

HMD60 PICS

BACnet Protocol Implementation Conformance Statement (PICS) Vaisala HMD60 Series Humidity and Temperature Transmitters

BACnet Protocol Implementation Conformance Statement

This statement is a part of the BACnet standard and is required for its use.

Vendor name:	Vaisala Oyj
Product Name:	HMD60 Series
Product Model Numbers:	HMD60, HMD65
Application Software Version:	2.0.8 (or greater)
Firmware Version:	2 (Interface version)
BACnet Protocol Revision:	Version 1, Revision 15
BACnet Standardized Device Profile (Annex L):	☐ BACnet Operator Workstation (B-OWS) ☐ BACnet Building Controller (B-BC) ☐ BACnet Advanced Application Controller (B-AAC) ☒ BACnet Application Specific Controller (B-ASC) ☐ BACnet Smart Sensor (B-SS) ☐ BACnet Smart Actuator (B-SA)
List of all BACnet Interoperability Building Blocks Supported (Annex K): See also: BIBBs Supported (page 14)	DS-RP-B, DS-RPM-B, DS-WP-B, DS-COVU-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B
Segmentation Capability:	☐ Segmentation Requests Supported ☐ Segmentation Responses Supported No segmentation.



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VAISALA

Standard Object Types Supported	☒ Analog Input ☐ Analog Output ☒ Analog Value ☐ Averaging ☐ Binary Input ☐ Binary Output ☐ Binary Value ☐ Calendar ☐ Command ☒ Device ☐ Event Enrollment ☐ File ☐ Group ☐ Life Safety Point ☐ Life Safety Zone ☐ Loop ☐ Multistate Input ☐ Multistate Output ☐ Multistate Value ☐ Notification Class ☐ Program ☐ Schedule ☐ Trend Log
Data Link Layer Options	☐ BACnet Internet Protocol (IP) (Annex J) ☐ BACnet IP (Annex J), Foreign Device ☐ ISO 88023, Ethernet (Clause 7) ☐ ANSI/ATA 878.1, 2.5 MB ARCNET® network (Clause 8) ☐ ANSI/ATA 878.1, RS485 ARCNET network (Clause 8), baud rates: _____ ☒ Master-Slave/Token-Passing (MS/TP) master (Clause 9), baud rates: 9600, 19200, 38400, 57600, 76800, 115200 ☐ MS/TP slave (Clause 9), baud rates: _____ ☐ Point-To-Point, EIA 232 (Clause 10), baud rates: _____ ☐ Point-To-Point, modem (Clause 10), baud rates: _____ ☐ LonTalk® protocol (Clause 11), medium: _____ ☐ Other: _____
Device Address Binding:	Is static device binding supported? (required for two-way communication between MS/TP slaves and other devices) ☐ Yes ☒ No

Networking Options	☐ Router, Clause 6: _____ ☐ Annex H, BACnet Tunneling Router over IP ☐ BACnet/IP Broadcast Management Device (BBMD) Does the BBMD support registrations by Foreign Devices? ☐ Yes ☐ No
Character Sets Supported:	Indicating support for multiple character sets does not imply that they can all be supported simultaneously. ☒ UTF-8 / ANSI X3.4 ☐ IBM®/Microsoft® DoubleByte Character Set (DBCS) ☐ ISO 8859-1 ☐ ISO 10646 Universal Character Set-2 (UCS2) ☐ ISO 10646 (UCS-4) ☐ Japanese Industrial Standard (JIS) C 6226
Types of non-BACnet equipment /network(s) supported:	None

