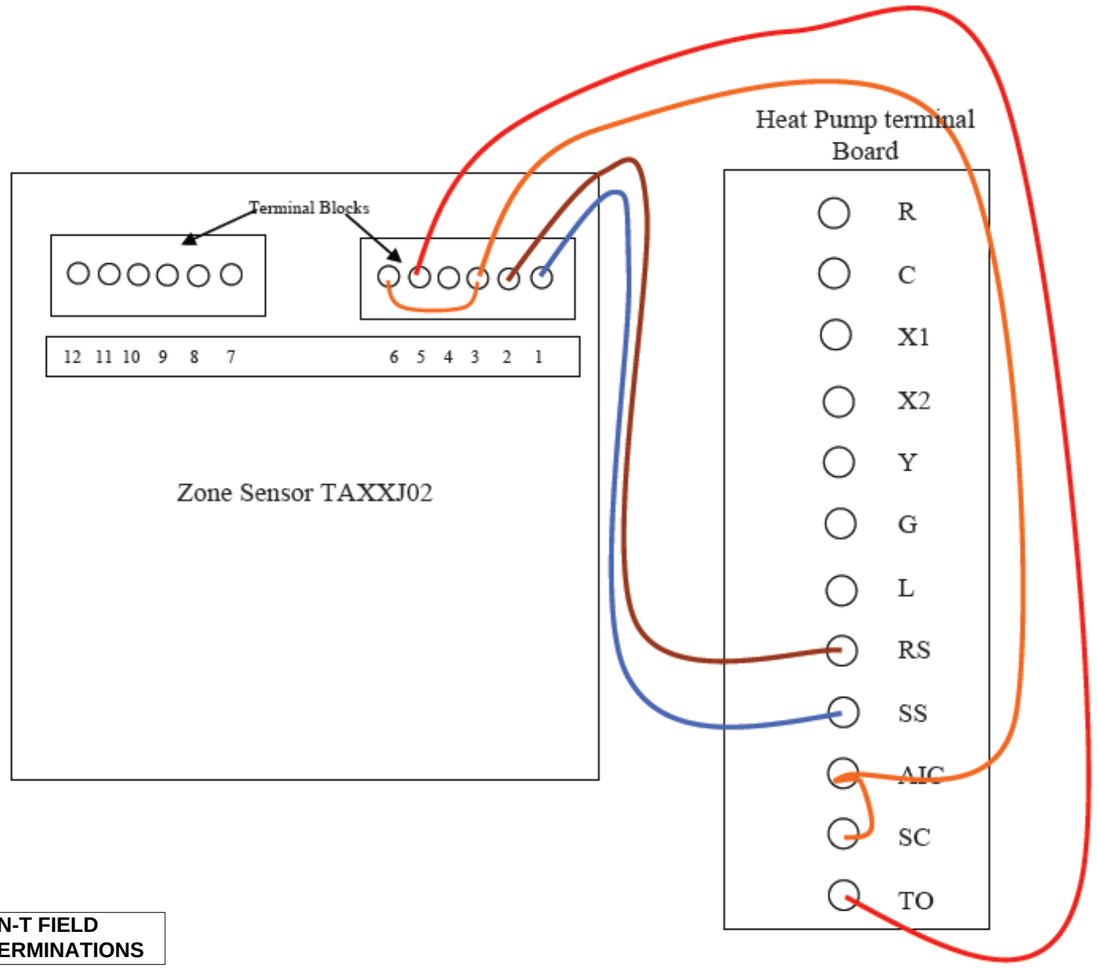
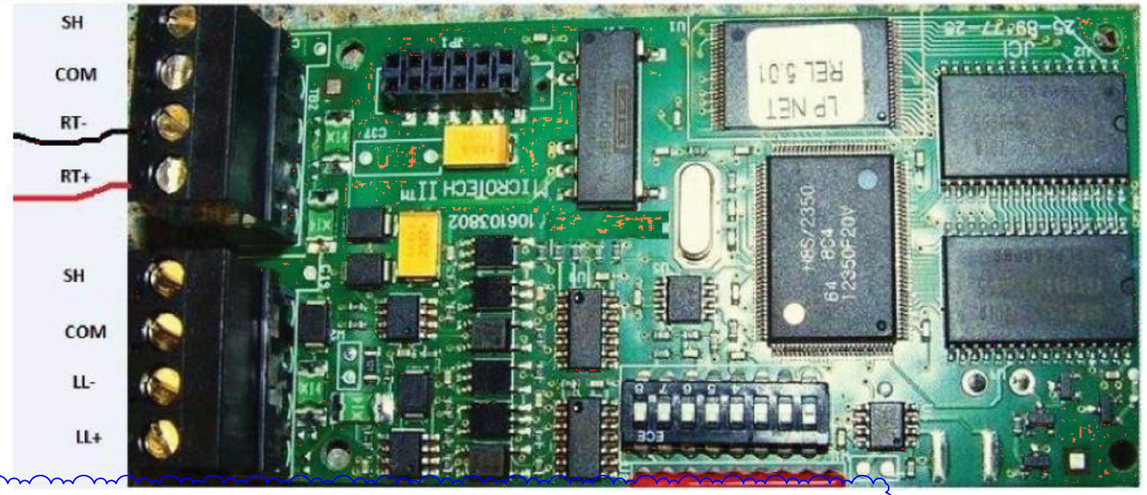
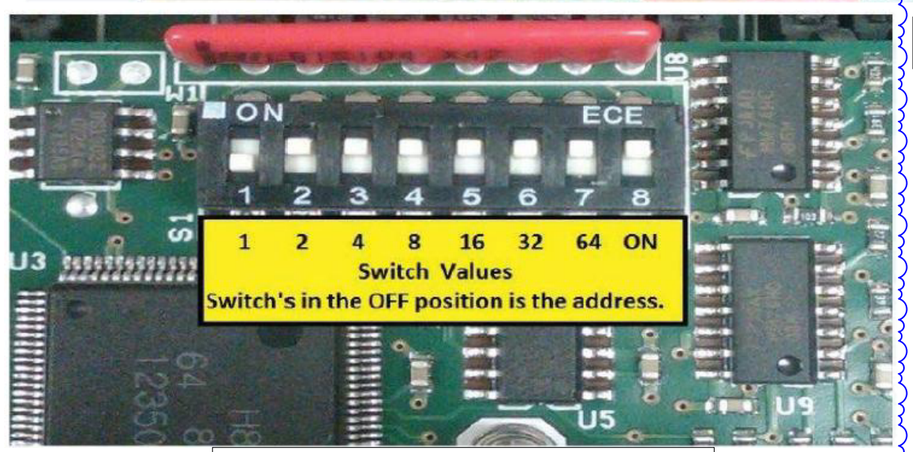
The following is an illustration on the connection details for the TAXXJ02 (Room Command Module) which is used for the FX10-equipped heat pumps. The detail will show the TAXXJ02 and the heat pump terminal board. The heat pump terminals are not shown in the order that they would be in the physical heat pump. The labels are accurate for all FX10-equipped heat pumps. The wire colors are arbitrary.



ZN-T FIELD TERMINATIONS

This communicates at a 19200 Baud Rate. The BAS connections are made to the ***RT+*** and the ***RT-*** terminals. This card is polarity sensitive and must have a MAC address that is different than any other device on the BAS trunk. The ***COM*** connection can be used, but necessary. This connection can be used to improve or it could degrade the network, depending on the network itself. The ***SH*** is used continue the shield through the network, and must grounded on one end only.





FX-10 BACNET MS/TP TERMINATIONS

Use above switches to set MS/TP address.
Refer to riser diagram 001.001 for addressing.

Drawing Title: **GWHP Wiring Details**

Project Title: **NYS Police HQ**

Rev. Num.	ECN	Date	Rev. By	Rev. Description
1			PT	REV PER ENGINEERS COMMENTS
			PT	SUBMITTAL

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
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Johnson Controls

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Johnson Controls, Inc.
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Contract Number: **6N710145**

Drawing Number: **005.002**

C:\project\6N710145\Drawings\GWHP Details.vsd

provide network adjustable:
- fan speed as per m-301.00
- occupied heating and cooling
- unoccupied heating and cooling

Network Alarm
- High pressure
- low pressure
- freeze (source)

Commercial FX10 with X13 Motor - 208-230/60/3

97P822-08
5/8/12

Notes:

1 – Disconnect for 15 degree freeze detection limit.
2 – Acc 1 output is cycled with the compressor.
3 – Acc 2 output is cycled with the blower.
4 – R, C, Y1, Y2, and G inputs are for use with a wall mount thermostat. TO, SC, RS, AIC, and SS are for use with a TAXX-J02 zone sensor.
5 – Network controllable 24VAC output.
6 – Network controllable PWM output.
7 – Wire #52 can be used to connect a field supplied and installed 0-5 VDC humidity transmitter.
8 – Not Used – Bundle in the air handler.
9 – Optional, factory installed unit mounted disconnect
10 – Optional, factory installed phase guard
11 – Optional, factory installed phase guard. The yellow transformer wire shall be connected directly to the PB1-1, if this option is not installed.
12 – Optional, factory installed internal isolation valve.
13 – Swap blue and red leads for 208V operation.
14 – Network configurable input.

ISOLATION VALVE INTERNAL TO UNIT.

DAMPER INTERLOCK

ZN-T FIELD TERMINATIONS

CONDENSATE OVERFLOW SENSOR.

FREEZESTAT INTERNAL TO UNIT.

DA-T A99DY-200C FIELD TERMINATIONS

PF-S FIELD TERMINATIONS

Legend

Factory Low voltage wiring
Factory Line voltage wiring
Field low voltage wiring
Field line voltage wiring
Optional block
DC Voltage PCB traces
Field Zone Sensor Wiring

Internal junction
Quick connect terminal
Field wire lug
Ground
Relay Contacts- N.O., N.C.
Rectified Compressor Solenoid Plug
Compressor Solenoid

Relay coil
Capacitor w/ bleed resistor
Switch - Condensate overflow
Switch - High pressure
Switch - Low pressure
Polarized connector
Open Jumper
Closed Jumper

CC -	Compressor Contactor	OS -	Occupied Switch
CO -	Condensate Overflow Sensor	PB1, PB2 -	Power blocks
CP -	Compressor Proving	PR-	Pump Relay
CS -	Compressor Solenoid	RB-	Blower Relay
DA -	Discharge Air Temperature Sensor	RCP -	Rectified Solenoid Compressor Plug
DF/BP	Dirty Filter or Blower Proving	RV -	Reversing Valve coil
DH -	Dehumidification Switch or Humidistat	TB -	Terminal Board
ES -	Emergency Shutdown	FD -	Freeze Detection Sensor
HP -	High Pressure Switch	PGM -	Phase Guard Module
LP -	Low Pressure Switch	RH -	Reheat Valve Coil

Johnson FX-10

GWHP FX-10
WIRING DETAILS
DWG 005.003

BACnet Points for Dual Compressor Water-to-Air Heat Pumps Utilizing the FX10 Controller

Johnson Controls

All volatile (Output) type points will revert to the uncommanded values after a power interruption. These have no limit on the number of writes in a lifetime. The nonvolatile (Value) type points have their values stored in flash memory and they retain their values through a power outage. These have a limited life-time number of write cycles, about 2,000,000. Excessive writes to these will cause controller failure.

Depending on the type of BAS that you are using to integrate the controllers, you will either have an uncommanded value of 254 or 255 for the multistate inputs, outputs and values. For the BAS systems that show 254 as the uncommanded value, you will read/write a "0" for the "Off" command and "1" for the "On" command. For the BAS that shows 255 you will read/write a "1" for the "Off" command and a "2" for the "On" command.

Analog Inputs	*Read/Write*	*Description*
AI1 Space Temp	Read	Shows the sensor value connected to terminals RS and AIC on the terminal board.
AI2 Discharge Air	Read	Shows sensor value connected to AI4 on the FX10.
AI3 Freeze Temp 1	Read	Shows the water coil heat exchanger temperature for circuit 1.
AI4 Freeze Temp 2	Read	Shows the water coil heat exchanger temperature for circuit 2.
AI5 Active Clg Setpt	Read	Shows the effective cooling setpoint value.
AI6 Active Hgt Setpt	Read	Shows the effective Heating setpoint value.
AI7 Freeze Temp Limit	Read	Shows the low temperature limit of the water coil heat exchanger.
AI8 nvoAlarms	Read	Shows the current alarm status of the heat pump. Refer to the Alarms table for a description of each enumeration.
AI9 Economizer Temp	Read	Shows the current alarm status of the heat pump. Refer to the Alarms table for a description of each enumeration.

Analog Outputs	*Read/Write*	*Description*	*Warning: Reverts to "Uncommanded" after a power cycle. These are volatile memory and allow unlimited writes.*
AO1 Common Setpoint	Write	Adjust the midpoint value between Active Clg Setpt and Active Htg Setpt, raises or lowers both from a single command.	
AO2 Space Temp Ovrd	Write	Override the space temperature reading.	

Warning: *These are written in Flash memory and have about 2,000,000 write cycles. Should only be written to by manual writes or through a scheduled writes, not by the automated reset process.* **EXCESSIVE WRITES WILL CAUSE CONTROLLER FAILURE, THIS WILL NOT BE COVERED UNDER WARRANTY!**

Analog Values	*Read/Write*	*Description*
AV1 Occupied Cool	Read/Write	Occupied cooling setpoint, nonvolatile.
AV2 Occupied Heat	Read/Write	Occupied heating setpoint, nonvolatile.
AV3 Unoccupied Cool	Read/Write	Unoccupied cooling setpoint, nonvolatile.
AV4 Unoccupied Heat	Read/Write	Unoccupied heating setpoint, nonvolatile.
AV5 Economizer Setpt	Read/Write	Adjust the temperature threshold for economizer operation.
AV6 Max Hgt Setpt	Read/Write	The upper limit that the heating setpoint may be adjusted to.
AV7 Min Clg Setpt	Read/Write	The lower limit that the cooling setpoint may be adjusted to.
AV8 Remote Setpt Max	Read/Write	Allows for adjustment of the sensor setpoint shift value on the plus side.
AV9 Remote Setpt Min	Read/Write	Allows for adjustment of the sensor setpoint shift value on the negative side.
AV10 Zone Temp Offset	Read/Write	Allows for adjustment to the zone sensor input, used to calibrate the zone temp reading on the network.
AV11 Econo Temp Offset	Read/Write	Allows adjustment to the economizer water temp sensor input, used to calibrate the economizer temp reading on the network.

Warning: If your uncommanded value is 254 then the numeric values listed below will be 1 less than what is described.

Multistate Inputs	*Read/Write*	*Description*
MI1 Effective Occupancy	Read	Shows the current occupancy status of the heatpump. 1=Occupied, 2=Unoccupied, 3=Bypass(Temporary Occupancy)
MI2 Mode	Read	Shows the current mode of the heatpump. 1=Auto (Normal), 7=Off(Shutdown)
MI3 Comp/Fan Prove	Read	Shows the contact status of digital input 4. Requires one or two field installed current relays wired in series for valid readings. 1=Off, 2=On
MI4 Fan Cmd Status	Read	Shows the commanded status of the fan. 1=Off, 2=On
MI5 Comp1 Cmd Status	Read	Shows the commanded status of compressor 1. 1=Off, 2=On

MI6 Comp2 Cmd Status	Read	Shows the commanded status of compressor 2. 1=Off, 2=On
MI7 Rev Valve Status	Read	Shows the commanded position of the reversing valve. 1=Heating, 2=Cooling
MI8 BO-5/Elect Heat	Read	Shows the commanded status of the binary output 5 for electric heat. 1=Off, 2=On
MI9 BO-9 Spare	Read	Shows the commanded status of the spare binary output 9. 1=Off, 2=On

Warning: If your uncommanded value is 254 then the numeric values listed below will be 1 less than what is described.

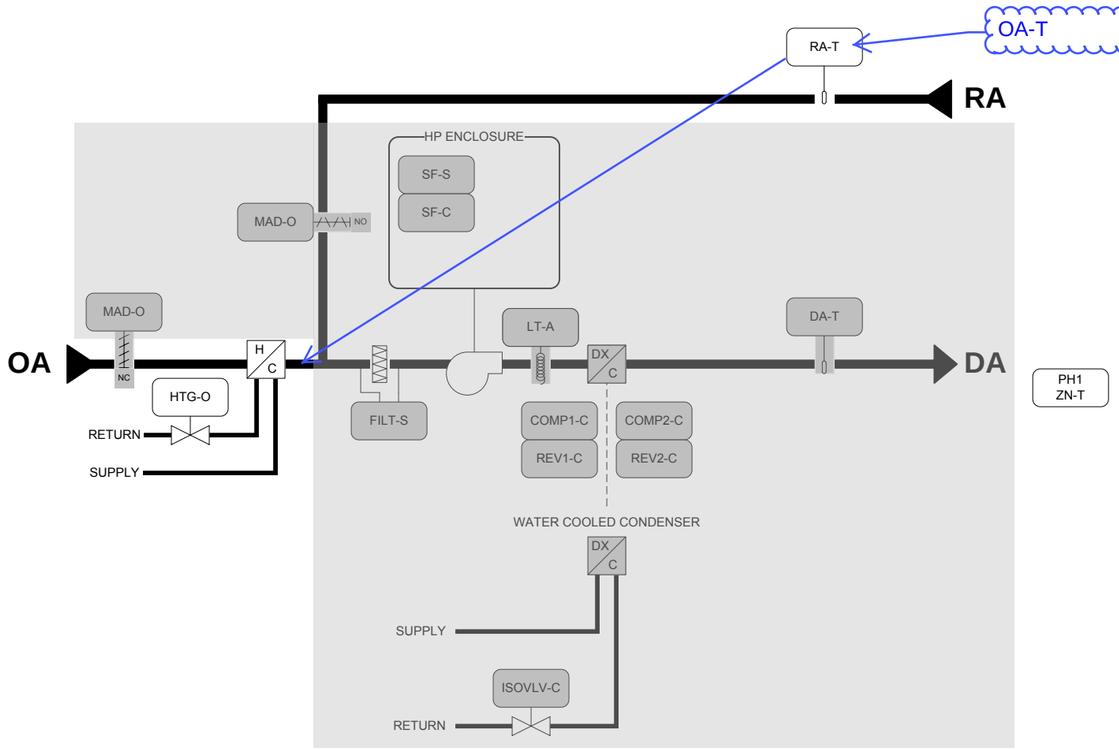
Multistate Outputs	***Read/Write***	***Description***
MO1 Occupancy Command	Write	Allows for a network command to the occupancy input of the heatpump. 1=Occupied, 2=Unoccupied, 3=Bypass, 4=Standby
MO2 Fan Command	Write	Allows for network command equivalent of a thermostat 'G' call. 1=Off, 2=On
MO3 Comp1 Command (Y1)	Write	Allows for network command equivalent of a thermostat 'Y1' call. 1=Off, 2=On
MO4 Comp2 Command (Y2)	Write	Allows for network command equivalent of a thermostat 'Y2' call. 1=Off, 2=On
MO5 Rev Vlv Cmd	Write	Allows for network command equivalent of a thermostat 'O' call. 1=Heat, 2=Cooling
MO6 Emergency Override	Write	Allows for a network command to put the unit in emergency shutdown. 1=Auto, 5=Shutdown
MO7 Alarm Reset	Write	Allows for remote reset of manual reset alarms, must write to a 2 then back to a 1 for reset to take effect.
MO8 BO5 Elect Heat	Write	Allows for network control of binary output 5, can be used for electric heat (this is interlocked with BI4), requires MV2 to be set to EmgHeat. 1=Off, 2=On
MO9 BO9 Spare	Write	Allows for network control of binary output 9. 1=Off, 2=On

Warning: *These are written in Flash memory and have about 2,000,000 write cycles. Should only be written to by manual writes or through a scheduled writes, not by the automated reset process.* **EXCESSIVE WRITES WILL CAUSE CONTROLLER FAILURE, THIS WILL NOT BE COVERED UNDER WARRANTY!**

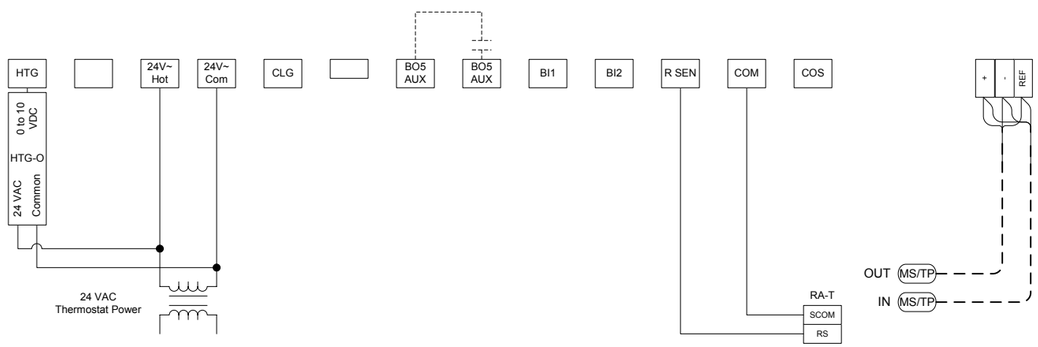
Multistate Values	*Read/Write*	*Description*
MV1 Economizer Enable	Write	Enable/Disable logic that controls economizer. 1=Off, 2=On
MV2 Electric Heat Mode	Write	Changes control of the BO5 from network control to emergency heat. Emergency heat requires DI4 to be wired to fan proving current switch on DI4. 1=EmgHeat, 2=Network Control
MV3 Fan Operation	Write	Changes the fan operation from continuous to cycled. 1=Continuous, 2=Cycled

PRODCWA-05 Alarm Table	
#	Description
0	No Alarm
1	Condensate Detected
2	Compressor 1 High Discharge Pressure
3	Compressor 1 Low Suction Pressure
4	Circuit 1 Low Temp Limit on Coax
5	Compressor 2 High Discharge Pressure
6	Compressor 2 Low Suction Pressure
7	Circuit 2 Low Temp Limit on Coax
8	Circuit 1 Bad Refrigerant Temp Sensor
9	Circuit 2 Bad Refrigerant Temp Sensor

PH-1 FLOW LAYOUT



NOTE: GWHP IN SHADED BOX IS GWHP-2



BILL OF MATERIALS

PH-1, Terminal Units.TEC
Contract Number: 6N710145

Designation	Qty	Part Number	Description
Field Devices:			
CONTROLLER	1	TEC3620-00-000	TSTAT, N2 & MSTP
HTG-O	1	VG1241BG+923GGA	3/4" 2W BALL VALVE 4.7CV
RA-T	1	TE-631GV-2	NICKEL DUCT PROB,4 INCHES

TEMPERATURE CONTROL:

The unit will control to maintain the temperature setpoint 55*f (adj.) as sensed by the remote temperature sensor (~~RA-T~~ OA-T AT THE PREHEAT COIL DISCHARGE. THIS WILL ALSO ACT AS A FREEZE STAT AND SAFETY ALARM TO SHUT DOWN THE UNIT IF THE COIL DISCHARGE IS BELOW 45 F (ADJ). WARM UP MODE CAN BE ACHIEVED BY USING SPACE TEMPERATURE SENSOR READING

OCCUPIED MODE:

The occupancy mode will be controlled via a network input. This network input serves to tell the system when it is in heating mode. Valve will only operate when in heating mode.

HEATING COIL:

The heating coil will modulate open and close in sequence to maintain the temperature setpoint.

Drawing Title: **PH-1 Flow Layout**

Project Title: **NYS Police HQ**

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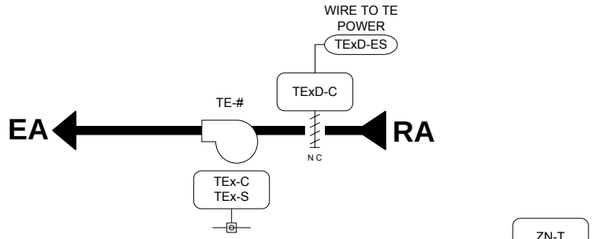
Contract Number: **6N710145**

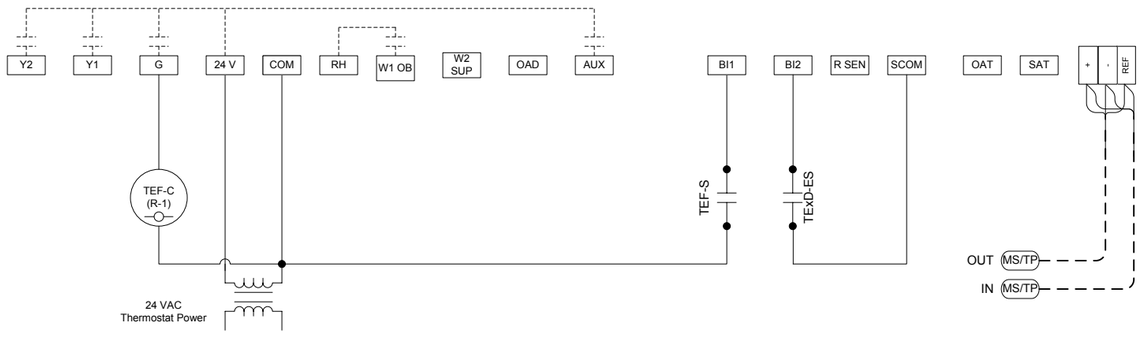
Drawing Number: **006.001**

C:\project\6N710145\Drawings\PH-1 Flow.vsd

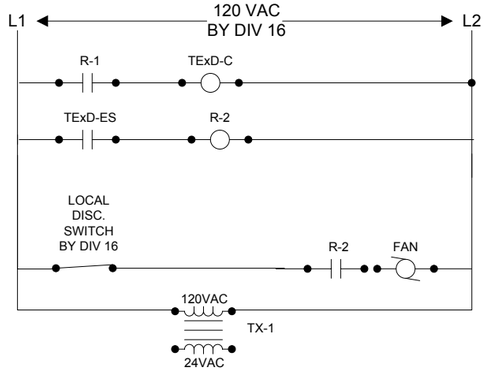
TE-1, 2, 3 FLOW LAYOUT



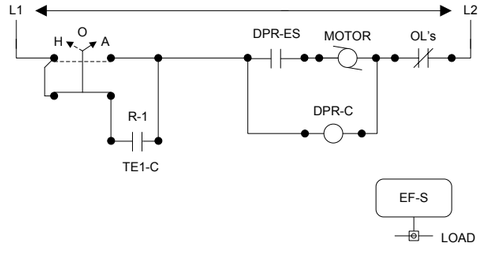
NOTE : DAMPERS & ACTUATORS ARE PROVIDED BY MECHANICAL CONTRACTOR



EXHAUST FAN STARTER WIRING DIAGRAM TE-2 & TE-3



TE-1 EXHAUST FAN STARTER WIRING DIAGRAM



BILL OF MATERIALS

TE-1, 2, 3, Air Handling Units.TEC (3)
Contract Number: 6N710145

Designation	Qty	Part Number	Description
Field Devices:			
ZN-T	1	TEC3630-00-000	TSTAT, N2 & MSTP
EF-S	1	CSD-CF0A0-1	SPLT/FIXED .15A W/O RELAY
TExD-ES	1	KLNJ-A2	WHISKER SWITCH WITH 10A
Panel Devices:			
Rx	2	RIBU1C	SPDT,10A,HC=10-30 VAC/DC,W/LED

TOILET EXHAUST FAN CONTROL:

The constant speed supply fan will run any time there is a call for occupied state.

OCCUPIED MODE:

The occupancy mode will be controlled via a network input.

ADDITIONAL POINTS MONITORED BY THE FMS:

- Fan Status (TEF-S)
- Exhaust Air Damper Status (TExD-ES)

Note: Per Bush Sales rep, fans provided have interlock to motor operated back draft damper.

Drawing Title
TE-1, 2, 3 Flow Layout
Typical Of 3

Project Title
NYS Police HQ

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Contract Number: **6N710145**

Drawing Number: **007.001**

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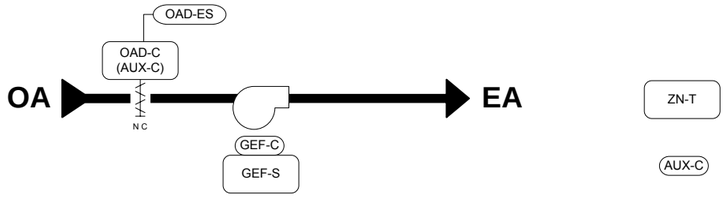
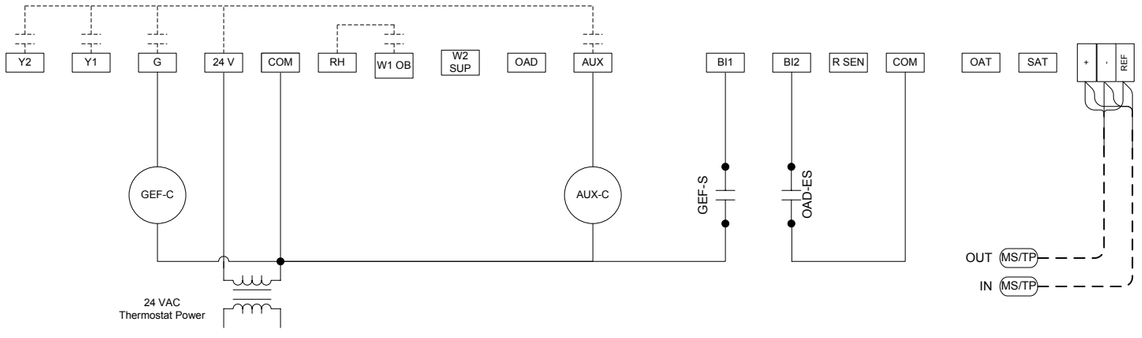
GE-1 FLOW LAYOUT



ZN-T

AUX-C



BILL OF MATERIALS

GE-1, Air Handling Units.TEC
Contract Number: 6N710145

Designation	Qty	Part Number	Description
Field Devices:			
ZN-T	1	TEC3630-00-000	TSTAT, N2 & MSTP
OAD-C, -ES	1	M9208-BGC-3	ACT ON/OFF 24 VAC/VDC
SF-S	1	CSD-CF0A0-1	SPLT/FIXED .15A W/O RELAY
Panel Devices:			
R-1	1	RIBU1C	SPDT,10A,HC=10-30 VAC/DC,W/LED

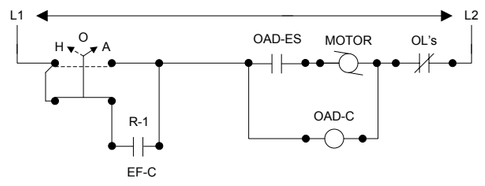
GARAGE EXHAUST FAN CONTROL:
The constant speed supply fan will run any time there is a call for occupied state.

OCCUPIED MODE:
The occupancy mode will be controlled via a network input. When the exhaust fan starts, the outdoor air intake dampers will open (AUX-C)

ADDITIONAL POINTS MONITORED BY THE FMS:

- Fan Status (GEF-S)
- Outside Air Damper Status (OAD-ES)

EXHAUST FAN STARTER WIRING DIAGRAM



Drawing Title
GE-1 Flow Layout

Project Title
NYS Police HQ

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1			PT	REV PER ENGINNERS COMMENTS
			PT	SUBMITTAL

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
Mario Lucero	Will Roblin	Peter Tai				

Johnson Controls

Branch Information
Johnson Controls, Inc.
6 Aerial Way
Syosset, NY 11791
Phone: 516 822 0490
Fax: 516 822 0592

Contract Number
6N710145

Drawing Number
008.001

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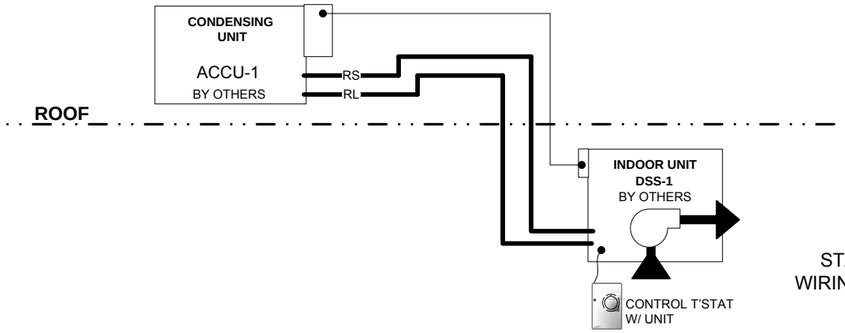
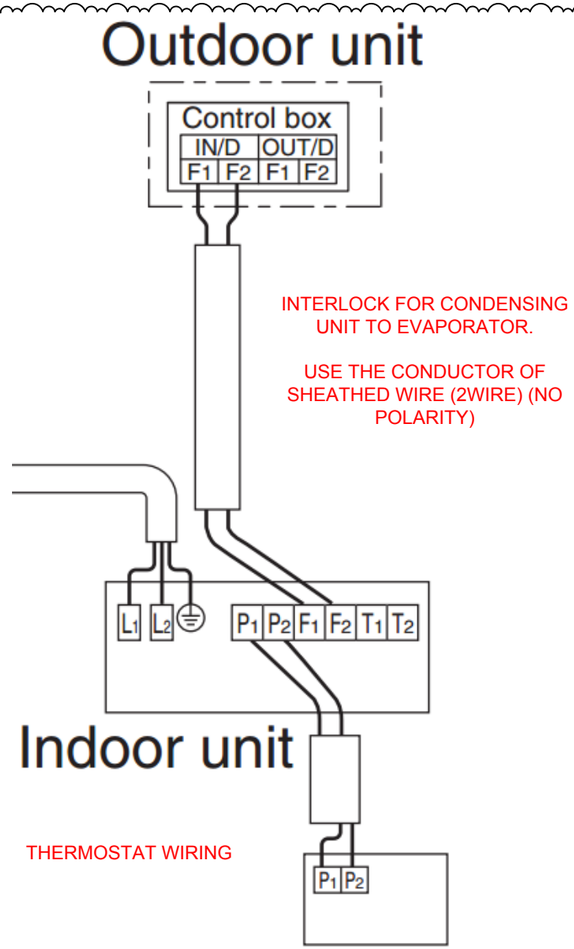
SPLIT SYSTEM FLOW LAYOUT



STAND ALONE CONTROL
WIRING/TERMINATIONS BY JCI (1)

1



Wire specification	Sheathed vinyl wire or cable (2 wires)
Gauge	AWG 18-16
Length	Max. 328 ft.
External terminal	Contact that can ensure the minimum applicable load of 15 V DC, 10 mA.

