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Using BACnet Recommendation

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Building technology

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References	www.kbob.admin.ch/ Rubrik: ⇒ Themen und Leistungen ⇒ Gebäudetechnik

Abbreviations and terms

Abbreviation	Description
ANSI	American National Standards Institute
AS	Automation station
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BACnet	Building Automation and Control Network
B-AWS	BACnet Advanced Operator Workstation
B-BC	BACnet Building Controller
BBMD	BACnet Broadcast Management Device
BIBB	BACnet Interoperability Building Block
B-OWS	BACnet Operator Workstation
COS	Change of State
COV	Change of Value
DIN	Deutsches Institut für Normung (German national organisation for standardisation)
DNS	Domain Name System
DP	Data point
EDE	Engineering Data Exchange
BA	Building automation
HVACR+SE	Heating, ventilation, air conditioning, refrigeration, sanitary and electrics
ISO	International Organization for Standardization
OWS	Operator Workstation (also called Building Control System, or BCS
PICS	Protocol Implementation Conformance Statement
SGK	Switchgear assembly
XLS or XLSX	MS Excel file format

Referenced documents

Title	Author/publisher	Date
[1] BACnet - A Data Communication Protocol for Building Automation and Control Networks	ASHRAE	
[2] DIN EN ISO 16484-5	ISO	2014-05
[3] BACnet in öffentlichen Gebäuden (BACnet 2017)	AMEV	2017
[4] Leitfaden zur Ausschreibung interoperabler Gebäudeautomation auf Basis von DIN EN ISO 16484-5 Systeme der Gebäudeautomation – Datenkommunikationsprotokoll (BACnet)	B.I.G.-EU	Oct. 2009 edition (V2.8a)
[5] SIA 112:2014, Construction planning model (SN 209 112:2014 de)	Swiss Society of Engineers and Architects	2014-11-01
[6] ISO/IEC 10646	ISO	2012
[7] Weisung zur Kennzeichnung und Beschriftung von Gebäudetechnik-Installationen	FOBL	01.01.2020
[8] Guidelines on KBOB recommendation on using BACnet	KBOB	2.0

Contents

General principles of the recommendation

Together with any individual construction and property services' **guidelines**, the KBOB BACnet recommendation forms the basis for planning, implementing and operating BACnet-based building automation systems. The use of BACnet in the area of safety and security is not covered.

In principle, the recommendation applies to all objects. Appropriate, project-specific deviations due to operating specifications or any objections are to be discussed with the project developer.

All specifications are formulated in a manufacturer and product neutral manner.

All current recommendations, tools and other documents can found at www.kbob.admin.ch.

1. About this document

1.1. Purpose of the document

Modern buildings are becoming increasingly intelligent, interconnected and integrated. Building automation (BA) represents the central hub of information from and over technical building systems. At the same time, BA makes up a relatively small part of the construction costs yet has an impact on a significant portion of the total operating costs.

A uniform language based on an international standard (BACnet) and standardised functions is required in order to ensure efficient building automation. A manufacturer-neutral interface allows devices from different manufacturers to be integrated into the system and thus promote competitive procurement.

The present recommendation covers topics which concern the planning, implementation and operation of open, manufacturer-neutrally configured building automation systems using BACnet. In addition, the present document forms the basis for defining a mutual understanding of BACnet between project developers, planners and integrators.

This recommendation therefore fundamentally supports the aim of the property developers to define a manufacturer-neutral interface between the BACnet devices integrated in a BA network and the control system. This is in order to achieve the most cost-effective BA complete solution. The varying life cycles of the individual units in the BA network mean that components can be replaced regardless of the manufacturer.

The recommendation does not define any conclusive specifications on the use of BACnet. In addition to the mandatory specifications presented here, it is necessary to specify which of the optional specifications the project developers also request. Furthermore, additional specifications, which are still to be defined, are necessary in order to cover a project developer's specific specifications (e.g. Notification Class assignment) and to take account of the features of a particular BA system (see Figure 2).

Specifications which can be considered independent of BACnet are not included in this document, e.g. system architecture, network architecture, plant identification system, numbering policy and cost planning specifications. These are to be provided by the project developer in question.

1.2. Scope of the document

The principle strategic decision on the use of BACnet for BA systems is to be made by project developers before a building project enters the planning process. The corresponding specifications (see Chapter 1.3) are to be made available to the specialist planners before project planning begins.

The BACnet specifications should be taken into account and included in the deliverables of the corresponding phase no later than during the planning stage of a building project (SIA construction phase 3), the tender (SIA construction phase 4) and up to and including implementation (SIA construction phase 5)[1]. During operation, the specifications are also to be met in the case of any changes to the systems (SIA construction phase 6).

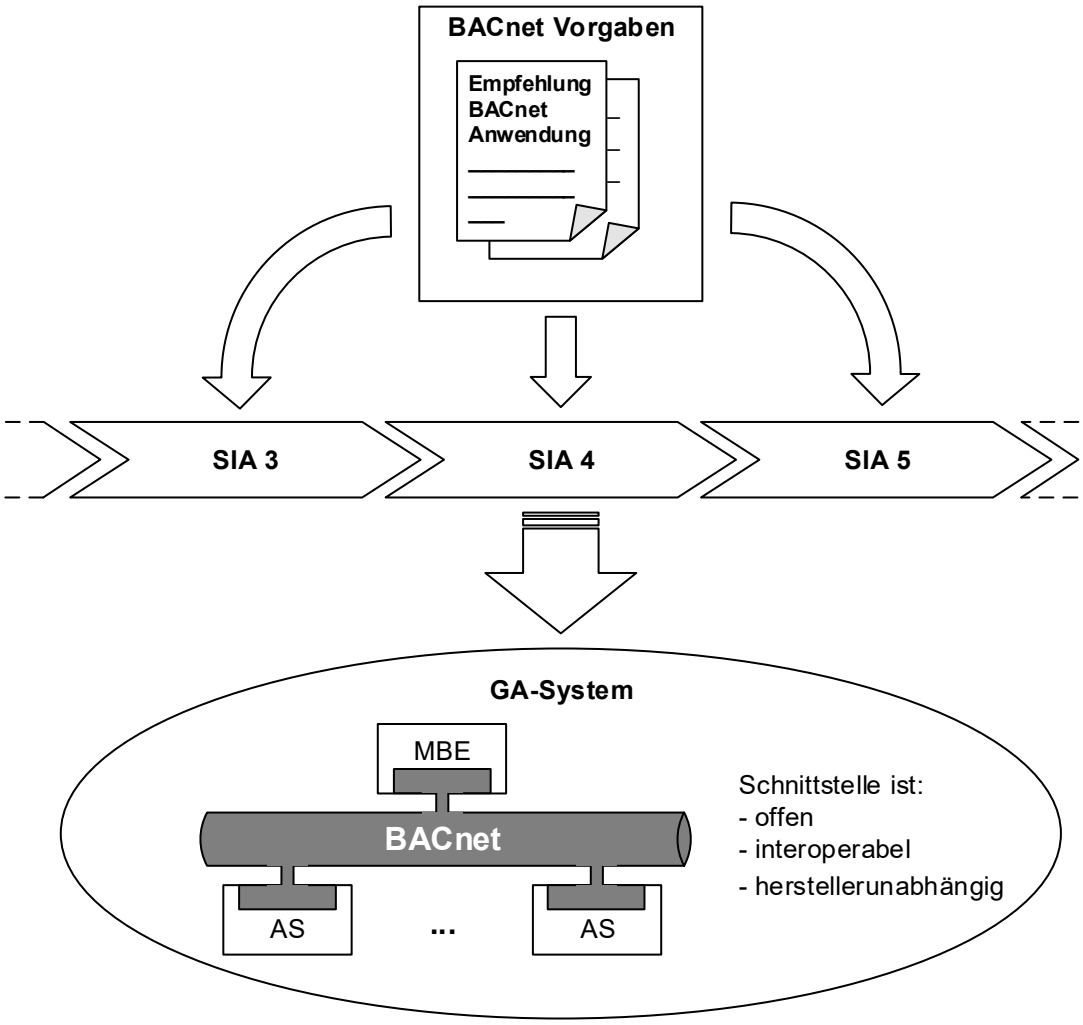


Figure 1: Scope of the document

[1] The construction phrases refer to the SIA standard 112 construction planning model (see [5])

1.3. Structure of the BACnet specifications

In order to plan, implement and operate BACnet, specifications comprising the ASHRAE standard, the present document and specifications specific to project developers are to be set (see Figure 2).

