VAV-Universal
VRU-D3-BAC
VRU-M1-BAC
VRU-M1R-BAC

Contents

Protocol Implementation Conformance Statement - PICS

General information

Date:	07. Feb 2022
Vendor Name:	BELIMO Automation AG
Vendor ID:	423
Product Name:	VRU-D3-BAC, VRU-M1-BAC, VRU-M1R-BAC
Product Model Number:	VRU-..-BAC
Applications Software Version:	01.04.0006
Firmware Revision:	14.10.0002
BACnet Protocol Revision:	14
Product Description:	Controller for VAV/CAV and pressure applications
BACnet Standard Device Profile:	BACnet Application Specific Controller (B-ASC)

BACnet Interoperability Building Blocks supported:
Data Sharing - ReadProperty-B (DS-RP-B)
Data Sharing - ReadPropertyMultiple-B (DS-RPM-B)
Data Sharing - WriteProperty-B (DS-WP-B)
Data Sharing - WritePropertyMultiple-B (DS-WPM-B)
Data Sharing - COV-B (DS-COV-B)
Device Management - DynamicDeviceBinding-B (DM-DDB-B)
Device Management - DynamicObjectBinding-B (DM-DOB-B)
Device Management - DeviceCommunicationControl-B (DM-DCC-B)

Segmentation Capability:	No
Data Link Layer Options:	MS/TP master, baud rates: 9'600, 19'200, 38'400, 76'800, 115'200
Device Address Binding:	No static device binding supported
Networking Options:	None
Character Sets Supported:	ISO 10646 (UTF-8)
Gateway Options:	None
Network Security Options:	Non-secure Device

PICS *(continued)*

Object processing

Object type	Optional properties	Writeable properties
Analog Input [AI]	Description COV Increment	COV Increment
Analog Output [AO]	Description COV Increment	Present Value COV Increment Relinquish Default
Analog Value [AV]	Description COV Increment	Present Value COV Increment
Binary Input [BI]	Description Active Text Inactive Text	
Device	Description Location Active COV Subscriptions Max Master Max Info Frames Profile Name	Object Identifier Object Name Location Description APDU Timeout (1000…60'000) Number Of APDU Retries (0...10) Max Master (1...127) Max Info Frames (1...255)
Multi-state Input [MI]	Description State Text	
Multi-state Output [MO]	Description State Text	Present Value Relinquish Default
Multi-state Value [MV]	Description State Text	Present Value (if marked)

- The device does not support the services CreateObject and DeleteObject.
- The specified maximum length of writable strings is based on single-byte characters.
  - Object name 32 char
  - Location 64 char
  - Description 64 char

Service processing

- The device supports the DeviceCommunicationControl services. No password is required.
- A maximum of 6 active COV subscriptions with a lifetime of 1…28800 sec. (max. 8 hours) are supported.

All Value Objects (AV/MV) are persistent and are not supposed to be written on a regular base.

BACnet object description

Object Name	Object Type [Instance]	Description Comment *Status Flags*	Values	COV Increment	Access
Device	Device [Inst.Nr.]		0…4'194'302 *Default:1*	-	R
RelPos	AI[1]	Relative position in % Related to the adapted mechanical range. *Status Flags:* *"Overridden" = true, if gear is disengaged* *"Out Of Service" = true, if the selected application is Flow Measurement or Room Pressure Control Cascade.*	0…100	0.01…100 *Default: 1*	R
AbsPos	AI[2]	Absolute angular position in degree Angular position according to the entire range of rotation. *Status Flags:* *"Overridden" = true, if gear is disengaged* *"Out Of Service" = true, if the selected application is Flow Measurement or Room Pressure Control Cascade.*	0...max angle	0.01…90 *Default: 1*	R
SpAnalog	AI[6]	Analog setpoint in % The analog setpoint in % refers to the demanded flow, pressure or damper position according to the selected application and control mode. The analog setpoint is activ if the setpoint is controlled by the analog input signal (if "SpSource" MV[122] = 1: Analog) If "ApplicationSel" MV [2] = 1: Flow control, the analog setpoint is referred to the demanded flow If "ApplicationSel" MV [2] = 1: Flow control, and "ControlMode" MV [100] = 1: PosCtrl, the analog setpoint is referred to the demanded damper position If "ApplicationSel" MV [2] = 2: Pressure Control or = 3: Room pressure control, the analog setpoint is referred to the demanded pressure The analog setpoint is always limited by the settings for "Min" AV[97] and "Max" AV[98] *Status Flags:* *"Overridden" = true, if gear is disengaged* *"Out of Service" = true, if "SpSource" = Bus*	0...100	0.01…100 *Default: 1*	R
RelDeltaP	AI[9]	Relative differential pressure in % Related to the nominal differential pressure "DeltaPnom_Pa" [AV122]	0...150	0.01…150 *Default: 1*	R
RelFlow	AI[10]	Relative volumetric flow in % Related to the nominal volumetric flow "Vnom_m3h" [AV112] *Status Flags:* *"Out of Service" = true, if the selected application is Pressure control or Room pressure control*	0...150	0.01…150 *Default: 1*	R