Split Systems
Split systems are stand alone control, all devices provided by others.
JCI will wire per MFG. details:

- Thermostat – supplied w/ unit
- Interlock between respective condensing unit.

● FIELD COORDINATE & DOCUMENT TERMINATIONS W/DEVICE MFG. DOCUMENTATION.

Drawing Title
SPLIT SYSTEM Flow Layout

Rev. Num.	ECN	Date	Rev. By	Rev. Description
1			PT	REV PER ENGINEERS COMMENTS
			PT	SUBMITTAL

Project Title
NYS Police HQ

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
Mario Lucero	Will Roblin	Peter Tai				

Johnson Controls

Branch Information
Johnson Controls, Inc.
6 Aerial Way
Syosset, NY 11791
Phone: 516 822 0490
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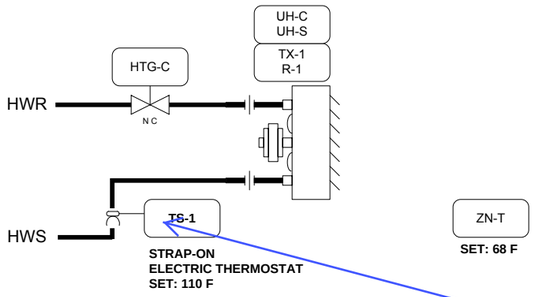
Contract Number
6N710145

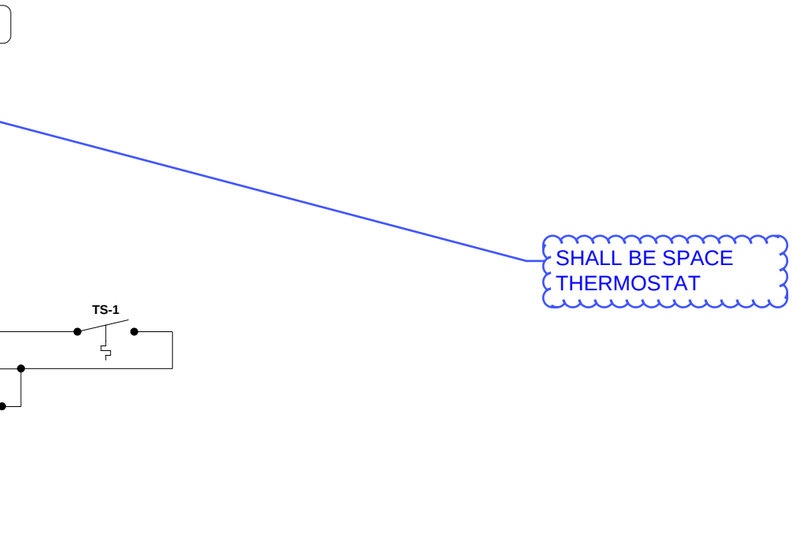
Drawing Number
009.001

C:\project\6N710145\Drawings\SPLIT SYSTEM Flow Layout 1.vsd

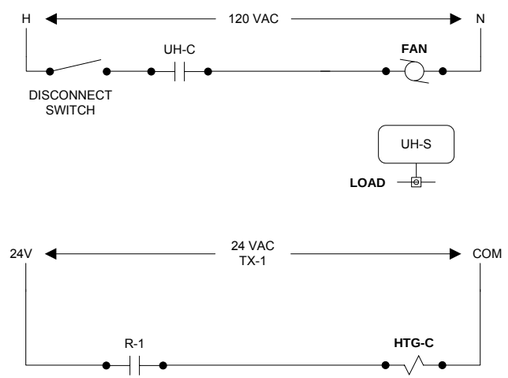
CABINET / UNIT HEATER

TYPICAL FOR XX





WIRING DIAGRAM FOR UH



HOT WATER CABINET/UNIT HEATER SEQUENCE OF OPERATION

OCCUPIED MODE: THE OCCUPANCY MODE WILL BE CONTROLLED VIA MANUFACTURER SUPPLIED THERMOSTAT. A PIPE-MOUNTED ELECTRIC AQUASTAT WILL LOCKOUT THE FAN IF HOT WATER IS NOT AVAILABLE.

TEMPERATURE CONTROL: A WALL-MOUNTED THERMOSTAT AND CONTROL VALVE WILL CONTROL THE CABINET UNIT HEATER. ON A FALL IN SPACE TEMPERATURE BELOW SET POINT, THE THERMOSTAT WILL OPEN THE VALVE, AND ENERGIZE THE UNIT FAN. ON A RISE IN SPACE TEMPERATURE, THE FAN WILL BE DE-ENERGIZED AND THE VALVE WILL CLOSE.

NOTE: ALL DEVICES PROVIDED BY OTHERS. JCI TO WIRE PER MANUFACTURERS WIRING DIAGRAMS.

Drawing Title
CUH, UH Flow Layout

Project Title
NYS Police HQ

Rev. Num.	ECN	Date	Rev. By	Rev. Description
			PT	SUBMITTAL

Account Executive	Project Owner	System Designer	Drawn By	Drawing Date	Approved By	Approval Date
Mario Lucero	Will Roblin	Peter Tai				

Johnson Controls

Branch Information
Johnson Controls, Inc.
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Contract Number
6N710145

Drawing Number
009.002

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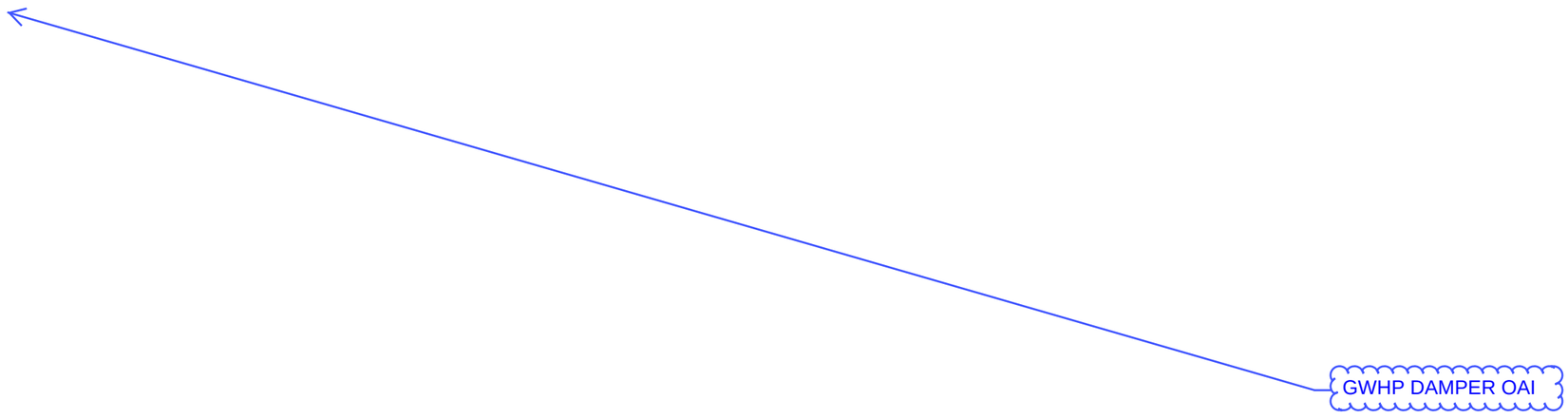
Tag					Valve Information															Actuator Information			
Item	System	Service	Qty.	Ref. Dwg.	Code Number	Valve Family	Configuration	Fail Position	Inlet Pipe Size (in)	Valve Size (in)	Medium	Flow (gpm or lbs/hr)	Design Delta P (psi)	Valve Delta P (psi)	Design Coefficient (Cv)	Valve Coefficient (Cv)	Valve Close Off (psi)	Trim Material	Connection	Code Number	Actuator Control	Piping Information	Comments
1	HWS	PH-1	1	M-103, M-602	VG1241BG+923GGA	Ball Valve	2-Way	Valve Open	1-1/4	3/4	Water	10.2	5.0	4.7	4.6	4.7	200.0	Brass	Threaded	VA9203-GGA-2Z	0-10VDC PROP	1 1/4" Pipe size per M103	
2	HWS	B-1, B-2	2	M-101, M-601	VG12A5HW+94NBGC	Ball Valve	2-Way	Valve Closed	3	3	Water	74.0	5.0	0.1	33.1	211.0	100.0	Stainless Steel	Flanged	M9220-BGC-3	24VAC On/Off	3" HWS pipe size per M-200	
3	HWS	BYPV-O	1	M-200	VG1241DN+910HGA	Ball Valve	2-Way	Last Position	3	1-1/4	Water	37.0	13.0	10.2	10.3	11.6	200.0	Brass	Threaded	VA9310-HGA-2	0-10VDC PROP	3" HWS pipe size per M-200	Bypass selected using 1/2 of single pump flow and 3/4 of single pump total head. Pressure drop @ 25% design flow = 2.92 psi. Reducer advised.
4	HWS/HX	HXISO-O	1	M-200	VG1241FT+958BGC	Ball Valve	2-Way	Valve Closed	2	2	Water	22.0	5.0	0.1	9.8	73.7	200.0	Brass	Threaded	VA9208-BGC-3	24VAC On/Off	2" HWR pipe size per M-200	
5	HX	HXMV-O	1	M-200	VG2831TM+94NGGC	Globe Valve	3-Way	Normal Position	4	2-1/2	Water	145.0	8.1	7.2	51.0	54.0	45.0	Brass	Flanged	M9220-GGC-3	0-10VDC PROP	4" CWS pipe size per M-200	
6	CWS	CWBYPV-O	1	M-200	VG1241EP+910HGC	Ball Valve	2-Way	Last Position	4	1-1/2	Water	72.5	21.1	15.4	15.8	18.5	200.0	Brass	Threaded	VA9310-HGA-2	0-10VDC PROP	4" pipe size per M-200	Bypass selected using 1/2 of single pump flow and 3/4 of single pump total head. Reducer advised.

Project Number: 6N710

Valves for CUH , UH not provided. contractor to submit for review.
Final qty by contractor.

Tag					Damper Information						Actuator Information					Comments
	bject Number: 6N7							Damper Size								
Item	System	Service	Ref. Dwg.	Qty.	Code Number	Type	Fail Position	Diameter or W (in.)	H (in.)	Area (ft²)	Qty.	Code No.	Actuator Control	Field Mtd Actuator	Mount Loc'n	
1	HWS	Boiler	M-101	1		Damper By Others	Normally Closed	64	20	8.89	1	M9220-BGA-3	24VAC/VDC On/Off	Yes		
2	FANS	GE-1	M-101	1		Damper By Others	Normally Closed	42	18	5.25	1	M9208-BGC-3	24VAC/VDC On/Off	Yes		



Bill of Materials

Tag	Type	Qty	Part	Description
NET			**Metasys Extended Architecture.New**	
ANTIVIRUS	Field	1	SYMANTICAV	SYMANTEC ANTIVIRUS SOFTWARE
COMPUTER	Field	1	ADS05USRPC	ADS WORKSTATION PC TURNKEY
GRAPHICSPLUS	Field	1	MS-GGT-0	MS GGT-0 GRAPHICS
MONITOR	Field	1	MONITOR22INCH	22 INCH LCD MONITOR
NAE-1	Field	1	PAGE00001FC0	PANEL NAE4510 16X20

Tag	Type	Qty	Part	Description
HWS / HX			**Central Heating**	
BLRx-EN	Field	2	RIBU1C	SPDT,10A,HC=10-30 VAC/DC,W/LED
BLRx-FS	Field	2	F261MAH-V01C	LIQUID FLOW SWITCH
BLRxISOV-C	Field	2	RIBU1C	SPDT,10A,HC=10-30 VAC/DC,W/LED
COMBDPR-C	Field	2	M9220-BGA-3	20NM,SR,DPR ACT,ON-OFF,24 VAC
COMBDPR-Ca	Field	1	RIBU1C	SPDT,10A,HC=10-30 VAC/DC,W/LED
CWS-T	Field	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
CWS-T	Field	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
HW-DP	Field	1	DPT2302-050D	PRESS SENS,DP,0-50 PSI,VDC,0.25%
HXISOV-C	Field	1	VG1245FT+958BGC	2" 2W BALL VALVE 73.7CV
HXMV-O	Field	1	VG2831TM+94NGGC	2-1/2", 3W,FLANGED, 54CV,
OA-T	Field	1	TE-6313P-1	SENSOR,T-NI,0.1%,3IN OAT
PHW-F	Field	1	F-1210	FLOW METER, DUAL TURBINE, ANA OUT
PHW-F	Field	1	F-STD-INSTL1	INSTALL KIT, STD, WELDED
PHWPx-C,-S	Field	2	CSD-CA1G1-1	SPLT/ADJ LED 1.25A W/RLY
PHWR-T	Field	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
PHWR-T	Field	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
PHWS-T	Field	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
PHWS-T	Field	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
PANEL	Panel	1	PAKGJJ002AH0	FEC2611/IOM4711,20X24

Tag	Type	Qty	Part	Description
GPP CWP			**Central Heating**	
CWBYPV-O	Field	1	VG1241EP+910HGC	2W 1-1/2 NPT CV19 2SPDT
CW-DP	Field	1	DPT2302-050D-V	PRESS SENS,DP,0-50 PSI,VDC,0.25%,3-VLV
CW-F	Field	1	F-1210	FLOW METER, DUAL TURBINE, ANA OUT
CW-F	Field	1	F-STD-INSTL1	INSTALL KIT, STD, WELDED
CWPx-C,-S	Field	2	CSD-CA1G1-1	SPLT/ADJ LED 1.25A W/RLY
CWR-T	Field	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
CWR-T	Field	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
CWS-T	Field	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT

Tag	Type	Qty	Part	Description
GPP CWP			**Central Heating**	
CWS-T	Field	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
GFWS-F	Field	1	F-1210	FLOW METER, DUAL TURBINE, ANA OUT
GPP-1-C,-S	Field	1	CSD-CA1G1-1	SPLT/ADJ LED 1.25A W/RLY
GPP-2-C,-S	Field	1	CSD-CA1G1-1	SPLT/ADJ LED 1.25A W/RLY
GPWR-T	Field	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
GPWR-T	Field	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
GPWS-T	Field	1	TE-6300W-102	T-WELL 6" SS DIRECT MNT
GPWS-T	Field	1	TE-631AM-2	WELL TEMP SEN 6" 1K NI
PANEL	Panel	1	PAKGJJ002AH0	FEC2611/IOM4711,20X24

Tag	Type	Qty	Part	Description
GWHP			**Heat Pumps**	
FILT-S	Field	9	FTG18A-600R	REMOTE MTD PROBE
FILT-S	Field	9	P32AC-2C	DIF,0.05 - 5 INWC,DIF=0.04-0.2 INWC,SPDT
MAD-O	Field	18	M9208-BGA-3	ACT ROTARY ON/OFF 24

Tag	Type	Qty	Part	Description
PH-1			**Terminal Units.TEC**	
CONTROLLER	Field	1	TEC3620-00-000	TSTAT, N2 & MSTP
HTG-O	Field	1	VG1241BG+923GGA	3/4" 2W BALL VALVE 4.7CV
RA-T	Field	1	TE-631GV-2	NICKEL DUCT PROB,4 INCHES

Tag	Type	Qty	Part	Description
TE-1			**Air Handling Units.TEC**	
SF-S	Field	1	CSD-CF0A0-1	SPLT/FIXED .15A W/O RELAY
TExD-ES	Field	1	KLNJ-A2	WHISKER SWITCH WITH 10A
ZN-T	Field	1	TEC3630-00-000	TSTAT, N2 & MSTP
R-1	Panel	1	RIBU1C	SPDT,10A,HC=10-30 VAC/DC,W/LED

Tag	Type	Qty	Part	Description
TE-2, 3			**Air Handling Units.TEC**	
SF-S	Field	2	CSD-CF0A0-1	SPLT/FIXED .15A W/O RELAY
TExD-ES	Field	2	KLNJ-A2	WHISKER SWITCH WITH 10A
ZN-T	Field	2	TEC3630-00-000	TSTAT, N2 & MSTP
R-1, R-2	Panel	4	RIBU1C	SPDT,10A,HC=10-30 VAC/DC,W/LED

Tag	Type	Qty	Part	Description
GE-1			**Air Handling Units.TEC**	
CONTROLLER	Field	1	TEC3630-00-000	TSTAT, N2 & MSTP
OAD-C, -ES	Field	1	M9208-BGC-3	ACT ON/OFF 24 VAC/VDC
SF-S	Field	1	CSD-CF0A0-1	SPLT/FIXED .15A W/O RELAY

Tag	Type	Qty	Part	Description
GE-1			**Air Handling Units.TEC**	
R-1	Panel	1	RIBU1C	SPDT,10A,HC=10-30 VAC/DC,W/LED

Tag	Type	Qty	Part	Description
Valve Schedule				
CWS\CWBYPV-O	Field	1	VG1241EP+910HGC	2W 1-1/2 NPT CV19 2SPDT
HWS/HX\HXISO-O	Field	1	VG1241FT+958BGC	2" 2W BALL VALVE 73.7CV
HWS\"B-1, B-2"	Field	2	VG12A5HW+94NBGC	3" 2W BALL VALVE 211 CV
HWS\BYPV-O	Field	1	VG1241DN+910HGA	2-WAY 1-1/4 IN CV=11.6;
HWS\PH-1	Field	1	VG1241BG+923GGA	3/4" 2W BALL VALVE 4.7CV
HX\HXMV-O	Field	1	VG2831TM+94NGGC	2-1/2", 3W,FLANGED, 54CV,

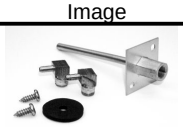
Tag	Type	Qty	Part	Description
Damper Schedule				
FANS\GE-1	Field	1	M9208-BGC-3	ACT ON/OFF 24 VAC/VDC
HWS\Boiler	Field	1	M9220-BGA-3	20NM,SR,DPR ACT,ON-OFF,24 VAC

Catalog

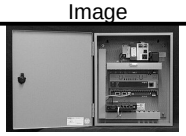
Part Name	Image	Additional Description
ADS05USRPC		ADS Workstation PC Turnkey-ITAS PN# ADSTK-8.0N
CSD-CA1G1-1		CSD-CA1G1-1 The CSD Series of digital output current switches are non-intrusive devices designed to detect current flow in cables or wires. These units are a very cost effective solution for monitoring on/off status or proof of operation, and ideal for monitoring current loads on motors driving fans, blowers, pumps, heating coils, even lighting. The CSD-CA1G1-1 is a split core, adjustable setpoint, with an amperage range from 1.25-135A, LED status indicator, output relay, and a hole size diameter of .765 in. (19mm).
CSD-CF0A0-1		CSD-CF0A0-1 The CSD Series of digital output current switches are non-intrusive devices designed to detect current flow in cables or wires. These units are a very cost effective solution for monitoring on/off status or proof of operation, and ideal for monitoring current loads on motors driving fans, blowers, pumps, heating coils, even lighting. The CSD-CF0A0-1 is a split core, fixed setpoint, with an amperage range from .15-200A, and a hole size diameter of .765 in. (19mm).
DPT2302-050D		230 Series Wet/Wet Differential Pressure Transducers The DPT2300, 2301 and 2302 wet/wet pressure transducers measure low differential pressures from 1 PSID to 100 PSID. The standard unit is offered with various outputs (5 VDC, 10 VDC or 4-20 mA), unidirectional and bi-directional ranges, high line pressure capabilities (250 PSIG), fast response time ((50 msec), NEMA 4 rated housing and excellent NIST traceable performance (+/-0.25% FS). With its stainless steel construction, the 230 series is compatible with the media encountered in wet/wet HVAC applications.
		230 Series Wet/Wet Differential Pressure Transducers with 3-Valve Manifold The DPT230 wet/wet pressure transducers measure differential pressure from 1 to 100 PSID. The standard unit is offered with various outputs, unidirectional and bi-directional ranges, high line pressure capabilities, fast response time, NEMA 4 rated housing and excellent performance. With its stainless steel construction, the 230 is compatible with wet/wet HVAC media. The 3-Valve Manifold is a machined brass body requiring no internal pipe connections. Its rugged, compact construction requires minimum space for installation and the Model 230 bleed ports eliminate any air in the line and pressure cavities. It is shipped complete and ready for installation.
F-1210		The model F-1210 Dual Turbine Insertion Flow Meter provides integral 4-20mA and 0-10VDC analog outputs highly accurate over a wide 50:1 flow range. The standard hot tap design allows for easy installation without system shutdown. The dual turbine configuration maintains high accuracy in short straight pipe runs. Electronic impedance sensing combined with engineered bearing systems provide excellent long-term reliability. Typical applications include HVAC and process water measurement.
F261MAH-V01C		The F261 Series Flow Switches respond to fluid flow in lines carrying water, ethylene glycol, or other nonhazardous fluids. These models also work in applications with swimming pool water and lubricating oils.
F-STD-INSTL1		INSTALL KIT, STD, 1.25-72 - STEEL PIPE.

FLOW METERS SHALL BE VENTURI TYPE

Catalog

Part Name	Image	Additional Description
FTG18A-600R		FTG18A-600R is a remote mounting kit for use with the P32 Series Sensitive Pressure Switch. The remote mounting kit consists of a four inch flanged sensing tube, two barbed fittings, two No. 10 screws, and a gasket.
KLNJ-A2		WHISKER SWITCH WITH 10A 120V CONTACTS
M9208-BGA-3		8 NM (70 lb-in.) SPRING RETURN DIRECT COUPLED DAMPER ACTUATOR, ON/OFF CONTROL, AC/DC 24 V 50/60 HZ, 95 DEGREE ROTATION, 60 SECONDS OPENING TIME, 21 SECONDS SPRING RETURN TIME AT ROOM TEMPERATURE, -40 TO 60C (-40 TO 140F) AMBIENT TEMPERATURE RATING, LOCKING MANUAL OVERRIDE, STANDARD CLAMP ACCEPTS 5/16 TO 5/8 INCH ROUND (8 to 16 MM) / 1/4 to 1/2 INCH (6 to 12 MM) SQUARE DAMPER SHAFT, OPTIONAL M9208-600 COUPLER KIT ACCEPTS 1/2 TO 3/4 INCH (12 to 19 MM) ROUND / 3/8 to 9/16 INCH (10 to 14 MM) SQUARE DAMPER SHAFT, 48 INCH (1.2 METER) 18 GA. APPLIANCE CABLE WITH CONNECTOR FOR 3/8 INCH FLEXIBLE METAL CONDUIT, NEMA 2 (IP54) ENCLOSURE RATING, FIVE YEAR WARRANTY
M9208-BGC-3		8 NM (70 lb-in.) SPRING RETURN DIRECT COUPLED DAMPER ACTUATOR, ON/OFF CONTROL, AC/DC 24 V 50/60 HZ, 95 DEGREE ROTATION, 60 SECONDS OPENING TIME, 21 SECONDS SPRING RETURN TIME AT ROOM TEMPERATURE, -40 TO 60C (-40 TO 140F) AMBIENT TEMPERATURE RATING, LOCKING MANUAL OVERRIDE, STANDARD CLAMP ACCEPTS 5/16 TO 5/8 INCH ROUND (8 to 16 MM) / 1/4 to 1/2 INCH (6 to 12 MM) SQUARE DAMPER SHAFT, OPTIONAL M9208-600 COUPLER KIT ACCEPTS 1/2 TO 3/4 INCH (12 to 19 MM) ROUND / 3/8 to 9/16 INCH (10 to 14 MM) SQUARE DAMPER SHAFT, TWO SPDT AUXILIARY SWITCHES, ONE FIXED AND ONE ADJUSTABLE, TWO 48 INCH (1.2 METER) 18 GA. APPLIANCE CABLES WITH CONNECTOR FOR 3/8 INCH FLEXIBLE METAL CONDUIT, NEMA 2 (IP54) ENCLOSURE RATING, FIVE YEAR WARRANTY
M9220-BGA-3		20 NM SPRING RETURN DIRECT COUPLED DAMPER ACTUATOR, TWO WIRE ON-OFF CONTROL, AC/DC 24 V 50/60 HZ, -5 TO 90 DEGREE ROTATION, OPTIONAL M9220-603 ROTATION LIMITER AVAILABLE TO LIMIT THE ACTUATOR STROKE BETWEEN 30 AND 90 DEGREES, 24 TO 57 SECONDS OPENING TIME, 15 SECOND SPRING RETURN TIME AT ROOM TEMPERATURE, -40 TO 55C (-40 TO 131F) AMBIENT TEMPERATURE RATING, ONE HANDED LOCKING MANUAL OVERRIDE, STANDARD CLAMP ACCEPTS 1/2 TO 3/4 INCH ROUND (12 to 19 MM) / 3/8 OR 1/2 INCH (10,12 and 14 MM) SQUARE DAMPER SHAFT, OPTIONAL M9220-600 CLAMP ACCEPTS 3/4 TO 1-1/16 INCH (19 to 27 MM) ROUND / 5/8 OR 3/4 INCH (16, 18 and 19 MM) SQUARE DAMPER SHAFT, ONE 48 INCH (1.2 METER) HALOGEN FREE APPLIANCE CABLE WITH CONNECTOR FOR 3/8 INCH FLEXIBLE METAL CONDUIT, NEMA 2 (IP54) ENCLOSURE RATING, FIVE YEAR WARRANTY
MONITOR22INCH		22 Inch VGA/DVI Monitor
P32AC-2C		This differential pressure switch is for air only.Use for air flow proving with electric duct heaters, humidifiers, etc., maximum air flow control for variable volume systems, reheat duct powered systems, clogged filter detection, and detection of icing of air conditioning coils and initiation of defrost cycle.

Catalog

Part Name	Image	Additional Description
PAGE00001FC0		The PAGE00001FC0 Control Panel is shipped complete, mounted in a 16 in. W x 20 in. H x 6.62 in. D steel enclosure. In addition to the MS-NAE4510-2 controller(s), the assembly also contains a5-port Ethernet switch and a power supply incorporating a 5 A circuit breaker, a 96 VA 120/24 VAC transformer, and two 120 VAC outlets
PAKGJJ002AH0		The PAKGJJ002AH0 Control Panel is shipped complete, mounted in a 20 in. W x 24 in. W x 6-5/8 in. D steel enclosure. In addition to the MS-FEC2611-0 controller(s), the assembly also contains a power supply incorporating a 5 A circuit breaker, a 96 VA 120/24 VAC transformer, and two 120 VAC outlets and a second 96 VA 120/24 VAC transformer
RIBU1C		Enclosed Relay 10Amp SPDT 10-30Vac/dc/120Vac
TE-6300W-102		TE-6300W-102 Thermowells are used in conjunction with remote temperature controls where thermowell insertion into a vessel or container to sense temperature is required. The TE-6300W-102 is a 6-in (152.4-mm) thermowell made of 304 stainless steel and marked with the Canadian Registration Number (CRN) for pressure vessel compliance.
TE-6313P-1		The TE-6300 Temperature Sensor line offers an economical solution for a wide variety of temperature sensing needs, including wall mount, outdoor air, duct, well, or duct averaging applications. The TE-6313P-1 thin-film nickel outdoor air sensor with a 3 in. probe comes with a handy box and an 1/2 in. NPT adaptor.
TE-631AM-2		TE-631AM-2 The TE-6300 Temperature Sensor line offers economical solutions for a variety of temperature sensing applications including, strap-mount, wall mount, outdoor air, duct, well, duct averaging, and Variable Air Volume (VAV) applications. The TE-631AM-2 is a 6-in. (152.4-mm), 1 k-ohm, nickel sensor probe with a metal enclosure. This unit is used with the TE-6300W-101 and TE-6300W-102 6-in. direct mount (adapterless) thermowells.
TE-631GV-2		TE-631GV-2 The TE-6300 Temperature Sensor line offers economical solution for a variety of temperature sensing applications including, strap-on, wall mount, outdoor air, duct, well, duct averaging, and Variable Air Volume (VAV) applications. The TE-631GV-2 is a 4-in. (101.6-mm), 1 k-ohm nickel sensor probe with a flange mounting bracket (no enclosure). This model comes with 10 ft (2.524 m) of plenum rated cable terminated with spade connectors.

Johnson Controls
INGENUITY WELCOME

Catalog

Part Name	Image	Additional Description
TEC3620-00-000		The TEC3620-00-000 BACnet or N2 network controller provides standalone room automation of fan coil units in 2-pipe, 4-pipe water systems and controls zone dampers in VVT systems.The network communications can be configured through the local 4.3" touchscreen display for N2 or BACnet MSTP BAS communications. Analog output voltages can be configured to control 0-10VDC modulating (proportional) valve & damper actuators. These versatile new controllers support single, multi, & variable speed fans in fan coil applications. Two binary dry-contact inputs support occupancy triggers, motion sensors, filter, service, fan lock, window & door status switches to provide additional monitoring and control in terminal unit applications. An additional analog input supports 1K ohm, 2.2k ohm, A99, 10k ohm type II, sensor types which provides a wider range of temperature sensing and control applications by replacing the on-board temperature sensor with a remote temperature sensor to meet the measurement needs of the application. The TEC3620-00-000 is a replacement for the TEC2145-4, TEC2146-4, TEC2146H-4, TEC2646-4, TEC2646H-4, and TEC2647-4 thermostat.
TEC3630-00-000		The TEC3330-00-000 BACnet or N2 network controller provides standalone room automation of staged heating and cooling equipment such as packaged roof top air-hanlders and heat-pumps with or without economizers. The network communications can be configured through the local 4.3" touchscreen display for N2 or BACnet MSTP BAS communications Outputs can be configured to control up to two stages of heating, two stages of cooling with the option for an analog economzier damper output, and a single speed supply fan. Two binary dry-contact inputs support occupancy triggers, motion sensors, filter, service, fan lock, window & door status switches to provide additional monitoring and control in terminal unit applications. An additional analog input supports 1K ohm, 2.2k ohm, A99, 10k ohm type II, sensor types which provides a wider range of temperature sensing and control applications by replacing the on-board temperature sensor with a remote temperature sensor to meet the measurement needs of the application. The TEC3630-00-000 is a replacement for the TEC2101-4, TEC2102-4, TEC2103-4, TEC2104-4, TEC2601-4, TEC2602-4, TEC2603-4, and TEC2604-4 thermostats.
VG1241BG+923GGA		3/4 in. two-way ball valve, 4.7 Cv, NPT end connections, plated brass trim, 23 to 203°F fluid temperature rating, not rated for steam service,VA9203-GGA-2Z spring return open, 0(2) - 10 VDC proportional control, 24 VAC 50/60 Hz or 24 VDC power required, no end switches, 0(2) to 10 VDC feedback, with 120 in. plenum rated cable
VG1241DN+910HGA		2-way, 1-1/4 in., NPT thread, Cv=11.6, with chrome plated brass ball, VA9310 Non Spring Return actuator, on/off floating and proportional control, 24 VAC/VDC supply
VG1241EP+910HGC		2-way, 1-1/2 in., NPT thread, Cv=18.5, with chrome plated brass ball, VA9310 Non Spring Return actuator, on/off floating and proportional control, 24 VAC/VDC supply, with aux switches 2 x SPDT
VG1241FT+958BGC		2 in. two-way ball valve, 73.7 Cv, NPT end connections, plated brass trim, 23 to 203°F fluid temperature rating, not rated for steam service,VA9208-BGC-3 spring return closed, 24 VAC 50/60 Hz or 24 VDC on/off control, 24 VAC 50/60 Hz or 24 VDC power required, two end switches, with two 48 in. appliance cables

Catalog

Part Name	Image	Additional Description
VG1245FT+958BGC		2 in. two-way ball valve, 73.7 Cv, NPT end connections, stainless steel trim, -22 to 212°F fluid temperature rating, not rated for steam service,VA9208-BGC-3 spring return closed, 24 VAC 50/60 Hz or 24 VDC on/off control, 24 VAC 50/60 Hz or 24 VDC power required, two end switches, with two 48 in. appliance cables
VG12A5HW+94NBGC		3 in. two-way flanged ball valve, 211 Cv (180 Kv), 150 ANSI Flanged end connections, stainless steel trim, 14 to 284°F fluid temperature rating, rated for 25 psig saturated steam, M9220-BGC-3 Electric Actuator, spring return closed, 24 VAC/24 VDC on/off (floating) control, 24 VAC 50/60 Hz or 24 VDC power required, two end switches, with two 48 in. halogen-free cables
VG2831TM+94NGGC		2-1/2 in. three-way mixing cast iron flanged globe valve, 54 Cv, 125 ANSI flanged end connection, brass trim, 25 to 281°F fluid temperatures, rated for 35 psig saturated steam, M9220-GGA-3 electric actuator, spring return stem down, 0(2)-10 VDC proportional control, 24 VAC 50/60 Hz or 24 VDC power required, two end switches, 0(2) to 10 VDC feedback, with 48 in. halogen-free cable

Code No. LIT-1900454
Issued April 5, 2013

CSD Series Current Devices

Description

The Current Switch Device (CSD) Series of digital output current switches are non-intrusive devices designed to detect current flowing through a cable or wire. A cost-effective solution for monitoring on and off status or proof of operation, these units are ideal for monitoring very small current loads on motors driving fans and blowers, pumps, heating coils, and lighting.