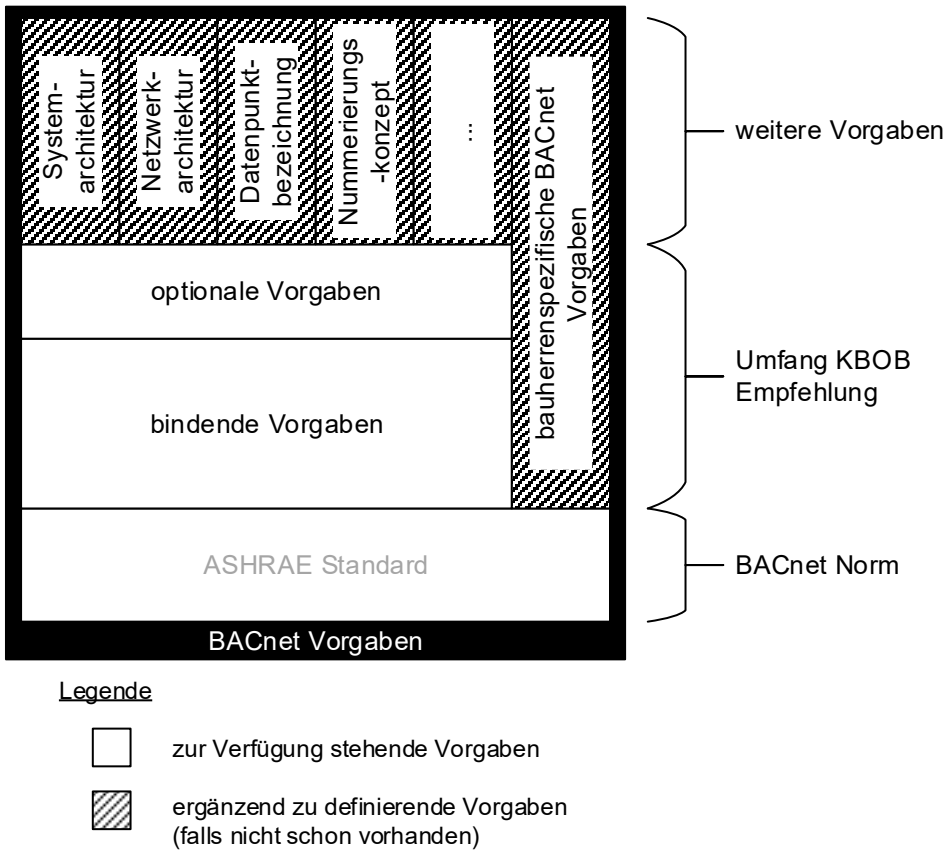


Figure 2: Structure of the specifications for planning, implementing and operating BACnet

BACnet is an international and European standard for data communication in building automation and is standardised by the BACnet Standard [1].

Some of the specifications provided in this document are binding, others are optional in the form of an additional function. In addition to the present document, project developers' specific BACnet specifications must also be provided. **In order to provide these specific BACnet specifications, it is recommended to use the "Guidelines on KBOB recommendation on using BACnet" [8].**

This document does not cover other specifications such as system architecture, network architecture, data point designation and numbering policy which contribute to completing the BACnet specifications. These specifications are always to be prepared and used in consideration of the BACnet Standard and the specifications and recommendations defined in this document.

1.4. Structure of the document

This document is divided into the following Chapters:

- **Chapter 2: Introduction**
  Explanation of BACnet and the structure of BACnet systems
- **Chapter 3: BACnet terms and system structure**
  Introduction to BACnet with explanation of basic terms and the BACnet system structure
- **Chapter 4: Principles**
  Principles governing the use of the defined BACnet specifications
- **Chapter 5: Using BACnet objects**
  Specifications relating to BACnet objects to be used and their properties
- **Chapter 6: Using BACnet services**
  Establishing BACnet specifications in order to manage the handling of the specific BACnet services
- **Chapter 7: BA functions**
  Concrete BACnet interface specifications for general system components found in building technology
- **Chapter 8: BACnet networks**
  Networks aspects of using BACnet
- **Chapter 9: Information on planning and implementing BACnet systems**
  Additional advice and implementation concepts relating to BACnet in various project phases
- **AnnexA: Objects**
  Specifications relating to the characteristics of the supported objects and their properties for the device profiles specified in this document
- **AnnexB: BIBB**
  BIBB specifications which can be used for the device profiles specified in this document

2. Introduction

This Chapter explains the basic concept of BACnet systems and their structure.

2.1. Standardisation

BACnet® (Building Automation and Control Network) is an international and European standard for data communication in building automation. The present document is based on the following ISO standard:

Building automation and control systems – Part 5: Data communication protocol (ISO 16484-5)

The standard is based on the ANSI/ASHRAE Standard 135 which is constantly developed and complemented in the form of addenda. The current version of the ANSI/ASHRAE standard is available at http://www.ashrae.org.

The present document is based on the addenda in the following version and revision numbers:

- **Version number = 1**
- **Revision number = 14**

2.2. Overview of BACnet

2.2.1. Basic concept of BACnet

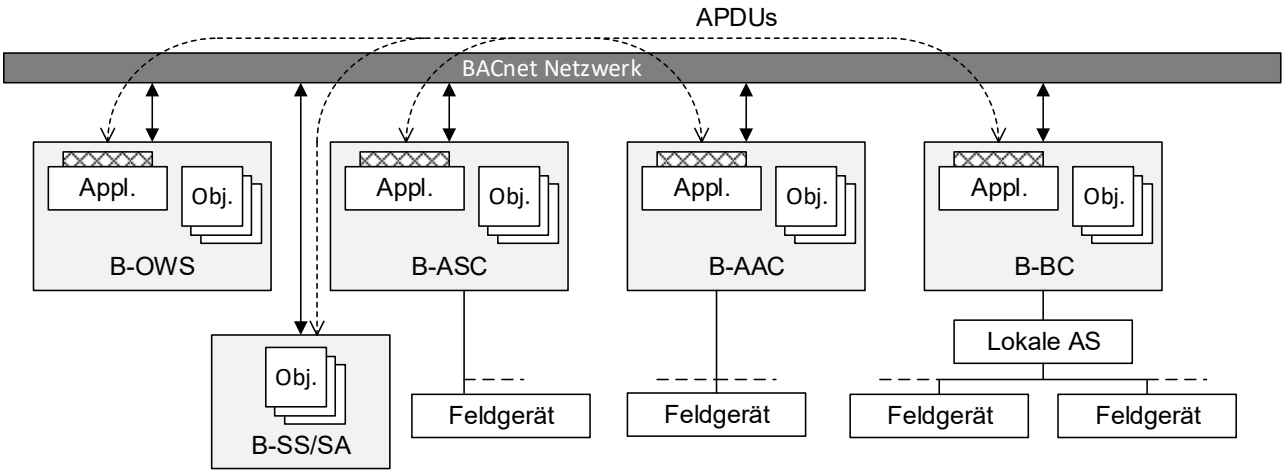
BACnet is an object-oriented data protocol for various function levels in building automation.

The main elements of the protocol are the specifications for object types, services and networks. BACnet allows the cross-system cooperation (interoperability) of devices or systems from different manufacturers if the configured functions are coordinated.

2.2.2. Structure of BACnet systems

The BACnet data communication protocol allows individual self-contained units to communicate with each other. BACnet differentiates between the functions of the facilities used which can be located at different communication levels (management level, automation level, field level).

Figure 3 provides an overview of the structure of BACnet systems with individual self-contained units and their functions. The individual units' functions correspond to the BACnet Standard device profiles which are explained in more detail in Chapter 3.7.



Legende:

Appl.	GA Anwendungsprogramme (Application)
APDUs	Daten-Telegramme (Application protcoll data units)
B-AAC	Automationsgerät (BACnet advanced application controller)
B-ASC	Anwendungsspezifische Geräte (BACnet application specific controller)
B-OWS	Bedienstation/-gerät (BACnet operator work station)
B-SS/SA	Vernetzbare Sensoren/Aktoren (BACnet smart sensor/actor)
B-BC	Automationsstation (BACnet building controller)
Obj.	BACnet Objekte (Objects)

Figure 3: Overview of the structure of BACnet systems (according to [4])

3. BACnet terms and system structure

This Chapter describes the basic BACnet terms and explains the general structure of BACnet systems.