Device Object

Table 1 Device Object Properties

Property	Data Type (Application Datatype)	Writable (Conformance Code)	Value or Initial Value	Persistence
Object_Identifier	BACnetObjectIdentifier	Y (R)	02 00 00 00 (hex) Object Type = 8, Instance = xxxxxxxx	Nonvolatile
Object_Name	CharacterString[40]	Y (R)	"HMD65_Yxxxxxxx"	Nonvolatile
Object_Type	BACnetObjectType (ENUMERATED)	N (R)	8 (Device Object)	Fixed
System_Status	BACnetDeviceStatus (ENUMERATED)	N (R)	0 (Operational)	Volatile
Vendor_Name	Character String	N (R)	"Vaisala"	Fixed
Vendor_Identifier	Unsigned16	N (R)	339	Fixed
Model_Name	CharacterString	N (R)	"HMD65"	Nonvolatile
Firmware_Revision	CharacterString	N (R)	X (BACnet interface)	Fixed
Application_Software_Version	CharacterString	N (R)	X.X.X	Fixed
Location	Character String[40]	Y (O)	"Location"	Nonvolatile
Description	Character String[24]	Y (O)	"Description"	Nonvolatile
Protocol_Version	Unsigned	N (R)	1	Fixed
Protocol_Revision	Unsigned	N (R)	15	Fixed
Protocol_Services	BACnetProtocolServices Supported (BIT STRING)	N (R)	Read Property Read Property Multiple Write Property Device Communication Control Reinitialize Device Who-Is Who-Has	Fixed
Protocol_Object_Types_Supported	BACnetObjectTypesSupported (BIT STRING)	N (R)	Analog Input Analog Value Device	Fixed

Property	Data Type (Application Datatype)	Writable (Conformance Code)	Value or Initial Value	Persistence
Object_List	BACnetARRAY[N]of BACnetObjectIdentifier	N (R)	Device Object AI1 (Relative Humidity) AI2 (Temperature) AI3 (Dewpoint / Td) AI4 (Dewpoint / Tdf) AI5 (Wet bulb temperature / Tw) AI6 (Absolute humidity / A) AI7 (Mixing ratio / X) AI8 (Enthalpy / H) AV1 (Pressure)	Fixed
Max_APDU_Length_Accepted	Unsigned16	N (R)	480	Fixed
Max_Master	Unsigned16 (0 ... 127)	Y (R/O)	127	Nonvolatile
Max_Info_Frames	Unsigned	N (R/O)	1	Fixed
Segmentation_Supported	BACnetSegmentation (ENUMERATED)	N (R)	3 (No segmentation)	Fixed
APDU_Timeout	Unsigned	N (R)	3000 (ms)	Fixed
APDU_Retries	Unsigned	N (R)	3	Fixed
Device_Address_Binding	List of BACnetAddressBinding	N (R)	NULL	Fixed
Database_Revision	Unsigned	N (R)	0	Volatile

Object_Identifier

Must be unique in BACnet network. As Object_Identifier is 22 bits long, it has a value range of 0 ... 4194303. Each device is assigned a random value in this range at Vaisala factory.

Object_Name

Must be unique in BACnet network. Default object name contains the name and serial number of the device. For example:

- Device model is HMD65, with serial number G1234567
- Object_Name is "HMD65_G1234567"

System_Status

System status can be OPERATIONAL (0) or NON-OPERATIONAL (4). Device goes to NON-OPERATIONAL state in case of fatal error.

Protocol_Services

Reinitialize Device and Device Communication Control services must be password protected. According to BACnet protocol, password is a character string of max. 20 characters. The default password is "1234". The password can be changed using Vaisala Insight PC software: for instructions, see *HMD65 User Guide M212243EN*.

Database_Revision

This is changed during operation according to standard 12.11.35 (EN ISO 17848-5).

Relative Humidity Object

Table 2 Relative Humidity Object Properties

Property	Data Type (Application Datatype)	Writable (Conformance Code)	Value or Initial Value	Persistence
Object_Identifier	BACnetObjectIdentifier	No (R)	00 00 00 01 (hex) Object Type = 0, Instance = 1	Fixed
Object_Name	CharacterString	No (R)	"RH"	Fixed
Object_Type	BACnetObjectType (ENUMERATED)	No (R)	0 (Analog Input)	Fixed
Present_Value	Real	Yes (When Oos) (R)	0.0	Volatile
Description	CharacterString	No (O)	"Relative Humidity"	Fixed
Units	BACnetEngineeringUnits (ENUMERATED)	No (R)	29 (percent-relative-humidity)	Nonvolatile
Status_Flags	BACnet Status Flags (BIT STRING)	No (R)	0 (FAULT == FALSE)	Volatile
Reliability	BACnet Reliability (ENUMERATED)	Yes (when OoS) (O)	0 (NO FAULT DETECTED)	Volatile
Event State	BACnetEventState (ENUMERATED)	No (R)	0 (NORMAL)	Volatile
Out_of_Service	BOOLEAN	Yes (R)	0 (FALSE)	Volatile
COV_Increment	Real	Yes (O)	NaN (COV reporting disabled)	Nonvolatile
Min_Pres_Value	Real	No (O)	0.0 (same as limit for Minimum RH error limit)	
Max_Pres_Value	Real	No (O)	100.0 (same as limit for Maximum RH error limit)	