Object Name	Object Type [Instance]	Description Comment *Status Flags*	Values	COV Increment	Access
AbsFlow_m3h	AI[12]	Absolute volumetric flow in m3/h *Status Flags:* *"Out of Service" = true, if the selected application is Pressure control or Room pressure control*	0...60'000	1...60'000 *Default: 10*	R
DeltaP_UnitSel	AI[18]	Absolute differential pressure in the selected unit Unit according to the setting on "UnitSelPressure" MV[127]	-10'000 ..100'000	0.001 ...100'000 *Default: 1*	R
AbsFlow_UnitSel	AI[19]	Absolute volumetric flow in the selected unit Unit according to the setting on "UnitSelAirFlow" MV[121] *Status Flags:* *"Out of Service" = true, if the selected application is Pressure control or Room pressure control*	0..500'000	0.01...500'000 *Default: 1*	R
Sens1Analog	AI[20]	Sensor 1 as analog value Shows the value of the connected sensor according to the settings on the object "Sens1Type" MV[220]. If "Sens1Type" MV[220] = 2: Active, the value is shown as 0-10V signal. If "Sens1Type" MV[220] = 3: Passive, the value shows the measured resistance. The sensor input is not available if the room pressure cascade "RmPCascade" MV[10] = 2: Enabled, or =3: Enabled Fast *Status Flags:* *"Out of Service" = true, if no sensor or or Switch type connected.*	0-65535	0.01...1000 *Default: 1*	R
DeltaP_Pa	AI[29]	Absolute differential pressure in Pa	0...600	0.01...600 *Default: 10*	R

Object Name	Object Type [Instance]	Description Comment *Status Flags*	Values	COV Increment	Access
SpRel	AO[1]	Relative setpoint in % The relative setpoint in % refers to the demanded flow, pressure or damper position according to the selected application and control mode. The relative setpoint is active if the setpoint is controlled by bus (if "SpSource" MV[122] = 2: Bus) If "ApplicationSel" MV [2] = 1: Flow control, the relative setpoint is referred to the demanded volumetric flow If "ApplicationSel" MV [2] = 1: Flow control, and "ControlMode" MV [100] = 1: PosCtrl, the relative setpoint is referred to the demanded damper position If "ApplicationSel" MV [2] = 2: Pressure Control or = 3: Room pressure control, the relative setpoint is referred to the demanded pressure The relative setpoint is always limited by the settings for "Min" AV[97] and "Max" AV[98] *Status Flags:* *"Overridden" = true, if gear is disengaged* *"Out Of Service" = true, if the selected application is Flow Measurement or Room Pressure Control Cascade.*	0...100	0.01…100 *Default: 1*	C
Min	AV[97]	Min setpoint in % The min setpoint in % is related to the nominal flow, nominal differential pressure or to the adapted mechanical range of the actuator according to the selected application and control mode. "Min" cannot be set higher than the "Max"	0...Max	0.01…100 *Default: 1*	W
Max	AV[98]	Max setpoint in % The max setpoint in % is related to the nominal flow, nominal differential pressure or to the adapted mechanical range of the actuator according to the selected application and control mode.	20...100	0.01…100 *Default: 1*	W
Vnom_m3h	AV[112]	Nominal volumetric flow in m3/h	0...60'000	0.01...60'000 *Default: 1*	R
Vnom_UnitSel	AV[119]	Nominal volumetric flow in [UnitSel] Unit according to the setting on "UnitSelAirFlow" MV[121]	0...250'000	0.01...1000 *Default: 1*	R
SystemAltitude	AV[120]	System altitude above sea level in meter (m.a.s.l./MüNN)	0..3000	1...3000 *Default: 10*	W