3.1. Objects

In BAC objects, the characteristics of building automation functions are considered as a whole. For example, a "room temperature" input function's information is not limited to the current temperature, it also includes other details such as the name and description of the point of measurement, physical unit, limit, etc.).

A BACnet analogue input object creates a collection of defined information on the analogue input; information is stored in its properties. In order to ensure maximum interoperability, certain characteristics are compulsory in the objects.

BACnet object types allow all physical and communicative input and output functions and multiple processing functions to be displayed.

During planning, each BACnet object within a device receives a unique identifier instance number which is created in the Object_Identifier property using the relevant object type and an instance number. The name of the object (Object_Name) is also used as a reference and must be clearly identified within a device or device object across the entire network.

3.2. Properties

Properties refer to defined object-specific data sets, the fields of which contain information required for the object's functionality. The Standard defines the properties and one of the following abbreviations for each standard type of object:

- **R** (required): the property is required and at least readable.
- **W** (writable): the property is required, readable and writable.
- **O** (optional): the property is optional.

R indicates that the property concerned must always be present and readable in the respective object. **W** indicates that the property concerned must always be present, readable and writable in the respective object.

In addition, the Standard includes optional properties (**O**) whose use and writability depend on the actual system's tasks (function) and which are often required. They must be Standard compliant and interoperably configured in the system.

3.3. Services

Services describe the processes which are made available to BACnet system participants for communication (e.g. for reading and writing properties from other BACnet objects).

The BACnet protocol offers numerous services which are divided into six categories:

Service category	Description
Object Access Services	Services for accessing objects
Remote Device Management Services	Services for managing devices in different networks
Device and Network Management	Services for accessing devices and the network
Alarm and Event Services	Services for processing alarms and events
File Access Services	Services for accessing files
Virtual Terminal Services	Services for terminal-based access

Table 1: BACnet service categories (according to [1])

3.4. Client-server principle

Data exchange using BACnet services follows the client-server principle. The BACnet client requests a service from the BACnet server. The BACnet server executes the service. Communication can also be triggered by an event on the server. An example of this is the event notification service which causes the server to send a message to one or more clients, e.g. following a limit violation.

3.5. Interoperability areas

Interoperability areas describe the operationally important function areas of BACnet systems. The BACnet Standard identifies five interoperability areas:

- Data sharing - **DS**
- Alarm and event management - **AE**
- Schedule - **SCHED**
- Trending - **T**
- Device and network management - **DM**

The BACnet services required to fulfil their function (BIBBs) are assigned to each interoperability area.

3.6. BIBBs

BIBBs (BACnet Interoperability Building Blocks) describe the functional specifications which BACnet devices must meet in order to achieve interoperable communication. Corresponding BIBBs from clients and servers are one of the necessary specifications for the interoperability of these devices.

The Standard details the corresponding functionality for each BIBB and lists the services which a BIBB requires for this functionality.

The Standard also stipulates whether a BIBB must be able to initiate or execute the service. An identifier (the letter A or B) is used to differentiate between the BIBBS which work as initiators of data or services (client or A device) and those which work as providers of data or services (server or B device).

3.7. Standard device profile

The BACnet Standard [1] differentiates between eight standard device profiles. The BIBBs of the respective BACnet device profiles assigned in the BACnet Standard are to at least be supported for the assigned device.

Table 2 describes the various standardised BACnet device profiles.

Abbreviation	Definition	Characteristic
B-AWS	Advanced Operator Workstation	Management and operating station with higher performance than B-OWS
B-OWS	Operator Workstation	Management and operating station
B-OD	Operator Display	Local operating device
B-BC	Building Controller	Programmable automation station
B-AAC	BC Advanced Application Controller	Automation device with lower performance than BC
B-ASC	Application Specific Controller	Automation device with lower performance than AAC
B-SA	Smart Actuator	Switchgear and actuator
B-SS	Smart Sensor	Sensor

Table 2: Standardised BACnet device profiles (according to [1])

The B-AWS, B-OWS and B-OD devices profiles are usually used by the user to operate and monitor the BA system. The B-BC, B-AAC, B-ASC, B-SA and B-SS device profiles are normally used at the automation level and are usually only available with limited functions. If these profiles are used, the available functions must be checked by the project developer before procurement, because the B-BC profile provides only a reduced range of functions compared to the AS-CH profile described below, for example.

Certain BACnet device profiles are defined in the present document (see Chapter 5.1). Unlike the standardised BACnet profiles, minimum specifications relating to object types, properties and read and write access are defined for the specifically defined device profiles. These device profiles are based on the common market profiles B-AWS, B-OWS and B-BC.

Annex B lists the BIBBs defined in the Standard and assigns them the B-AWS and B-BC devices profiles, among others. In addition to the profiles standardised by the BACnet

Standard, the specifically defined specification profiles (according to Chapter 5.1) are also listed.

3.8. PICS

A PICS (Protocol Implementation Conformance Statement) is a statement of conformity provided by the manufacturer in accordance with Annex A of the Standard concerning its BACnet devices, i.e. a list of the implemented BACnet functionalities.

According to the Standard, each PICS must contain the following information:

- Product description
- Standardised device profile
- Supported BACnet Interoperability Building Blocks (BIBBs)
- Supported segmentation capability
- Supported Standard object types
- Network options (data link layer options)
- Static device address binding
- Router options (networking options)
- Supported character sets
- Other information (in the case of gateways)

The following additional information is to be provided for each supported object type:

- Information concerning the object's dynamic creatability/deletability
- List of all optional supported properties
- List of all optional writable properties
- List of all proprietary properties, each with identifier, data type and definition
- List of any existing area constraints

A user can use the PICS to find out which functions a BACnet device supports.

Please note: a PICS only contains a manufacturer's unverified information.

3.9. EDE files

Engineering Data Exchange (EXE) files can be created by automatically selecting the BACnet functionalities of a planned BACnet device. These contain simplified yet incomplete information on the BACnet functions configured in a BACnet device. They are useful when comprehensive information is not available.

Instead of being standardising, EDE files are a recommendation made by the BIG-EU in 2004. For presentation purposes, XLS and CSV file formats were chosen due to the suitability of tables and further distribution. They consist of a table calculation with the EDE files as an overview and three further tables and include a total of four sheets (EDE file, state texts, unit texts, object types).

Extended EDE files can also contain further properties (e.g. properties such as NC). This allows them to be checked in advance of implementation. These extended properties are described as optional in the BIG-EU template.

It is recommended to require the use of at least version 2.3 of the BIG-EU EDE files.

4. Principles

The topics covered in this Chapter form the basis for using the BACnet specifications defined in this document.

4.1. BACnet protocol version and revision numbers

The BACnet protocol should be used at least in the following version and revision numbers:

- **Version number = 1**
- **Revision number = 14**

As most devices available on the market require a certain amount of time before they can support the current revision, a lower revision number than the current one is provided.

The terminology etc. used in this document always refers to the BACnet protocol status in the version and revision numbers mentioned above.

4.2. Character set

In order to ensure interoperability, the default character set is UTF-8. The revision number stated in Chapter 4.1 indirectly requires the character set to be supported.

UTF-8 is an international character set according to ISO 10646 [6]. UTF-8 allows up to 8 bytes to be used for character coding. UTF-8 allows, among other things, the use of special characters, e.g. German umlauts. As ASCII characters form a subset of the UTF-8 character set, UTF-8 is backwards compatible with ANSI X3.4.

4.3. BACnet mechanisms

In principle, BACnet mechanisms such as COV reporting, intrinsic reporting, algorithmic reporting and Priority Array are to be used.

Incidents in the BA network should always be processed using the alarms and events provided by BACnet.

4.4. Proprietary BACnet objects and services

Proprietary BACnet objects are not permitted for the BA functions detailed in Chapter 7. In addition, standardised BACnet objects and services cannot be replaced by proprietary ones.

5. Using BACnet objects

The specifications in this Chapter are tailored to the practical relevance and market availability of BACnet devices.

5.1. Specification profiles

A difference is made between two main specification profiles for Operator Workstation (OWS) and Automation Station (AS).

Profile	Definition	Description
OWS-CH	Configuration for OWS	BACnet profile which can be used as a basic profile for BACnet specifications by the OWS of the BA.
AS-CH	Configuration for AS	BACnet profile which can be used as a basic profile for BACnet specifications by the AS of the BA.

Table 3: Specification profiles

Each BACnet object which is to be used is to be assigned a profile in Table 3. The project developer must confirm the assignment. The minimum specifications defined in this documents are to be supported by the device used.