Table 3 Status Flags

Flag	State	Cause
IN_ALARM	FALSE	Event State equals 0 (NORMAL)
	TRUE	Event State not 0
FAULT	FALSE	Reliability equals 0 (NO FAULT DETECTED)
	TRUE	Reliability not 0
OVERRIDDEN	FALSE	Always FALSE

Flag	State	Cause
OUT_OF_SERVICE	FALSE	Present Value may NOT be written via BACnet
	TRUE	Present Value may be written via BACnet

Table 4 Reliability

STATE	CAUSE
0 NO_FAULT_DETECTED	
1 NO_SENSOR	Sensor failure detected.
2 OVER_RANGE	RH over Max_Pres_Value
3 UNDER_RANGE	RH under Min_Pres_Value
7 UNRELIABLE_OTHER	Other measurement error

Table 5 Event State

STATE	CAUSE
0 NORMAL	Reliability equals 0 (NO FAULT DETECTED)
1 FAULT	Reliability not 0

Out of Service

Out of Service value is writeable. By Default = FALSE.

Temperature Object

Table 6 Relative Humidity Object Properties

Property	Data Type (Application Datatype)	Writable (Conformance Code)	Value or Initial Value	Persistence
Object_Identifier	BACnetObjectIdentifier	Y (R)	00 00 00 02 (hex) Object Type = 0, Instance = 2	Fixed
Object_Name	CharacterString	No (R)	"T"	Fixed
Object_Type	BACnetObjectType (ENUMERATED)	No (R)	0 (Analog Input)	Fixed
Present_Value	Real	Yes (When Oos) (R)	0.0	Volatile
Description	CharacterString	No (O)	"Temperature"	Fixed
Units	BACnetEngineeringUnits (ENUMERATED)	Yes (R)	62 (degrees-Celsius)	Nonvolatile
Status_Flags	BACnet Status Flags (BIT STRING)	No (R)	0 (FAULT == FALSE)	Volatile
Reliability	BACnet Reliability (ENUMERATED)	Yes (when OoS) (O)	0 (NO FAULT DETECTED)	Volatile
Event State	BACnetEventState (ENUMERATED)	No (R)	0 (NORMAL)	Volatile
Out_of_Service	BOOLEAN	Yes (R)	0 (FALSE)	Volatile
COV_Increment	Real	Yes (O)	NaN (COV reporting disabled)	Nonvolatile
Min_Pres_Value	Real	No (O)	40.0 (same as limit for Minimum T error limit)	
Max_Pres_Value	Real	No (O)	+80.0 (same as limit for Maximum T error limit)	

Table 7 Status Flags

Flag	State	Cause
IN_ALARM	FALSE	Event State equals 0 (NORMAL)
	TRUE	Event State not 0
FAULT	FALSE	Reliability equals 0 (NO FAULT DETECTED)
	TRUE	Reliability not 0
OVERRIDDEN	FALSE	Always FALSE

Flag	State	Cause
OUT_OF_SERVICE	FALSE	Present Value may NOT be written via BACnet
	TRUE	Present Value may be written via BACnet

Table 8 Reliability

STATE	CAUSE
0 NO_FAULT_DETECTED	
1 NO_SENSOR	Sensor failure detected.
2 OVER_RANGE	T over Max_Pres_Value
3 UNDER_RANGE	T under Min_Pres_Value
7 UNRELIABLE_OTHER	Other measurement error

Table 9 Event State

STATE	CAUSE
0 NORMAL	Reliability equals 0 (NO FAULT DETECTED)
1 FAULT	Reliability not 0

Units

Unit can be changed using BACnet. Possible units (Celsius or Fahrenheit) are C (62) or F (64).

Out of Service

Out of Service value is writable. By Default = FALSE.