Object Name	Object Type [Instance]	Description Comment *Status Flags*	Values	COV Increment	Access
DeltaPnom_Pa	AV[122]	Nominal differential pressure in Pa The nominal differential pressure is set according to the range of the implemented sensor element. According to the selected application, the nominal differential pressure serves as dp@Vnom, or as a max. limitation for the differential pressure measurement. If "ApplicationSel" MV [2] = 1: Flow control, the setting represents the nominal differential pressure at the nominal volumetric flow "Vnom_m3/h" AV[112] If "ApplicationSel" MV [2] = 2: Pressure Control or = 3: Room pressure control, the setting serves as a maximum limitation for the measured differential pressure.	D3: 0 … 500 M1: 0 … 600 M1R: 0… 75	1...600 *Default: 1*	R
DeltaPnom_UnitSel	AV[129]	Nominal differential Pressure in [UnitSel] See AV[122] for further information. Unit according to the setting on "UnitSelPressure" MV[127]		0.01...1000 *Default: 1*	R
BusWatchdog	AV[130]	Timeout for Bus Watchdog in seconds If the "BusWatchdog" is not defined as 0, the implementation tracks write procedures to the Present_Values of all Output Objects: AO[1] "SpRel" => relative setpoint MO[1] "Override" => Override control If the Present_Value of an Output Object is written, the timer is reset. Upon timeout the Priority_Arrays of the Output Objects are cleared and Relinquish_Default becomes valid. Note: If "SpSource" MV[122] = 1: Analog, the "BusWatchdog" will only track write procedures on the output object "Override" MO[1].	0...3600 0: disabled	0.01...1000 *Default: 1*	W

Object Name	Object Type [Instance]	Description / *Comment*	Values	Default	Access
Sens1Switch	BI[20]	Status of switch input Status of the sensor 1 if the sensor 1 type is defined as switch (if "Sens1Type" MV[220] = 5: Switch) *Status Flags* *"Out of Service" = true, if sensor type is not Switch.*	0: Inactive (Inactive_Text) 1: Active (Active_Text)	-	R
BusTermination	BI[99]	Bus termination (120Ω)	0: Disabled (Inactive_Text) 1: Enabled (Active_Text)	0	R
SummaryStatus	BI[101]	Summary status The summary status summarizes the status of all the status objects: "StatusSensor" MI[103] "StatusFlow" MI[104] "StatusActuator" MI[106] "StatusPressure" MI[109] "StatusDevice" MI[110] If one of the objects is ≠ 1: OK, the "Summary status" is = 1: Not OK	0: OK (Inactive_Text) 1: Not OK (Active_Text)	-	R
ApplicationSel	MV[2]	Application selection Visualisation of the application selected by the damper manufacturer. VRU-D3-BAC / VRU-M1-BAC: - Flow control - Pressure control - Flow measurement VRU-M1R-BAC: - Room pressure control	1: Flow control 2: Pressure control 3: Room pressure control 4: Flow measurement	1	R
RmPCascade	MV[10]	Room pressure cascade If the room pressure cascade is enabled or enabled fast, the sensor input S1 will be set as input signal for the room pressure cascade (0-10V). The room pressure cascade is only available if the "ApplicationSel" MV [2] = 1: Flow control or = 3: Room pressure control The "Enable Fast" is only available for the VRU-M1R-BAC with a fast running actuator connected. *Status Flags* *"Out of Service" = true, if selected application is Pressure Control or Flow Measurement.*	1: Disabled 2: Enabled 3: Enabled Fast (M1R only)	1	R