5.2. Objects

5.2.1. Required BACnet object types

Table 4 lists the standard BACnet object types which are required in this document. Each object type is assigned an object type number which corresponds to the enumerated value of the BACnetObjectType according to the BACnet Standard [1].

Certain objects in the case of optional BA functions are listed in Chapter 7 and are therefore an obligatory specification if the corresponding BA functions are also required. The following key explains the meaning of the symbols used in Table 4.

Key:

Symbol	Definition
■	Mandatory use
□	Mandatory use when using the corresponding functions in Chapter 7 or additional functions.

Each object type is assigned an abbreviation which will be used hereon in this document to describe the corresponding object type.

No.	Object type	Abbreviation	OWS-CH	AS-CH
0	Analog Input	AI	■	■
1	Analog Output	AO	■	■
2	Analog Value	AV	■	■
3	Binary Input	BI	■	■
4	Binary Output	BO	■	■
5	Binary Value	BV	■	■
6	Calendar	CAL	■	■
8	Device	DEV	■	■
9	Event Enrolment	EE	■	■
10	File	FIL	☐	☐
12	Loop	LP	■	■
13	Multi-state Input	MI	■	■
14	Multi-state Output	MO	■	☐
15	Notification Class	NC	■	■
16	Program	PROG	☐	☐
17	Schedule	SCHED	■	■
19	Multi-state Value	MV	■	■
20	Trend Log	TLOG	■	■
25	Event Log	ELOG	■	☐
48	Positive Integer Value	PIV	☐	☐

Table 4: Overview of the required BACnet object types

No proprietary objects may be used for communication between the individual BACnet devices. Instead objects predefined in the open BACnet communication protocol should always be used.

5.2.2. Dynamically creatable and deletable object types

The specifications for dynamic creation (DC) and dynamic deletion (DD) for certain BACnet object types required in Table 4 are also to be complied with. Table 5 lists these object types and details for which device profile this characteristic is required.

No.	Object type	Abbreviation	OWS-CH	AS-CH
6	Calendar	CAL	DC/DD	DC/DD
9	Event Enrolment	EE	DC/DD	DC/DD
17	Schedule	SCHED	DC/DD	DC/DD
20	Trend Log	TLOG	DC/DD	DC/DD

Table 5: Overview of the dynamically creatable and deletable object types

Only objects which were created dynamically can be deleted dynamically.

5.2.3. Visibility of BACnet objects in a BA network

BACnet objects which are neither used nor assigned to a function (e.g. reserve hardware inputs and hardware outputs) should not, if technically possibly, be visible in the BA network.

If BACnet objects are created as reserves for later use, these should be labelled as such in the Object Name (see Chapter 5.3.3).

5.3. Properties

The properties of the objects mentioned must at least meet the specifications listed. Only objects and properties which are specified by BACnet in the area of open communication may be used for the exchange of relevant information[2] between individual BACnet devices (only BTL certified products are permitted).

Annex A lists the minimum specifications of the properties to be used for the respective specification profiles per BACnet object type.

5.3.1. Character string length

The character string values of the predefined properties which are used in the OWS-CH and AS-CH profiles should at least support the lengths predefined in Table 6.

Property	Minimum character string length	
	OWS-CH	AS-CH
Action Text[3]	32	32
Application Software Version	64	No specification
Description	128	64
Description_Of_Halt	64	32
Device_Type	64	32
File_Type	32	32
Firmware_Version	64	No specification
Inactive_Text	32	32
Active_Text	32	32
Instance_Of	64	32
Location	64	64
Model_Name	64	No specification
Object_Name	64	64
Profil_Name	64	No specification
State_Text[4]	32	32
Event_Message_Texts[5]	128	64
Vendor_Name	64	No specification
All other character string properties	32	32

[2] Information which ensures the OWS application's functionality
[3] Minimum character string length is to be supported per action
[4] Minimum character string length is to be supported per state
[5] Minimum character string length is to be supported per event text

Table 6: Minimum length of character strength values of the respective properties for OWS-CH and AS-CH

The minimum character string lengths in Table 6 do not always have to be used but should always be made available for each property mentioned.

Umlauts in the German alphabet should be able to be displayed in one single character (see Chapter 4.2).

5.3.2. Object_Identifier

No specifications are made concerning the issuing of Object Identifiers.

5.3.3. Object_Name

The Object Name must be unique for all object types in the entire BACnet network.

All BACnet objects used must be labelled with the Object Name. Furthermore, it must be possible to use a labelling and addressing concept predefined by the project developer for the Object Name. No specifications are made concerning the issuing of an Object Name.

The minimum length of the character string of the Object Name property is defined in Table 6.

5.3.4. Units

Physical units are to be used in accordance with the BACnetEngineeringUnit data type defined in the Standard [1].

5.3.5. Notification_Class

The Notification Class is to be defined in accordance with the specifications in Chapter 6.2 for each object with intrinsic reporting.

5.3.6. Status Text (Active_Text / Inactive_Text / State_Text)

The status text describes the planned event which the status of the Present_Value of a binary input/value or multi-state input/value object should trigger. This will clarify the meaning of the planned event for the OWS operator.

Assigning a status text to the present value of a binary input/value and multi-state input/value object is to be defined in discussion with the project developer.

The minimum length of the character string of the Active Text, Inactive Text and State Text properties is defined in Table 6.

5.3.7. Event_Message_Texts[6]

A message text can been sent as an argument together with an event notification and will then be saved in the Event_Message_Text property. The Event_Message texts property therefore contains notification texts which are transferred at the last status transition of the respective event from TO-NORMAL, TO-OFFNORMAL and TO-FAULT. Using this

[6] Only available from version number 1 and revision number 11

notification text, it is possible to inform the OWS operator of the type and origin of an event.

If the project developer requests information on the event notification for TO-NORMAL, TO-OFFNORMAL and TO-FAULT, a message text for the respective events is to be defined.

The minimum length of the character string of the Event_Message_Texts property is defined in Table 6.

6. Using BACnet services

The following Chapter gives specifications on using BACnet services.

In principle, BACnet services are to be used in accordance with the Standard. Protocols which run over private[7] BACnet data channels may not be used.

6.1. BIBBs

The BIBBs predefined in Annex B must be supported at least for the respective specification profiles (see Chapter 5.1).

6.2. Notification Classes

Intrinsic reporting and algorithmic change reporting mechanisms are managed by Notification Class objects. The Notification Class of an event report allows it to be delivered to the recipient who is registered for this Notification Class in the Notification Class object. The control system must be able to process the list of recipients.

6.2.1. Event categories

Notification Classes are to be classified into event categories according to Table 7.

Event category	NC	Definition	Examples of use
Personal alarm (Life Safety)	NC1 NC2 NC3 NC4	Notification which concerns the safety of people and objects	- Emergency call - Accident - Fire alarm - Detection of carbon monoxide, explosives or poisonous gases - Medical emergencies
Object protection (Property Safety)	NC32 NC33 NC34 NC35	Technical notification with increased (e.g. more security relevant) effect and high response time specifications	- Important system failure - Risk of personal injury or damage to objects - Burglary
Technical Alarm (Supervisory)	NC64 NC65 NC66 NC67	Technical notification with increased effect	- Device overheating - Active fire control system - Frost protection - Load shedding
Technical fault (Trouble)	NC96 NC97 NC98 NC99	Technical notification with medium effect	- Engine fault - Communication fault - Excessive message exchange - Safety equipment fault
Maintenance reports (Miscellaneous Higher Priority Message Group)	NC128 NC129 NC130 NC131	Notifications which require urgent action	- Maintenance notification - Notification of unpleasant environmental conditions

[7] Standardised services replaced by proprietary services

Event category	NC	Definition	Examples of use
Revision notifications	NC160 NC161 NC162 NC163	Manually switching systems or components from normal status to revision in order to carry out maintenance or repairs.	- Revision / emergency use central ventilation
Trend Log Events	NC192 NC193	Notifications concerning the provision of measured values from Trend Log objects (e.g. "Trend Log Event threshold reached" or "Buffer ready")	- Trend Log Events
Operation and status notification (Miscellaneous Lower Priority Message Group)	NC224 NC225	Status and information notification	- Status notifications

Table 7: Event categories of the Notification Classes to be used

6.2.2. Predefined Notification Classes

Event notifications must be processed using the standardised BACnet mechanisms. Manufacturer-specific services or properties are not permitted.

Each automatic notification is assigned a numerical priority (Alarm and Event Priority Classification). Every event transition (TO-OFFNORMAL, TO-FAULT and TO-NORMAL) can be linked to its own individual priority.