The CSD models with command relays not only monitor the current flowing through the cable but also facilitate the start and stopping of the motor.

These units also provide a universal solid-state output and do not require a power supply. Completely self-powered, these units draw their power from current induced from the cable or line being monitored.

CSD Series Current Devices are available in the following types:

- solid core, setpoint fixed
- solid core, setpoint adjustable
- solid core with command relay, setpoint adjustable
- split core, setpoint fixed
- split core, setpoint adjustable
- split core with command relay, setpoint fixed
- split core with command relay, setpoint adjustable
- 12 VAC/VDC and 24 VAC/VDC accessory command relays

Refer to the *CSD Series Current Devices Product Bulletin (LIT-12011292)* for important product application information.

Features

- dual function — monitors current and motor start and stop
- 100% solid-state output — has no moving parts to fail
- polarity insensitive output — provides easier wiring
- snap-in mounting bracket — simplifies installation
- small size — fits in tight enclosures

Fixed Setpoint Models

CSD-SF0C0-1 (solid core)
- Setpoint fixed at 0.25 A
- Current range — 0.25 to 200 A

CSD-CF0A0-1 (split core)
- Setpoint fixed at 0.15 A
- Current range — 0.15 to 200 A

CSD-CF0J0-1 (split core)
- Setpoint fixed at 1.5 A
- Current range — 1.5 to 200 A

CSD-CF0J1-1 (split core with 24 V command relay)
- Relay Single Pole, Single Throw (SPST), Normally Open (N.O.), 10 A at 260 VAC, 5 A at 30 VDC
- Actuation coil — 20–30 VAC/DC, 40–85 mA maximum
- Setpoint fixed at 1.5 A
- Current range — 1.5 to 200 A

Adjustable Setpoint Models

CSD-SA1E0-1 (solid core)
- Multi-turn potentiometer — adjust setpoint for application
- Adjustable setpoint — wide range from 1.0 to 135 A
- Two status Light-Emitting Diodes (LEDs) — provide visual indication of off and on status

CSD-SA1E1-1 (solid core with 24 V command relay)
- Multi-turn potentiometer — adjust setpoint for application
- Adjustable setpoint — wide range from 1.00 to 135 A
- Relay SPST, N.O., 10 A at 260 VAC, 5 A at 30 VDC
- Actuation coil — 20–30 VAC/DC, 40–85 mA maximum
- Two Status LEDs — provide visual indication of off and on status

CSD-CA1G0-1 (split core)
- Multi-turn potentiometers — adjust setpoint for application
- Two status LEDs — provide visual indication of off and on status
- Adjustable setpoint — wide range from 1.25 to 135 A

CSD Series Current Device

CSD-CA1G1-1 (split core with 24 V command relay)
- Multi-turn potentiometers — adjust setpoint for application
- Adjustable setpoint — wide range from 1.25 to 135 A
- Relay SPST, N.O., 10 A at 260 VAC, 5 A at 30 VDC
- Actuation coil — 20–30 VAC/VDC, 40–85 mA maximum
- Two status LEDs — provide visual indication of off and on status

CSD-SA1E2-1 (solid core with 12 V command relay
- Multi-turn potentiometers — adjust setpoint for application
- Adjustable setpoint — wide range from 1.00 to 135 A
- Relay SPST, N.O., 10 A at 260 VAC, 5 A at 30 VDC
- Actuation coil — 10–14 VAC/VDC, 25–45 mA maximum
- Two status LEDs — provide visual indication of off and on status

Repair Information

If the CSD Series Current Device fails to operate within its specifications, replace the unit. For a replacement CSD Series Current Device, contact the nearest Johnson Controls® representative.

CSD Series Current Devices (Continued)

Selection Chart

Code Number	Core Type	Setpoint Threshold	LED Display	Low Setpoint (Amperes)	Output Relay
CSD-SF0C0-1	Solid	Fixed	No	0.25	No
CSD-SA1E0-1	Solid	Adjustable	Yes	1.00	No
CSD-SA1E1-1	Solid	Adjustable	Yes	1.00	24 V SPST, N.O. 10 A at 260 VAC, 5 A at 30 VDC
CSD-SA1E2-1	Solid	Adjustable	Yes	1.00	12 V SPST, N.O. 10 A at 260 VAC, 5 A at 30 VDC
CSD-CF0A0-1	Clamp/Split	Fixed	No	0.15	No
CSD-CF0J0-1	Clamp/Split	Fixed	No	1.5	No
CSD-CA1G0-1	Clamp/Split	Adjustable	Yes	1.25	No
CSD-CF0J1-1	Clamp/Split	Fixed	No	1.5	24 V SPST, N.O. 10 A at 260 VAC, 5 A at 30 VDC
CSD-CA1G1-1	Clamp/Split	Adjustable	Yes	1.25	24 V SPST, N.O. 10 A at 260 VAC, 5 A at 30 VDC

Accessories (Order Separately)

Code Number	Description
CR-01200-0[1]	12 VAC/VDC SPST, N.O. Relay
CR-02400-0[1]	24 VAC/VDC SPST, N.O. Relay

1. Refer to the *Command Relay Installation Instructions (Part No.24-10345-50)* for more information regarding the command relays.

Technical Specifications

CSD Series Current Devices - Solid Core Models					
		CSD-SF0C0-1	**CSD-SA1E0-1**	**CSD-SA1E1-1**	**CDS-SA1E2-1**
Amperage Range		0.25–200 A	1.00–135 A	1.00–135 A	1.00–135 A
Switch Setpoint		Fixed	Adjustable	Adjustable	Adjustable
Output Relay		No	No	24 V SPST, N.O. 10 A at 260 VAC, 5 A at 30 VDC	12 V SPST, N.O. 10 A at 260 VAC, 5 A at 30 VDC
Actuation Coil		No	No	20–30 VAC/VDC, 40–85 mA Maximum	10–14 VAC/VDC, 25–45 mA Maximum
Switch LED Indication		No	Yes	Yes	Yes
Relay LED Indication		No	No	Yes	Yes
Trip Setpoint Value		0.25 A	1.00 A	1.00–135 A	
Current Switching Mode		Under Current Sensing	Over/Under Current Sensing	Over/Under Current Sensing	
Sensor Supply Voltage		Induced from power conductor cable.			
Wire Size		2.1–0.6 mm (12–22 AWG) Diameter			
Status Output		Switch normally open.			
Switch Load Capacity		1 A at 30 VAC/42 VDC Maximum			
Isolation Voltage		600 VAC rms			
Temperature Range		-15 to 60°C (5 to 140°F)			
Frequency Range		50/60 Hz			
Humidity Range		0–95% Noncondensing			
Screw Torque		0.5 N·m (4 lb·in.)			
Dimensions		65 x 47 x 25 mm (2-9/16 x 1-7/8 x 1 in.)		65 x 65 x 40 mm (2-9/16 x 2-9/16 x 1-19/32 in.)	
Aperture (Sensing Hole) Size		18 mm Diameter (0.71 in. Diameter)			
Compliance	**United States**	UL Listed, File E310692, CCN NRNT, Under UL 508, Industrial Control Equipment			
	Canada	UL Listed, File E310692, CCN NRNT7, Under CAN/CSA C22.2 No. 14-M91 Industrial Control Equipment			
CE	**Europe**	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EC.			
Shipping Weight		0.16 kg (0.35 lb)			

CSD Series Current Devices (Continued)

CSD Series Current Devices - Split Core Models					
		CSD-CF0A0-1/ CSD-CF0J0-1	**CSD-CA1G0-1**	**CSD-CF0J1-1**	**CSD-CA1G1-1**
Amperage Range		0.15–200 A/ 1.5–200 A	1.25–135 A	1.5–200 A	1.25–135 A
Switch Setpoint		Fixed	Adjustable	Fixed	Adjustable
Output Relay		No	No	24 V SPST, N.O. 10 A at 260 VAC, 5 A at 30 VDC	24 V SPST, N.O. 10 A at 260 VAC, 5 A at 30 VDC
Actuation Coil		No	No	20–30 VAC/VDC, 40–85 mA Maximum	20–30 VAC/VDC, 40–85 mA Maximum
Switch LED Indication		No	Yes	No	Yes
Relay LED Indication		No	No	Yes	Yes
Trip Setpoint Value		0.15 A/1.5 A	1.25–135 A	1.5 A	1.25–135 A
Current Switching Mode		Under Current Sensing	Over/Under Current Sensing	Under Current Sensing	Over/Under Current Sensing
Sensor Supply Voltage		Induced from power conductor cable.			
Wire Size		2.1–0.6 mm (12–22 AWG) Diameter Recommended			
Status Output		Switch normally open.			
Switch Load Capacity		1 A at 30 VAC/42 VDC Maximum			
Isolation Voltage		600 VAC rms			
Temperature Range		-15 to 60°C (5 to 140°F)			
Frequency Range		50/60 Hz			
Humidity Range		0–95% Noncondensing			
Screw Torque		0.5 N·m (4 lb·in.)			
Dimension		69 x 65 x 27 mm (2-23/32 x 2-9/16 x 1-1/16 in.)		69 x 65 x 44 mm (2-23/32 x 2-9/16 x 1-3/4 in.)	
Aperture (Sensing Hole) Size		18 x 20 mm Diameter (0.72 x 0.78 in. Diameter)			
Compliance	**United States**	UL Listed, File E310692, CCN NRNT, Under UL 508, Industrial Control Equipment			
	Canada	UL Listed, File E310692, CCN NRNT7, Under CAN/CSA C22.2 No. 14-M91 Industrial Control Equipment			
CE	**Europe**	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EC.			
Shipping Weight		0.16 kg (0.35 lb)			

Model DPT 230

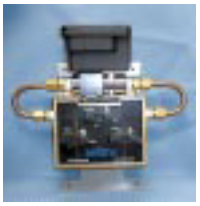
Wet/Wet Differential Pressure Transducer

(Available with 3-Valve Manifold Assembly)

Ranges: 0 to ±0.5 psid up to 0 to 100 psid. Liquids or Gases Both Sides

Setra Systems Model 230 is a high output, low differential pressure transducer designed for wet to wet differential pressure measurements of liquids or gases. A fast-response capacitance sensor and signal conditioned electronic circuitry provide a highly accurate, linear analog output proportional to pressure. Both unidirectional and bidirectional pressure ranges are available for applications with line pressure up to 250 psig.

A unique isolation system transmits the motion of the differential pressure sensing diaphragm from the high line pressure environment (e.g. corrosive liquids) to the dry (air) enclosure where it moves one of a pair of capacitance plates proportionally to the diaphragm movement. All parts exposed to the pressure media are stainless steel and elastomer seals. The 230 has a NEMA 4/IP65 rated package to withstand environmental effects. This system responds to pressure changes approximately 20 times faster than conventional fluid-filled transducers. The electronic circuit linearizes output vs. pressure and compensates for thermal effects of the sensor.



The Model 230 can be supplied with a 3-valve manifold assembly (ordered as Pressure Fitting Code V) to protect against excessive differential overpressure, which may occur during installation, start-up or shut-down. The 230 bleed ports allow for total elimination of air in the line and pressure cavities. The manifold's rugged, yet compact, construction requires minimum space for installation. If the Model 230 is ordered with the 3-valve manifold, the system is shipped completely assembled and ready for wall or pipe mounting. If 3-Valve Manifold Assembly is ordered separately without 230 transducer, order as DPT 3-VALVE.

Pressure Ranges

UNIDIRECTIONAL		
Pressure Range PSID	Proof Pressure High Side* PSI	Proof Pressure Low Side* PSI
0 to 1	20	2.5
0 to 2	40	5
0 to 5	100	12.5
0 to 10	100	25
0 to 25	250	62.5
0 to 50	250	125
0 to 100	250	250

BIDIRECTIONAL		
Pressure Range PSID	Proof Pressure High Side* PSI	Proof Pressure Low Side* PSI
0 to ±0.5	20	1.25
0 to ±1	40	2.5
0 to ±2.5	100	6.25
0 to ±5	100	12.5
0 to ±10	200	25
0 to ±25	250	62.5
0 to ±50	250	125

NOTE: Setra quality standards including ISO 9001 are based on ANSI-Z540-1. The calibration of this product is NIST traceable.

U.S. Patent nos. 4054833

*The zero will shift slightly when high differential overpressure is applied. The shift may be as much as ±10% FS with overpressure applied to the low pressure port. Other parameters (sensitivity, linearity, etc) will not shift. If the overpressure is normally only in one direction, the user may apply this overpressure to preset the sensor. Subsequent overload of less magnitude will not cause additional shift. The unit is pre-zeroed at the factory after application of maximum overload pressure to the high pressure port.

Applications

- Process Control
- Energy Management Systems
- Flow measurement of various gases or liquids
- Liquid level measurement of pressurized vessels
- Pressure Drop Across Filters

Features

- NEMA 4/IP65 rating
- 3-Valve Manifold Assembly
- High Accuracy
- Low Cost
- Fast Response
- Gas and Liquid Compatible
- Low Differential Ranges
- Low Line Pressure Effect
- No Liquid Fill Diaphragms

ISO 9001 Certified

Visit Setra Online:
http://www.setra.com

setra

800-257-3872

159 Swanson Rd., Boxborough, MA 01719/Telephone: 978-263-1400/Fax: 978-264-0292

Model 230 Specifications

Performance Data

Accuracy RSS* (at constant temp)	±0.25% FS
Non-Linearity, BFSL	±0.20% FS
Hysteresis	0.10% FS
Non-Repeatability	0.05% FS
Thermal Effects	
Compensated Range °F(°C)	30 to 150 (-1 to 65)
Zero shift %FS/°F(%FS/°C)	2.0 (1.8)
Span Shift %FS/°F(%FS/°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/g (most sensitive axis)
Natural Frequency	500 Hz (gaseous media)
Warm-up Shift	±0.1% FS total
Response Time	30 to 50 milliseconds
Long Term Stability	0.5%/1 YR
Maximum Working Pressure	250 psig

*RSS of Non-Linearity, Non-Repeatability and Hysteresis.

Specifications subject to change without notice.

Environmental Data

Temperature	
Operating* °F (°C)	0 to +175 (-18 to +80)
Storage °F (°C)	-65 to +250 (-54 to +121)
Vibration	5g from 5Hz to 500Hz
Acceleration	10g
Shock	50g

*Operating temperature limits of the electronics only.
Pressure media temperatures may be considerably higher or lower.

Physical Description

Case	Stainless Steel/Aluminum
Electrical Connection	Barrier strip terminal block with conduit enclosure & 0.875 DIA conduit opening.
Pressure Fittings	1/4"-18" NPT internal
Weight (approx.)	14.4oz
Sensor Cavity Volume	0.27 in^3 Positive Port, 0.08 in^3 Negative Port

(With 1/4"NPT external fittings installed - does not include cavity volume of 1/4"NPT external fittings.)

Electrical Data (Voltage)

Circuit	3-Wire (Exc., Out, Com)
Excitation	9 to 30 VDC for 0-5 VDC output 13 to 30 VDC for 0-10 VDC output

Electrical Data (Voltage) Cont'd.

Output*	0-5 VDC** 0-10 VDC**
Output Impedance	100 ohms

*Calibrated into a 50K ohm load, operable into a 5000 ohm load or greater.
**Zero output factory set at 50mV (±25mV) for 0-5 VDC and 50mV (±50mV) for 0-10 VDC.
**Span output factory set at 5 VDC (±25mV) or 10 VDC (±50mV).

Electrical Data (Current)

Circuit	2-Wire
Output*	4 to 20mA**
External Load	0 to 1000 ohms

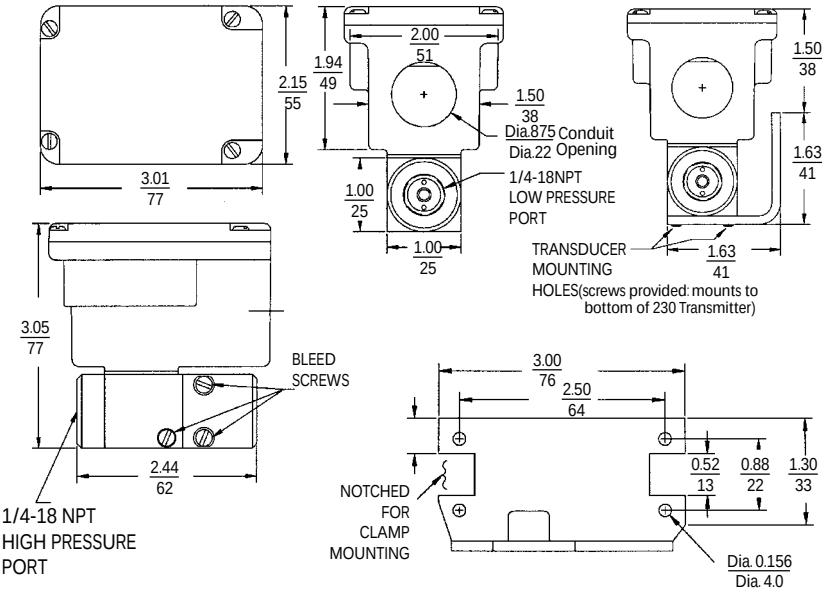
Minimum loop supply voltage (VDC) = 9 + 0.02 x (Resistance of receiver plus line).
Maximum loop supply voltage (VDC) = 30 + 0.004 x (Resistance of receiver plus line).
*Calibrated at factory with a 24 VDC loop supply voltage and a 250 ohm load.
**Zero output factory set at 4mA (±.08mA)
**Span output factory set at 20mA (±.08mA)

Pressure Media

Gases or liquids compatible with 17-4 PH Stainless Steel, 300 Series Stainless Steel, Viton and Silicone O-Rings.

Note: Hydrogen not recommended for use with 17-4 PH stainless steel.

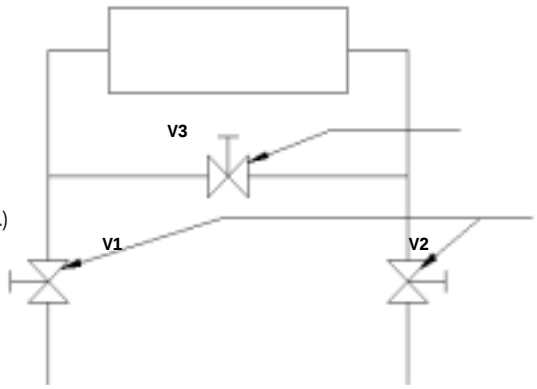
Outline Drawings



3-Valve Manifold Assembly Description

(Order by adding "-V" to standard part number. See example below.)

Manifold Block	Brass
Valves (3)	V1 for connection to +port V2 for connection to -port V3 for equalizing pressure
Valve type	90 Degree On/Off
Process Connections	1/4" -18 NPT Internal Thread



Ordering Information

Input Range PSID	Product Codes 0 to 5 VDC Output	0 to 10 VDC Output	4 to 20 mA Output
0 to 1	DPT2300-001D	DPT2302-001D	DPT2301-001D
0 to 2	DPT2300-002D	DPT2302-002D	DPT2301-002D
0 to 5	DPT2300-005D	DPT2302-005D	DPT2301-005D
0 to 10	DPT2300-010D	DPT2302-010D	DPT2301-010D
0 to 25	DPT2300-025D	DPT2302-025D	DPT2301-025D
0 to 50	DPT2300-050D	DPT2302-050D	DPT2301-050D
0 to 100	DPT2300-100D	DPT2302-100D	DPT2301-100D
-0.5 to 0.5	DPT2300-0R5B	DPT2302-0R5B	DPT2301-0R5B
-1 to 1	DPT2300-001B	DPT2302-001B	DPT2301-001B
-2.5 to 2.5	DPT2300-2R5B	DPT2302-2R5B	DPT2301-2R5B
-5 to 5	DPT2300-005B	DPT2302-005B	DPT2301-005B
-10 to 10	DPT2300-010B	DPT2302-010B	DPT2301-010B
-25 to 25	DPT2300-025B	DPT2302-025B	DPT2301-025B
-50 to 50	DPT2300-050B	DPT2302-050B	DPT2301-050B

Input Range PSID	Product Codes with 3-Valve Manifold Option 0 to 5 VDC Output	0 to 10 VDC Output	4 to 20 mA Output
0 to 1	DPT2300-001D-V	DPT2302-001D-V	DPT2301-001D-V
0 to 2	DPT2300-002D-V	DPT2302-002D-V	DPT2301-002D-V
0 to 5	DPT2300-005D-V	DPT2302-005D-V	DPT2301-005D-V
0 to 10	DPT2300-010D-V	DPT2302-010D-V	DPT2301-010D-V
0 to 25	DPT2300-025D-V	DPT2302-025D-V	DPT2301-025D-V
0 to 50	DPT2300-050D-V	DPT2302-050D-V	DPT2301-050D-V
0 to 100	DPT2300-100D-V	DPT2302-100D-V	DPT2301-100D-V
-0.5 to 0.5	DPT2300-0R5B-V	DPT2302-0R5B-V	DPT2301-0R5B-V
-1 to 1	DPT2300-001B-V	DPT2302-001B-V	DPT2301-001B-V
-2.5 to 2.5	DPT2300-2R5B-V	DPT2302-2R5B-V	DPT2301-2R5B-V
-5 to 5	DPT2300-005B-V	DPT2302-005B-V	DPT2301-005B-V
-10 to 10	DPT2300-010B-V	DPT2302-010B-V	DPT2301-010B-V
-25 to 25	DPT2300-025B-V	DPT2302-025B-V	DPT2301-025B-V
-50 to 50	DPT2300-050B-V	DPT2302-050B-V	DPT2301-050B-V

For calibration certificate, add DPT-CAL-REPORT after part number.

For separate 3-Valve Manifold order as DPT 3-VALVE

Example: Part No. 2300-005D-V for a 230 Transducer, 0 to 5 PSID. Unidirectional Range, 0 to 5 VDC Output. Assembled with the 3-Valve Manifold.

159 Swanson Road, Boxborough, MA 01719/Tel: 978-263-1400;
Toll Free: 800-257-3872; Fax: 978-264-0292; email: sales@setra.com

SSPC2300D Rev.C-2pg. 02/22/02

Made in the USA

• F-1210 DUAL TURBINE •
INSERTION FLOW METER
ANALOG OUTPUT

ONICON INCORPORATED

DESCRIPTION

ONICON insertion turbine flow meters are suitable for measuring electrically conductive water-based liquids. The F-1210 model provides non-isolated 4-20 mA and 0-10 V analog output signals that are linear with the flow rate.

APPLICATIONS

- Closed loop chilled water, hot water, condenser water & water/glycol/brine solutions for HVAC
- Process water & water mixtures
- Domestic water

GENERAL SPECIFICATIONS

ACCURACY
± 0.5% of reading at calibrated velocity
± 1% of reading from 3 to 30 ft/s (10:1 range)
± 2% of reading from 0.4 to 20 ft/s (50:1 range)

SENSING METHOD
Electronic impedance sensing
(non-magnetic and non-photoelectric)

PIPE SIZE RANGE
2½" through 72" nominal diameter

SUPPLY VOLTAGE
24 ± 4 V AC/DC at 50 mA

LIQUID TEMPERATURE RANGE
Standard: 180° F continuous, 200° F peak
High Temp: 280° F continuous, 300° F peak
Meters operating above 250° F require 316 SS construction option

AMBIENT TEMPERATURE RANGE
-5° to 160° F (-20° to 70° C)

OPERATING PRESSURE
400 PSI maximum

PRESSURE DROP
Less than 1 PSI at 20 ft/s in 2½" pipe, decreasing in larger pipes and lower velocities

OUTPUT SIGNALS PROVIDED
Analog Output (non-isolated)
Voltage output: 0-10 V (0-5 V available)
Current output: 4-20 mA
Frequency Output
0 – 15 V peak pulse, typically less than 300 Hz

(continued on back)

CALIBRATION

Every ONICON flow meter is wet calibrated in our flow laboratory against primary volumetric standards that are directly traceable to N.I.S.T. A certificate of calibration accompanies every meter.

FEATURES

Unmatched Price vs. Performance - Custom calibrated, highly accurate instrumentation at very competitive prices.

Excellent Long-term Reliability - Patented electronic sensing is resistant to scale and particulate matter. Low mass turbines with engineered jewel bearing systems provide a mechanical system that virtually does not wear.

Industry Leading Two-year "No-fault" Warranty - Reduces start-up costs with extended coverage to include accidental installation damage (miswiring, etc.) Certain exclusions apply. See our complete warranty statement for details.

Simplified Hot Tap Insertion Design - Standard on every insertion flow meter. Allows for insertion and removal by hand without system shutdown.

OPERATING RANGE FOR COMMON PIPE SIZES
0.17 TO 20 ft/s
±2% accuracy begins at 0.4 ft/s

Pipe Size (Inches)	Flow Rate (GPM)
2 ½	2.5 - 230
3	4 - 460
4	8 - 800
6	15 - 1,800
8	26 - 3,100
10	42 - 4,900
12	60 - 7,050
14	72 - 8,600
16	98 - 11,400
18	120 - 14,600
20	150 - 18,100
24	230 - 26,500
30	360 - 41,900
36	510 - 60,900

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www.onicon.com • sales@onicon.com

F-1210 SPECIFICATIONS cont.

MATERIAL

Wetted metal components:
- Standard: Electroless nickel plated brass
- Optional: 316 stainless steel

ELECTRONICS ENCLOSURE
- Standard: Weathertight aluminum enclosure
- Optional: Submersible enclosure

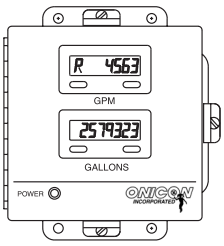
ELECTRICAL CONNECTIONS

3-wire minimum for 4-20 mA or 0-10 V output
Second analog output and/or frequency output requires additional wires
- Standard: 10' of cable with ½" NPT conduit connection
- Optional: Indoor DIN connector with 10' of plenum rated cable

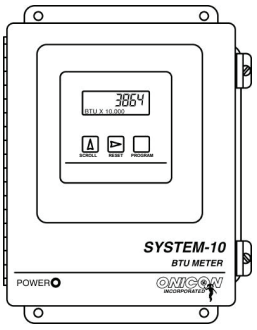
F-1210 Wiring Information

WIRE COLOR	DESCRIPTION	NOTES
RED	(+) 24 V AC/DC supply voltage, 50 mA	Connect to power supply positive
BLACK	(-) Common ground (Common with pipe ground)	Connect to power supply negative & analog input ground
GREEN	(+) Frequency output signal: 0-15 V peak pulse	Required when meter is connected to local display or Btu meter
BLUE	(+) Analog signal: 4-20 mA (non-isolated)	Both signals may be used independently
BROWN	(+) Analog signal: 0-10 V (non-isolated)	
DIAGNOSTIC SIGNALS		
ORANGE	Bottom turbine frequency	These signals are for diagnostic purposes - connect to local display or Btu meter
WHITE	Top turbine frequency	

ALSO AVAILABLE



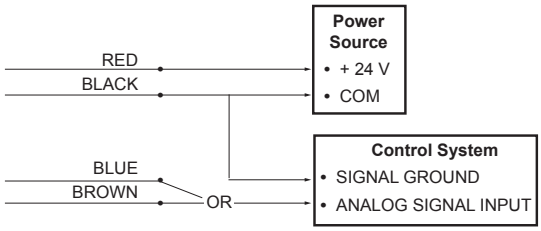
Display Modules



Btu Measurement Systems

F-1210 Wiring Diagram

Flow meter into control system (no display or Btu meter)

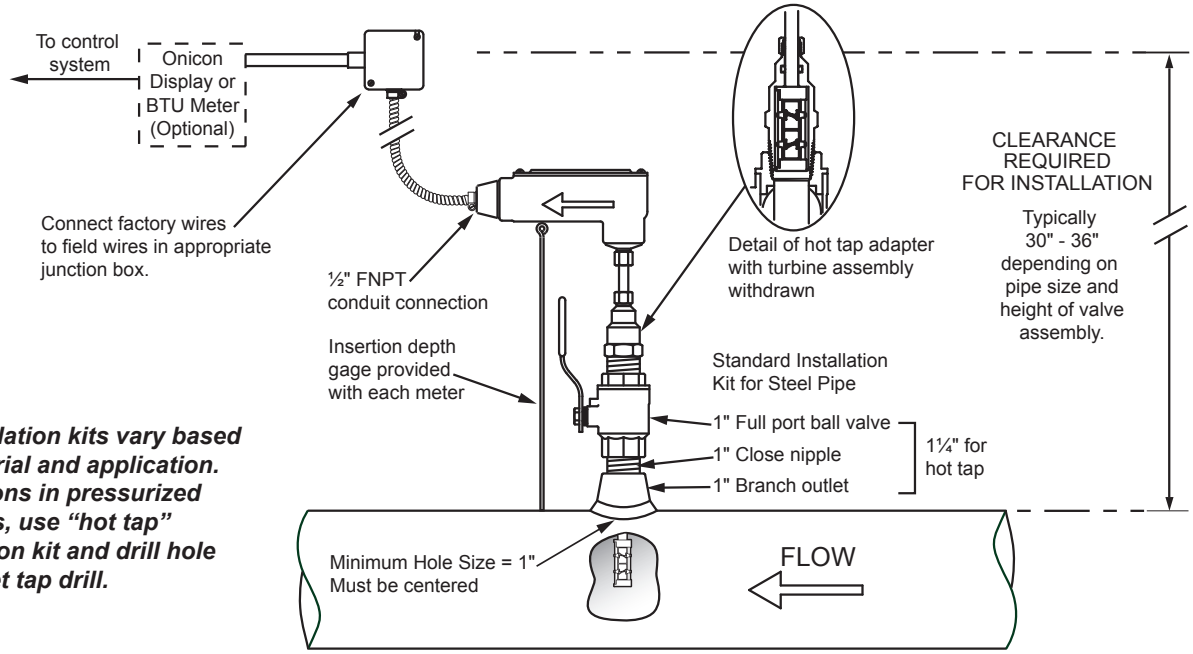


NOTE: 1. Black wire is common with the pipe ground (typically earth ground).
2. Frequency output required for ONICON display module or Btu meter, refer to wiring diagram for peripheral device.

Typical Meter Installation
(New construction or scheduled shutdown)

- Acceptable to install in vertical pipe
- Position meter anywhere in upper 240° for horizontal pipe

Horizontal Run Pipe



NOTE: Installation kits vary based on pipe material and application. For installations in pressurized (live) systems, use "hot tap" 1¼" installation kit and drill hole using a 1" wet tap drill.

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Code No. LIT-1900948
Issued November 13, 2015

F261 Series Fluid Flow Switches

Description

The F261 Series Flow Switches respond to fluid flow in lines carrying water, ethylene glycol, or other nonhazardous fluids. These models also work in applications with swimming pool water and lubricating oils.

F261 Series Standard Flow Switches use a variety of paddle sizes to respond to fluid flow rates in applications with pipe sizes greater than 1 inch trade size.

Refer to the *F261 Series Fluid Flow Switches Product Bulletin (LIT-12011987)* for important product application information.