Calculated Humidity Objects

Table 10 Calculated Humidity Object Instances

Instance	Name	Description	Unit
3	"Td"	"Dewpoint"	62/64 (°C / °F)
4	"Tdf"	"Dew/Frostpoint"	62/64 (°C / °F)
5	"Tw"	"Wet bulb temperature"	62/64 (°C / °F)
6	"a"	"Absolute humidity"	217/2000 grams-per-cubic-meter / grains-per-cubic-foot - Vaisala defined unit
7	"x"	Mixing ratio	28/2001 grams-of-water-per-kilogram-dry-air / grains-of-water-per-pound - Vaisala defined unit
8	"h"	Enthalpy	149/24 kilojoules-per-kilogram-dry-air / btus-per-pound-dry-air

Table 11 Calculated Humidity Object Properties

Property	Data Type (Application Datatype)	Writable (Conformance Code)	Value or Initial Value	Persistence
Object_Identifier	BACnetObjectIdentifier	No (R)	00 00 00 xx (hex) Object Type = 0, Instance = x (see Table 10 (page 11))	Fixed
Object_Name	CharacterString	No (R)	See Table 10 (page 11)	Fixed
Object_Type	BACnetObjectType (ENUMERATED)	No (R)	0 (Analog Input)	Fixed
Present_Value	Real	Yes (When Oos) (R)	0.0	Volatile
Description	CharacterString	No (O)	See Table 10 (page 11)	Fixed
Units	BACnetEngineeringUnits (ENUMERATED)	Yes (R)	See Table 10 (page 11)	Nonvolatile
Status_Flags	BACnet Status Flags (BIT STRING)	No (R)	0 (FAULT == FALSE)	Volatile
Reliability	BACnet Reliability (ENUMERATED)	Yes (when OoS) (O)	0 (NO FAULT DETECTED)	Volatile
Event State	BACnetEventState (ENUMERATED)	No (R)	0 (NORMAL)	Volatile
Out_of_Service	BOOLEAN	Yes (R)	0 (FALSE)	Volatile

Property	Data Type (Application Datatype)	Writable (Conformance Code)	Value or Initial Value	Persistence
COV_Increment	Real	Yes (O)	NaN (COV reporting disabled)	Nonvolatile

Table 12 Status Flags

Flag	State	Cause
IN_ALARM	FALSE	Event State equals 0 (NORMAL)
	TRUE	Event State not 0
FAULT	FALSE	Reliability equals 0 (NO FAULT DETECTED)
	TRUE	Reliability not 0
OVERRIDDEN	FALSE	Always FALSE
OUT_OF_SERVICE	FALSE	Present Value may NOT be written via BACnet
	TRUE	Present Value may be written via BACnet

Table 13 Reliability

STATE	CAUSE
0 NO_FAULT_DETECTED	
1 NO_SENSOR	Sensor failure detected.
2 OVER_RANGE	Not checked
3 UNDER_RANGE	Not checked
7 UNRELIABLE_OTHER	Other measurement error

Table 14 Event State

STATE	CAUSE
0 NORMAL	Reliability equals 0 (NO FAULT DETECTED)
1 FAULT	Reliability not 0

Out of Service

Out of Service value is writable. By Default = FALSE.

Operation Pressure Object

Table 15 Operation Pressure Object Properties

Property	Data Type	Writable	Value or Initial Value	Persistence
Object_Identifier	BACnetObjectIdentifier	No	00 80 00 01 (hex) Object Type = 2, Instance = 1	Fixed
Object_Name	Character String	No	"OPER P"	Fixed
Object_Type	BACnet Object Type	No	2 (Analog Value)	Fixed
Present_Value	Real	Yes	1013.25	Nonvolatile
Description	Character String	No	"Operation Pressure"	Fixed
Units	BACnet Engineering Units	No	133 (hectopascals)	Fixed
Status_Flags	BACnet Status Flags	No	0 (FAULT == FALSE)	Fixed
Event State	BACnet Event State	No	0 (NORMAL)	Fixed
Out_of_Service	BOOLEAN	No	0 (FALSE)	Fixed

Table 16 Status Flags

Flag	State	Cause
IN_ALARM	FALSE	Always FALSE
FAULT	FALSE	Always FALSE)
OVERRIDDEN	FALSE	Always FALSE
OUT_OF_SERVICE	FALSE	Always FALSE

Event State

Event State value is always NORMAL.

Out of Service

Out of Service value is not writable.