Object Name	Object Type / Instance	Description / Comment	Values	Default	Access
InternalActivity	MI[100]	Internal activity Indicates an active internal activity of the actuator	1: None 2: Test 3: Adaption 4: Synchronization	-	R
StatusSensor	MI[103]	Status of the differential pressure sensor If the specific condition disappears, the status is reset automatically.	1: OK 2: dP Sensor not OK 3: dP Sensor out of range 4: dP Sensor wrong connected	-	R
StatusFlow	MI[104]	Status flow If the demanded volumetric flow cannot be reached within 600 s, the "StatusFlow" indicates "Airflow not reached" If the specific condition disappears, the status is reset automatically.	1: OK 2 - 3: Airflow not reached	-	R
StatusActuator	MI[106]	Status of the actuator Mechanical overload e.g. blocked valve, Gear disengaged, etc. If the specific condition disappears, the status is reset automatically. *Status Flags* *"Out Of Service" = true, if the selected application is Flow Measurement or Room Pressure Control Cascade.*	1: OK 2: - 3: Gear disengaged 4: - 5: Actuator doesn't fit to application (only for angular characteristic curve)	-	R
StatusPressure	MI[109]	Status differential pressure If the demanded differential pressure cannot be reached within 180 s, the state changes to "Pressure not reached" If the specific condition disappears, the status is reset automatically.	1: OK 2: - 3: Pressure not reached	-	R
StatusDevice	MI[110]	Status device According to the settings on the Object "BusWatchdog" AV[130], the status device indicates if the bus watchdog is triggered or not. If the specific condition disappears, the status is reset automatically.	1: OK 2: Bus Watchdog triggered	-	R
Override	MO[1]	Override control Overrides the current setpoint. *Status Flags* *"Out Of Service" = true, if the selected application is Flow Measurement.*	1: None 2: Open 3: Close 4: Min 5: - 6: Max 7: - 8: - 9: Motor Stop	1	C

Object Name	Object Type / Instance	Description / Comment	Values	Default	Access
ControlMode	MV[100]	Control mode Visualization of the control mode selected by the damper manufacturer. If the control mode "Flow control" is selected, the Min/Max limits are related to "Nominal volumetric flow in m3/h". If the control mode "Position control" is selected, the Min/Max limits are related to the adapted mechanical range of the actuator. *Status Flags* *"Out Of Service" = true, if the selected application is not Flow Control.*	1: PosCtrl 2: FlowCtrl	2	R
OperationMode	MV[102]	Operation mode Selection is only available for actuator type VRU-M1R-BAC. It changes the room pressure from positive pressure (default) to negative pressure. *Status Flags* *"Out Of Service" = true, if the selected application is not Room Pressure Control.*	1: Negative Pressure 2: Positive Pressure	2	W
Command	MV[120]	Initiate function Initiation of actuator functions for service and testing *Status Flags* *"Out Of Service" = true, if the selected application is Flow Measurement or Room Pressure Control Cascade.*	1: None 2: Adaption 3: Test run 4: Synchronization	1	W
UnitSelAirFlow	MV[121]	Unit selection volumetric flow The selected unit is valid for "AbsFlow_Unitsel" AI[19] and "Vnom_UnitSel"AV[119]	1: - 2: m3/h 3: l/s 4: - 5: - 6: - 7: cfm	2	W
SpSource	MV[122]	Setpoint source Defines whether the setpoint is controlled by the analog input signal on wire 3 or the by bus signal on the serial communication line D+/D- (BACnet MS/TP). If "SpSource" MV [122] = 1: Analog, the setpoint in the object "SpAnalog" AI[6] is active If "SpSource" MV [122] = 2: Bus, the setpoint in the object "SpRel" AO[1] is active	1: Analog 2: Bus	2	W
UnitSelPressure	MV[127]	Unit selection pressure The selected unit is valid for "DeltaP_UnitSel" AI[18] and "DeltaPnom_UnitSel" AV[129]	1: pascal 2: - 3: inches of water	1	W
Sens1Type	MV[220]	Sensor 1 type Defines the connected sensor type.	1: None 2: Active 3: Passive 4: -	2	W

		If the "Sens1Type" MV[220] = 2: Active or = 3: Passive, the corresponding value is shown in the object "Sens1Analog" AI[20] If the "Sens1Type" MV[220] = 5: Switch, the status of the switch is shown in the object "Sens1Switch" BI[20]	5: Switch		

Access: R = Read, W = Write, C = Commendable with priority array