Features

- Type 3R (NEMA) or Type 4 (NEMA) enclosure allows use in indoor or outdoor applications.
- Viton® diaphragms allow use in fluid lines carrying chlorinated water, treated water, or other nonhazardous fluids.
- low-flow operation on low-flow models actuates switch with less than 1.0 GPM (3.8 L/min) flow for water applications or 9.0 GPM (34.1 L/min) flow for steam applications.
- maximum fluid pressure of 290 psig (20 bar) permits use in a wide range of pressure flow conditions.

F261 Flow Switch

Repair Information

If the F261 Series Flow Switch fails to operate within its specifications, replace the unit. For a replacement F261 Series Flow Switch, contact the nearest Johnson Controls® representative.

Selection Chart

F261 Series Standard Model Flow Switches

Product Code Number	Description
F261KAH-V01C	Standard model flow switch with Type 3R (NEMA) enclosure; 1 in., 2 in., 3 in., and 6 in. stainless steel paddles, lock-tooth washer, and stainless steel paddle screw supplied uninstalled
F261MAH-V01C	Standard model flow switch with Type 4 (NEMA) enclosure; 1 in., 2 in., 3 in., and 6 in. stainless steel paddles, lock-tooth washer, and stainless steel paddle screw supplied uninstalled
F261MAL-V01C	Standard model flow switch with Type 4 (NEMA) enclosure; 1 in., 2 in., 3 in., and 6 in. stainless steel paddles, lock-tooth washer, and stainless steel paddle supplied uninstalled.

F261 Series Low-Flow Model Flow Switches

Product Code Number	Description
F261KEH-V01C	Low-flow model flow switch with Type 3R (NEMA) enclosure; 1/2 in. x 1/2 in. External NPTF inlet and outlet
F261KFH-V01C	Low-flow model flow switch with Type 3R (NEMA) enclosure; 3/4 in. x 3/4 in. External NPTF inlet and outlet
F261KFH-V02C	Low-flow model flow switch with Type 3R (NEMA) enclosure; 3/4 in. x 3/4 in. External NPTF inlet and outlet
F261MEH-V01C	Low-flow model flow switch with Type 4 (NEMA) enclosure; 1/2 in. x 1/2 in. External NPTF inlet and outlet
F261MFH-V01C	Low-flow model flow switch with Type 4 (NEMA) enclosure; 3/4 in x 3/4 in. External NPTF inlet and outlet

Replacement Paddle Parts

Product Code Number	Description
KIT21A-600	Stainless steel three-piece paddle (3 in., 2 in., and 1 in. segments)
KIT21A-601	Stainless steel 6 in. paddle
PLT52A-600R	Stainless steel three-piece paddle (3 in., 2 in., and 1 in. segments) and Stainless steel 6 in. paddle

Technical Specifications

F261xxH Series Standard Controls Electrical Ratings

Volts, 50/60 Hz	UL60730/UL1059				EN60730	
	24	120	208	240	24	230
Horsepower	–	1	1	1	–	–
Full Load Amperes	–	16	10	10	–	8
Locked Rotor Amperes	–	96	60	60	–	48
Resistive Amperes	16	16	10	10	16	16
Pilot Duty VA	125	720	720	720	77	720

F261 Series Fluid Flow Switches (Continued)

UL Conformity Declaration Information

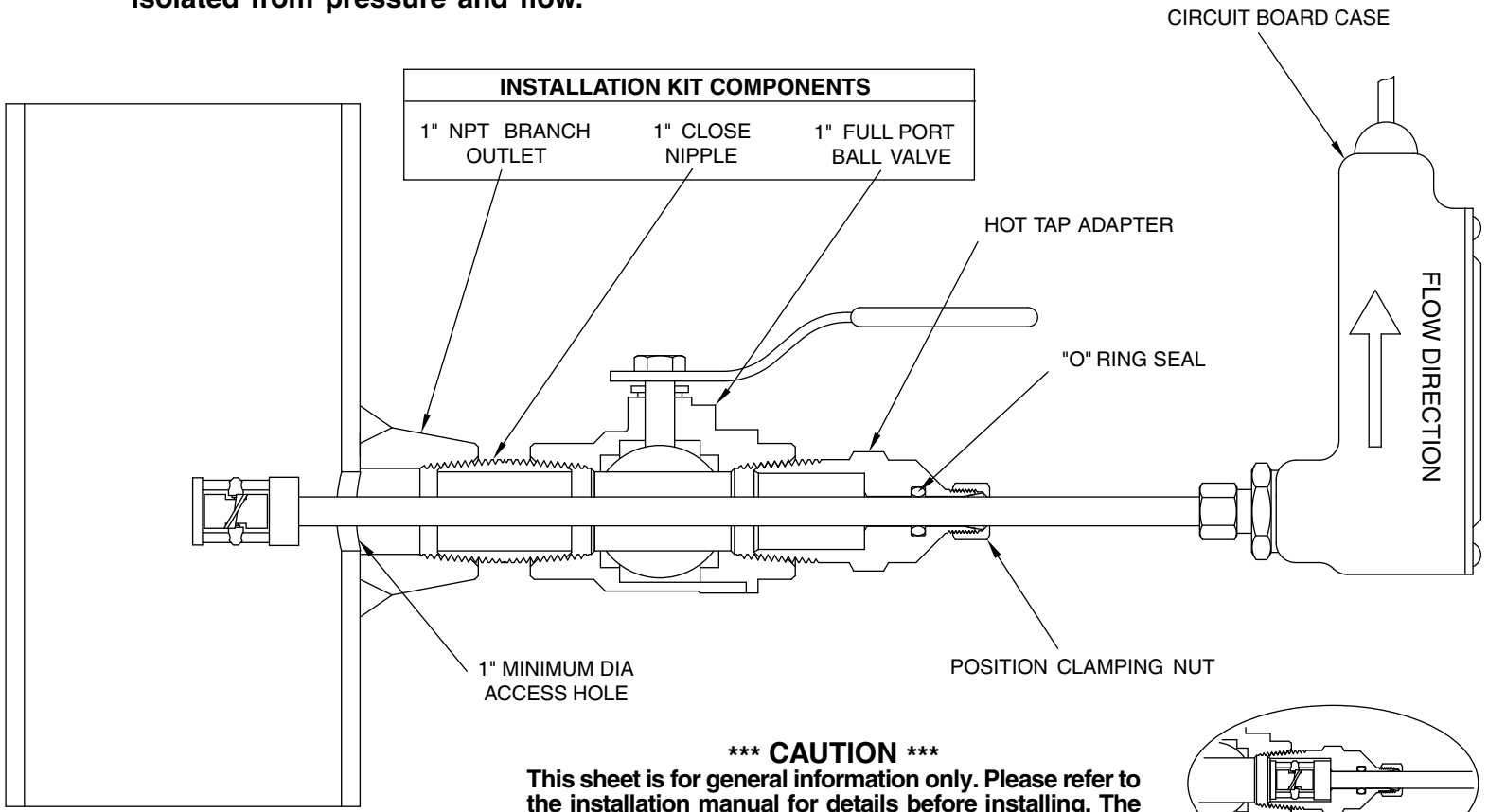
Information	Description
Purpose of Control	F261 Fluid Flow Switch
Construction of Control	Electronic independently mounted control
Number of Cycles	100,000 cycles
Method of Mounting Control	Mounting to sensed media vessel/orientation
Type 1 or Type 2 Action	Type 1.C (Microinterruption)
External Pollution Situation	Pollution degree 4
Internal Pollution Situation	Pollution degree 2
Rated Impulse Voltage	4,000 VAC
Ball Pressure Temperature	Enclosure: 266°F (130°C) Switch Component: 252°F (122°C)
Control Adjustment Instruction	-
Field Wiring Rating	**Wire/Cord Temperature Ratings:** 140°F (60°C) only permitted when ambient air and media are less than 113°F (45°C) 167°F (75°C) only permitted when ambient air and media are less than 140°F (60°C) 194°F (90°C) only permitted when ambient air is less than 140°F (60°C) and media is less than 167°F (75°C) 302°F (150°C) permitted when ambient air is less than 140°F (60°C) and media is less than 249°F (121°C)
Vessel Pressure	F261 Fluid Flow Switch: 290 psi (20 Bar)

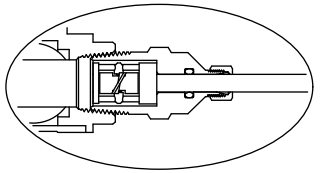
F261 Series Fluid Flow Switches	
Switch	Single-Pole, Double-Throw (SPDT)
Enclosure	UL: Type 3R or Type 4 CE: IP43 (IP23 with drain hole plug removed) or IP67
Wiring Connections	Three color-coded screw terminals and one ground terminal
Conduit Connection	One 7/8 in. (22 mm) hole for 1/2 in. trade size (or PG16) conduit
Pipe Connector	Standard: 1 in. 11-1/2 NPT Threads
Maximum Fluid Pressure	290 psi (20 bar)
Minimum Fluid Temperature[1]	-20°F (-29°C)
Maximum Fluid Temperature[2]	250°F (121°C)
Ambient Conditions	-40 to 140°F (-40 to 60°C)
Compliance CE	**North America:** cULus Listed; UL 60730, File E6688; FCC Compliant to CFR47, Part 15, Subpart B, Class B Industry Canada (IC) Compliant to Canadian ICES-003, Class B limits
	Europe: CE Mark – Johnson Controls, Inc. declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and the Low Voltage Directive.
	Australia/New Zealand Mark: RCM Compliant

1. Ensure that the low liquid temperature combined with the low ambient temperature does not lead to the freezing the liquid inside the body (or bellows, where appropriate). Please observe the liquid freezing point.
2. At higher ambient temperatures, the maximum allowed liquid temperature becomes lower. The temperature of the electrical switch inside should not exceed 158°F (70°C).

STANDARD INSTALLATION LAYOUT FOR WELDED PIPE

The Standard Installation option allows for removal and re-insertion of the flow meter without system shutdown. For the initial installation, the 1" flow meter access hole in the pipe must be drilled before installing the valve either prior to filling the system or into a section of pipe isolated from pressure and flow.





***** CAUTION *****

This sheet is for general information only. Please refer to the installation manual for details before installing. The manual contains specific dimensions and safety data.

JCI ITEM #	DESCRIPTION
F-STD-INSTL1	Install kit, standard, welded steel pipe
F-STD-INSTL5	Install kit, std SS, welded steel pipe
F-STD-INSTL18	Install kit, standard 316 SS, for SS pipe

2161 Logan St., Clearwater, Florida 33765 Tel (727) 447-6140 Fax (727) 442-5699

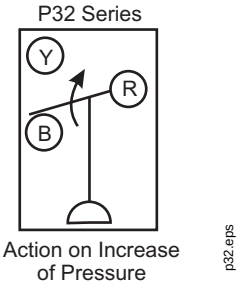
Code No. LIT-1927195
Issued November 13, 2015

P32 Series Sensitive Pressure Switch

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.



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.

P32 Sensitive Pressure Switch

Selection Chart

Product Code Number	Ambient Temperature Min./Max.	Connector	Maximum Over-pressure psig (kPa)[1]	Contact Action	Range in. WC (kPa)	Sensitivity at Min. Setpoint in. WC (kPa)	Setpoint	Scale Plate	Mounting Bracket (Included) bracket2.eps bracket1.eps
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)	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

Technical Specifications

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		

WHISKER SWITCH
KLNJ-A2

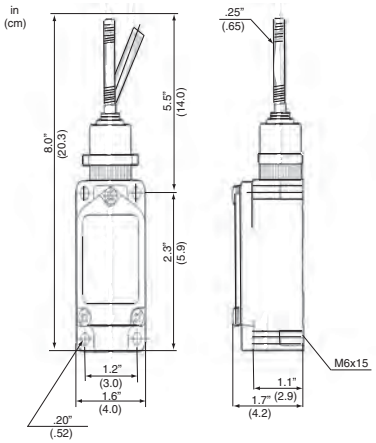
DESCRIPTION

The **KLNJ-A2 Whisker Switch** is a high-quality, multi-directional contact switch with a plastic coated spring-rod whisker. It is perfect for sensing damper blade position and can be used to provide position status of valve linkages or other mechanical devices.

FEATURES

- ***Plastic coated spring-rod whisker for long life***
- ***Captive wiring cover screws to save time***
- ***Heavy duty 10A @ 120 VAC contacts***

DIMENSIONS



KLNJ-A2

NEW!

SPECIFICATIONS

Wiring Terminations	Screw terminals
Conduit Connection	1/2" NPT
Contact Rating	10A @ 24 VAC, 10A @ 120 VAC, 6A @ 24 VDC
Contact Arrangement	1 N.O. and 1 N.C.
Switch Angle	15° make, 6° reset
Operating Temperature	-13° to 131°F (-25° to 55°C)
Dimensions	8.0"H x 1.6"W x 1.7"D (20 x 4.0 x 4.2 cm)
Weight	0.5 lb (0.2 kg)
Enclosure Rating	IP67
Approvals	CE, cUL recognized, NRNT8. E117960
Warranty	1 year

ORDERING INFORMATION

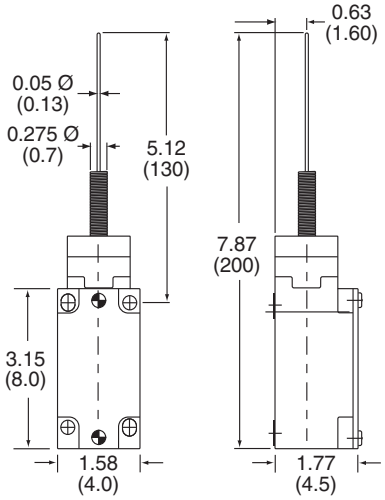
MODEL	DESCRIPTION
KLNJ-A2	Whisker switch with coated spring-rod and 10A @ 120 VAC contacts

WHISKER SWITCH
LS45M91B11

DESCRIPTION

The **LS45M91B11 Whisker Switch** is a multidirectional metal limit switch. This spring rod whisker version allows flexibility when applying to damper, valve, and other HVAC applications that need position sensing.

DIMENSIONS



LS45M91B11

SPECIFICATIONS

Wiring Terminations	Screw terminals
Conduit Connection	1/2" NPT
Contact Rating	10A @ 24 VAC, 5A @ 120 VAC, 2.8A @ 24 VDC
Contact Arrangement	1 N.O. and 1 N.C.
Switch Angle	14° make, 6° reset
Operating Temperature	-13° to 158°F (-25° to 70°C)
Dimensions	7.9"H x 1.6"W x 1.8"D (20 x 4.0 x 4.5 cm)
Weight	0.5 lb (0.2 kg)
Enclosure Rating	NEMA 4X
Approvals	CE, UL Listed, CSA
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
LS45M91B11	Whisker switch with steel spring-rod and 5A @ 120 VAC contacts

NEW!

Code No. LIT-1900562
Issued May 2016

M9208-xxx-x Series Electric Spring-Return Actuators

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

M9208-xxx-x Series Electric Spring-Return Actuator

Accessories and Replacement Parts

Code Number	Description
DMPR-KC003[1]	7 in. (178 mm) Blade Pin Extension (without Bracket) for Johnson Controls Direct-Mount Damper Applications (Quantity 1)
M9000-200	Commissioning Tool that Provides a Control Signal to Drive 24 V On/Off, Floating, Proportional, and/or Resistive Electric Actuators (Quantity 1)
M9000-321	Weather Shield Kit for Damper Application of M9203 and M9208 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 from 1/2 to 3/4 in. (12 to 19 mm) or Square Shafts from 3/8 to 9/16 in. (10 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 to 5/8 in. (8 to 16 mm) or Square Shafts from 1/4 to 1/2 in. (6 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)

1. Furnished with the damper and may be ordered separately

M9208-xxx-x Series Electric Spring-Return Actuators (Continued)

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[1]		■			8	7.9 (5.5)	—	■	■				■		■
M9208-AGC-3	150	17 to 25[1]		■			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[2]	■				7	6.1 (1.2)	—	■				■	■		■
M9208-BAA-3	55 to 71	13 to 26[2]			■		—	—	0.05 (0.03)	■					■		■
M9208-BAC-3	55 to 71	13 to 26[2]			■		—	—	0.05 (0.03)	■				■	■		■
M9208-BDA-3	55 to 71	13 to 26[2]				■	—	—	0.04 (0.03)	■					■		■
M9208-BDC-3	55 to 71	13 to 26[2]				■	—	—	0.04 (0.03)	■				■	■		■
M9208-GGA-2	150	17 to 25[1]		■			8	7.9 (5.5)	—			■	■			■	■
M9208-GGA-3	150	17 to 25[1]		■			8	7.9 (5.5)	—			■	■		■		■
M9208-GGC-3	150	17 to 25[1]		■			8	7.9 (5.5)	—			■	■	■	■		■

1. 22 seconds nominal at room temperature and rated load, 94 seconds maximum at rated load and -40ºF (-40ºC)
2. 21 seconds nominal at room temperature and rated load, 39 seconds maximum at rated load and -4ºF (-20ºC), 108 seconds maximum at 53 lb·in (6 N·m) and -40ºF (-40ºC)

M9208-xxx-x Series Electric Spring-Return Actuators (Continued)

Technical Specifications

M9208-GGx-x Series Proportional Electric Spring-Return Actuator (Part 1 of 2)		
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 Switch Rating	**-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 to 70 lb·in (8 N·m) Load, At All Operating Conditions
	Power Off (Spring Returning)	17 to 25 Seconds for 0 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 and0.25 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 to 5/8 in. (8 to 16 mm)
	Square Shafts	Range of Sizes: 1/4 to 1/2 in. (6 to 12 mm)
Enclosure Rating		NEMA 2 (IP54) for All Mounting Directions
Ambient Conditions	**Standard Operating**	-40 to 140°F (-40 to 60°C); 90% RH Maximum, Noncondensing
	Storage	-40 to 185ºF (-40 to 85ºC); 95% RH Maximum, Noncondensing
Dimensions		6.33 x 3.90 x 2.26 in. (160.7 x 99 x 57.5 mm)

M9208-xxx-x Series Electric Spring-Return Actuators (Continued)

M9208-GGx-x Series Proportional Electric Spring-Return Actuator (Part 2 of 2)		
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; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
CE	**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).
	Europe	CE Mark – Johnson Controls, Inc. 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 (Part 1 of 2)		
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 to 70 lb·in (8·N m) Load, At All Operating Conditions
	Power Off (Spring Returning)	17 to 25 Seconds for 0 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: 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 to 5/8 in. (8 to 16 mm)
	Square Shafts	Range of Sizes: 1/4 to 1/2 in. (6 to 12 mm)
Enclosure Rating		NEMA 2 (IP54) for All Mounting Directions

M9208-xxx-x Series Electric Spring-Return Actuators (Continued)

M9208-AGx-x Series On/Off and Floating Point Control Electric Spring-Return Actuator (Part 2 of 2)		
Ambient Conditions	**Standard Operating**	-40 to 140°F (-40 to 60°C); 90% RH Maximum, Noncondensing
	Storage	-40 to 185ºF (-40 to 85ºC); 95% RH Maximum, Noncondensing
Dimensions		6.33 x 3.90 x 2.26 in. (160.7 x 99 x 57.5 mm)
Compliance CE	**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; and UL 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).
	Europe	CE Mark – Johnson Controls, Inc. 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 (Part 1 of 2)		
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 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 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 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 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
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. (10 mm) Flexible Metal Conduit
Mechanical Connections	**Round Shafts**	Range of Sizes: 5/16 to 5/8 in. (8 to 16 mm)
	Square Shafts	Range of Sizes: 1/4 to 1/2 in. (6 to 12 mm)

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M9208-xxx-x Series Electric Spring-Return Actuators (Continued)

M9208-Bxx-3 Series On/Off Electric Spring-Return Actuators (Part 2 of 2)		
Ambient Conditions	**Extended Operating**	-40 to -4°F (-40 to -20°C); 90% RH Maximum, Noncondensing
	Storage	-40 to 185°F (-40 to 85°C); 95% RH Maximum, Noncondensing
Dimensions		6.33 x 3.90 x 2.26 in. (160.7 x 99 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; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
CE	**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).
	Europe	CE Mark – Johnson Controls, Inc. 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)

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Issued January 2, 2014

M9220 Series Electric Spring-Return Actuators

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 to 3/4 in. or 12 to 19 mm round shafts, or 3/8 and 1/2 in. or 10, 12, 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 to 1-1/16 in. or 19 to 27 mm round shafts, or 5/8 and 3/4 in. or 16, 18, 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.

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.

M9220 Series Electric Spring-Return Actuator

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

M9220 Series Electric Spring-Return Actuators (Continued)

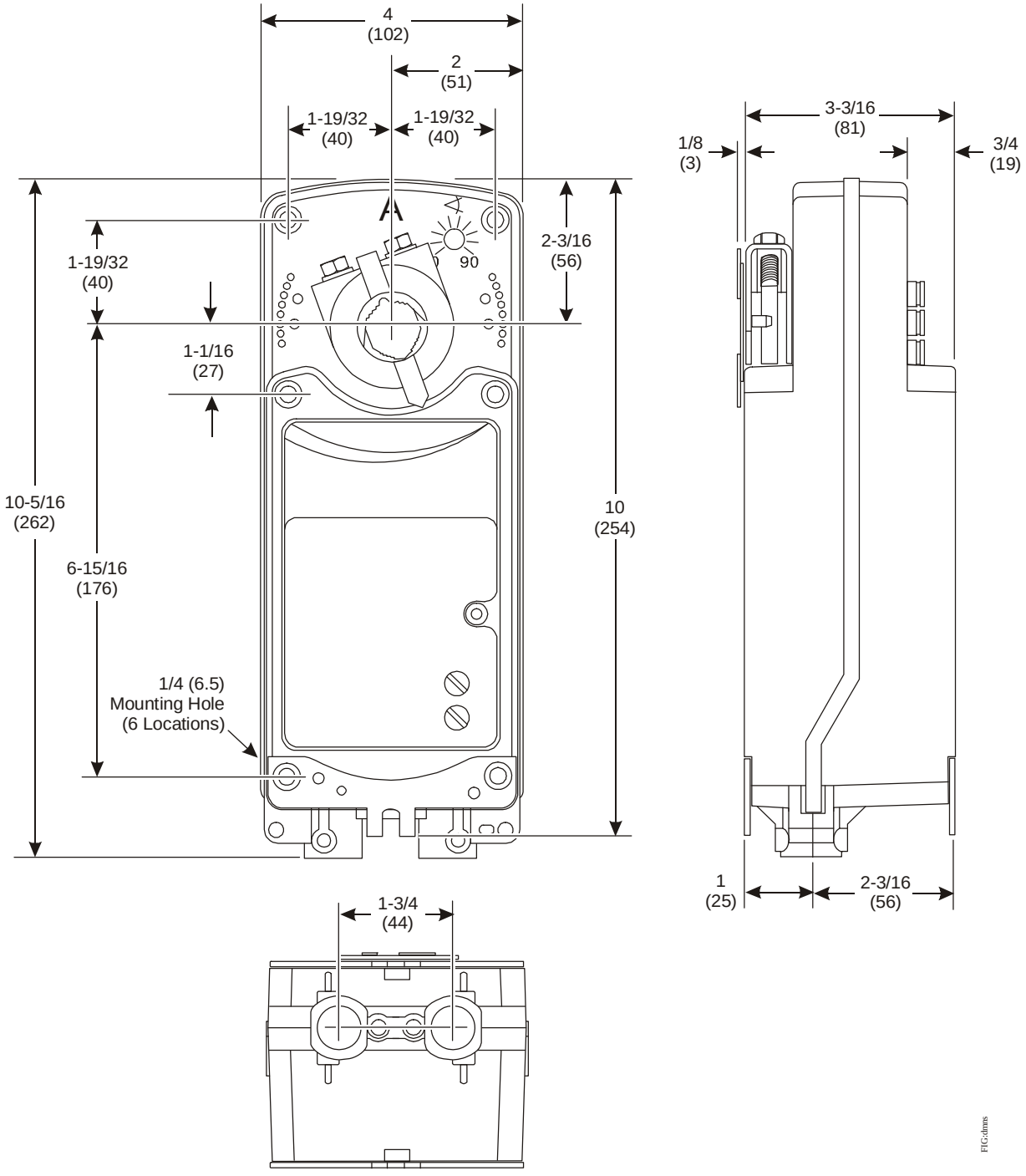
Accessories

Code Number	Description
DMPR-KC003[1]	7 in. (178 mm) Blade Pin Extension (without Bracket) for Johnson Controls Direct-Mount Damper Applications (Quantity 5)
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)
M9000-200	Commissioning Tool that Provides a Control Signal to Drive 24 V On/Off, Floating, Proportional, and/or Resistive Electric Actuators (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)
M9000-604	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 to 1-1/16 in. or 19 to 27 mm Round Shafts, or 5/8 and 3/4 in. or 16, 18, 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 with 1/2 to 3/4 in. or 12 to 19 mm Round Shafts, or 3/8 and 1/2 in. or 10, 12, 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)

1. Furnished with the damper and may be ordered separately

M9220 Series Electric Spring-Return Actuators (Continued)

Dimensions



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

M9220 Series Electric Spring-Return Actuators (Continued)

Technical Specifications

M9220 Series Electric Spring-Return Actuators (Part 1 of 2)		
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 to 30 V) at 50/60 Hz: Class 2, 15.5 VA Running, 7.7 VA Holding Position; DC 24 V (21.6 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
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 to 177 lb·in (0 to 20 N·m) at All Operating Conditions; Independent of Load
	BGx Models	24 to 57 Seconds for 0 to 177 lb·in (0 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 to 177 lb·in (0 to 20 N·m) at Room Temperature
	BGx Models	11 to 15 Seconds for 0 to 177 lb·in (0 to 20 N·m) at Room Temperature; 35 Seconds Maximum for 0 to 177 lb·in (0 to 20 N·m) at -22°F (-30°C) 130 Seconds Maximum for 0 to 177 lb·in (0 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)

M9220 Series Electric Spring-Return Actuators (Continued)

M9220 Series Electric Spring-Return Actuators (Part 2 of 2)		
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 to 3/4 in. or 12 to 19 mm Diameter Round Shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm Square Shafts
	Optional M9220-600 Jackshaft Coupler Kit	3/4 to 1-1/16 in. or 19 to 27 mm Diameter Round Shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm Square Shafts
Aluminum Enclosure		NEMA 2 (IP54) for All Mounting Orientations
Ambient Conditions	**Operating**	-40 to 131°F (-40 to 55°C); 90% RH Maximum, Noncondensing
	Storage	-85 to 185°F (-65 to 85°C); 95% RH Maximum, Noncondensing
Dimensions		See *Dimensions*.
Compliance CE	**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; and UL 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).
	Europe	CE Mark – Johnson Controls, Inc. declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant (Models: All)
Shipping Weight	**xGx Models**	6.4 lb (2.9 kg)
	BAx and BDx Models	7.6 lb (3.5 kg)

Graphics+ Catalog Page

MS-GGT-0, MS-GGT-6

Code No. LIT-1900689
Software Release 1.3
Issued December 5, 2014

Refer to the QuickLIT website for the most up-to-date version of this document.

Graphics+ is a data visualization software package designed for Metasys® system customers who are looking for a quick way to create interactive building data representations, thus empowering them to visualize, analyze, and respond to problems faster. The Graphics+ software package comprises two components: the Graphic Generation Tool (GGT) and the Graphics+ Viewer.

The Graphic Generation Tool is a simple yet powerful diagramming tool that helps designers create compelling representations of their building equipment and floor plans and bind them to Metasys data objects. The tool includes an extensive library of pre-built symbols and templates, shortcut keys, and right-click functions, giving designers the ability to assemble graphics faster. The tool also provides flexibility to create customized graphics using a rich set of effects known as behaviors. Behaviors allow users to command, navigate, change color, apply flash, set visibility, and display a context menu for bound Metasys objects. You can save these graphics directly to a supported Metasys Host, such as a Site Director or a System Configuration Tool (SCT) archive database.

With the GGT, you can easily create a graphic of status summaries for each monitored system or space (for example, building, floor, or floor group). The graphic uses color to summarize the overall condition of monitored points. In one quick glance, you can view the number of warnings, alarms, or offline items across your entire facility or campus. By clicking any one of these spaces or systems, you can see a detailed view of the monitored equipment. You can also open historical data for any trended point within the graphic using the Trend Module. The Trend Module can show trend data for up to four points at once for system diagnosis and comparison purposes. Additionally, using the predefined set of gauges, you can create an energy dashboard graphic that quickly conveys the current state of energy savings in your facility.

The Graphics+ Viewer is integrated with the Site Management Portal (SMP), SCT, and Ready Access Portal, allowing users to show, command, or update in real time all the data linked objects that were created in the GGT. The graphical display gives you a three-dimensional view of your facility, offering an intuitive way to manage the daily events of your buildings or campus.

Refer to the *Graphics+ Feature Product Bulletin (LIT-12011698)* for important product application information.

Features

- Thermographic Display of Temperature Conditions of a Floor
- Easy and Consistent Access to Room Information
- Summary Data of Multiple Buildings in a Single Graphical View with Navigational Aids
- Ability to Quickly and Easily Switch from Tabular to Graphical Views
- Stand-Alone Graphic Generation Tool
- Extensive Library of Prebuilt Dynamic Symbols and Templates
- Dynamic Symbol Capabilities, Including Commanding, Flashing, Changing Color, Showing and Hiding Elements, Navigation, and Context Menus, for Enhanced User Experience
- HVAC Library Elements Pre-Populated with Aliased Binding Strings
- Historical Trend Information Available Directly within a Graphic
- Computer Aided Drafting (CAD) File Import Capability
- Right-Click Functions, Short-Cut Keys, and User-Configurable Symbols Properties
- Comprehensive Representation of Facility Support Systems
- Multiple Language Support
- Optimal Graphics Display Performance

Figure 1: Graphics+ Example

Technical Specifications

Table 1: Graphic Generation Tool System Requirements

Product	MS-GGT-0 (new Graphic Generation Tool software) MS-GGT-6 (upgrade Graphic Generation Tool software)
Recommended Computer Platform[1]	Intel® Core™ 2 Duo E6700 or better (Intel Core 2 Duo E4300 minimum) 100 MB recommended free hard disk space available DVD drive
Memory	4 GB RAM recommended (2 GB RAM minimum)

Table 1: Graphic Generation Tool System Requirements

Operating System	Windows 8.1 and Windows 8.1 Enterprise Editions (64-bit) Windows 8 and Windows 8 Enterprise Editions (64-bit) Windows® 7 Professional, Enterprise, or Ultimate Editions with SP1 (32-bit and 64-bit) Windows Server 2012 R2 (64-bit) Windows Server 2012 (64-bit) Windows Server 2008 R2 with SP1 (64-bit) Windows Server 2008 with SP2 (32-bit)
Other Software	Microsoft .NET Framework 4.0 (required for creating Graphics+ graphics; included on the GGT product disk) **Note:** We recommend you install the full version of Microsoft .NET Framework 4.0.
Communication	Ethernet network interface card 10/100/1,000 Mbps (100 Mbps network recommended) **Note:** We recommend a wired connection. Wireless 802.11 connection

1 Our computer platform and memory recommendations are not meant to imply that older or slower machines are not usable. Refer to the *Network and IT Guidance for the BAS Professional Technical Bulletin (LIT-12011279)* for more information regarding computer/server recommendations.

Table 2: Graphics+ Viewer System Requirements

Product	Graphics+ Viewer built into Site Management Portal UI, SCT UI, and Ready Access Portal UI
Recommended Computer Platform[1] [2]	Intel® Core™ 2 Duo E6700 or better (Intel Core 2 Duo E4300 minimum)
Memory	4 GB RAM recommended (2 GB RAM minimum)
Operating System	Windows 8.1 and Windows 8.1 Enterprise Editions (64-bit) Windows 8 and Windows 8 Enterprise Editions (64-bit) Windows® 7 Professional, Enterprise, or Ultimate Editions with SP1 (32-bit and 64-bit) Windows Server 2012 R2 (64-bit) Windows Server 2012 (64-bit) Windows Server 2008 R2 with SP1 (64-bit) Windows Server 2008 with SP2 (32-bit) Apple® OS X® 10.8 Mountain Lion Apple® OS X® 10.9 Mavericks **Note:** Apple operating systems are supported for Metasys client computers only. **Note:** In OS X, you cannot view Graphics+ graphics in the Site Management Portal UI.
Other Software	Windows Internet Explorer® Version 8, 9, 10, or 11 **Note:** In Internet Explorer 11, select the **Use Microsoft compatibility lists** option, found under Tools > Compatibility View Settings, to ensure that websites appear and function correctly. Microsoft Silverlight 5.0 or higher (available as a free download from Microsoft Corporation.) Apple® Safari version 6.0.5 and 7.0 (Other browsers, such as Google® Chrome and Mozilla Firefox, may also be used but are not fully supported.)
Communication	Ethernet network interface card 10/100/1,000 Mbps (100 Mbps network recommended) **Note:** We recommend a wired connection. Wireless 802.11 connection

1 For large graphics, rendering the image is CPU intensive. In general, a higher performing CPU with multiple cores is recommended.
2 Our computer platform and memory recommendations are not meant to imply that older or slower machines are not usable. Refer to the *Network and IT Guidance for the BAS Professional Technical Bulletin (LIT-12011279)* for more information regarding computer/server recommendations.