BIBBs Supported

Table 17 (page 14) lists all the BACnet Interoperability Building Blocks (BIBBs) that, per EN ISO 16484-5-2017 standard, could be supported by a BACnet Application Specific Controller (B-ASC). The checked BIBBs are supported by HMD65.

Table 17 BIBBs Supported

Function	Designation	Supported
Data Sharing - Read Property - A	DS-RP-A	☐
Data Sharing - Read Property - B	DS-RP-B	☒
Data Sharing - Read Property Multiple - A	DS-RPM-A	☐
Data Sharing - Read Property Multiple - B	DS-RPM-B	☒
Data Sharing - Write Property - A	DS-WP-A	☐
Data Sharing - Write Property - B	DS-WP-B	☒
Data Sharing - Write Property Multiple - B	DS-WPM-B	☐
Data Sharing - COV - Unsolicited - A	DS-COVU-A	☐
Data Sharing - COV - Unsolicited - B	DS-COVU-B	☒
Alarm and Event - Notification Internal - B	AE-N-I-B	☐
Alarm and Event - ACK - B	AE-ACK-B	☐
Alarm and Event - Information - B	AE-INFO-B	☐
Alarm and Event - Enrollment Summary - B	AE-ESUM-B	☐
Scheduling - External - B	SCHED-E-B	☐
Trending - Viewing and Modifying Trends Internal - B	T-VMT-I-B	☐
Trending - Automated Trend Retrieval - B	T-ATR-B	☐
Device Management - Dynamic Device Binding - A	DM-DDB-A	☐
Device Management - Dynamic Device Binding - B	DM-DDB-B	☒
Device Management - Dynamic Object Binding - A	DM-DOB-A	☐
Device Management - Dynamic Object Binding - B	DM-DOB-B	☒
Device Management - Device Communication Control - B	DM-DCC-B	☒
Device Management - Time Synchronization - B	DM-TS-B	☐
Device Management - UTC Time Synchronization - B	DM-UTC-B	☐
Device Management - Reinitialize Device - B	DM-RD-B	☒
Device Management - Backup and Restore - B	DM-BR-B	☐
Network Management - Connection Establishment - A	NM-CE-A	☐

Application Services Supported

Table 18 (page 16) lists all the BACnet standard application services. The checked services are supported by HMD65.

Table 18 Application Services Supported

Application Service	Initiates Requests	Executes Requests
AcknowledgeAlarm	☐	☐
AddListElement	☐	☐
AtomicReadFile	☐	☐
AtomicWriteFile	☐	☐
ConfirmedCOVNotification	☐	☐
ConfirmedEventNotification	☐	☐
ConfirmedPrivateTransfer	☐	☐
ConfirmedTextMessage	☐	☐
CreateObject	☐	☐
DeleteObject	☐	☐
DeviceCommunicationControl	☐	☒
Disconnect-Connection-To-Network	☐	☐
Establish-Connection-To-Network	☐	☐
GetAlarmSummary	☐	☐
GetEnrollmentSummary	☐	☐
GetEventInformation	☐	☐
I-Am	☒	☐
I-Am-Router-To-Network	☐	☐
I-Could-Be-Router-To-Network	☐	☐
I-Have	☒	☐
Initialize-Routing-Table	☐	☐
Initialize-Routing-Table-Ack	☐	☐
LifeSafetyOperation	☐	☐
ReadProperty	☐	☒
ReadPropertyConditional	☐	☐
ReadPropertyMultiple	☐	☒
ReadRange	☐	☐
ReinitializeDevice	☐	☒
RemoveListElement	☐	☐

Application Service	Initiates Requests	Executes Requests
SubscribeCOV	☐	☐
SubscribeCOVProperty	☐	☐
TimeSynchronization	☐	☐
UnconfirmedCOVNotification	☒	☐
UnconfirmedEventNotification	☐	☐
UnconfirmedPrivateTransfer	☐	☐
UnconfirmedTextMessage	☐	☐
UTCTimeSynchronization	☐	☐
VT-Close	☐	☐
VT-Data	☐	☐
VT-Open	☐	☐
Who-Has	☐	☒
Who-Is	☐	☒
Who-Is-Router-To-Network	☐	☐
WriteProperty	☐	☒
WritePropertyMultiple	☐	☐