Table 8 defines the specifications for the Notification Classes which result from the event classes. Among others, the description and priority interval for each Notification Class is given. Notification Class properties which are not defined here are either already predefined in the Standard [1] or are to be defined together with the project developer.

The priority number of the priority property which is to be assigned to a priority according to the interval listed in Table 8, is to be defined together with the project developer.

In addition to the predefined Notification Classes, the project developer is free to define their own Notification Classes or a detailed subdivision of the predefined Notification Classes, if necessary.

Property Identifier (Standard)	Property Datatype (Standard)	Field size / comments	NC1	NC2	NC3	NC4	NC32	NC33	NC34	NC35	NC64	NC65	NC66	NC67	NC96	NC97	NC98	NC99	NC128	NC129	NC130	NC131	NC160	NC161	NC162	NC163	NC192	NC193	NC224	NC225
Object_Identifier	BACnetObjectIdentifier	No specification																												
Object_Name	CharacterString	-																												
Object_Type	BACnetObjectType	Specified in the Standard																												
Description	CharacterString	-	Personal alarm				Object protection				Technical alarm				Technical fault				Maintenance notifications				Revision notifications				Trend Log Events		Operation and status notifications	
Notification_Class	Unsigned	-	1	2	3	4	32	33	34	35	64	65	66	67	96	97	98	99	128	129	130	131	160	161	162	163	192	193	224	225
Priority	BACnetARRAY[3] of Unsigned	TO-OFFNORMAL	1-7				32-39				64-71				96-103				128-135				160-167				192-199		224-231	
		TO-FAULT	1-7				32-39				64-71				96-103				128-135				160-167				192-199		224-231	
		TO-NORMAL	1-7				32-39				64-71				96-103				128-135				160-167				192-199		224-231	
Ack_Required[8]	BACnetEventTransitionBits[9]	TO-OFFNORMAL	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	0	0
		TO-FAULT	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	0	1
		TO-NORMAL	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0
Recipient_List	List of BACnetDestination	See Table 9																												
Profile_Name	CharacterString	The profile name can be used but not for the exchange of relevant information.																												

Table 8: Specifications for Notification Classes[10]

[8] Not to be confused with the Property ID Acked_Transitions
[9] 0 → FALSE, 1 → TRUE
[10] Fields which are not completed (crossed out) are to be defined in discussion with the project developer

Table 9 lists the values of the Property Recipient_List components to be used for all Notification Classes. The values for each Notification Class can be defined on an individual basis.

Parameter	Type	Description	Recommended values
Valid Days	BACnetDaysOfWeek	Days of the week on which the notification recipient should be notified.	TRUE, TRUE, TRUE, TRUE, TRUE, TRUE, TRUE
From Time, To Time	Time	Times during which the notification recipient should be notified.	00:00:00.00, 23:59:59.99
Recipient	BACnetRecipient[11]	Recipient	
Process Identifier	Unsigned32	Handling the process within the receiving device	
Issue Confirmed Notifications	Boolean	Validation bit	TRUE
Transitions	BACnetEventTransitionBits	Use of the recipient configuration for notification of TO-OFFNORMAL, TO-FAULT, TO-NORMAL	TRUE, TRUE, TRUE

Table 9: Values for defining the components of the Identifier Recipient_List property for all Notification Classes

Deviation from the values and fields which are not completed (crossed out) can only be defined in discussion with the project developer.

6.2.3. Assigning Notification Classes to individual BACnet objects

The assignment of Notification Classes to individual BACnet objects is to be defined in discussion with the project developer.

6.2.4. Event confirmation (Ack_Required)

The Ack_Required property decides whether events generated by TO-OFFNORMAL, TO-FAULT and TO-NORMAL must be confirmed. Table 8 defines common variants for confirming events for each event category (see Chapter 6.2.1).

In discussion with the project developer, the given Notification Classes are to be assigned to the individual BACnet objects. This is so that the classification class and the confirmation sample for the course of one or more events of the respective classification class correspond to the specifications of the affiliated BA function.

Coupling the local acknowledgement (confirmation of TO-OFFNORMAL and TO-FAULT) and event reset (confirmation of TO-NORMAL) with the Ack_Required property can also be actioned if requested by the project developer.

[11] According to [1], the BACnetRecipient data unit can defined by the BACnet ID (BACnetObjectIdentifier) or the address (BACnetAddress). It is recommended to use the BACnet ID.

6.2.5. Alarm notification deactivation

The Event_Detection_Enable property is to be used if intrinsic reporting is to be deactivated for individual objects.

The Event_Detection_Enable property is to be configured during engineering and not at runtime.

6.2.6. Alarm suppression

Alarm suppression is to be implemented using the Event_Algorithm_Inhibit and Reliability_Evaluation_Inhibit properties.

The activation of the Event_Algorithm_Inhibit property can take place at runtime and also on a temporary basis.

6.3. Priority control

6.3.1. BACnet prioritisation mechanism

An object for commanding systems can be used by a number of commanding applications. BACnet therefore specifies a mechanism for prioritising control commands.

Commanding BACnet objects are given commanding priorities. Applications with higher priorities can override those with lower priorities.

Every BACnet object which can be commanded by an application has a Priority Array and a value to be set (e.g. Present Value). The property to be set then accepts the value to be set in place of the Priority Array with the lowest number or highest priority. The entries in the Priority Array can either take the value NULL[12] or the values from the data type of the object's Present Value.

An application can notify a BACnet object of a control command by providing the BACnet object with the name of the property to be set (Commandable_Property), the value to be set (Desired Value) and the control priority (Priority). The value to be set is then written in place of the Priority Array which corresponds to the priority of the command.

If a control command is outdated, a command should be used to withdraw it (Relinquish Command). The Priority Array will then be written with a NULL value at the corresponding priority position.

Figure 4 illustrates the BACnet prioritisation mechanism using a binary output object.

[12] Not to be confused with the number "0"

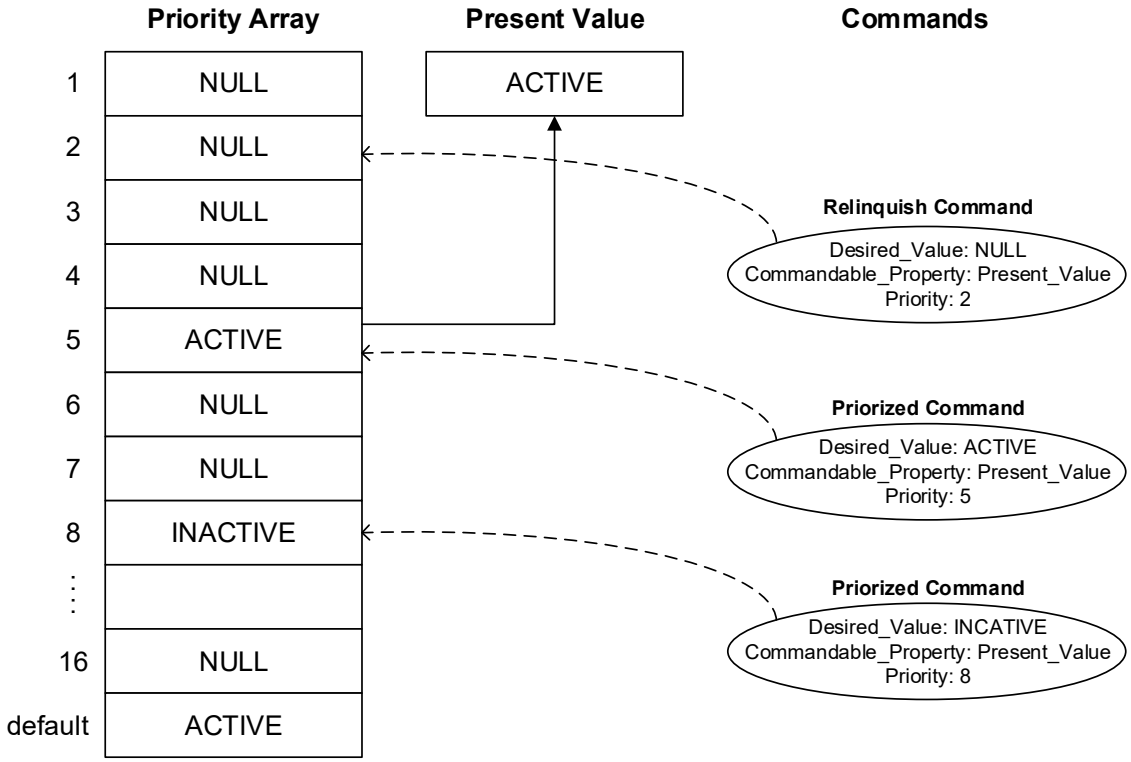


Figure 4: BACnet prioritisation mechanism using a binary output object

For physical output objects (BO, MO, AO) that fulfil security-related functions (e.g. frost), the use of the prioritisation mechanism using Priority Array is mandatory for the switching of control commands. For virtual switching objects (BV, MV, AV), it must also be agreed with the project developer for which objects the prioritisation mechanism using Priority Array should be used. However, it is recommended to use the prioritisation mechanism using Priority Array only in special, selected cases.