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PAGx00001FC0 NAE Standard Control Panel Assembly Mounted in a 16 in. x 20 in. Enclosure

Description

The PAGx00001FC0 is a prewired, preassembled standard control panel and enclosure that contains the Metasys® Network Automation Engine (NAE). These Web-based network controllers communicate using Information Technology (IT) and Internet languages while incorporating the communication technology of the building automation industry, including the BACnet® protocol, LONWORKS® network, and the N2 Bus.

The PAGx00001FC0 Control Panel is shipped complete, mounted in a 16 in. W x 20 in. H steel enclosure. In addition to the NAE, the assembly also contains a 5-port Ethernet switch and a power supply incorporating a 5 A circuit breaker, a 96 VA 120/24 VAC transformer, and two 120 VAC outlets.

Features

- consistent layout for all standard control panel solutions simplifies installation and commissioning
- panel prebuilt, pre-wired, and retested in an ISO-9002 manufacturing facility provides products of consistently high quality
- power supply with resettable circuit breaker and transformer provides high and low voltage protection
- 5-port switch simplifies installation and commissioning
- Network Automation Engine (NAE) speaks IT and internet language to web browsers and remote operations centers
- Network Automation Engine (NAE) monitors and supervises Heating, Ventilating, and Air Conditioning (HVAC) equipment; lighting; fire systems; security; and access control system

PAGx00001FC0 NAE Standard Control Panel Assembly Mounted in a 16 in. x 20 in. Enclosure

- Web Browser-Based User Interface allows access to system data in the NAE from any standard Web browser device connected to the network, including remote users connected by dial-up telephone or an Internet Service Provider (ISP)
- California Office of Statewide Health Planning and Development (OSHPD) Special Seismic Certification Preapproved control panel assembly meets standards for rigid and flexible mounting conditions to account for unit-mounted and remote-mounted application
- UL 508A Rated Control Panel and UL 50 Rated, Canadian Standards Association (CSA) Approved Enclosure meets local and national code requirements for US and Canada (cULus listed)

Ordering Information

Basic Control Panel Bill of Material

Quantity	Description
1	Enclosure: 16 in. W x 20 in. H x 6-5/8 in. D (406 mm W x 508 mm H x 168 mm D), Type 1, with keyed lock
1	MS-NAE45xx-2 or MS-NAE35xx-2: Network Automation Engine (NAE)
1	96 VA 120/24 VAC power supply with 5 A primary circuit protection and two 120 VAC outlets
1	5-Port Ethernet switch

Product Code Numbers

Product Code Number	Description/Options
PAGE00001FC0	MS-NAE4510-2 mounted in 16 in. W x 20 in. H x 6-5/8 in. D custom enclosure with 96 VA 120/24 VAC power supply and 5-port switch
PAGF00001FC0	MS-NAE4511-2 mounted in 16 in. W x 20 in. H x 6-5/8 in. D custom enclosure with 96 VA 120/24 VAC power supply and 5-port switch
PAGG00001FC0	MS-NAE4520-2 mounted in 16 in. W x 20 in. H x 6-5/8 in. D custom enclosure with 96 VA 120/24 VAC power supply and 5-port switch
PAGH00001FC0	MS-NAE4521-2 mounted in 16 in. W x 20 in. H x 6-5/8 in. D custom enclosure with 96 VA 120/24 VAC power supply and 5-port switch
PAGJ00001FC0	MS-NAE3510-2 mounted in 16 in. W x 20 in. H x 6-5/8 in. D custom enclosure with 96 VA 120/24 VAC power supply and 5-port switch
PAGK00001FC0	MS-NAE3511-2 mounted in 16 in. W x 20 in. H x 6-5/8 in. D custom enclosure with 96 VA 120/24 VAC power supply and 5-port switch
PAGL00001FC0	MS-NAE3520-2 mounted in 16 in. W x 20 in. H x 6-5/8 in. D custom enclosure with 96 VA 120/24 VAC power supply and 5-port switch
PAGM00001FC0	MS-NAE3521-2 mounted in 16 in. W x 20 in. H x 6-5/8 in. D custom enclosure with 96 VA 120/24 VAC power supply and 5-port switch
PAGS00001FC0	MS-NAE3514-2 mounted in 16 in. W x 20 in. H x 6-5/8 in. D custom enclosure with 96 VA 120/24 VAC power supply and 5-port switch
PAGT00001FC0	MS-NAE3515-2 mounted in 16 in. W x 20 in. H x 6-5/8 in. D custom enclosure with 96 VA 120/24 VAC power supply and 5-port switch
PAGU00001FC0	MS-NAE3524-2 mounted in 16 in. W x 20 in. H x 6-5/8 in. D custom enclosure with 96 VA 120/24 VAC power supply and 5-port switch
PAGV00001FC0	MS-NAE3525-2 mounted in 16 in. W x 20 in. H x 6-5/8 in. D custom enclosure with 96 VA 120/24 VAC power supply and 5-port switch

PAGx00001FC0 NAE Standard Control Panel Assembly Mounted in a 16 in. x 20 in. Enclosure (Continued)

Technical Specifications

Product	PAGx00001FC0 NAE standard control panel mounted in a 16 in. x 20 in. enclosure
Wiring	24 VAC pre-wired from transformer secondary to NAE
Wire Size	Ground wire: 14 AWG; 24 VAC controller wires: 16 AWG
Enclosure Rating	Type 1
Finish	ANSI 61 gray polyester powder coating (inside and outside over phosphatized surfaces)
Ambient Operating Condition	32–122°F (0–50°C) 10–90% RH
Dimensions (Width x Height x Depth)	16 in. x 20 in. x 6-5/8 in. (406 mm x 508 mm x 168 mm)
Weight	40 lb (18.1 kg)
Ambient Storage Condition	-40–158°F (-40–70°C) 5–95% RH
Agency Compliance	Control panel: UL 508A rated (cULus); Enclosure: UL 50 rated, CSA approved OSHPD Special Seismic Certification Preapproval: OSP-0140-10 California Building Code (CBC) - 2010, International Building Code (IBC) - 2009 Seismic Performance Characteristics: $S_{DS}(g) = 2.26$, $z/h = 1.0$, $I_p = 1.5$

Code No. LIT-1900503
Issued September 4, 2015

FEC/IOM Standard Control Panel Assembly Mounted in a 20 in. x 24 in. Enclosure

Description

The 20 in. x 24 in. Field Equipment Controller (FEC) and Input/Output Module (IOM) control panel is a pre-wired, preassembled standard control panel and enclosure that contains an FEC and/or IOM digital controller. This predesigned solution saves both time and money. In addition, the assembly may be tailored to a variety of common applications for additional savings.

The control panel is shipped complete, mounted in a 20 in. x 24 in. steel enclosure. In addition to the controller(s), the assembly also contains a power supply incorporating a 5 A circuit breaker, a 96 VA 120/24 VAC transformer, and two 120 VAC outlets; an optional second 96 VA 120/24 VAC transformer is also available. A five- or ten-point 24 VAC distribution terminal block that allows for termination of additional field mounted devices is also included. Noted models are provided with an integral display on the face of the controller or a remote mounted display (MS-DIS1710-0), which is visible on the face of the panel. Space is reserved in the panel along with a section of DIN rail to mount relays and/or transducers, if desired.

These control panels allow for direct wire termination to the controller, making installation, commissioning, and servicing quicker and easier.

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 allows easy upgrading to a standard-plus control panel
- prebuilt, pre-wired, and pretested in an ISO-9002 manufacturing facility provides products of consistently high quality

FEC/IOM Standard Control Panel Assembly Mounted in a 20 in. x 24 in. Enclosure

- UL 508A rated control panel and UL 50, Canadian Standards Association (CSA) 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 standards for rigid and flexible mounting conditions to account for unit-mounted and remote-mounted application
- controller with color-coded and clearly labeled screw terminals provides easily identifiable input/output points at the controller

Repair Information

If the FEC/IOM control panel assembly fails to operate within its specifications, replace the unit. For a replacement assembly, contact the nearest Johnson Controls® representative.

Components Included with the FEC/IOM Standard Control Panel Assembly

Quantity	Description
1	Enclosure: 20 in. W x 24 in. H x 6-5/8 in. D, Type 1 or Type 3R
1	MS-FEC1611-1, MS-FEC2611-0, or MS-FEC2621-0 digital controller
1	MS-IOM1711-0, MS-IOM1721-0, MS-IOM2721-0, MS-IOM3711-0, MS-IOM3721-0, MS-IOM3731-0, and/or MS-IOM4711-0 (if applicable)
1	MS-DIS1710-0 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 (if applicable)
1	Five- or ten-point 24 VAC distribution terminal block[1]

1. All panels with a single power supply ship with a five-point terminal block. Panels with an additional transformer ship with a ten-point terminal block.

Selection Chart

Product Code Number (Part 1 of 2)	Description
PAKF00001AH0	MS-FEC1611-1 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman® enclosure
PAKFJF001AH0	MS-FEC1611-1 and MS-IOM1711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure
PAKFJG002AH0	MS-FEC1611-1 and MS-IOM2711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with additional 96 VA transformer
PAKFJH002AH0	MS-FEC1611-1 and MS-IOM3711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with additional 96 VA transformer
PAKFJJ002AH0	MS-FEC1611-1 and MS-IOM4711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with additional 96 VA transformer
PAKG00001AH0	MS-FEC2611-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure
PAKG00002AH0	MS-FEC2611-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with additional 96 VA transformer
PAKG00001AH4	MS-FEC2611-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with remote mount display
PAKGJF001AH0	MS-FEC2611-0 and MS-IOM1711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure
PAKGJG002AH0	MS-FEC2611-0 and MS-IOM2711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with additional 96 VA transformer
PAKGJH002AH0	MS-FEC2611-0 and MS-IOM3711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with additional 96 VA transformer
PAKGJJ002AH0	MS-FEC2611-0 and MS-IOM4711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with additional 96 VA transformer

FEC/IOM Standard Control Panel Assembly Mounted in a 20 in. x 24 in. Enclosure (Continued)

Product Code Number (Part 2 of 2)	Description
PAKGJL002AA0	MS-FEC2611-0 and MS-IOM2721-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure (NEMA 3R) with additional 96 VA power supply and 96 VA transformer
PAKGJL002AH0	MS-FEC2611-0 and MS-IOM2721-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with additional 96 VA transformer
PAKGJM002AH0	MS-FEC2611-0 and MS-IOM3721-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with additional 96 VA transformer
PAKGJN002AA0	MS-FEC2611-0 and MS-IOM2731-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure (NEMA 3R) with additional 96 VA power supply and 96 VA transformer
PAKGJN002AH0	MS-FEC2611-0 and MS-IOM3731-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with additional 96 VA transformer
PAKJ00001AH0	MS-FEC2621-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with integral display
PAKJJF001AH0	MS-FEC2621-0 and MS-IOM1711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with integral display
PAKJJG002AA0	MS-FEC2621-0 and MS-IOM2711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure (NEMA 3R) with additional 96 VA power supply and 96 VA transformer
PAKJJG002AH0	MS-FEC2621-0 and MS-IOM2711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with integral display and additional 96 VA transformer
PAKJJH002AA0	MS-FEC2621-0 and MS-IOM3711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure (NEMA 3R) with additional 96 VA power supply and 96 VA transformer
PAKJJH002AH0	MS-FEC2621-0 and MS-IOM3711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with integral display and additional 96 VA transformer
PAKJJJ002AA0	MS-FEC2621-0 and MS-IOM4711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure (NEMA 3R) with additional 96 VA power supply and 96 VA transformer
PAKJJJ002AH0	MS-FEC2621-0 and MS-IOM4711-0 panel mounted in a 20 in. W x 24 in. H x 6-5/8 in. D Hoffman enclosure with integral display and additional 96 VA transformer

Technical Specifications

FEC/IOM Standard Control Panel Assembly Mounted in a 20 in. x 24 in. Enclosure	
Terminals	Controller mounted screw termination
Wire Size	Ground wire: 14 AWG; Transformer wires: 16 AWG
Enclosure Rating	Type 1 or Type 3R
Finish	ANSI 61 gray polyester powder coating (perforated panel and enclosure)
Ambient Operating Condition	32–122°F (0–50°C) 10–90% RH
Dimensions (Width x Height x Depth)	20 in. x 24 in. x 6-5/8 in. (508 mm x 610 mm x 168 mm)
Weight	50.0 lb (22.7 kg)
Ambient Storage Condition	-40–176°F (-40–80°C) 5–95% RH
Agency Compliance	UL 508A Rated (cULus listed); Enclosure UL 50 Rated, CSA Approved OSHPD Special Seismic Certification Preapproval: OSP-0140-10 California Building Code (CBC) - 2010, International Building Code (IBC) - 2009 Seismic Performance Characteristics: $S_{DS}(g) = 2.26$, $z/h = 1.0$, $I_p = 1.5$

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Manufacturing quality products in the United States of America since 1969

RIBU1C

Enclosed Relay 10 Amp SPDT with 10-30 Vac/dc/120 Vac Coil

Functional Devices, Inc. A600D 2006

c UL us LISTED

MADE IN USA

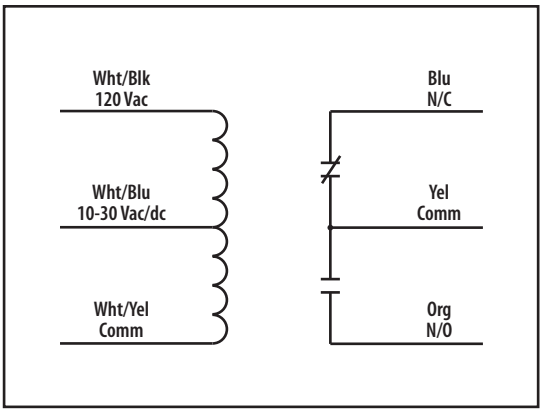
 # Relays & Contact Type: One (1) SPDT Continuous Duty Coil
Expected Relay Life: 10 million cycles minimum mechanical
Operating Temperature: -30 to 140° F
Operate Time: 20mS
Relay Status: LED On = Activated
Dimensions: 1.70" x 2.80" x 1.50" with .50" NPT nipple
Wires: 16", 600V Rated
Approvals: UL Listed, UL916, UL864, UL924, C-UL California State Fire Marshal, CE
Housing Rating: Plenum, NEMA 1
Gold Flash: Yes
Override Switch: No

Contact Ratings:
10 Amp Resistive @ 120-277 Vac
10 Amp Resistive @ 28 Vdc
480 VA Pilot Duty @ 240-277 Vac
480 VA Ballast @ 277 Vac
600 Watt Tungsten @ 120 Vac N/O
240 Watt Tungsten @ 120 Vac N/C
1/3 HP for N/O @ 120-240 Vac
1/6 HP for N/C @ 120-240 Vac
1/4 HP for N/O @ 277 Vac
1/8 HP for N/C @ 277 Vac

Coil Current:

30 mA @ 10 Vac	12 mA @ 10 Vdc
32 mA @ 12 Vac	14 mA @ 12 Vdc
42 mA @ 24 Vac	16 mA @ 24 Vdc
50 mA @ 30 Vac	18 mA @ 30 Vdc
25 mA @ 120 Vac	

Coil Voltage Input:
10-30 Vac/dc ; 120 Vac ; 50-60 Hz
Drop Out = 2.1 Vac / 2.8 Vdc
Pull In = 9 Vac / 10 Vdc



RIBU1C-RD
» Red housing

RIBU1C-N4
» NEMA 4X housing

NOTES

Code No. LIT-1900217
Issued June 2016

TE-6300 Series Temperature Sensors

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 Variable Air Volume (VAV) 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

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

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

Features

- full line of versatile sensors — supports all your temperature sensing needs from a single supplier: wall mount, outdoor air, duct probe, 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 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-63xxM Models only) — 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 — provides a tamper-proof installation ideally suited for schools, sporting complexes, retailers, prisons, and more

All TE-6300 series 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) female insulated quick-connect terminations on leads

TE-63xxF Models

The TE-63xxF (flush mount) models:

- provide a low profile when installed in an electrical box
- feature thermally isolated sensor from the wall with a foam pad
- offer a rugged stainless steel cover
- provide 22 AWG 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 (well models only) either a direct mount or 1/2-14 NPT threaded well sensor holder for mounting in TE-6300W Series thermal wells (Order the thermal well separately.)
- provide optional well sensor holders (order separately) to mount duct models in thermal wells.
- 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 with 1/2-14 NPT female thread for connecting to conduit
- provide aluminum mounting plate and 1/2-14 NPT threaded hub mounting options for the duct and duct averaging models
- use the 1/2-14 NPT female thread to mount the Outdoor Air models directly to ridged conduit
- provide optional sensor holders (order separately) to mount duct models in thermal wells
- offer an optional accessory metal cover 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-6300 Series Temperature Sensors

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) 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) 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) female 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, refer to the *TE-6300 Series Temperature Sensors Product Bulletin (LIT-216320)* for a list of repair parts available.

TE-6300 Series Temperature Sensors (Continued)

Selection Chart

TE-6300 Temperature Sensor Models (Part 1 of 2)

Sensor	Mounting Style	Probe Length in. (mm)	Product Code Number
Nickel (1k ohm)	Adjustable[1]	8 (203)	TE-6311A-1
	Averaging	8 ft (2.4 m)	TE-6315M-1
			TE-6315P-1
			TE-6315V-2[1]
		17 ft (5.2 m)	TE-6316M-1
			TE-6316P-1
			TE-6316V-2[1]
	Duct	4 (102)	TE-631GM-1
		8 (203)	TE-6311M-1
			TE-6311P-1
		18 (457)	TE-631JM-1
	Flange	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	4 (102)	TE-635GV-2
		8 (203)	TE-6351V-2
	Flush	N/A	TE-6350F-0
			TE-6350F-1
	Strap-Mount	3 (76)	TE-635S-1
	Outdoor Air	3 (76)	TE-6353P-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

TE-6300 Temperature Sensor Models (Part 2 of 2)

Sensor	Mounting Style	Probe Length in. (mm)	Product Code Number
Platinum Equivalent	1k ohm Averaging[1]	10 ft (3 m)	TE-6327P-1
		20 ft (6.1 m)	TE-6328P-1
	100 ohm Averaging[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	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	8 (203)	TE-6342M-1
		6 (152)	TE-634AM-2
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	4 (102)	TE-636GV-2
		8 (203)	TE-6361V-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 brass threadless well adaptor for retrofit to TE-6300W-103 or WZ-1000-5 thermowells.

Optional Accessories (Part 1 of 2)

Product Code Number	Description
F-1000-182	Thermal Conductive Grease for element wells (8 oz.)
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	Element Holder for mounting an averaging sensor (order in multiples of 10)
TE-6001-13	Metal Cover and Gasket Kit (5 per package)
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 10)
TE-6300-105	12 in. (305 mm) (1k ohm) Platinum Class A Probe (cut to an appropriate length)[1]
TE-6300-601	8 in. (203 mm), 1k ohm Nickel Probe
TE-6300-603	3 in. (76 mm), 1k ohm Nickel Probe

TE-6300 Series Temperature Sensors (Continued)

Optional Accessories (Part 2 of 2)

Product Code Number	Description
TE-6300-605	Sensor Holder/Well Adaptor, Plastic, 1/2-14 NPT, for use with TE-6300W-110 (replacement part, included with TE-63xxP-1)
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-6300-608	NCT Thermistor Sensor with 8 ft (2.4 m) Leads
TE-6300-609	Sensor Holder/Well Adaptor, Plastic, Threadless, for use with TE-6300W-103 (replacement part, included with TE-63xAP-1)
TE-6300-610	NCT Thermistor Sensor with 12 ft (3.7 m) Leads
TE-6300-611	1/2-14 NPT Threaded Brass Sensor Holder (Order in multiples of 10)
TE-6300-612	Threadless Brass Sensor Holder (Order in multiples of 10)
TE-6300-613	IMC Kit, Metal Knockout Plug, Metal Clamp Connector (order in multiples of 10)
TE-6300-614	Cable Tie Mounting Kit, 0.50 to 2.625 in. (12.7 to 66.7 mm) Bundle Diameter (10 per package)
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	6 in. (152 mm) Brass Well (direct mount with thermal grease included)
TE-6300W-102	6 in. (152 mm) Stainless Steel Well (direct mount)
TE-6300W-103	6 in. (152 mm) Brass Well, 1/2 in. – 14 NPT outside pipe thread (with thermal grease, requires sensor with adapter)
TE-6300W-110	8 in. (203 mm) Stainless Steel Well

1. Cut 12 in. probes to a minimum of 3 in. (76 mm).

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

TE-6300 Series Temperature Sensors (Part 1 of 3)		
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	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	EN 60751 Class A, ± [0.15 + 0.002 * | T °C |], ±0.19C° at 21°C (±0.35F° at 70°F)
	1k ohm Platinum Class B	EN 60751 Class B, ± [0.30 + 0.005 * | T °C |], ±0.41C° at 21°C (±0.73F° at 70°F)
	100 ohm Platinum Averaging	±1.0F°at 70°F (± 0.58C° at 21°C)
	1k ohm Platinum Averaging	
	2.2k ohm Thermistor	±0.36F° (±0.2C°) in the range: 32 to 158°F (0 to 70°C)
	10k ohm Thermistor	±0.9F° (±0.5C°) in the range: 32 to 158°F (0 to 70°C)

TE-6300 Series Temperature Sensors (Continued)

TE-6300 Series Temperature Sensors (Part 2 of 3)		
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
Electrical Connection	**TE-63xxM**	22 AWG (0.6 mm diameter) x 6 in. (152 mm) long
	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, TE-63xxV	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable with 0.25 in. (6.35 mm) female quick-connect terminals
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 (except Averaging): 0.25 in. (6.35 mm) O.D. Stainless Steel
	TE-63xxA	Mounting Adapter 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-63xxV	Mounting Flange: Stainless Steel
Operating Conditions	**TE-63xxA**	-50 to 140°F (-46 to 60°C)
	TE-63xxF	32 to 104°F (0 to 40°C)
	TE-63xxM	-50 to 220°F (-46 to 104°C)
	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-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)

TE-6300 Series Temperature Sensors (Continued)

TE-6300 Series Temperature Sensors (Part 3 of 3)		
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-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. (6.35 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 m) element

Code No. LIT-1900896
Issued August 2016

TEC3000 Series Stand-Alone and Field-Selectable BACnet® MS/TP or N2 Networked Thermostat Controllers

Description

The TEC3000 Series Thermostat Controllers are stand-alone and field-selectable BACnet® Master-Slave/Token-Passing (MS/TP) or N2 networked devices that provide on/off, floating, and proportional control of the following:

- local hydronic reheat valves
- pressure-dependent VAV equipment with or without local reheat
- two- or four-pipe fan coils
- cabinet unit heaters
- other zoning equipment using an on/off, floating, or 0 to 10 VDC proportional control input

Models also provide single- or two-stage control of unitary rooftop units (RTUs) with or without economizers and heat pumps.

The networked models feature a field-selectable Building Automation System (BAS) BACnet MS/TP or N2 communication capability that enables remote monitoring and programming for efficient space temperature control. All models include a USB port configuration that reduces installation time by allowing simple backup and restore features from a USB drive, which enables rapid cloning of configuration between like units.

Some models have occupancy sensing capability built into the device. These thermostat controllers maximize up to 30% energy savings in high-energy usage commercial buildings, such as schools and hotels, during occupied times by using additional standby setpoints.

All models feature an intuitive UI with backlit display that makes setup and operation quick and easy. Multiple fan configurations are supported for fan coil equipment types:

- single-speed
- multi-speed (two or three discrete speeds)
- variable-speed/EC motors (0 to 10 VDC control)

Some models support dehumidification on two-pipe fan coil units with reheat, and four-pipe fan coil units with or without reheat. When no heating is required, the thermostat controller monitors space humidity and activates dehumidification control as necessary. Heat and/or reheat is used as required to maintain the space temperature. For optimal dehumidification performance, use a fan coil unit that has a multi-speed or variable-speed fan (VSF).

Models are available with or without the Johnson Controls® logo.

Refer to the *TEC3000 Series Stand-Alone and Field Selectable BACnet MS/TP or N2 Networked Thermostat Controllers Product Bulletin (LIT-12011954)* for important product application and single point of contact information.

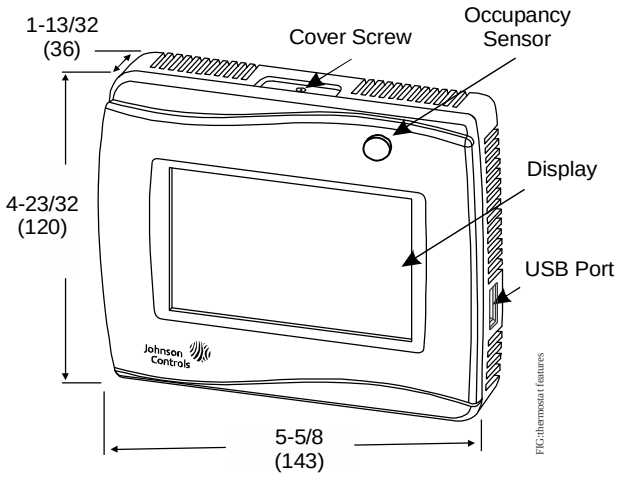
TEC3000 Series Thermostat Controller Shown with Occupancy Sensor

Features

- **Two Configurable Binary Inputs**—provide additional inputs for advanced functions such as remote night setback, service or filter alarms, motion detector, and window status.
- **Field-Selectable BACnet MS/TP or N2 Networked Communication (TEC36xx-0x-000 Models)**—simplifies the upgrade from N2 networked communication to BACnet MS/TP networked communication without changing hardware.
- **USB Port Configuration**—reduces installation time by allowing simple backup and restore features from a USB drive, which enables rapid cloning of configuration between like units.
- **Backlit Liquid Crystal Display (LCD)**—offers real-time control status of the environment in easy-to-read, plain text messages with adjustable backlight that brightens during user interaction.
- **Configurable Touch Screen UI**—allows facility managers to limit the user interaction with the thermostat controller display based on specific energy policies.
- **End-of-Line Switch**—simplifies the layout and installation of communication buses.
- **Mobile Access Portal (MAP) Gateway Compatibility (MAP Release 4.0 or Later)**—allows the user to view equipment and control conditions using mobile devices.
- **Stand-Alone and BACnet MS/TP or N2 Networked Models**—offer application flexibility.
- **Onboard Occupancy Sensor (TEC3xx1-0x-000 and TEC3xx3-0x-000 Models)**—provides energy savings in high-energy usage commercial buildings without additional installation time or cost.
- **On/Off, Floating, Proportional 0 to 10 VDC, and Single- or Two-Stage Control**—offers additional application flexibility by providing more advanced control signals.
- **Integral Humidity Sensor (TEC3xx2-0x-000 and TEC3xx3-0x-000 Models)**—monitors space humidity and activates dehumidification control on two-pipe fan coil units with reheat and four-pipe fan coil units with or without reheat.
- **Multiple Fan Configurations for Fan Coil Equipment Types**—provide field-selectable single-speed, multi-speed, and variable-speed fan control capabilities.
- **Full Line of Remote TE-6300 Series Temperature Sensors**—support a wide range of remote temperature sensing needs from a single supplier.
- **Built-In Schedule Object**—allows all models of thermostat controllers to be scheduled as stand-alone devices; allows BACnet MS/TP models to be defined and adjusted through the building automation system.
- **Optimal Start**—allows each thermostat controller to anticipate the heating or cooling needs of a space by starting the equipment early enough to reach the setpoint at the beginning of the scheduled occupancy.
- **Auto-Tuned Control Loops**—reduce commissioning time, eliminate change-of-season recommissioning, and reduce wear and tear of the mechanical devices.

TEC3000 Series Stand-Alone and Field-Selectable BACnet® MS/TP or N2 Networked Thermostat Controllers (Continued)

TEC3000 Series Thermostat Controller Shown with Occupancy Sensor, Dimensions, in. (mm)



Selection Charts

Stand-Alone Thermostat Controller Models[1]

Code Number	Johnson Controls Logo	Control Output	Onboard Occupancy Sensor	Dehumidification Capability
TEC3310-00-000	Yes	On/off or floating fan coil and zoning	No	No
TEC3310-01-000	No	On/off or floating fan coil and zoning	No	No
TEC3311-00-000	Yes	On/off or floating fan coil and zoning	Yes	No
TEC3311-01-000	No	On/off or floating fan coil and zoning	Yes	No
TEC3312-00-000	Yes	On/off or floating fan coil and zoning	No	Yes
TEC3312-01-000	No	On/off or floating fan coil and zoning	No	Yes
TEC3313-00-000	Yes	On/off or floating fan coil and zoning	Yes	Yes
TEC3313-01-000	No	On/off or floating fan coil and zoning	Yes	Yes
TEC3320-00-000	Yes	0 to 10 VDC proportional fan coil and zoning	No	No
TEC3320-01-000	No	0 to 10 VDC proportional fan coil and zoning	No	No
TEC3321-00-000	Yes	0 to 10 VDC proportional fan coil and zoning	Yes	No
TEC3321-01-000	No	0 to 10 VDC proportional fan coil and zoning	Yes	No
TEC3322-00-000	Yes	0 to 10 VDC proportional fan coil and zoning	No	Yes
TEC3322-01-000	No	0 to 10 VDC proportional fan coil and zoning	No	Yes
TEC3323-00-000	Yes	0 to 10 VDC proportional fan coil and zoning	Yes	Yes
TEC3323-01-000	No	0 to 10 VDC proportional fan coil and zoning	Yes	Yes
TEC3330-00-000	Yes	Single- or two-stage RTU/heat pump with economizer	No	No
TEC3330-01-000	No	Single- or two-stage RTU/heat pump with economizer	No	No
TEC3331-00-000	Yes	Single- or two-stage RTU/heat pump with economizer	Yes	No
TEC3331-01-000	No	Single- or two-stage RTU/heat pump with economizer	Yes	No

1. Multiple fan configurations are supported for fan coil equipment types.

TEC3000 Series Stand-Alone and Field-Selectable BACnet® MS/TP or N2 Networked Thermostat Controllers (Continued)

Field-Selectable BACnet MS/TP or N2 Networked Thermostat Controller Models[1]

Code Number	Johnson Controls Logo	Control Output	Onboard Occupancy Sensor	Dehumidification Capability
TEC3610-00-000	Yes	On/off or floating fan coil and zoning	No	No
TEC3610-01-000	No	On/off or floating fan coil and zoning	No	No
TEC3611-00-000	Yes	On/off or floating fan coil and zoning	Yes	No
TEC3611-01-000	No	On/off or floating fan coil and zoning	Yes	No
TEC3612-00-000	Yes	On/off or floating fan coil and zoning	No	Yes
TEC3612-01-000	No	On/off or floating fan coil and zoning	No	Yes
TEC3613-00-000	Yes	On/off or floating fan coil and zoning	Yes	Yes
TEC3613-01-000	No	On/off or floating fan coil and zoning	Yes	Yes
TEC3620-00-000	Yes	0 to 10 VDC proportional fan coil and zoning	No	No
TEC3620-01-000	No	0 to 10 VDC proportional fan coil and zoning	No	No
TEC3621-00-000	Yes	0 to 10 VDC proportional fan coil and zoning	Yes	No
TEC3621-01-000	No	0 to 10 VDC proportional fan coil and zoning	Yes	No
TEC3622-00-000	Yes	0 to 10 VDC proportional fan coil and zoning	No	Yes
TEC3622-01-000	No	0 to 10 VDC proportional fan coil and zoning	No	Yes
TEC3623-00-000	Yes	0 to 10 VDC proportional fan coil and zoning	Yes	Yes
TEC3623-01-000	No	0 to 10 VDC proportional fan coil and zoning	Yes	Yes
TEC3630-00-000	Yes	Single- or two-stage RTU/heat pump with economizer	No	No
TEC3630-01-000	No	Single- or two-stage RTU/heat pump with economizer	No	No
TEC3631-00-000	Yes	Single- or two-stage RTU/heat pump with economizer	Yes	No
TEC3631-01-000	No	Single- or two-stage RTU/heat pump with economizer	Yes	No

1. Multiple fan configurations are supported for fan coil equipment types.

Accessories (Order Separately)

Product Code Number	Description
TEC-WALLPLT	Wallplate for retrofitting existing installations or concealing mounting surface damage; can be used with any TEC3000 Series Thermostat Controller
TE-6300 Series[1]	Remote temperature sensors
T-4000-119	Allen-head adjustment tool (30 per bag)

1. See Johnson Controls TE-6300 Series Room Temperature Sensors table for ordering details regarding Johnson Controls TE-6300 Series Remote Temperature Sensors.

TEC3000 Series Stand-Alone and Field-Selectable BACnet® MS/TP or N2 Networked Thermostat Controllers (Continued)

Johnson Controls TE-6300 Series Temperature Sensors (Order Separately) (Part 1 of 2)

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

TEC3000 Series Stand-Alone and Field-Selectable BACnet® MS/TP or N2 Networked Thermostat Controllers (Continued)

Johnson Controls TE-6300 Series Temperature Sensors (Order Separately) (Part 2 of 2)

Sensor Type	Mounting Style	Probe Length	Product Code Number
Thermistor (10k ohm) Type II	Adjustable	8 in. (203 mm)	TE-6361A-1
	Duct	4 in. (102 mm)	TE-636GM-1
		8 in. (203 mm)	TE-6361M-1
			TE-6361P-1
		18 in. (457 mm)	TE-636JM-1
	Flange	4 in. (102 mm)	TE-636GV-2
		8 in. (203 mm)	TE-6361V-2
	Flush	N/A	TE-6360F-0
			TE-6360F-1
	Outside air	3 in. (76 mm)	TE-6363P-1
	Strap-mount	3 in. (76 mm)	TE-636S-1
	Well	6 in. (152 mm)	TE-636AM-2
		8 in. (203 mm)	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.

Repair Information

If the TEC3000 Series Thermostat Controller fails to operate within its specifications, replace the unit. For a replacement thermostat controller, contact the nearest Johnson Controls representative.

Technical Specifications

TEC3000 Series Stand-Alone and Field-Selectable BACnet MS/TP or N2 Networked Thermostat Controllers (Part 1 of 2)		
Power Requirements		19 to 30 VAC, 50/60 Hz, 4 VA at 24 VAC nominal, Class 2 or safety extra-low voltage (SELV)
Analog Output Rating (Proportional Control Models)		0 to 10 VDC into 2k ohm resistance (minimum)
Relay Contact Rating (On/Off, Floating, or Staged Economizer Control Models)		19 to 30 VAC, 1.0 A maximum, 15 mA minimum, 3.0 A in-rush, Class 2 or SELV
Fan Relay Output Rating (On/Off, Floating, and Proportional Control Models)		19 to 30 VAC, 1.0 A maximum, 15 mA minimum, 3.0 A in-rush
Auxiliary Output Rating/Triac Output (On/Off, Floating, and Proportional Control Models)		19 to 30 VAC, 1.0 A maximum, 15 mA minimum, 3.0 A in-rush
Binary Inputs		Dry contact across terminal COM to terminals BI1, BI2, or COS
Analog Inputs		Nickel, platinum, A99B, 2.25k ohm negative temperature coefficient (NTC), 10k ohm NTC, 10k ohm NTC Type 3 across terminal COM to terminals R SEN or COS
Temperature Sensor Type		Local 1k ohm platinum sensor
Wire Size		18 AWG (1.0 mm diameter) maximum, 22 AWG (0.6 mm diameter) recommended
MS/TP Network Guidelines		Up to 100 devices maximum per Network Automation Engine (NAE); 4,000 ft (1,219 m) maximum cable length
Temperature Range	**Backlit Display**	-40.0°F/-40.0°C to 122.0°F/50.0°C in 0.5° increments
	Heating Control	40.0°F/4.5°C to 90.0°F/32.0°C
	Cooling Control	54.0°F/12.0°C to 100.0°F/38.0°C
Accuracy	**Temperature**	±0.9F°/±0.5C° at 70.0°F/21.0°C typical calibrated
	Humidity (On/Off, Floating, and Proportional Control Models)	±5% RH from 20 to 80% RH at 50 to 90°F (10 to 32°C)
Minimum Deadband		2F°/1C° between heating and cooling
Occupancy Sensor Motion Detection (Occupancy Sensing Models)		Minimum of 94 angular degrees up to a distance of 15 ft (4.6 m); based on a clear line of sight

TEC3000 Series Stand-Alone and Field-Selectable BACnet® MS/TP or N2 Networked Thermostat Controllers (Continued)

TEC3000 Series Stand-Alone and Field-Selectable BACnet MS/TP or N2 Networked Thermostat Controllers (Part 2 of 2)		
Ambient Conditions	**Operating**	32 to 122°F (0 to 50°C); 95% RH maximum, noncondensing
	Storage	-22 to 122°F (-30 to 50°C); 95% RH maximum, noncondensing
Compliance	**BACnet International**	BACnet Testing Laboratories™ (BTL) 135-2001 Listed BACnet Application Specific Controller (B-ASC)
	United States	UL Listed, File E27734, CCN XAPX, Under UL60730
		FCC Compliant to CFR 47, Part 15, Subpart B, Class B
	Canada	UL Listed, File E27734, CCN XAPX7 Under E60730
		Industry Canada, ICES-003
CE	**Europe**	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and the RoHS Directive.
	Australia and New Zealand	RCM Mark, Australia/NZ Emissions Compliant
Shipping Weight	**Models without Occupancy Sensor**	0.75 lb (0.34 kg)
	Models with Occupancy Sensor	0.77 lb (0.35 kg)

Code No. LIT-1900228
Issued January 2, 2014

VG1000 Series Two-Way, Plated Brass Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators without Switches

Description

VG1000 Series Ball Valves are designed to regulate the flow of hot or chilled water and, for some models, low-pressure steam in response to the demand of a controller in HVAC systems. Available in sizes 1/2 through 2 in. (DN15 through DN50), this family of two- and three-way forged brass valves is factory or field mounted to Johnson Controls® VA9104, M9106, M9109, and M9100 Series Non-Spring-Return and VA9203 and VA9208 Series Spring-Return Electric Actuators for on/off, floating, or proportional control.

Refer to the *VG1000 Series Forged Brass Ball Valves Product Bulletin (LIT-977132)* for important product application information.

Features

- Forged Brass Body — provides 580 psig static pressure rating.
- Chrome-Plated Brass Ball and Stem Assembly Standard — handles both chilled water and hot water applications with a fluid temperature range of 23 to 203°F (-5 to 95°C).
- Graphite-Reinforced Polytetrafluoroethylene (PTFE) Seats — include 15% graphite-reinforced ball seals, providing better wear resistance.
- 500:1 Rangeability — provides accurate control under all load conditions.
- Maintenance-Free Design — performs without failure in excess of 200,000 full stroke cycles in iron-oxide contaminated water.

Repair Information

If the VG1000 Series Ball Valve fails to operate within its specifications, replace the valve body, actuator, or entire assembly. For replacement parts, contact the nearest Johnson Controls representative.

VG1000 Series Two-Way, Spring-Return, Plated Brass Ball and Stem Ball Valve Assemblies without End Switches

Selection Chart

Two-Way — Spring Return without Switches (Part 1 of 2)

Fluid Temperatures: 23 to 203°F (-5 to 95°C)				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
Valve	**Size, in.**	**Cv**	**Closeoff psig**	**Floating**	**DC 0 to 10 V Proportional**	**On/Off**	**On/Off**
				Spring Return Open — Valve Normally Open			
				VA9203-AGA-2Z	**VA9203-GGA-2Z**	**VA9203-BGA-2**	**VA9203-BUA-2**
VG1241AD	1/2	1.2[1]	200	VG1241AD+923AGA	VG1241AD+923GGA	VG1241AD+923BGA	VG1241AD+923BUA
VG1241AE		1.9[1]		VG1241AE+923AGA	VG1241AE+923GGA	VG1241AE+923BGA	VG1241AE+923BUA
VG1241AF		2.9[1]		VG1241AF+923AGA	VG1241AF+923GGA	VG1241AF+923BGA	VG1241AF+923BUA
VG1241AG		4.7[1]		VG1241AG+923AGA	VG1241AG+923GGA	VG1241AG+923BGA	VG1241AG+923BUA
VG1241AL		7.4[1]		VG1241AL+923AGA	VG1241AL+923GGA	VG1241AL+923BGA	VG1241AL+923BUA
VG1241AN		11.7		VG1241AN+923AGA	VG1241AN+923GGA	VG1241AN+923BGA	VG1241AN+923BUA
VG1241BG	3/4	4.7[1]	200	VG1241BG+923AGA	VG1241BG+923GGA	VG1241BG+923BGA	VG1241BG+923BUA
VG1241BL		7.4[1]		VG1241BL+923AGA	VG1241BL+923GGA	VG1241BL+923BGA	VG1241BL+923BUA
VG1241BN		11.7		VG1241BN+923AGA	VG1241BN+923GGA	VG1241BN+923BGA	VG1241BN+923BUA
VG1241CL	1	7.4[1]	200	VG1241CL+923AGA	VG1241CL+923GGA	VG1241CL+923BGA	VG1241CL+923BUA
VG1241CN		11.7[1]		VG1241CN+923AGA	VG1241CN+923GGA	VG1241CN+923BGA	VG1241CN+923BUA
VG1241CP		18.7		VG1241CP+923AGA	VG1241CP+923GGA	VG1241CP+923BGA	VG1241CP+923BUA
				Spring Return Open — Valve Normally Open			
				VA9208-AGA-2	**VA9208-GGA-2**	**VA9208-BGA-3**	**VA9208-BAA-3**
VG1241DN	1-1/4	11.7[1]	200	VG1241DN+928AGA	VG1241DN+928GGA	VG1241DN+938BGA	VG1241DN+938BAA
VG1241DP		18.7[1]		VG1241DP+928AGA	VG1241DP+928GGA	VG1241DP+938BGA	VG1241DP+938BAA
VG1241DR		29.2		VG1241DR+928AGA	VG1241DR+928GGA	VG1241DR+938BGA	VG1241DR+938BAA
VG1241EP	1-1/2	18.7[1]	200	VG1241EP+928AGA	VG1241EP+928GGA	VG1241EP+938BGA	VG1241EP+938BAA
VG1241ER		29.2[1]		VG1241ER+928AGA	VG1241ER+928GGA	VG1241ER+938BGA	VG1241ER+938BAA
VG1241ES		46.8		VG1241ES+928AGA	VG1241ES+928GGA	VG1241ES+938BGA	VG1241ES+938BAA
VG1241FR	2	29.2[1]	200	VG1241FR+928AGA	VG1241FR+928GGA	VG1241FR+938BGA	VG1241FR+938BAA
VG1241FS		46.8[1]		VG1241FS+928AGA	VG1241FS+928GGA	VG1241FS+938BGA	VG1241FS+938BAA
VG1241FT		73.7		VG1241FT+928AGA	VG1241FT+928GGA	VG1241FT+938BGA	VG1241FT+938BAA

VG1000 Series Two-Way, Plated Brass Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators without Switches (Continued)

Two-Way — Spring Return without Switches (Part 2 of 2)

Fluid Temperatures: 23 to 203°F (-5 to 95°C)				**AC 24 V**			**AC 85–264 V (VA9203) AC 120 V (VA9208)**
Valve	**Size, in.**	**Cv**	**Closeoff psig**	**Floating**	**DC 0 to 10 V Proportional**	**On/Off**	**On/Off**
				Spring Return Closed — Valve Normally Closed			
				VA9203-AGA-2Z	**VA9203-GGA-2Z**	**VA9203-BGA-2**	**VA9203-BUA-2**
VG1241AD	1/2	1.2[1]	200	VG1241AD+943AGA	VG1241AD+943GGA	VG1241AD+943BGA	VG1241AD+943BUA
VG1241AE		1.9[1]		VG1241AE+943AGA	VG1241AE+943GGA	VG1241AE+943BGA	VG1241AE+943BUA
VG1241AF		2.9[1]		VG1241AF+943AGA	VG1241AF+943GGA	VG1241AF+943BGA	VG1241AF+943BUA
VG1241AG		4.7[1]		VG1241AG+943AGA	VG1241AG+943GGA	VG1241AG+943BGA	VG1241AG+943BUA
VG1241AL		7.4[1]		VG1241AL+943AGA	VG1241AL+943GGA	VG1241AL+943BGA	VG1241AL+943BUA
VG1241AN		11.7		VG1241AN+943AGA	VG1241AN+943GGA	VG1241AN+943BGA	VG1241AN+943BUA
VG1241BG	3/4	4.7[1]	200	VG1241BG+943AGA	VG1241BG+943GGA	VG1241BG+943BGA	VG1241BG+943BUA
VG1241BL		7.4[1]		VG1241BL+943AGA	VG1241BL+943GGA	VG1241BL+943BGA	VG1241BL+943BUA
VG1241BN		11.7		VG1241BN+943AGA	VG1241BN+943GGA	VG1241BN+943BGA	VG1241BN+943BUA
VG1241CL	1	7.4[1]	200	VG1241CL+943AGA	VG1241CL+943GGA	VG1241CL+943BGA	VG1241CL+943BUA
VG1241CN		11.7[1]		VG1241CN+943AGA	VG1241CN+943GGA	VG1241CN+943BGA	VG1241CN+943BUA
VG1241CP		18.7		VG1241CP+943AGA	VG1241CP+943GGA	VG1241CP+943BGA	VG1241CP+943BUA
				Spring Return Closed — Valve Normally Closed			
				VA9208-AGA-2	**VA9208-GGA-2**	**VA9208-BGA-3**	**VA9208-BAA-3**
VG1241DN	1-1/4	11.7[1]	200	VG1241DN+948AGA	VG1241DN+948GGA	VG1241DN+958BGA	VG1241DN+958BAA
VG1241DP		18.7[1]		VG1241DP+948AGA	VG1241DP+948GGA	VG1241DP+958BGA	VG1241DP+958BAA
VG1241DR		29.2		VG1241DR+948AGA	VG1241DR+948GGA	VG1241DR+958BGA	VG1241DR+958BAA
VG1241EP	1-1/2	18.7[1]	200	VG1241EP+948AGA	VG1241EP+948GGA	VG1241EP+958BGA	VG1241EP+958BAA
VG1241ER		29.2[1]		VG1241ER+948AGA	VG1241ER+948GGA	VG1241ER+958BGA	VG1241ER+958BAA
VG1241ES		46.8		VG1241ES+948AGA	VG1241ES+948GGA	VG1241ES+958BGA	VG1241ES+958BAA
VG1241FR	2	29.2[1]	200	VG1241FR+948AGA	VG1241FR+948GGA	VG1241FR+958BGA	VG1241FR+958BAA
VG1241FS		46.8[1]		VG1241FS+948AGA	VG1241FS+948GGA	VG1241FS+958BGA	VG1241FS+958BAA
VG1241FT		73.7		VG1241FT+948AGA	VG1241FT+948GGA	VG1241FT+958BGA	VG1241FT+958BAA

1. Valve has a characterizing disk.

VG1000 Series Two-Way, Plated Brass Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators without Switches (Continued)

Technical Specifications

VG1000 Series Two-Way, Plated Brass Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators without Switches		
Service[1]		Hot Water, Chilled Water, 50/50 Glycol Solutions
Fluid Temperature Limits	**Water**	23 to 203°F (-5 to 95°C)
	Steam	Not Rated for Steam Service
Valve Body Pressure Rating	**Water**	580 psig (4,000 kPa) (PN40)
	Steam	Not Rated for Steam Service
Maximum Closeoff Pressure		200 psid (1,378 kPa)
Maximum Recommended Operating Pressure Drop		50 psid (340 kPa)
Flow Characteristics	**Two-Way**	Equal Percentage
Rangeability[2]		Greater than 500:1
Minimum Ambient Operating Temperature	**-22°F (-30°C)**	VA9203 Series Spring-Return Actuators
	-40°F (-40°C)	VA9208 Series Spring-Return Actuators
Maximum Ambient Operating Temperature[3] **(Limited by the Actuator)**	**140°F (60°C)**	VA9203 or VA9208 Series Spring-Return Actuators
Leakage		0.01% of Maximum Flow per ANSI/FCI 70-2, Class 4
End Connections		National Pipe Thread (NPT)
Materials	**Body**	Forged Brass
	Ball	Chrome Plated Brass
	Blowout-Proof Stem	Nickel Plated Brass
	Seats	Graphite-Reinforced PTFE with Ethylene Propylene Diene Monomer (EPDM) O-Ring Backing
	Stem Seals	EPDM Double O-Rings
	Characterizing Disk	Amodel® AS-1145HS Polyphthalamide Resin

1. Proper water treatment is recommended; refer to the VDI 2035 Guideline.
2. Rangeability is defined as the ratio of maximum controllable flow to minimum controllable flow.
3. In steam applications, install the valve with the stem horizontal to the piping and wrap the valve and piping with insulation.

Code No. LIT-1900226
Issued June 2016

VG1000 Series Two-Way, Plated Brass Trim, NPT End Connections Ball Valves with Non-Spring Return Electric Actuators

Description

VG1000 Series Ball Valves are designed to regulate the flow of hot or chilled water and, for some models, low-pressure steam in response to the demand of a controller in HVAC systems. Available in sizes 1/2 through 2 in. (DN15 through DN50), this family of two- and three-way forged brass valves is factory or field mounted to Johnson Controls® VA9104 and VA9300 Series Non-Spring Return and VA9203 and VA9208 Series Spring-Return Electric Actuators for on/off, floating, or proportional control.

Refer to the *VG1000 Series Forged Brass Ball Valves Product Bulletin (LIT-977132)* for important product application information.

Features

- Forged Brass Body — provides 580 psig static pressure rating.
- 200 psi Closeoff Pressure Rating — provides tight shutoff.
- Graphite-Reinforced Polytetrafluoroethylene (PTFE) Seats — include 15% graphite-reinforced ball seals, providing better wear resistance.
- Chrome-Plated Brass Ball and Stem Assembly Standard — handles both chilled and hot water applications with a fluid temperature range of 23 to 203°F (-5 to 95°C).
- 500:1 Rangeability — provides accurate control under all load conditions.

Repair Information

If the VG1000 Series Ball Valve fails to operate within its specifications, replace the valve body, actuator, or entire assembly. For replacement parts, contact the nearest Johnson Controls representative.

VG1000 Series Two-Way Non-Spring Return Plated Brass Ball and Stem Ball Valve Assemblies

Selection Charts

Two-Way Plated Brass Trim Valves, Non-Spring Return, VA9104 Series Electric Actuators without Switches

Fluid Temperatures: 23 to 203°F (-5 to 95°C) Not Rated for Steam Service				AC 24 V		
Valve	Size, in.	Cv	Closeoff psig	On/Off and/or Floating without Timeout[1]	On/Off and/or Floating with Timeout	DC 0 to 10 V Proportional
Actuators with M3 Screw Terminals				**VA9104-AGA-3S**	**VA9104-IGA-3S**	**VA9104-GGA-3S**
VG1241AD	1/2	1.2[2]	200	VG1241AD+9T4AGA	VG1241AD+9T4IGA	VG1241AD+9T4GGA
VG1241AE		1.9[2]		VG1241AE+9T4AGA	VG1241AE+9T4IGA	VG1241AE+9T4GGA
VG1241AF		2.9[2]		VG1241AF+9T4AGA	VG1241AF+9T4IGA	VG1241AF+9T4GGA
VG1241AG		4.7[2]		VG1241AG+9T4AGA	VG1241AG+9T4IGA	VG1241AG+9T4GGA
VG1241AL		7.4[2]		VG1241AL+9T4AGA	VG1241AL+9T4IGA	VG1241AL+9T4GGA
VG1241AN		11.7		VG1241AN+9T4AGA	VG1241AN+9T4IGA	VG1241AN+9T4GGA
VG1241BG	3/4	4.7[2]	200	VG1241BG+9T4AGA	VG1241BG+9T4IGA	VG1241BG+9T4GGA
VG1241BL		7.4[2]		VG1241BL+9T4AGA	VG1241BL+9T4IGA	VG1241BL+9T4GGA
VG1241BN		11.7		VG1241BN+9T4AGA	VG1241BN+9T4IGA	VG1241BN+9T4GGA
VG1241CL	1	7.4[2]	200	VG1241CL+9T4AGA	VG1241CL+9T4IGA	VG1241CL+9T4GGA
VG1241CN		11.7[2]		VG1241CN+9T4AGA	VG1241CN+9T4IGA	VG1241CN+9T4GGA
VG1241CP		18.7		VG1241CP+9T4AGA	VG1241CP+9T4IGA	VG1241CP+9T4GGA
Actuators with 120 in. (3.05 m) 18 AWG Plenum Cable				**VA9104-AGA-2S**	**VA9104-IGA-2S**	**VA9104-GGA-2S**
VG1241AD	1/2	1.2[2]	200	VG1241AD+9A4AGA	VG1241AD+9A4IGA	VG1241AD+9A4GGA
VG1241AE		1.9[2]		VG1241AE+9A4AGA	VG1241AE+9A4IGA	VG1241AE+9A4GGA
VG1241AF		2.9[2]		VG1241AF+9A4AGA	VG1241AF+9A4IGA	VG1241AF+9A4GGA
VG1241AG		4.7[2]		VG1241AG+9A4AGA	VG1241AG+9A4IGA	VG1241AG+9A4GGA
VG1241AL		7.4[2]		VG1241AL+9A4AGA	VG1241AL+9A4IGA	VG1241AL+9A4GGA
VG1241AN		11.7		VG1241AN+9A4AGA	VG1241AN+9A4IGA	VG1241AN+9A4GGA
VG1241BG	3/4	4.7[2]	200	VG1241BG+9A4AGA	VG1241BG+9A4IGA	VG1241BG+9A4GGA
VG1241BL		7.4[2]		VG1241BL+9A4AGA	VG1241BL+9A4IGA	VG1241BL+9A4GGA
VG1241BN		11.7		VG1241BN+9A4AGA	VG1241BN+9A4IGA	VG1241BN+9A4GGA
VG1241CL	1	7.4[2]	200	VG1241CL+9A4AGA	VG1241CL+9A4IGA	VG1241CL+9A4GGA
VG1241CN		11.7[2]		VG1241CN+9A4AGA	VG1241CN+9A4IGA	VG1241CN+9A4GGA
VG1241CP		18.7		VG1241CP+9A4AGA	VG1241CP+9A4IGA	VG1241CP+9A4GGA

1. To avoid excessive wear or drive time on the motor for the AGA models, use a controller or software that provides a timeout function to remove the signal at the end of rotation (stall).
2. Valve has a characterizing disk.

VG1000 Series Two-Way, Plated Brass Trim, NPT End Connections Ball Valves with Non-Spring Return Electric Actuators (Continued)

Two-Way Plated Brass Trim Ball Valves, Non-Spring Return, VA9300 Series Electric Actuators For Fluid Temperatures to 203°F

Fluid Temperature: **23 to 203°F (-5 to 95°C)** **Not Rated for Steam Service**				**AC/DC 24 V**		
				On/Off with Timeout	**Floating with Timeout**	**DC 0(2) to 10 V Proportional**
Valve	**Size, in.**	**Cv**	**Closeoff psi**	**Actuators without Switches**		
				VA9310-HGA-2		
VG1241DN	1-1/4	11.7[1]	200	VG1241DN+910HGA		
VG1241DP		18.7[1]		VG1241DP+910HGA		
VG1241DR		29.2		VG1241DR+910HGA		
VG1241EP	1-1/2	18.7[1]	200	VG1241EP+910HGA		
VG1241ER		29.2[1]		VG1241ER+910HGA		
VG1241ES		46.8		VG1241ES+910HGA		
VG1241FR	2	29.2[1]	200	VG1241FR+910HGA		
VG1241FS		46.8[1]		VG1241FS+910HGA		
VG1241FT		73.7		VG1241FT+910HGA		
Valve	**Size, in.**	**Cv**	**Closeoff psi**	**Actuators With Two Switches**		
				VA9300 actuator with M9300-2 Switch Kit[2]		
VG1241AD	1/2	1.2[1]	200	VG1241AD+910HGC		
VG1241AE		1.9[1]		VG1241AE+910HGC		
VG1241AF		2.9[1]		VG1241AF+910HGC		
VG1241AG		4.7[1]		VG1241AG+910HGC		
VG1241AL		7.4[1]		VG1241AL+910HGC		
VG1241AN		11.7		VG1241AN+910HGC		
VG1241BG	3/4	4.7[1]	200	VG1241BG+910HGC		
VG1241BL		7.4[1]		VG1241BL+910HGC		
VG1241BN		11.7		VG1241BN+910HGC		
VG1241CL	1	7.4[1]	200	VG1241CL+910HGC		
VG1241CN		11.7[1]		VG1241CN+910HGC		
VG1241CP		18.7		VG1241CP+910HGC		
VG1241DN	1-1/4	11.7[1]	200	VG1241DN+910HGC		
VG1241DP		18.7[1]		VG1241DP+910HGC		
VG1241DR		29.2		VG1241DR+910HGC		
VG1241EP	1-1/2	18.7[1]	200	VG1241EP+910HGC		
VG1241ER		29.2[1]		VG1241ER+910HGC		
VG1241ES		46.8		VG1241ES+910HGC		
VG1241FR	2	29.2[1]	200	VG1241FR+910HGC		
VG1241FS		46.8[1]		VG1241FS+910HGC		
VG1241FT		73.7		VG1241FT+910HGC		

1. Valve has a characterizing disk.
2. For field mounting order VA9310-HGA-2 and the M9300-2 Switch Kit separately.

VG1000 Series Two-Way, Plated Brass Trim, NPT End Connections Ball Valves with Non-Spring Return Electric Actuators (Continued)

Technical Specifications

VG1000 Series Two-Way, Plated Brass Trim, NPT End Connections Ball Valves with Non-Spring Return Electric Actuators		
Service[1]		Hot Water, Chilled Water, or 50/50 Glycol Solutions for HVAC Systems
Valve Fluid Temperature Limits	**Water**	23 to 203°F (-5 to 95°C)
	Steam	Not Rated for Steam Service
Maximum Fluid Temperature Limit	**203°F (95°C)**	VA9104 Series Non-Spring Return Actuators VA9300 Series Non-Spring Return Actuators
Valve Body Pressure Rating	**Water**	580 psig (4,000 kPa) at 203°F (95°C) (PN40)
	Steam	Not Rated for Steam Service
Maximum Closeoff Pressure		200 psid (1,378 kPa)
Maximum Recommended Operating Pressure Drop		50 psid (340 kPa)
Flow Characteristics	**Two-Way**	Equal Percentage
Rangeability[2]		Greater than 500:1
Minimum Ambient Operating Temperature	**-4°F (-20°C)**	VA9104 Series Non-Spring Return Actuators
	-22°F (-30°C)	VA9300 Series Non-Spring Return Actuators
Maximum Ambient Operating Temperature	**140°F (60°C)**	VA9104 Series Non-Spring Return Actuators VA9300 Series Non-Spring Return Actuators
Leakage		0.01% of Maximum Flow per ANSI/FCI 70-2, Class 4
End Connections		National Pipe Thread (NPT)
Materials	**Body**	Forged Brass
	Ball	Chrome Plated Brass
	Blowout-Proof Stem	Nickel Plated Brass
	Seats	Graphite-Reinforced PTFE with Ethylene Propylene Diene Monomer (EPDM) O-Ring Backing
	Stem Seals	EPDM Double O-Rings
	Characterizing Disk	Amodel® AS-1145HS Polyphthalamide Resin

1. Proper water treatment is recommended; refer to the VDI 2035 Guideline.
2. Rangeability is defined as the ratio of maximum controllable flow to minimum controllable flow.

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VG1000 Series Two-Way, Plated Brass Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators with Switches

Description

VG1000 Series Ball Valves are designed to regulate the flow of hot or chilled water and, for some models, low-pressure steam in response to the demand of a controller in HVAC systems. Available in sizes 1/2 through 2 in. (DN15 through DN50), this family of two- and three-way forged brass valves is factory or field mounted to Johnson Controls® VA9104, M9106, M9109, and M9100 Series Non-Spring-Return and VA9203 and VA9208 Series Spring-Return Electric Actuators for on/off, floating, or proportional control.

Refer to the *VG1000 Series Forged Brass Ball Valves Product Bulletin (LIT-977132)* for important product application information.

Features

- Forged Brass Body — provides 580 psig static pressure rating.
- Graphite-Reinforced Polytetrafluoroethylene (PTFE) Seats — include 15% graphite-reinforced ball seals, providing better wear resistance.
- 500:1 Rangeability — provides accurate control under all load conditions.
- Maintenance-Free Design — performs without failure in excess of 200,000 full stroke cycles in iron-oxide contaminated water.

Repair Information

If the VG1000 Series Ball Valve fails to operate within its specifications, replace the valve body, actuator, or entire assembly. For replacement parts, contact the nearest Johnson Controls representative.