Furthermore, it must be defined by the project developer whether or not a Priority Array should also be used when target values are used. It is recommended that target values be used without Priority Arrays.

6.3.2. Priority list

Table 10 details the priorities to be used in priority control.

Priority	Standard (according to [1])	Recommendation	Description / example
1	Manual Life Safety	Manual Life Safety	e.g. key control for fire services
2	Automatic Life Safety	Automatic Life Safety	e.g. in the case of a fire alarm circuit/override by a fire emergency control
3	Available		
4	Available		
5	Critical Equipment Control	Critical Equipment Control	May only be used if the total losses to be avoided outweigh the possible device losses as the minimum on/off times are overridden. e.g. load shedding
6	Minimum On/Off	Minimum On/Off (cannot be written by external parties)	For minimum on/off times for devices which would otherwise suffer damage. e.g. chillers/heat pumps
7	Available	Manual from the system	Local operation of the entire system by a chosen user
8	Manual Operator	Manual from the OWS	Manual activation of an OWS user
9	Available		
10	Available		
11	Available		
12	Available	Central functions	e.g. lighting for cleaning
13	Available		
14	Available	Timers, central controls	To be used for BIBB scheduling / central timer programme
15	Available		
16	Available	Automatic operation control	Automatic operation control functions
-	Relinquish_Default	Relinquish_Default	Permanently integrated into the device during planning

Table 10: Priority control priority list

The priority of the commanding application that fulfils security-related functions (e.g. frost) is to be inherited by all aggregates (e.g. fans, valves, pumps).

Deviation from the recommendation is only permitted with the agreement of the property developer. Freely available priorities (crossed out field in Table 10) are only to be released for use in discussion with the property developer.

6.4. Confirmed / Unconfirmed

Depending on their type, BACnet services can be executed as confirmed or unconfirmed.

Table 11 provides the execution type specifications (confirmed/unconfirmed) for certain services. No execution type specifications are made for services not listed.

Service	Execution type	Description
Event and alarm services		
AcknowledgeAlarm	confirmed	A client confirms an alarm notification from the server
ConfirmedCOVNotification	confirmed	A server notifies a client about a change in the current value or status flag
ConfirmedEventNotification	confirmed	A server notifies a client about an alarm notification or event
GetAlarmSummary	confirmed	A client requests a list of pending alarm notifications
Remote device management services		
TimeSynchronisation	unconfirmed	Time synchronisation, within the same time zone, devices must adjust their internal clock accordingly
UTCTimeSynchronisation	unconfirmed	Time synchronisation, different time zones are supported, devices must adjust their internal clock accordingly
Who-Has	unconfirmed	Identifies the network addresses of the device which contains the required object
I-Have	unconfirmed	Positive reply to Who-Has, broadcast
Who-Is	unconfirmed	Identifies the network address and/or device object identifiers of devices in the network
I-AM	unconfirmed	Positive reply to Who-Is or when the device is started, broadcast

Table 11: Execution type specifications for BACnet services

6.5. Restricted use of services

The services listed in Table 12 are subject to their respective restrictions.

Service	Description	Restriction
DeviceCommunicationControl	The "DeviceCommunicationControl" service allows a BACnet device to be locked for all network traffic (except "DeviceCommunicationControl" and "ReinitializeDevice") and then released again.	The service is only to be initiated from devices with the OWS-CH profile (see Chapter 5.1).
ReinitializeDevice	The "ReinitializeDevice" service allows a BACnet client to restart a server (cold start), restore default settings (warm start) or execute a backup/restore procedure.	The service is only to be initiated from devices with the OWS-CH profile (see Chapter 5.1).
UTCTimeSynchronization	The "UTCTimeSynchronisation" service notifies the BACnet devices of the correct Universal Time Coordinated (UTC). This synchronises the time of the individual BACnet devices across the entire BACnet system.	The service is only to be performed by devices with the OWS-CH profile (see Chapter 5.1). It must be ensured that no devices with the AS-CH profile trigger "UTCTimeSynchronisation" as a broadcast and thereby influence other devices. Without a control level, a master is to be defined for the time synchronisation.

Table 12: Specifications for restricted use of services

Various manufacturers require a password to be defined for the "DeviceCommunicationControl" and "ReinitializeDevice" services. The project developer is responsible for defining how the password is to be used.

6.6. Recording data

6.6.1. Trend logs

Measured and actuating values, binary inputs, calculated set points and operation statuses (excluding alarm and fault values) are to be recorded with trend log objects. These can be recorded with either value change (COV/COS) or time-triggered.

The following is recommended for logging trends:

- In general, time-triggered trend logs are to be used.
- However, it is recommended to use COV/COS for switching statuses and measurement readings.

In addition, it is possible to log trends using triggers. However, this is not discussed here.

If the standard SIA 386.110 (EN15232/EN52120E) is applied, it is recommended to record all data points that have an influence on energy consumption. This is in order to be able to analyse any errors.

If data is recorded locally, Trend Log objects should generally be used. One exception is the recording of events, for which Event Log objects should be used (see Chapter 6.6.2).

If Trend Log objects are used, data on site within the BACnet devices (e.g. ASs) can be recorded. The data is available for transport at the client's request (e.g. OWS) and for analysis and long-term storage. This ability can be advantageous if no permanent network connection exists between the devices, e.g. in smaller properties with standalone BA solutions for remote monitoring. The temporary storage in the AS avoids unnecessary network loads.

The following properties are to be configured as default for Trend Log objects:

- Stop_When_Full: False

The Notification_Threshold property is to be configured so that the Buffer Ready event is triggered twice a day.

6.6.1.1. Time-triggered trend logs

For time-triggered trend logs, a trend log object is to be assigned to the measuring signal and actuator with polled reporting (Logging_Type = POLLED). If the project developer makes no specific specifications, a default of 15 minutes is to be used for time-triggered trend logs. Table 13 shows an example of use.

Value type		Unit	Log_Interval	
			Default values	Project developer's specific specifications[13]
Energy	Heat	kWh	15 min	
	Electrical	kWh	15 min	

Table 13: Example of interval periods for establishing a time-triggered Trend Log

In accordance with [1], it should be noted that the Property Log_Interval, the periodic log interval, is required to have a resolution (i.e. shortest possible log interval) of 1/100 second. Accordingly, the interval values are to be given to the nearest one-hundredth of a second.

A minimum retention time of 10 days for the recorded data is to be set up locally. Should a problem arise, this allows the comparison of logged data from an entire week plus three days from the previous week.

The logging of energy meters should be carried out synchronously across all automation stations. The "Align_Intervals" and "Interval_Offset" properties are to be set and applied accordingly.

6.6.1.2. COV Trend Logs

For COV Trend Logs, a Trend Log object is to be assigned to the measuring signal and actuator with COV reporting (Logging_Type = COV).

The business operator is responsible for the definition of the deviation values for COV Trend Logs. For each specific project, the values for each system are to be defined by the business operator in collaboration with the planner. The default values in Table 14 can be used as benchmark values.

[13] The log intervals are to be defined individually for each Trend Log object

Value type		Unit	Deviation	
			Default values	Project developer's specific specifications[14]
Temperature	Room temperature	K	+/- 0.2	
	Cooling systems	K	+/- 0.1	
Rel. humidity		%	+/- 2	
Control systems	Drives	%	+/- 2	
	Shut-off devices	%	+/- 2	
Electrical power		kW	+/- 1	
Air pressure		Pa	+/- 20	
Water pressure		bar	+/- 0.1	
Volume flow	Water	m^3/h	+/- 1	
	Air	m^3/h	*10% of the maximum value*	
Air quality (CO_2)		ppm	+/- 50	

Table 14: Deviations in individual value types for establishing a COV Trend Log

In principle, the deviation values for COV Trend Logs are to be defined so that they lie between the minimum 1% and the maximum 5% of the maximum value change.

A minimum retention time of 10 days for the recorded data is to be set up locally. Should a problem arise, this allows the comparison of logged data from an entire week plus three days from the previous week.

The COV_Increment setting values can be adopted as the basis for the Client_COV_Increment settings.

6.6.2. Event logs

If local event notifications are recorded, Event Log objects are to be used.

[14] The deviation values are to be defined individually for each Trend Log object

6.7. Time-dependent switching

6.7.1. Calendar Object

Date lists can be defined in various forms in a Calendar Object (individual days, time periods, recurring days) which generally represent public holidays or calendar events. If the current date matches a date on the list, the Present Value of the object is set to True.

Public holidays (e.g. Easter Monday, New Year's Day), holidays (e.g. spring holidays) and half days (e.g. half day before Good Friday) are each to be defined in separate calendars. Table 15 shows sample entries for the weekly schedule and the special schedule for a Schedule object.

Day	Time period	Recurring	Note
CAL 1 Calendar Object: public holidays			
02.04.2021			Easter Friday
05.04.2021			Easter Monday
13.05.2021			Ascension Thursday
24.05.2021			Whit Monday
		01.01.	New Year's Day
		01.05.	Labour Day
		01.08.	Swiss National Day
		25.12.	Christmas Day
		26.12.	Boxing Day
		31.12.	New Year's Eve (cantonal)
CAL 2 Calendar Object: holidays			
	10.04.2016 – 24.04.2016		Spring holidays
	10.07.2016 – 14.08.2016		Summer holidays
	02.10.2016 – 23.10.2016		Autumn holidays
	25.12.2016 – 08.01.2016		Christmas holidays
CAL 3 Calendar Object: half days preceding public holidays			
01.04.2021			Half day before Good Friday
12.05.2021			Half day before Ascension

Table 15: Calendar Objects for public holidays, holidays and half days with sample entries

Calendar entries are to be defined in discussion with the project developer.

6.7.2. Scheduler

Schedulers are to be mapped using Schedule objects. These define a periodical (weekly cycle) scheduler with a date range on which the scheduler repeats.

The following is to be considered when using the scheduler functions of the Schedule object:

- Schedule objects should work on the corresponding position of the Priority Array of the object to be controlled (Present_Value).
- The schedules are to be created or defined with as few entries as possible.
- Start times at 00:00 which do not have "NULL" as default value define the schedule for the entire day.
- The default value is to be set to "NULL" and all systems which are switched on are to be reset using "NULL".
- The object to be commanded is to be entered into the Schedule object.

In addition, special days on a standard schedule can also be defined in a Schedule object. The validity time/period of the exception (explicitly or by reference to a Calendar Object) and the special schedule valid for this time (in place of the weekly schedule) with the corresponding values are to be provided.

Table 16 shows sample entries for the weekly schedule and the special schedule for a Schedule object.

<table>
<tr><th colspan="10">SCHED Schedule object: Schedulers</th></tr>
<tr><td colspan="10">Weekly_Schedule</td></tr>
<tr><td colspan="2">Mon</td><td colspan="2">Tue</td><td>Wed</td><td>Thu</td><td>Fri</td><td>Sat</td><td colspan="2">Sun</td></tr>
<tr><td colspan="2">07:00
On</td><td colspan="2">07:00
On</td><td>07:00
On</td><td>07:00
On</td><td>07:00
On</td><td>00:00
Off</td><td colspan="2">00:00
Off</td></tr>
<tr><td colspan="2">16:30
Off</td><td colspan="2">16:30
Off</td><td>16:30
Off</td><td>16:30
Off</td><td>16:30
Off</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="10">Special schedule
(Exception_Schedule)</td></tr>
<tr><td colspan="4">Date</td><td rowspan="2">Time</td><td rowspan="2">Value</td><td colspan="2" rowspan="2">Event priority</td></tr>
<tr><td>Day</td><td>Time period</td><td>Recurring</td><td>Cal. obj.</td></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">2nd Saturday in the month</td><td rowspan="2"></td><td>05:00</td><td>On</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>12:00</td><td>Off</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">30.06.2016 - 03.07.2016</td><td rowspan="2"></td><td rowspan="2"></td><td>05:00</td><td>On</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>13:00</td><td>Off</td></tr>
<tr><td rowspan="2">05.03.2016</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td>17:00</td><td>On</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>21:00</td><td>Off</td></tr>
<tr><td></td><td></td><td></td><td>CAL 1</td><td>00:00</td><td>Off</td><td colspan="2">10</td></tr>
<tr><td></td><td></td><td></td><td>CAL 2</td><td>00:00</td><td>Off</td><td colspan="2">11</td></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">CAL 3</td><td>12:00</td><td>On</td><td colspan="2" rowspan="2">12</td></tr>
<tr><td>23:59</td><td>Off</td></tr>
</table>

Table 16: Schedule object with sample entries for the weekly schedule and the special schedule

The special schedule usually has priority over the weekly schedule. Furthermore, each entry in the special schedule is to be prioritised with an "Event_Priority" with a value between 1 and 16. If more than one entry compete, the entry with the lowest Event_Priority will be performed. The "event priority" has no direct link with the "write priority" of the Priority Array (see Chapter 6.3.2).

The Calendar Objects predefined in Chapter 6.7.1 are to be performed as a reference in the special schedule of the weekly schedule. The "event priorities" of the Calendar Objects are to be used according to Table 16. Any other entries in the special schedule are to be defined in discussion with the project developer.

All schedulers are to be defined in discussion with the project developer.

6.7.3. Specifications for referencing schedulers and synchronising Calendar Objects

Schedule objects with schedulers are to be defined at the corresponding system level in accordance with the specifications of the BA functions (see Chapter 7). Depending on the function of the Schedule object, it can control multiple systems (e.g. multiple doors on a building floor) or is only responsible for the time-dependent management of individual system components (e.g. fire damper). The object should be defined at the respective function level according to its function.

In addition to special schedules, schedulers also contain references to Calendar Objects. In order to ensure access to the referenced Calendar Objects even in the case of a network failure, at least the Calendar Objects predefined in Chapter 6.7.1 are to be created locally.

At the function level, for overarching system functions at least the Calendar Objects predefined in Chapter 6.7.1 are to be defined centrally and serve as master calendars for unidirectional synchronisation of all locally created slave calendars. This allows centrally defined calendar entries to be updated.

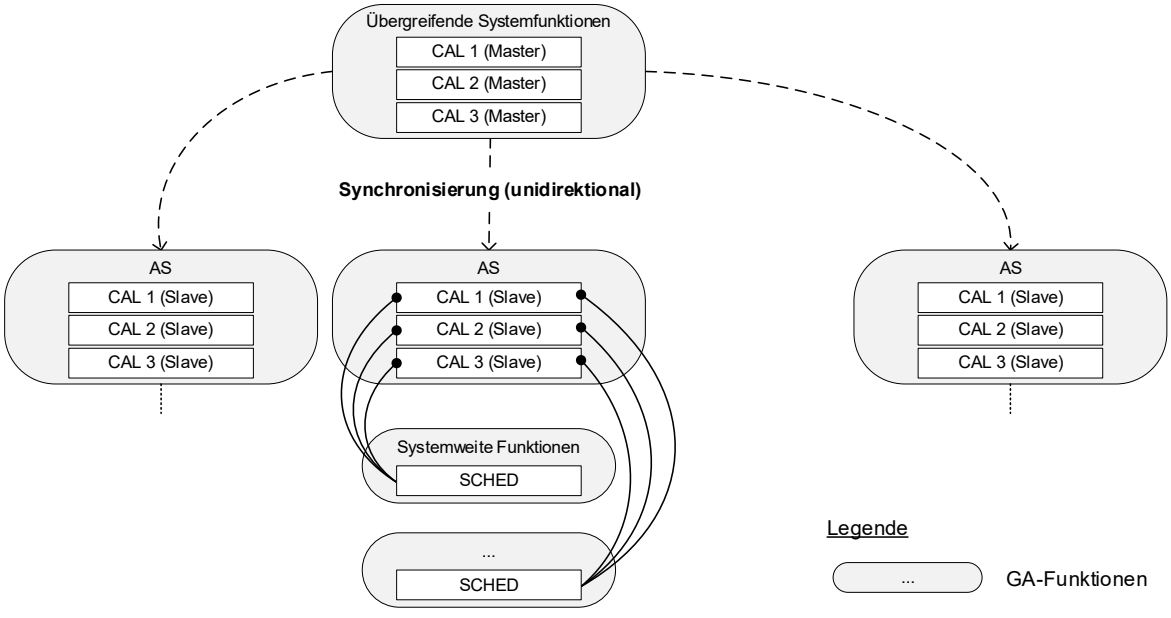


Figure 5: Synchronisation of calendar entries and referencing schedulers to Calendar Objects concept

7. BA functions

7.1. Concept of BA functions

In order to be able to clearly define the individual self-contained units of the BA, BA functions of system sections are assigned to BACnet objects and the BACnet interface of the BA function is thereby defined.