VG1000 Series Two-Way, Spring-Return, Plated Brass Ball and Stem Ball Valve Assemblies with End Switches

Selection Charts

Two-Way — Spring Return Valve Open — Normally Open with Switches

Fluid Temperatures: 23 to 203°F (-5 to 95°C)				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
Valve	**Size, in.**	**Cv**	**Closeoff psig**	**Floating**	**DC 0 to 10 V Proportional**	**On/Off**	**On/Off**
				Spring Return Open — Valve Normally Open — Actuators with One Switch			
				VA9203-AGB-2Z	**VA9203-GGB-2Z**	**VA9203-BGB-2**	**VA9203-BUB-2**
VG1241AD	1/2	1.2[1]	200	VG1241AD+923AGB	VG1241AD+923GGB	VG1241AD+923BGB	VG1241AD+923BUB
VG1241AE		1.9[1]		VG1241AE+923AGB	VG1241AE+923GGB	VG1241AE+923BGB	VG1241AE+923BUB
VG1241AF		2.9[1]		VG1241AF+923AGB	VG1241AF+923GGB	VG1241AF+923BGB	VG1241AF+923BUB
VG1241AG		4.7[1]		VG1241AG+923AGB	VG1241AG+923GGB	VG1241AG+923BGB	VG1241AG+923BUB
VG1241AL		7.4[1]		VG1241AL+923AGB	VG1241AL+923GGB	VG1241AL+923BGB	VG1241AL+923BUB
VG1241AN		11.7		VG1241AN+923AGB	VG1241AN+923GGB	VG1241AN+923BGB	VG1241AN+923BUB
VG1241BG	3/4	4.7[1]	200	VG1241BG+923AGB	VG1241BG+923GGB	VG1241BG+923BGB	VG1241BG+923BUB
VG1241BL		7.4[1]		VG1241BL+923AGB	VG1241BL+923GGB	VG1241BL+923BGB	VG1241BL+923BUB
VG1241BN		11.7		VG1241BN+923AGB	VG1241BN+923GGB	VG1241BN+923BGB	VG1241BN+923BUB
VG1241CL	1	7.4[1]	200	VG1241CL+923AGB	VG1241CL+923GGB	VG1241CL+923BGB	VG1241CL+923BUB
VG1241CN		11.7[1]		VG1241CN+923AGB	VG1241CN+923GGB	VG1241CN+923BGB	VG1241CN+923BUB
VG1241CP		18.7		VG1241CP+923AGB	VG1241CP+923GGB	VG1241CP+923BGB	VG1241CP+923BUB
				Spring Return Open — Valve Normally Open — Actuators with Two Switches			
				VA9208-AGC-3	**VA9208-GGC-3**	**VA9208-BGC-3**	**VA9208-BAC-3**
VG1241DN	1-1/4	11.7[1]	200	VG1241DN+938AGC	VG1241DN+938GGC	VG1241DN+938BGB	VG1241DN+938BAB
VG1241DP		18.7[1]		VG1241DP+938AGC	VG1241DP+938GGC	VG1241DP+938BGB	VG1241DP+938BAB
VG1241DR		29.2		VG1241DR+938AGC	VG1241DR+938GGC	VG1241DR+938BGB	VG1241DR+938BAB
VG1241EP	1-1/2	18.7[1]	200	VG1241EP+938AGC	VG1241EP+938GGC	VG1241EP+938BGB	VG1241EP+938BAB
VG1241ER		29.2[1]		VG1241ER+938AGC	VG1241ER+938GGC	VG1241ER+938BGB	VG1241ER+938BAB
VG1241ES		46.8		VG1241ES+938AGC	VG1241ES+938GGC	VG1241ES+938BGB	VG1241ES+938BAB
VG1241FR	2	29.2[1]	200	VG1241FR+938AGC	VG1241FR+938GGC	VG1241FR+938BGC	VG1241FR+938BAC
VG1241FS		46.8[1]		VG1241FS+938AGC	VG1241FS+938GGC	VG1241FS+938BGC	VG1241FS+938BAC
VG1241FT		73.7		VG1241FT+938AGC	VG1241FT+938GGC	VG1241FT+938BGC	VG1241FT+938BAC

1. Valve has a characterizing disk.

VG1000 Series Two-Way, Plated Brass Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators with Switches (Continued)

Two-Way — Spring Return Valve Closed — Normally Closed with End Switches

Fluid Temperatures: 23 to 203°F (-5 to 95°C)				**AC 24 V**			**AC 85–264 V (VA9203) AC 120 V (VA9208)**
Valve	**Size, in.**	**Cv**	**Closeoff psig**	**Floating**	**DC 0 to 10 V Proportional**	**On/Off**	**On/Off**
				Spring Return Closed — Valve Normally Closed — Actuators with One Switch			
				VA9203-AGB-2Z	**VA9203-GGB-2Z**	**VA9203-BGB-2**	**VA9203-BUB-2**
VG1241AD	1/2	1.2[1]	200	VG1241AD+943AGB	VG1241AD+943GGB	VG1241AD+943BGB	VG1241AD+943BUB
VG1241AE		1.9[1]		VG1241AE+943AGB	VG1241AE+943GGB	VG1241AE+943BGB	VG1241AE+943BUB
VG1241AF		2.9[1]		VG1241AF+943AGB	VG1241AF+943GGB	VG1241AF+943BGB	VG1241AF+943BUB
VG1241AG		4.7[1]		VG1241AG+943AGB	VG1241AG+943GGB	VG1241AG+943BGB	VG1241AG+943BUB
VG1241AL		7.4[1]		VG1241AL+943AGB	VG1241AL+943GGB	VG1241AL+943BGB	VG1241AL+943BUB
VG1241AN		11.7		VG1241AN+943AGB	VG1241AN+943GGB	VG1241AN+943BGB	VG1241AN+943BUB
VG1241BG	3/4	4.7[1]	200	VG1241BG+943AGB	VG1241BG+943GGB	VG1241BG+943BGB	VG1241BG+943BUB
VG1241BL		7.4[1]		VG1241BL+943AGB	VG1241BL+943GGB	VG1241BL+943BGB	VG1241BL+943BUB
VG1241BN		11.7		VG1241BN+943AGB	VG1241BN+943GGB	VG1241BN+943BGB	VG1241BN+943BUB
VG1241CL	1	7.4[1]	200	VG1241CL+943AGB	VG1241CL+943GGB	VG1241CL+943BGB	VG1241CL+943BUB
VG1241CN		11.7[1]		VG1241CN+943AGB	VG1241CN+943GGB	VG1241CN+943BGB	VG1241CN+943BUB
VG1241CP		18.7		VG1241CP+943AGB	VG1241CP+943GGB	VG1241CP+943BGB	VG1241CP+943BUB
				Spring Return Closed — Valve Normally Closed — Actuators with Two Switches			
				VA9208-AGC-3	**VA9208-GGC-3**	**VA9208-BGC-3**	**VA9208-BAC-3**
VG1241DN	1-1/4	11.7[1]	200	VG1241DN+958AGC	VG1241DN+958GGC	VG1241DN+958BGB	VG1241DN+958BAB
VG1241DP		18.7[1]		VG1241DP+958AGC	VG1241DP+958GGC	VG1241DP+958BGB	VG1241DP+958BAB
VG1241DR		29.2		VG1241DR+958AGC	VG1241DR+958GGC	VG1241DR+958BGB	VG1241DR+958BAB
VG1241EP	1-1/2	18.7[1]	200	VG1241EP+958AGC	VG1241EP+958GGC	VG1241EP+958BGB	VG1241EP+958BAB
VG1241ER		29.2[1]		VG1241ER+958AGC	VG1241ER+958GGC	VG1241ER+958BGB	VG1241ER+958BAB
VG1241ES		46.8		VG1241ES+958AGC	VG1241ES+958GGC	VG1241ES+958BGB	VG1241ES+958BAB
VG1241FR	2	29.2[1]	200	VG1241FR+958AGC	VG1241FR+958GGC	VG1241FR+958BGC	VG1241FR+958BAC
VG1241FS		46.8[1]		VG1241FS+958AGC	VG1241FS+958GGC	VG1241FS+958BGC	VG1241FS+958BAC
VG1241FT		73.7		VG1241FT+958AGC	VG1241FT+958GGC	VG1241FT+958BGC	VG1241FT+958BAC

1. Valve has a characterizing disk.

VG1000 Series Two-Way, Plated Brass Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators with Switches (Continued)

Technical Specifications

VG1000 Series Two-Way, Plated Brass Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators with Switches		
Service[1]		Hot Water, Chilled Water, 50/50 Glycol Solutions, and 15 psig (103 kPa) Saturated Steam for HVAC Systems
Fluid Temperature Limits	**Water**	23 to 203°F (-5 to 95°C)
	Steam	Not Rated for Steam Service
Valve Body Pressure Rating	**Water**	580 psig (4,000 kPa) (PN40)
	Steam	Not Rated for Steam Service
Maximum Closeoff Pressure		200 psid (1,378 kPa)
Maximum Recommended Operating Pressure Drop		50 psid (340 kPa)
Flow Characteristics	**Two-Way**	Equal Percentage
Rangeability[2]		Greater than 500:1
Minimum Ambient Operating Temperature	**-22°F (-30°C)**	VA9203 Series Spring-Return Actuators
	-40°F (-40°C)	VA9208 Series Spring-Return Actuators
Maximum Ambient Operating Temperature[3] **(Limited by the Actuator and Linkage)**	**Direct Mount**	140°F (60°C): VA9208 Series Spring-Return Actuators
Leakage		0.01% of Maximum Flow per ANSI/FCI 70-2, Class 4
End Connections		National Pipe Thread (NPT)
Materials	**Body**	Forged Brass
	Ball	Chrome Plated Brass
	Blowout-Proof Stem	Nickel Plated Brass
	Seats	Graphite-Reinforced PTFE with Ethylene Propylene Diene Monomer (EPDM) O-Ring Backing
	Stem Seals	EPDM Double O-Rings
	Characterizing Disk	Amodel® AS-1145HS Polyphthalamide Resin

1. Proper water treatment is recommended; refer to the VDI 2035 Guideline.
2. Rangeability is defined as the ratio of maximum controllable flow to minimum controllable flow.
3. In steam applications, install the valve with the stem horizontal to the piping and wrap the valve and piping with insulation.

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VG1000 Series Two-Way, Stainless Steel Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators with Switches

Description

VG1000 Series Ball Valves are designed to regulate the flow of hot or chilled water and, for some models, low-pressure steam in response to the demand of a controller in HVAC systems. Available in sizes 1/2 through 2 in. (DN15 through DN50), this family of two- and three-way forged brass valves is factory or field mounted to Johnson Controls® VA9104, M9106, M9109, and M9100 Series Non-Spring-Return and VA9203 and VA9208 Series Spring-Return Electric Actuators for on/off, floating, or proportional control.

Refer to the *VG1000 Series Forged Brass Ball Valves Product Bulletin (LIT-977132)* for important product application information.

Features

- Forged Brass Body — provides 580 psig static pressure rating.
- Graphite-Reinforced Polytetrafluoroethylene (PTFE) Seats — include 15% graphite-reinforced ball seals, providing better wear resistance.
- 500:1 Rangeability — provides accurate control under all load conditions.
- Maintenance-Free Design — performs without failure in excess of 200,000 full stroke cycles in iron-oxide contaminated water.

Repair Information

If the VG1000 Series Ball Valve fails to operate within its specifications, replace the valve body, actuator, or entire assembly. For replacement parts, contact the nearest Johnson Controls representative.

VG1000 Series Two-Way, Spring-Return, Stainless Steel Ball and Stem Ball Valve Assemblies with End Switches

Selection Charts

Two-Way — Spring Return Valve Open — Normally Open with Switches (Not Rated for Steam Service)

Fluid Temperatures: -22 to 212°F (-30 to 100°C) Not Rated for Steam Service				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
Valve	**Size, in.**	**Cv**	**Closeoff psig**	**Floating**	**DC 0 to 10 V Proportional**	**On/Off**	**On/Off**
				Spring Return Open — Valve Normally Open — Actuators with One Switch			
				VA9203-AGB-2Z	**VA9203-GGB-2Z**	**VA9203-BGB-2**	**VA9203-BUB-2**
VG1245AD	1/2	1.2[1]	200	VG1245AD+923AGB	VG1245AD+923GGB	VG1245AD+923BGB	VG1245AD+923BUB
VG1245AE		1.9[1]		VG1245AE+923AGB	VG1245AE+923GGB	VG1245AE+923BGB	VG1245AE+923BUB
VG1245AF		2.9[1]		VG1245AF+923AGB	VG1245AF+923GGB	VG1245AF+923BGB	VG1245AF+923BUB
VG1245AG		4.7[1]		VG1245AG+923AGB	VG1245AG+923GGB	VG1245AG+923BGB	VG1245AG+923BUB
VG1245AL		7.4[1]		VG1245AL+923AGB	VG1245AL+923GGB	VG1245AL+923BGB	VG1245AL+923BUB
VG1245AN		11.7		VG1245AN+923AGB	VG1245AN+923GGB	VG1245AN+923BGB	VG1245AN+923BUB
VG1245BG	3/4	4.7[1]	200	VG1245BG+923AGB	VG1245BG+923GGB	VG1245BG+923BGB	VG1245BG+923BUB
VG1245BL		7.4[1]		VG1245BL+923AGB	VG1245BL+923GGB	VG1245BL+923BGB	VG1245BL+923BUB
VG1245BN		11.7		VG1245BN+923AGB	VG1245BN+923GGB	VG1245BN+923BGB	VG1245BN+923BUB
VG1245CL	1	7.4[1]	200	VG1245CL+923AGB	VG1245CL+923GGB	VG1245CL+923BGB	VG1245CL+923BUB
VG1245CN		11.7[1]		VG1245CN+923AGB	VG1245CN+923GGB	VG1245CN+923BGB	VG1245CN+923BUB
VG1245CP		18.7		VG1245CP+923AGB	VG1245CP+923GGB	VG1245CP+923BGB	VG1245CP+923BUB
				Spring Return Open — Valve Normally Open — Actuators with Two Switches			
				VA9208-AGC-3	**VA9208-GGC-3**	**VA9208-BGC-3**	**VA9208-BAC-3**
VG1245DN	1-1/4	11.7[1]	200	VG1245DN+938AGC	VG1245DN+938GGC	VG1245DN+938BGC	VG1245DN+938BAC
VG1245DP		18.7[1]		VG1245DP+938AGC	VG1245DP+938GGC	VG1245DP+938BGC	VG1245DP+938BAC
VG1245DR		29.2		VG1245DR+938AGC	VG1245DR+938GGC	VG1245DR+938BGC	VG1245DR+938BAC
VG1245EP	1-1/2	18.7[1]	200	VG1245EP+938AGC	VG1245EP+938GGC	VG1245EP+938BGC	VG1245EP+938BAC
VG1245ER		29.2[1]		VG1245ER+938AGC	VG1245ER+938GGC	VG1245ER+938BGC	VG1245ER+938BAC
VG1245ES		46.8		VG1245ES+938AGC	VG1245ES+938GGC	VG1245ES+938BGC	VG1245ES+938BAC
VG1245FR	2	29.2[1]	200	VG1245FR+938AGC	VG1245FR+938GGC	VG1245FR+938BGC	VG1245FR+938BAC
VG1245FS		46.8[1]		VG1245FS+938AGC	VG1245FS+938GGC	VG1245FS+938BGC	VG1245FS+938BAC
VG1245FT		73.7		VG1245FT+938AGC	VG1245FT+938GGC	VG1245FT+938BGC	VG1245FT+938BAC

1. Valve has a characterizing disk.

VG1000 Series Two-Way, Stainless Steel Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators with Switches (Continued)

Two-Way — Spring Return Closed — Valve Normally Closed

Fluid Temperatures: -22 to 212°F (-30 to 100°C) Not Rated for Steam Service				**AC 24 V**			**AC 85–264 V (VA9203) AC 120 V (VA9208)**
Valve	**Size, in.**	**Cv**	**Closeoff psig**	**Floating**	**DC 0 to 10 V Proportional**	**On/Off**	**On/Off**
				Spring Return Closed — Valve Normally Closed — Actuators with One Switch			
				VA9203-AGB-2Z	**VA9203-GGB-2Z**	**VA9203-BGB-2**	**VA9203-BUB-2**
VG1245AD	1/2	1.2[1]	200	VG1245AD+943AGB	VG1245AD+943GGB	VG1245AD+943BGB	VG1245AD+943BUB
VG1245AE		1.9[1]		VG1245AE+943AGB	VG1245AE+943GGB	VG1245AE+943BGB	VG1245AE+943BUB
VG1245AF		2.9[1]		VG1245AF+943AGB	VG1245AF+943GGB	VG1245AF+943BGB	VG1245AF+943BUB
VG1245AG		4.7[1]		VG1245AG+943AGB	VG1245AG+943GGB	VG1245AG+943BGB	VG1245AG+943BUB
VG1245AL		7.4[1]		VG1245AL+943AGB	VG1245AL+943GGB	VG1245AL+943BGB	VG1245AL+943BUB
VG1245AN		11.7		VG1245AN+943AGB	VG1245AN+943GGB	VG1245AN+943BGB	VG1245AN+943BUB
VG1245BG	3/4	4.7[1]	200	VG1245BG+943AGB	VG1245BG+943GGB	VG1245BG+943BGB	VG1245BG+943BUB
VG1245BL		7.4[1]		VG1245BL+943AGB	VG1245BL+943GGB	VG1245BL+943BGB	VG1245BL+943BUB
VG1245BN		11.7		VG1245BN+943AGB	VG1245BN+943GGB	VG1245BN+943BGB	VG1245BN+943BUB
VG1245CL	1	7.4[1]	200	VG1245CL+943AGB	VG1245CL+943GGB	VG1245CL+943BGB	VG1245CL+943BUB
VG1245CN		11.7[1]		VG1245CN+943AGB	VG1245CN+943GGB	VG1245CN+943BGB	VG1245CN+943BUB
VG1245CP		18.7		VG1245CP+943AGB	VG1245CP+943GGB	VG1245CP+924TBGB	VG1245CP+943BUB
				Spring Return Closed — Valve Normally Closed — Actuators with Two Switches			
				VA9208-AGC-3	**VA9208-GGC-3**	**VA9208-BGC-3**	**VA9208-BAC-3**
VG1245DN	1-1/4	11.7[1]	200	VG1245DN+958AGC	VG1245DN+958GGC	VG1245DN+958BGC	VG1245DN+958BAC
VG1245DP		18.7[1]		VG1245DP+958AGC	VG1245DP+958GGC	VG1245DP+958BGC	VG1245DP+958BAC
VG1245DR		29.2		VG1245DR+958AGC	VG1245DR+958GGC	VG1245DR+958BGC	VG1245DR+958BAC
VG1245EP	1-1/2	18.7[1]	200	VG1245EP+958AGC	VG1245EP+958GGC	VG1245EP+958BGC	VG1245EP+958BAC
VG1245ER		29.2[1]		VG1245ER+958AGC	VG1245ER+958GGC	VG1245ER+958BGC	VG1245ER+958BAC
VG1245ES		46.8		VG1245ES+958AGC	VG1245ES+958GGC	VG1245ES+958BGC	VG1245ES+958BAC
VG1245FR	2	29.2[1]	200	VG1245FR+958AGC	VG1245FR+958GGC	VG1245FR+958BGC	VG1245FR+958BAC
VG1245FS		46.8[1]		VG1245FS+958AGC	VG1245FS+958GGC	VG1245FS+958BGC	VG1245FS+958BAC
VG1245FT		73.7		VG1245FT+958AGC	VG1245FT+958GGC	VG1245FT+958BGC	VG1245FT+958BAC

1. Valve has a characterizing disk.

VG1000 Series Two-Way, Stainless Steel Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators with Switches (Continued)

Valve Assemblies with M9000-561 Thermal Barrier Installed — Rated for High-Temperature Fluid Service, Two-Way — Spring Return — With End Switches

Fluid Temperatures: -22 to 284°F (-30 to 140°C),15 psi Steam				**AC 24 V**			**AC 85–264 V (VA9203) AC 120 V (VA9208)**
Valve	**Size, in.**	**Cv**	**Closeoff psig**	**Floating**	**DC 0 to 10 V Proportional**	**On/Off**	**On/Off**
				Spring Return Open — Valve Normally Open — Actuators with One Switch			
				VA9203-AGB-2Z	**VA9203-GGB-2Z**	**VA9203-BGB-2**	**VA9203-BUB-2**
VG1245AD	1/2	1.2[1]	200	VG1245ADH923AGB	VG1245ADH923GGB	VG1245ADH923BGB	VG1245ADH923BUB
VG1245AE		1.9[1]		VG1245AEH923AGB	VG1245AEH923GGB	VG1245AEH923BGB	VG1245AEH923BUB
VG1245AF		2.9[1]		VG1245AFH923AGB	VG1245AFH923GGB	VG1245AFH923BGB	VG1245AFH923BUB
VG1245AG		4.7[1]		VG1245AGH923AGB	VG1245AGH923GGB	VG1245AGH923BGB	VG1245AGH923BUB
VG1245AL		7.4[1]		VG1245ALH923AGB	VG1245ALH923GGB	VG1245ALH923BGB	VG1245ALH923BUB
VG1245AN		11.7		VG1245ANH923AGB	VG1245ANH923GGB	VG1245ANH923BGB	VG1245ANH923BUB
VG1245BG	3/4	4.7[1]	200	VG1245BGH923AGB	VG1245BGH923GGB	VG1245BGH923BGB	VG1245BGH923BUB
VG1245BL		7.4[1]		VG1245BLH923AGB	VG1245BLH923GGB	VG1245BLH923BGB	VG1245BLH923BUB
VG1245BN		11.7		VG1245BNH923AGB	VG1245BNH923GGB	VG1245BNH923BGB	VG1245BNH923BUB
VG1245CL	1	7.4[1]	200	VG1245CLH923AGB	VG1245CLH923GGB	VG1245CLH923BGB	VG1245CLH923BUB
VG1245CN		11.7[1]		VG1245CNH923AGB	VG1245CNH923GGB	VG1245CNH923BGB	VG1245CNH923BUB
VG1245CP		18.7		VG1245CPH923AGB	VG1245CPH923GGB	VG1245CPH923BGB	VG1245CPH923BUB
				Spring Return Open — Valve Normally Open — Actuators with Two Switches			
				VA9208-AGC-3	**VA9208-GGC-3**	**VA9208-BGC-3**	**VA9208-BAC-3**
VG1245DN	1-1/4	11.7[1]	200	VG1245DNH938AGC	VG1245DNH938GGC	VG1245DNH938BGC	VG1245DNH938BAC
VG1245DP		18.7[1]		VG1245DPH938AGC	VG1245DPH938GGC	VG1245DPH938BGC	VG1245DPH938BAC
VG1245DR		29.2		VG1245DRH938AGC	VG1245DRH938GGC	VG1245DRH938BGC	VG1245DRH938BAC
VG1245EP	1-1/2	18.7[1]	200	VG1245EPH938AGC	VG1245EPH938GGC	VG1245EPH938BGC	VG1245EPH938BAC
VG1245ER		29.2[1]		VG1245ERH938AGC	VG1245ERH938GGC	VG1245ERH938BGC	VG1245ERH938BAC
VG1245ES		46.8		VG1245ESH938AGC	VG1245ESH938GGC	VG1245ESH938BGC	VG1245ESH938BAC
VG1245FR	2	29.2[1]	200	VG1245FRH938AGC	VG1245FRH938GGC	VG1245FRH938BGC	VG1245FRH938BAC
VG1245FS		46.8[1]		VG1245FSH938AGC	VG1245FSH938GGC	VG1245FSH938BGC	VG1245FSH938BAC
VG1245FT		73.7		VG1245FTH938AGC	VG1245FTH938GGC	VG1245FTH938BGC	VG1245FTH938BAC
				Spring Return Closed — Valve Normally Closed — Actuators with One Switch			
				VA9203-AGB-2Z	**VA9203-GGB-2Z**	**VA9203-BGB-2**	**VA9203-BUB-2**
VG1245AD	1/2	1.2[1]	200	VG1245ADH943AGB	VG1245ADH943GGB	VG1245ADH943BGB	VG1245ADH943BUB
VG1245AE		1.9[1]		VG1245AEH943AGB	VG1245AEH943GGB	VG1245AEH943BGB	VG1245AEH943BUB
VG1245AF		2.9[1]		VG1245AFH943AGB	VG1245AFH943GGB	VG1245AFH943BGB	VG1245AFH943BUB
VG1245AG		4.7[1]		VG1245AGH943AGB	VG1245AGH943GGB	VG1245AGH943BGB	VG1245AGH943BUB
VG1245AL		7.4[1]		VG1245ALH943AGB	VG1245ALH943GGB	VG1245ALH943BGB	VG1245ALH943BUB
VG1245AN		11.7		VG1245ANH943AGB	VG1245ANH943GGB	VG1245ANH943BGB	VG1245ANH943BUB
VG1245BG	3/4	4.7[1]	200	VG1245BGH943AGB	VG1245BGH943GGB	VG1245BGH943BGB	VG1245BGH943BUB
VG1245BL		7.4[1]		VG1245BLH943AGB	VG1245BLH943GGB	VG1245BLH943BGB	VG1245BLH943BUB
VG1245BN		11.7		VG1245BNH943AGB	VG1245BNH943GGB	VG1245BNH943BGB	VG1245BNH943BUB
VG1245CL	1	7.4[1]	200	VG1245CLH943AGB	VG1245CLH943GGB	VG1245CLH943BGB	VG1245CLH943BUB
VG1245CN		11.7[1]		VG1245CNH943AGB	VG1245CNH943GGB	VG1245CNH943BGB	VG1245CNH943BUB
VG1245CP		18.7		VG1245CPH943AGB	VG1245CPH943GGB	VG1245CPH943BGB	VG1245CPH943BUB
				Spring Return Closed — Valve Normally Closed — Actuators with Two Switches			
				VA9208-AGC-3	**VA9208-GGC-3**	**VA9208-BGC-3**	**VA9208-BAC-3**
VG1245DN	1-1/4	11.7[1]	200	VG1245DNH958AGC	VG1245DNH958GGC	VG1245DNH958BGC	VG1245DNH958BAC
VG1245DP		18.7[1]		VG1245DPH958AGC	VG1245DPH958GGC	VG1245DPH958BGC	VG1245DPH958BAC
VG1245DR		29.2		VG1245DRH958AGC	VG1245DRH958GGC	VG1245DRH958BGC	VG1245DRH958BAC
VG1245EP	1-1/2	18.7[1]	200	VG1245EPH958AGC	VG1245EPH958GGC	VG1245EPH958BGC	VG1245EPH958BAC
VG1245ER		29.2[1]		VG1245ERH958AGC	VG1245ERH958GGC	VG1245ERH958BGC	VG1245ERH958BAC
VG1245ES		46.8		VG1245ESH958AGC	VG1245ESH958GGC	VG1245ESH958BGC	VG1245ESH958BAC
VG1245FR	2	29.2[1]	200	VG1245FRH958AGC	VG1245FRH958GGC	VG1245FRH958BGC	VG1245FRH958BAC
VG1245FS		46.8[1]		VG1245FSH958AGC	VG1245FSH958GGC	VG1245FSH958BGC	VG1245FSH958BAC
VG1245FT		73.7		VG1245FTH958AGC	VG1245FTH958GGC	VG1245FTH958BGC	VG1245FTH958BAC

1. Valve has a characterizing disk.

VG1000 Series Two-Way, Stainless Steel Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators with Switches (Continued)

Technical Specifications

VG1000 Series Two-Way, Stainless Steel Trim, NPT End Connections Ball Valves with Spring-Return Electric Actuators with Switches		
Service[1]		Hot Water, Chilled Water, 50/50 Glycol Solutions, and 15 psig (103 kPa) Saturated Steam for HVAC Systems (Select Models)
Fluid Temperature Limits	**Water**	-22 to 284°F (-30 to 140°C)
	Steam	15 psig (103 kPa) at 250°F (121°C)
Maximum Actuator Fluid Temperature Limit	**212°F (100°C)**	VA9203 VA9208
	284°F (140°C)	VA9203 with M9000-561 Thermal Barrier VA9208 with M9000-561 Thermal Barrier
Valve Body Pressure Rating	**Water**	580 psig (4,000 kPa) at 203°F (95°C) 464 psig (3,199 kPa) at 284°F (140°C) (PN40)
	Steam	15 psig (103 kPa) Saturated Steam (Only with VA9203 or VA9208 Series Actuator with M900-561 Thermal Barrier)
Maximum Closeoff Pressure		200 psid (1,378 kPa)
Maximum Recommended Operating Pressure Drop		50 psid (340 kPa)
Flow Characteristics	**Two-Way**	Equal Percentage
Rangeability[2]		Greater than 500:1
Minimum Ambient Operating Temperature	**-22°F (-30°C)**	VA9203 Series Spring-Return Actuators
	-40°F (-40°C)	VA9208 Series Spring-Return Actuators
Maximum Ambient Operating Temperature[3] **(Limited by the Actuator)**	**Direct Mount**	140°F (60°C): VA9203 or VA9208 Series Spring-Return Actuators
Leakage		0.01% of Maximum Flow per ANSI/FCI 70-2, Class 4
		1% of Maximum Flow for Three-Way Bypass Port
End Connections		National Pipe Thread (NPT)
Materials	**Body**	Forged Brass
	Ball	300 Series Stainless Steel
	Blowout-Proof Stem	300 Series Stainless Steel
	Seats	Graphite-Reinforced PTFE with Ethylene Propylene Diene Monomer (EPDM) O-Ring Backing
	Stem Seals	EPDM Double O-Rings
	Characterizing Disk	Amodel® AS-1145HS Polyphthalamide Resin
Compliance CRN		0C16910.5C

1. Proper water treatment is recommended; refer to the VDI 2035 Guideline.
2. Rangeability is defined as the ratio of maximum controllable flow to minimum controllable flow.
3. In steam applications, install the valve with the stem horizontal to the piping and wrap the valve and piping with insulation.

Johnson Controls

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VG1000 Series Flanged Ball Valves

Description

VG1000 Series Flanged Ball Valves are designed primarily to regulate the flow of hot water, chilled water, and 50% glycol solutions in response to the demand of a controller in HVAC systems. The valves come in sizes of 2-1/2, 3, and 4 in. (DN65, DN80, and DN100). These American Society of Mechanical Engineers (ASME) Class 150 flanged valves come in both two- and three-way configurations. Johnson Controls offers valve, linkage, and actuator assemblies for factory or field mounting with either spring-return or non-spring-return actuators.

Refer to the *VG1000 Series Flanged Ball Valves Product Bulletin (LIT-12011228)* for important product application information.

Features

- Closeoff Pressure Rating: 100 psi for Two-Way Valves; 50 psi for Three-Way Valves — provides tight shutoff.
- 300 Stainless Steel Ball and Stem Assembly — applies to systems with high-temperature water (0 to 284°F [-18 to 140°C]) or 25 psi saturated steam.
- 500:1 Rangeability — provides accurate control under all load conditions.
- Amodel® Flow Characterizing Disk — provides equal percentage flow characteristics for best temperature control; available in a wide array of Cv ranges to cover a broad variety of applications.
- Ethylene Propylene Diene Monomer (EPDM) Double O-Ring Stem Seal — offers tested leak-free operation for 200,000 cycles in iron-oxide contaminated water.
- Graphite-Reinforced Polytetrafluoroethylene (PTFE) Seats — include 15% graphite-reinforced ball seals that last twice as long in iron-oxide contaminated water when compared to virgin Teflon® ball seats.
- PTFE Thermal Spacer — provides thermal isolation between the actuator and the valve.
- Seats Backed with EPDM O-Rings — maintain a constant seating force that compensates for expansion, contraction, and seat wear without increasing operating torque.
- Maintenance-Free Design — performs without failure in excess of 200,000 full stroke cycles in iron-oxide contaminated water.
- Available with Factory-Mounted M9124 or M9220 Series Electric Actuators — reduces field installation time and cost.

VG1000 Series Ball Valves Shown with Field Mounted M9000 Series Actuators

- M9000-330 and M9000-340 Weather Shields Available for Field Installation — protect the actuator from corrosion, rain, freezing rain, sleet, and snow.

Repair Information

If the VG1000 Series Ball Valve fails to operate within its specifications, replace the valve body, actuator, or entire assembly. For replacement parts, contact the nearest Johnson Controls® representative.

Selection Charts

Flanged Stainless Steel Trim Ball Valves with Non-Spring-Return Electric Actuators

Valve	Size, In.	Cv	Closeoff psig	AC 24 V			
				Without Switches		With Two Auxiliary Switches	
				On/Off (Floating)	DC 0 to 10 V Proportional	On/Off (Floating)	DC 0 to 10 V Proportional
				M9124-AGA-2	M9124-GGA-2	M9124-AGC-2	M9124-GGC-2
Two-Way							
VG12A5GS	2-1/2	47[1]	100	VG12A5GS+924AGA	VG12A5GS+924GGA	VG12A5GS+924AGC	VG12A5GS+924GGC
VG12A5GT		74[1]		VG12A5GT+924AGA	VG12A5GT+924GGA	VG12A5GT+924AGC	VG12A5GT+924GGC
VG12A5GU		117[1]		VG12A5GU+924AGA	VG12A5GU+924GGA	VG12A5GU+924AGC	VG12A5GU+924GGC
VG12A5HT	3	74[1]	100	VG12A5HT+924AGA	VG12A5HT+924GGA	VG12A5HT+924AGC	VG12A5HT+924GGC
VG12A5HU		117[1]		VG12A5HU+924AGA	VG12A5HU+924GGA	VG12A5HU+924AGC	VG12A5HU+924GGC
VG12A5HV		176[1]		VG12A5HV+924AGA	VG12A5HV+924GGA	VG12A5HV+924AGC	VG12A5HV+924GGC
VG12A5HW		211		VG12A5HW+924AGA	VG12A5HW+924GGA	VG12A5HW+924AGC	VG12A5HW+924GGC
VG12A5JU	4	117[1]	100	VG12A5JU+924AGA	VG12A5JU+924GGA	VG12A5JU+924AGC	VG12A5JU+924GGC
VG12A5JV		176		VG12A5JV+924AGA	VG12A5JV+924GGA	VG12A5JV+924AGC	VG12A5JV+924GGC
Three-Way							
VG18A5GS	2-1/2	47/29[1]	50	VG18A5GS+924AGA	VG18A5GS+924GGA	VG18A5GS+924AGC	VG18A5GS+924GGC
VG18A5GT		74/47[1]		VG18A5GT+924AGA	VG18A5GT+924GGA	VG18A5GT+924AGC	VG18A5GT+924GGC
VG18A5GU		117/74[1]		VG18A5GU+924AGA	VG18A5GU+924GGA	VG18A5GU+924AGC	VG18A5GU+924GGC
VG18A5HT	3	74/47[1]	50	VG18A5HT+924AGA	VG18A5HT+924GGA	VG18A5HT+924AGC	VG18A5HT+924GGC
VG18A5HU		117/74[1]		VG18A5HU+924AGA	VG18A5HU+924GGA	VG18A5HU+924AGC	VG18A5HU+924GGC
VG18A5HV		176/88[1]		VG18A5HV+924AGA	VG18A5HV+924GGA	VG18A5HV+924AGC	VG18A5HV+924GGC
VG18A5HW		211/105		VG18A5HW+924AGA	VG18A5HW+924GGA	VG18A5HW+924AGC	VG18A5HW+924GGC
VG18A5JU	4	117/74[1]	50	VG18A5JU+924AGA	VG18A5JU+924GGA	VG18A5JU+924AGC	VG18A5JU+924GGC
VG18A5JV		176/88		VG18A5JV+924AGA	VG18A5JV+924GGA	VG18A5JV+924AGC	VG18A5JV+924GGC

1. Valve has a characterizing disk.

VG1000 Series Flanged Ball Valves (Continued)

Flanged Stainless Steel Trim Ball Valves with Spring-Return Electric Actuators without Switches

Valve	Size, In.	Cv	Closeoff psig	AC 24 V			AC 120 V
				Floating	DC 0 to 10 V Proportional	On/Off	On/Off
				M9220-AGA-3	M9220-GGA-3	M9220-BGA-3	M9220-BAA-3
Two-Way — Valve Open (Normally Open)							
VG12A5GS	2-1/2	47[1]	100	VG12A5GS+92NAGA	VG12A5GS+92NGGA	VG12A5GS+92NBGA	VG12A5GS+92NBAA
VG12A5GT		74[1]		VG12A5GT+92NAGA	VG12A5GT+92NGGA	VG12A5GT+92NBGA	VG12A5GT+92NBAA
VG12A5GU		117[1]		VG12A5GU+92NAGA	VG12A5GU+92NGGA	VG12A5GU+92NBGA	VG12A5GU+92NBAA
VG12A5HT	3	74[1]	100	VG12A5HT+92NAGA	VG12A5HT+92NGGA	VG12A5HT+92NBGA	VG12A5HT+92NBAA
VG12A5HU		117[1]		VG12A5HU+92NAGA	VG12A5HU+92NGGA	VG12A5HU+92NBGA	VG12A5HU+92NBAA
VG12A5HV		176[1]		VG12A5HV+92NAGA	VG12A5HV+92NGGA	VG12A5HV+92NBGA	VG12A5HV+92NBAA
VG12A5HW		211		VG12A5HW+92NAGA	VG12A5HW+92NGGA	VG12A5HW+92NBGA	VG12A5HW+92NBAA
VG12A5JU	4	117[1]	100	VG12A5JU+92NAGA	VG12A5JU+92NGGA	VG12A5JU+92NBGA	VG12A5JU+92NBAA
VG12A5JV		176		VG12A5JV+92NAGA	VG12A5JV+92NGGA	VG12A5JV+92NBGA	VG12A5JV+92NBAA
Two-Way — Valve Closed (Normally Closed)							
VG12A5GS	2-1/2	47[1]	100	VG12A5GS+94NAGA	VG12A5GS+94NGGA	VG12A5GS+94NBGA	VG12A5GS+94NBAA
VG12A5GT		74[1]		VG12A5GT+94NAGA	VG12A5GT+94NGGA	VG12A5GT+94NBGA	VG12A5GT+94NBAA
VG12A5GU		117[1]		VG12A5GU+94NAGA	VG12A5GU+94NGGA	VG12A5GU+94NBGA	VG12A5GU+94NBAA
VG12A5HT	3	74[1]	100	VG12A5HT+94NAGA	VG12A5HT+94NGGA	VG12A5HT+94NBGA	VG12A5HT+94NBAA
VG12A5HU		117[1]		VG12A5HU+94NAGA	VG12A5HU+94NGGA	VG12A5HU+94NBGA	VG12A5HU+94NBAA
VG12A5HV		176[1]		VG12A5HV+94NAGA	VG12A5HV+94NGGA	VG12A5HV+94NBGA	VG12A5HV+94NBAA
VG12A5HW		211		VG12A5HW+94NAGA	VG12A5HW+94NGGA	VG12A5HW+94NBGA	VG12A5HW+94NBAA
VG12A5JU	4	117[1]	100	VG12A5JU+94NAGA	VG12A5JU+94NGGA	VG12A5JU+94NBGA	VG12A5JU+94NBAA
VG12A5JV		176		VG12A5JV+94NAGA	VG12A5JV+94NGGA	VG12A5JV+94NBGA	VG12A5JV+94NBAA
Three-Way — Port A (Coil) Open to Port AB (Common)							
VG18A5GS	2-1/2	47/29[1]	50	VG18A5GS+92NAGA	VG18A5GS+92NGGA	VG18A5GS+92NBGA	VG18A5GS+92NBAA
VG18A5GT		74/47[1]		VG18A5GT+92NAGA	VG18A5GT+92NGGA	VG18A5GT+92NBGA	VG18A5GT+92NBAA
VG18A5GU		117/74[1]		VG18A5GU+92NAGA	VG18A5GU+92NGGA	VG18A5GU+92NBGA	VG18A5GU+92NBAA
VG18A5HT	3	74/47[1]	50	VG18A5HT+92NAGA	VG18A5HT+92NGGA	VG18A5HT+92NBGA	VG18A5HT+92NBAA
VG18A5HU		117/74[1]		VG18A5HU+92NAGA	VG18A5HU+92NGGA	VG18A5HU+92NBGA	VG18A5HU+92NBAA
VG18A5HV		176/88[1]		VG18A5HV+92NAGA	VG18A5HV+92NGGA	VG18A5HV+92NBGA	VG18A5HV+92NBAA
VG18A5HW		211/105		VG18A5HW+92NAGA	VG18A5HW+92NGGA	VG18A5HW+92NBGA	VG18A5HW+92NBAA
VG18A5JU	4	117/74	50	VG18A5JU+92NAGA	VG18A5JU+92NGGA	VG18A5JU+92NBGA	VG18A5JU+92NBAA
VG18A5JV		176/88		VG18A5JV+92NAGA	VG18A5JV+92NGGA	VG18A5JV+92NBGA	VG18A5JV+92NBAA
Three-Way — Port B (Bypass) Open to Port AB (Common)							
VG18A5GS	2-1/2	47/29[1]	50	VG18A5GS+94NAGA	VG18A5GS+94NGGA	VG18A5GS+94NBGA	VG18A5GS+94NBAA
VG18A5GT		74/47[1]		VG18A5GT+94NAGA	VG18A5GT+94NGGA	VG18A5GT+94NBGA	VG18A5GT+94NBAA
VG18A5GU		117/74[1]		VG18A5GU+94NAGA	VG18A5GU+94NGGA	VG18A5GU+94NBGA	VG18A5GU+94NBAA
VG18A5HT	3	74/47[1]	50	VG18A5HT+94NAGA	VG18A5HT+94NGGA	VG18A5HT+94NBGA	VG18A5HT+94NBAA
VG18A5HU		117/74[1]		VG18A5HU+94NAGA	VG18A5HU+94NGGA	VG18A5HU+94NBGA	VG18A5HU+94NBAA
VG18A5HV		176/88[1]		VG18A5HV+94NAGA	VG18A5HV+94NGGA	VG18A5HV+94NBGA	VG18A5HV+94NBAA
VG18A5HW		211/105		VG18A5HW+94NAGA	VG18A5HW+94NGGA	VG18A5HW+94NBGA	VG18A5HW+94NBAA
VG18A5JU	4	117/74[1]	50	VG18A5JU+94NAGA	VG18A5JU+94NGGA	VG18A5JU+94NBGA	VG18A5JU+94NBAA
VG18A5JV		176/88		VG18A5JV+94NAGA	VG18A5JV+94NGGA	VG18A5JV+94NBGA	VG18A5JV+94NBAA

1. Valve has a characterizing disk.

VG1000 Series Flanged Ball Valves (Continued)

Flanged Stainless Steel Trim Ball Valves with Spring-Return Electric Actuators with Two Switches

Valve	Size, in.	Cv	Closeoff psig	AC 24 V			AC 120 V
				Floating	0 to 10 VDC Proportional	On/Off	On/Off
				M9220-AGC-3	M9220-GGC-3	M9220-BGC-3	M9220-BAC-3
Two-Way — Valve Open (Normally Open)							
VG12A5GS	2-1/2	47[1]	100	VG12A5GS+92NAGC	VG12A5GS+92NGGC	VG12A5GS+92NBGC	VG12A5GS+92NBAC
VG12A5GT		74[1]		VG12A5GT+92NAGC	VG12A5GT+92NGGC	VG12A5GT+92NBGC	VG12A5GT+92NBAC
VG12A5GU		117[1]		VG12A5GU+92NAGC	VG12A5GU+92NGGC	VG12A5GU+92NBGC	VG12A5GU+92NBAC
VG12A5HT	3	74[1]	100	VG12A5HT+92NAGC	VG12A5HT+92NGGC	VG12A5HT+92NBGC	VG12A5HT+92NBAC
VG12A5HU		117[1]		VG12A5HU+92NAGC	VG12A5HU+92NGGC	VG12A5HU+92NBGC	VG12A5HU+92NBAC
VG12A5HV		176[1]		VG12A5HV+92NAGC	VG12A5HV+92NGGC	VG12A5HV+92NBGC	VG12A5HV+92NBAC
VG12A5HW		211		VG12A5HW+92NAGC	VG12A5HW+92NGGC	VG12A5HW+92NBGC	VG12A5HW+92NBAC
VG12A5JU	4	117[1]	100	VG12A5JU+92NAGC	VG12A5JU+92NGGC	VG12A5JU+92NBGC	VG12A5JU+92NBAC
VG12A5JV		176		VG12A5JV+92NAGC	VG12A5JV+92NGGC	VG12A5JV+92NBGC	VG12A5JV+92NBAC
Two-Way — Valve Closed (Normally Closed)							
VG12A5GS	2-1/2	47[1]	100	VG12A5GS+94NAGC	VG12A5GS+94NGGC	VG12A5GS+94NBGC	VG12A5GS+94NBAC
VG12A5GT		74[1]		VG12A5GT+94NAGC	VG12A5GT+94NGGC	VG12A5GT+94NBGC	VG12A5GT+94NBAC
VG12A5GU		117[1]		VG12A5GU+94NAGC	VG12A5GU+94NGGC	VG12A5GU+94NBGC	VG12A5GU+94NBAC
VG12A5HT	3	74[1]	100	VG12A5HT+94NAGC	VG12A5HT+94NGGC	VG12A5HT+94NBGC	VG12A5HT+94NBAC
VG12A5HU		117[1]		VG12A5HU+94NAGC	VG12A5HU+94NGGC	VG12A5HU+94NBGC	VG12A5HU+94NBAC
VG12A5HV		176[1]		VG12A5HV+94NAGC	VG12A5HV+94NGGC	VG12A5HV+94NBGC	VG12A5HV+94NBAC
VG12A5HW		211		VG12A5HW+94NAGC	VG12A5HW+94NGGC	VG12A5HW+94NBGC	VG12A5HW+94NBAC
VG12A5JU	4	117[1]	100	VG12A5JU+94NAGC	VG12A5JU+94NGGC	VG12A5JU+94NBGC	VG12A5JU94NBAC
VG12A5JV		176		VG12A5JV+94NAGC	VG12A5JV+94NGGC	VG12A5JV+94NBGC	VG12A5JV+94NBAC
Three-Way — Port A (Coil) Open to Port AB (Common)							
VG18A5GS	2-1/2	47/29[1]	50	VG18A5GS+92NAGC	VG18A5GS+92NGGC	VG18A5GS+92NBGC	VG18A5GS+92NBAC
VG18A5GT		74/47[1]		VG18A5GT+92NAGC	VG18A5GT+92NGGC	VG18A5GT+92NBGC	VG18A5GT+92NBAC
VG18A5GU		117/74[1]		VG18A5GU+92NAGC	VG18A5GU+92NGGC	VG18A5GU+92NBGC	VG18A5GU+92NBAC
VG18A5HT	3	74/47[1]	50	VG18A5HT+92NAGC	VG18A5HT+92NGGC	VG18A5HT+92NBGC	VG18A5HT+92NBAC
VG18A5HU		117/74[1]		VG18A5HU+92NAGC	VG18A5HU+92NGGC	VG18A5HU+92NBGC	VG18A5HU+92NBAC
VG18A5HV		176/88[1]		VG18A5HV+92NAGC	VG18A5HV+92NGGC	VG18A5HV+92NBGC	VG18A5HV+92NBAC
VG18A5HW		211/105		VG18A5HW+92NAGC	VG18A5HW+92NGGC	VG18A5HW+92NBGC	VG18A5HW+92NBAC
VG18A5JU	4	117/74[1]	50	VG18A5JU+92NAGC	VG18A5JU+92NGGC	VG18A5JU+92NBGC	VG18A5JU+92NBAC
VG18A5JV		176/88		VG18A5JV+92NAGC	VG18A5JV+92NGGC	VG18A5JV+92NBGC	VG18A5JV+92NBAC
Three-Way — Port B (Bypass) Open to Port AB (Common)							
VG18A5GS	2-1/2	47/29[1]	50	VG18A5GS+94NAGC	VG18A5GS+94NGGC	VG18A5GS+94NBGC	VG18A5GS+94NBAC
VG18A5GT		74/47[1]		VG18A5GT+94NAGC	VG18A5GT+94NGGC	VG18A5GT+94NBGC	VG18A5GT+94NBAC
VG18A5GU		117/74[1]		VG18A5GU+94NAGC	VG18A5GU+94NGGC	VG18A5GU+94NBGC	VG18A5GU+94NBAC
VG18A5HT	3	74/47[1]	50	VG18A5HT+94NAGC	VG18A5HT+94NGGC	VG18A5HT+94NBGC	VG18A5HT+94NBAC
VG18A5HU		117/74[1]		VG18A5HU+94NAGC	VG18A5HU+94NGGC	VG18A5HU+94NBGC	VG18A5HU+94NBAC
VG18A5HV		176/88[1]		VG18A5HV+94NAGC	VG18A5HV+94NGGC	VG18A5HV+94NBGC	VG18A5HV+94NBAC
VG18A5HW		211/105		VG18A5HW+94NAGC	VG18A5HW+94NGGC	VG18A5HW+94NBGC	VG18A5HW+94NBAC
VG18A5JU	4	117/74[1]	50	VG18A5JU+94NAGC	VG18A5JU+94NGGC	VG18A5JU+94NBGC	VG18A5JU+94NBAC
VG18A5JV		176/88		VG18A5JV+94NAGC	VG18A5JV+94NGGC	VG18A5JV+94NBGC	VG18A5JV+94NBAC

1. Valve has a characterizing disk.

VG1000 Series Flanged Ball Valves (Continued)

Technical Specifications

VG1000 Series Flanged Ball Valves		
Service[1]		Hot Water, Chilled Water, 50/50 Glycol Solutions, and 25 psig (172 kPa) Saturated Steam for HVAC Systems
Valve Fluid Temperature Limits		0 to 284°F (-18 to 140°C)
Valve Body Pressure/Temperature Rating	**Water**	ASME Class 150 250 psi at -20 to 100°F (29 to 38°C) 235 psi at 200°F(93°C) 218 psi at 284°F(140°C)
	Steam	25 psig (172 kPa) Saturated Steam for HVAC Systems
Maximum Closeoff Pressure	**Two-Way**	100 psi (689 kPa)
	Three-Way	50 psi (345 kPa)
Maximum Recommended Operating Pressure Drop		30 psi (207 kPa) for Quiet Service
Flow Characteristics	**Two-Way**	Equal Percentage
	Three-Way	Equal Percentage Flow Characteristics of In-Line Port or Linear Percentage Flow Characteristics of Angle Port
Rangeability[2]		Greater than 500:1
Minimum Ambient Operating Temperature	**-4°F (-20°C)**	M9124 Series Non-Spring-Return Actuators
	-40°F (-40°C)	M9220 Series Spring-Return Actuators
Maximum Ambient Operating Temperature[3]	**122°F (50°C)**	M9124 Series Non-Spring-Return Actuators
	131°F (55°C)	M9220 Series Spring-Return Actuators
Leakage	**Two- or Three-Way**	0.01% of Maximum Flow, Control Port, ANSI/FCI 70-2, Class 4
	Three-Way	1% of Maximum Flow, Bypass Port
End Connections		ASME Class 150 Flange
Materials	**Body**	Brass
	Flanges	Ductile Iron
	Ball	300 Series Stainless Steel
	Stem	300 Series Stainless Steel
	Seats	Graphite Reinforced PTFE with EPDM O-Ring Backing
	Stem Seals	EPDM O-Rings
	Flow Control Disk	Amodel AS-1145HS Polyphthalamide Resin

1. Refer to the VDI 2035 Guideline for proper water treatment.
2. Rangeability is defined as the ratio of maximum controllable flow to minimum controllable flow.
3. In steam applications, install the valve with the stem horizontal to the piping and wrap the valve and piping with insulation.

Johnson Controls

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VG2000 Series Electric Cast Iron Flanged Globe Valves

Description

VG2000 Series Electric Cast Iron Flanged Globe Valves are designed primarily to regulate the flow of water and steam in response to the demand of a controller in HVAC systems. Available in sizes 2-1/2 through 6 in., these ANSI Class 125 valves are available in Normally Open (N.O.), Normally Closed (N.C.), and three-way mixing configurations. Both electric and pneumatic actuators are available for factory or field mounting.

Refer to the *VG2000 Series Cast Iron Flanged Globe Valves Product Bulletin (LIT-977133)* for important product application information.

Repair Information

If the VG2000 Series Globe Valve fails to operate within its specifications, replace the valve body, actuator, or entire assembly. For replacement parts, contact the nearest Johnson Controls® representative.

Features

- Complete Family of 2-1/2 through 6 in. Cast Iron Flanged Globe Valves, Brass Trim, with Several Styles of Electric and Pneumatic Actuators — offers a broad selection from which to choose.
- Flexible Features and Options Ordering Matrix — allow engineering to suit your specific application from thousands of easy-to-select, factory-assembled combinations.
- Standard Johnson Controls Ring Pack Packings — provide industry-leading reliability and operating life.
- Every Valve Tested for Leakage — provides energy conservation and ensures occupant comfort.

VG2000 Series Electric Cast Iron Flanged Globe Valves

Selection Charts

VG2000 Series Valves with M91xx-xGx-2 Actuators — Non-Spring Return

Valve Code Number	Size, in.	Cv	Closeoff psig	On/Off Floating without Switches	Proportional without Switches	On/Off Floating with Two Switches	Proportional with Two Switches
				M9116-AGA-2 M9124-AGA-2	M9116-GGA-2 M9124-GGA-2	M9116-AGC-2 M9124-AGC-2	M9116-GGC-2 M9124-GGC-2
Two-Way, Push-Down-to-Close							
VG2231TM	2-1/2	51	62	VG2231TM+916AGA	VG2231TM+916GGA	VG2231TM+916AGC	VG2231TM+916GGC
	2-1/2	51	101	VG2231TM+924AGA	VG2231TM+924GGA	VG2231TM+924AGC	VG2231TM+924GGC
VG2231UM	3	83	27	VG2231UM+916AGA	VG2231UM+916GGA	VG2231UM+916AGC	VG2231UM+916GGC
	3	83	43	VG2231UM+924AGA	VG2231UM+924GGA	VG2231UM+924AGC	VG2231UM+924GGC
	3	83	88	VG2231UM2924AGA[1]	VG2231UM2924GGA[1]	VG2231UM2924AGC[1]	VG2231UM2924GGC[1]
VG2231VM	4	150	24	VG2231VM+924AGA	VG2231VM+924GGA	VG2231VM+924AGC	VG2231VM+924GGC
	4	150	49	VG2231VM2924AGA[1]	VG2231VM2924GGA[1]	VG2231VM2924AGC[1]	VG2231VM2924GGC[1]
VG2231WN	5	240	26	VG2231WN2924AGA[1]	VG2231WN2924GGA[1]	VG2231WN2924AGC[1]	VG2231WN2924GGC[1]
VG2231YN	6	350	16	VG2231YN2924AGA[1]	VG2231YN2924GGA[1]	VG2231YN2924AGC[1]	VG2231YN2924GGC[1]
Three-Way, Mixing							
VG2831TM	2-1/2	54	37	VG2831TM+916AGA	VG2831TM+916GGA	VG2831TM+916AGC	VG2831TM+916GGC
	2-1/2	54	60	VG2831TM+924AGA	VG2831TM+924GGA	VG2831TM+924AGC	VG2831TM+924GGC
VG2831UM	3	80	16	VG2831UM+916AGA	VG2831UM+916GGA	VG2831UM+916AGC	VG2831UM+916GGC
	3	80	26	VG2831UM+924AGA	VG2831UM+924GGA	VG2831UM+924AGC	VG2831UM+924GGC
	3	80	53	VG2831UM2924AGA[1]	VG2831UM2924GGA[1]	VG2831UM2924AGC[1]	VG2831UM2924GGC[1]
VG2831VM	4	157	9	VG2831VM+916AGA	VG2831VM+916GGA	VG2831VM+916AGC	VG2831VM+916GGC
	4	157	14	VG2831VM+924AGA	VG2831VM+924GGA	VG2831VM+924AGC	VG2831VM+924GGC
	4	157	30	VG2831VM2924AGA[1]	VG2831VM2924GGA[1]	VG2831VM2924AGC[1]	VG2831VM2924GGC[1]
VG2831WN	5	238	7	VG2831WN+924AGA	VG2831WN+924GGA	VG2831WN+924AGC	VG2831WN+924GGC
	5	238	15	VG2831WN2924AGA[1]	VG2831WN2924GGA[1]	VG2831WN2924AGC[1]	VG2831WN2924GGC[1]
VG2831YN	6	347	4	VG2831YN+924AGA	VG2831YN+924GGA	VG2831YN+924AGC	VG2831YN+924GGC
	6	347	9	VG2831YN2924AGA[1]	VG2831YN2924GGA[1]	VG2831YN2924AGC[1]	VG2831YN2924GGC[1]

1. Valve assemblies have two actuators mounted in tandem. On tandem actuator assemblies with switches, only one actuator is provided with auxiliary switches. M9116-AGx-2 actuators are not designed for tandem operation.

VG2000 Series Electric Cast Iron Flanged Globe Valves (Continued)

VG2000 Series Valves with M9220 Series Non-Spring-Return Electric Valve Actuators

VG2000 Series Valves with M9220-xGx-3 Actuators — Spring Return — Floating and On/Off

Valve Code Number	Size, in.	Cv	Closeoff psig	Floating		On/Off	
				Without Switches	With Two Switches	Without Switches	With Two Switches
				M9220-AGA-3	M9220-AGC-3	M9220-BGA-3	M9220-BGC-3
Two-Way — Spring Return Normally Open — Valve Stem Up							
VG2231TM	2-1/2	51	76	VG2231TM+92NAGA	VG2231TM+92NAGC	VG2231TM+92NBGA	VG2231TM+92NBGC
VG2231UM	3	83	33	VG2231UM+92NAGA	VG2231UM+92NAGC	VG2231UM+92NBGA	VG2231UM+92NBGC
	3	83	66	VG2231UM292NAGA[1]	VG2231UM292NAGC[1]	VG2231UM292NBGA[1]	VG2231UM292NBGC[1]
VG2231VM	4	150	37	VG2231VM292NAGA[1]	VG2231VM292NAGC[1]	VG2231VM292NBGA[1]	VG2231VM292NBGC[1]
VG2231WM	5	240	20	VG2231WM292NAGA[1]	VG2231WM292NAGC[1]	VG2231WM292NBGA[1]	VG2231WM292NBGC[1]
Two-Way — Spring Return Normally Closed — Valve Stem Down							
VG2231TM	2-1/2	51	76	VG2231TM+94NAGA	VG2231TM+94NAGC	VG2231TM+94NBGA	VG2231TM+94NBGC
VG2231UM	3	83	33	VG2231UM+94NAGA	VG2231UM+94NAGC	VG2231UM+94NBGA	VG2231UM+94NBGC
	3	83	66	VG2231UM294NAGA[1]	VG2231UM294NAGC[1]	VG2231UM294NBGA[1]	VG2231UM294NBGC[1]
VG2231VM	4	150	37	VG2231VM294NAGA[1]	VG2231VM294NAGC[1]	VG2231VM294NBGA[1]	VG2231VM294NBGC[1]
VG2231WM	5	240	20	VG2231WM294NAGA[1]	VG2231WM294NAGC[1]	VG2231WM294NBGA[1]	VG2231WM294NBGC[1]
Three-Way Mixing — Spring Return — Valve Stem Up — Side Inlet Port Closed							
VG2831TM	2-1/2	54	45	VG2831TM+92NAGA	VG2831TM+92NAGC	VG2831TM+92NBGA	VG2831TM+92NBGC
VG2831UM	3	80	20	VG2831UM+92NAGA	VG2831UM+92NAGC	VG2831UM+92NBGA	VG2831UM+92NBGC
	3	80	40	VG2831UM292NAGA[1]	VG2831UM292NAGC[1]	VG2831UM292NBGA[1]	VG2831UM292NBGC[1]
VG2831VM	4	157	11	VG2831VM+92NAGA	VG2831VM+92NAGC	VG2831VM+92NBGA	VG2831VM+92NBGC
	4	157	22	VG2831VM292NAGA[1]	VG2831VM292NAGC[1]	VG2831VM292NBGA[1]	VG2831VM292NBGC[1]
VG2831WN	5	238	12	VG2831WN292NAGA[1]	VG2831WN292NAGC[1]	VG2831WN292NBGA[1]	VG2831WN292NBGC[1]
VG2831YN	6	347	7	VG2831YN292NAGA[1]	VG2831YN292NAGC[1]	VG2831YN292NBGA[1]	VG2831YN292NBGC[1]
Three-Way Mixing — Spring Return — Valve Stem Down — Side Inlet Port Open							
VG2831TM	2-1/2	54	45	VG2831TM+94NAGA	VG2831TM+94NAGC	VG2831TM+94NBGA	VG2831TM+94NBGC
VG2831UM	3	80	20	VG2831UM+94NAGA	VG2831UM+94NAGC	VG2831UM+94NBGA	VG2831UM+94NBGC
	3	80	40	VG2831UM294NAGA[1]	VG2831UM294NAGC[1]	VG2831UM294NBGA[1]	VG2831UM294NBGC[1]
VG2831VM	4	157	11	VG2831VM+94NAGA	VG2831VM+94NAGC	VG2831VM+94NBGA	VG2831VM+94NBGC
	4	157	22	VG2831VM294NAGA[1]	VG2831VM294NAGC[1]	VG2831VM294NBGA[1]	VG2831VM294NBGC[1]
VG2831WN	5	238	12	VG2831WN294NAGA[1]	VG2831WN294NAGC[1]	VG2831WN294NBGA[1]	VG2831WN294NBGC[1]
VG2831YN	6	347	7	VG2831YN294NAGA[1]	VG2831YN294NAGC[1]	VG2831YN294NBGA[1]	VG2831YN294NBGC[1]

1. Valve assemblies have two actuators mounted in tandem. On tandem actuator assemblies with switches, only one actuator is provided with auxiliary switches.

VG2000 Series Electric Cast Iron Flanged Globe Valves (Continued)

VG2000 Series Valves with M9220-xGx-3 Actuators — Proportional

Valve Code Number	Size, in.	Cv	Closeoff psig	Without Switches	With Two Switches
				M9220-GGA-3	M9220-GGC-3
Two-Way — Spring Return Normally Open — Valve Stem Up					
VG2231TM	2-1/2	51	76	VG2231TM+92NGGA	VG2231TM+92NGGC
VG2231UM	3	83	33	VG2231UM+92NGGA	VG2231UM+92NGGC
	3	83	66	VG2231UM292NGGA[1]	VG2231UM292NGGC[1]
VG2231VM	4	150	37	VG2231VM292NGGA[1]	VG2231VM292NGGC[1]
VG2231WM	5	240	20	VG2231WM292NGGA[1]	VG2231WM292NGGC[1]
Two-Way — Spring Return Normally Closed — Valve Stem Down					
VG2231TM	2-1/2	51	76	VG2231TM+94NGGA	VG2231TM+94NGGC
VG2231UM	3	83	33	VG2231UM+94NGGA	VG2231UM+94NGGC
	3	83	66	VG2231UM294NGGA[1]	VG2231UM294NGGC[1]
VG2231VM	4	150	37	VG2231VM294NGGA[1]	VG2231VM294NGGC[1]
VG2231WM	5	240	20	VG2231WM294NGGA[1]	VG2231WM294NGGC[1]
Three-Way Mixing — Spring Return — Valve Stem Up — Side Inlet Port Closed					
VG2831TM	2-1/2	54	45	VG2831TM+92NGGA	VG2831TM+92NGGC
VG2831UM	3	80	20	VG2831UM+92NGGA	VG2831UM+92NGGC
	3	80	40	VG2831UM292NGGA[1]	VG2831UM292NGGC[1]
VG2831VM	4	157	11	VG2831VM+92NGGA	VG2831VM+92NGGC
	4	157	22	VG2831VM292NGGA[1]	VG2831VM292NGGC[1]
VG2831WN	5	238	12	VG2831WN292NGGA[1]	VG2831WN292NGGC[1]
VG2831YN	6	347	7	VG2831YN292NGGA[1]	VG2831YN292NGGC[1]
Three-Way Mixing — Spring Return — Valve Stem Down — Side Inlet Port Open					
VG2831TM	2-1/2	54	45	VG2831TM+94NGGA	VG2831TM+94NGGC
VG2831UM	3	80	20	VG2831UM+94NGGA	VG2831UM+94NGGC
	3	80	40	VG2831UM294NGGA[1]	VG2831UM294NGGC[1]
VG2831VM	4	157	11	VG2831VM+94NGGA	VG2831VM+94NGGC
	4	157	22	VG2831VM294NGGA[1]	VG2831VM294NGGC[1]
VG2831WN	5	238	12	VG2831WN294NGGA[1]	VG2831WN294NGGC[1]
VG2831YN	6	347	7	VG2831YN294NGGA[1]	VG2831YN294NGGC[1]

1. Valve assemblies have two actuators mounted in tandem. On tandem actuator assemblies with switches, only one actuator is provided with auxiliary switches.

VG2000 Series Electric Cast Iron Flanged Globe Valves (Continued)

VG2000 Series Valves with VA-3100 Series Non-Spring-Return Electric Valve Actuators

VG2000 Series Valves with VA-6100 Series Non-Spring-Return Electric Valve Actuators

VG2000 Series Valves with VA-3100-xGx Series Non-Spring-Return Actuators

Valve Code Number	Size, in.	Cv	Closeoff psig	Floating without Switches	Floating with Feedback and Two Switches	0 to 10 VDC Proportional with Two Switches
				VA-3100-AGA	VA-3100-AGC	VA-3100-HGC
Two-Way, Push-Down-to-Close						
VG2231TM	2-1/2	51	115	VG2231TM+300AGA	VG2231TM+300AGC	VG2231TM+300HGC
VG2231UM	3	83	79	VG2231UM+301AGA	VG2231UM+301AGC	VG2231UM+301HGC
VG2231VM	4	150	45	VG2231VM+301AGA	VG2231VM+301AGC	VG2231VM+301HGC
VG2231WN	5	240	29	VG2231WN+302AGA	VG2231WN+302AGC	VG2231WN+302HGC
VG2231YN	6	350	20	VG2231YN+302AGA	VG2231YN+302AGC	VG2231YN+302HGC
Three-Way Mixing						
VG2831TM	2-1/2	54	69	VG2831TM+300AGA	VG2831TM+300AGC	VG2831TM+300HGC
VG2831UM	3	80	48	VG2831UM+301AGA	VG2831UM+301AGC	VG2831UM+301HGC
VG2831VM	4	157	27	VG2831VM+301AGA	VG2831VM+301AGC	VG2831VM+301HGC
VG2831WN	5	238	17	VG2831WN+302AGA	VG2831WN+302AGC	VG2831WN+302HGC
VG2831YN	6	347	12	VG2831YN+302AGA	VG2831YN+302AGC	VG2831YN+302HGC

VG2000 Series Valves with VA-6100-xGx Series Non-Spring-Return Actuators

Valve Code Number	Size, in.	Cv	Closeoff psig	Floating with Two Switches	0 to 10 VDC Proportional with Two Switches
				VA-6100-AGC	VA-6100-HGC
Two-Way Push-Down-to-Close					
VG2231VM	4	150	89	VG2231VM+602AGC	VG2231VM+602HGC
VG2231WN	5	240	57	VG2231WN+602AGC	VG2231WN+602HGC
VG2231YN	6	350	40	VG2231YN+602AGC	VG2231YN+602HGC
Three-Way Mixing					
VG2831VM	4	157	54	VG2831VM+602AGC	VG2831VM+602HGC
VG2831WN	5	238	34	VG2831WN+602AGC	VG2831WN+602HGC
VG2831YN	6	347	24	VG2831YN+602AGC	VG2831YN+602HGC

VG2000 Series Electric Cast Iron Flanged Globe Valves (Continued)

Technical Specifications

VG2000 Series Electric Cast Iron Flanged Globe Valves		
Service[1]		Hot Water, Chilled Water, 50% Glycol Solutions, and Steam for HVAC Systems
Valve Stroke	**2-1/2 and 3 in. Valves**	3/4 in. (19 mm)
	3 and 4 in. Valves	1-1/8 in. (29 mm)
	5 in. Valves	1-3/8 in. (35 mm)
	6 in. Valves	1-1/2 in. (38 mm)
Valve Body Rating		Meets Requirements of ASME B16.1, Class 125
Valve Assembly Maximum Allowable Pressure/Temperature	**Steam**	35 psig (241 kPa) at 281°F (138°C)
	Water	175 psig (1,206 kPa) up to 150°F (66°C), Decreasing to 125 psig (861 kPa) at 281°F (138°C)
Leakage		0.1% of Maximum Flow
Inherent Flow Characteristics		Modified Linear
Rangeability[2]	**2-1/2 in. Valves**	6.5:1
	3 in. Valves	7.7:1
	4 in. Valves	9.3:1
	5 in. Valves	10.7:1
	6 in. Valves	10.4:1
Spring Ranges (MP8000 Series Actuators)		3 to 7, 4 to 8, and 9 to 13 psig (21 to 48, 28 to 55, and 62 to 90 kPa)
Maximum Recommended Operating Pressure Drop		35 psig (241 kPa) for All Valve Sizes
Maximum Actuator Supply Pressure (Pneumatically Actuated Valves Only)		25 psig (172 kPa) Maximum
Materials	**Body**	Cast Iron with Black Lacquer Finish
	Stem	316 Stainless Steel
	Plug	Brass
	Packing	Ethylene Propylene Terpolymer (EPT) Ring Packs
Valve Fluid Operating Temperature Limits		35 to 281°F (2 to 138°C), 35 psig (241 kPa) Saturated Steam
Actuator Ambient Operating Temperature Limits		Refer to the Appropriate Actuator Product Bulletin.
Compliance	**Canada**	CRN: 0C1100.9087YTN

1. Proper water treatment is recommended; refer to the VDI 2035 Guideline.
2. Rangeability is defined as the ratio of maximum flow to minimum controllable flow.