A BA function aligns itself to the respective level of the overall system according to its function. A combination of clearly defined BA functions at different levels allows a system's entire BACnet interface to be defined.

It is possible that certain functions are used for multiple systems or system sections. For instance, if an automation station is used to control multiple systems, the "AS" BA function is only to be used once per AS and makes functions available for multiple systems. Furthermore, BA functions (e.g. transmitter) can be used multiple times per system.

Figure 6 illustrates the concept for setting up BA functions using possible system structures.

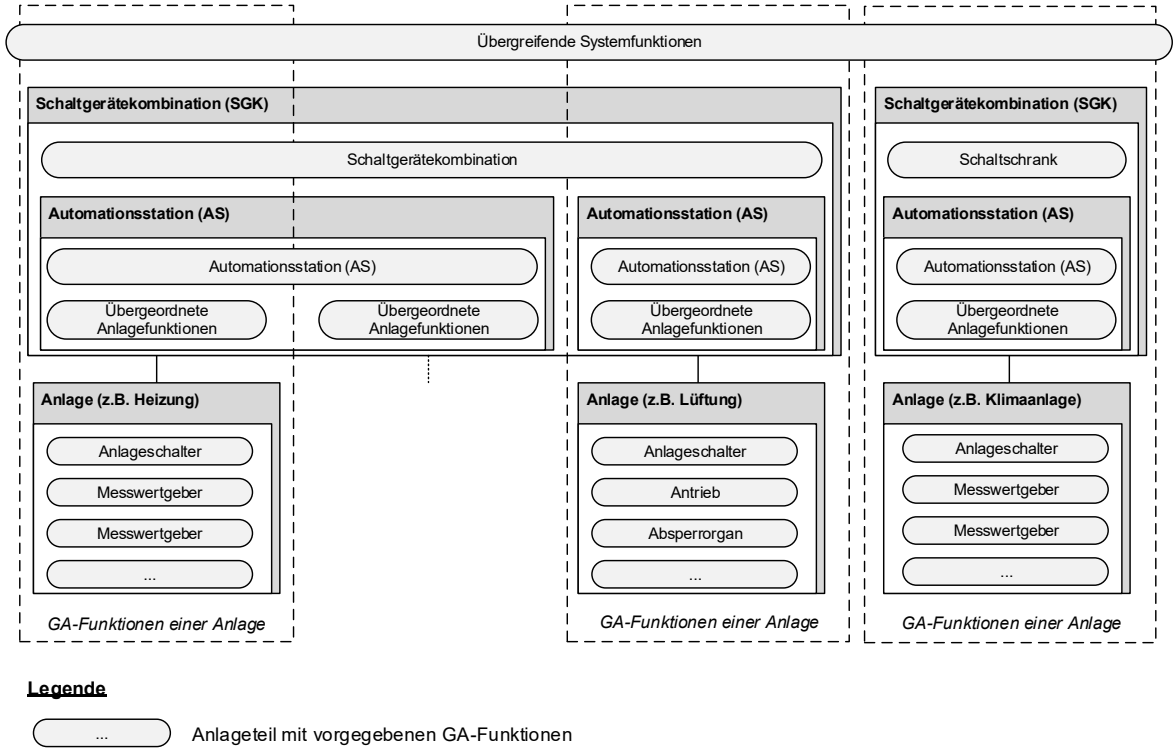


Figure 6: Concept for setting up a system with possible BA functions

The system sections with assigned BA functions predefined in this Chapter form the basis for creating a system-specific BACnet interface. The system sections are general in nature and can be adapted to the specific system components in accordance with the defined specifications. For instance, the engine system section can be used for a system's pump. Depending on the pump's function range, the BA functions assigned to the system section are to be used.

7.2. BACnet recommendations relating to BA functions

This Chapter defines the BACnet recommendations relating to the BA functions of a BACnet system. As a BACnet object can undertake multiple functions, recommendations are sometimes also defined for one or more properties of a BACnet object. This means the BA function will be more comprehensive.

In addition to the mandatory BACnet objects of a BA function, a project developer should also require the use of their own specific BACnet objects which contribute to an enhanced function of the BA function. The following key explains how the use of objects can be predefined.

Key:

Symbol	Definition
■	Mandatory use
□	Use according to property developer

The assignment of GA functions to individual BACnet objects can be seen in the following table.

System section	BA function	☑	BACnet object			Notes
			Type	Property	Value	
Overarching system functions						
Overarching system functions	Calendar public holidays	■	CAL	-	-	According to Chapter time-dependent switching
	Calendar holidays	■	CAL	-	-	According to Chapter time-dependent switching
	Half days preceding public holidays	■	CAL	-	-	According to Chapter time-dependent switching
Switchgear and controlgear assembly (SGK)						
Switchgear and controlgear assembly (SGK)	Load-break switch	☐	BI	Present_Value	Off → INACTIVE On → ACTIVE	Main switch of the SGK
				Alarm_Value	INACTIVE	
	Fault-current circuit breaker	☐	BI	Present_Value	Normal → ACTIVE Triggered → INACTIVE	
				Alarm_Value	INACTIVE	
	Voltage control	☐	BI	Present_Value	Normal → ACTIVE Triggered → INACTIVE	
				Alarm_Value	INACTIVE	
	Surge protector	☐	BI	Present_Value	Normal → ACTIVE Triggered → INACTIVE	
				Alarm_Value	INACTIVE	
	Circuit breaker	☐	BI	Present_Value	Normal → ACTIVE Triggered → INACTIVE	
				Alarm_Value	INACTIVE	
	Alarm suppression	☐	BI	Present_Value	Inactive → INACTIVE Active → ACTIVE	
				Alarm_Value	ACTIVE	
	Alarm suppression signalling	☐	BO	Present_Value	Off → INACTIVE On → ACTIVE	
	Collective alarm confirmation	☐	BI	Present_Value	Inactive → INACTIVE Active → ACTIVE	
				Alarm_Value	ACTIVE	
	Collective alarm signalling	☐	BO	Present_Value	Off → INACTIVE On → ACTIVE	
	Fire alarm	☐	BI	Present_Value	Normal → ACTIVE Fire → INACTIVE	
				Alarm_Value	INACTIVE	
	Fire alarm confirmation	☐	BI	Present_Value	Inactive → INACTIVE Active → ACTIVE	
				Alarm_Value	ACTIVE	

System section	BA function	☑	BACnet object			Notes
			Type	Property	Value	
Switchgear and controlgear assembly (SGK)	Fire alarm signalling	☐	BO	Present_Value	Off → INACTIVE On → ACTIVE	
	Local operation	☐	BI	Present_Value	Manual → INACTIVE Normal → ACTIVE	
				Alarm_Value	INACTIVE	
	Local operation signalling	☐	BO	Present_Value	Off → INACTIVE On → ACTIVE	
	Monitoring 24 V DC	☐	BI	Present_Value	Normal → ACTIVE Triggered → INACTIVE	
				Alarm_Value	INACTIVE	
Automation station (AS)						
Automation station (AS)	Device object	■	DEV	-	-	
	Calendar public holidays	■	CAL	-	-	According to Chapter time-dependent switching
	Calendar holidays	■	CAL	-	-	According to Chapter time-dependent switching
	Half days preceding public holidays	■	CAL	-	-	According to Chapter time-dependent switching
	Recording of all internal device events	☐	ELOG	-	-	Can be used more than once
	Security alarm	☐	NC	Notification_Class	1	
		☐	NC	Notification_Class	2	
		☐	NC	Notification_Class	3	
		☐	NC	Notification_Class	4	
	Object protection	☐	NC	Notification_Class	32	
		☐	NC	Notification_Class	33	
		☐	NC	Notification_Class	34	
		☐	NC	Notification_Class	35	
	Technical alarm	☐	NC	Notification_Class	64	
		☐	NC	Notification_Class	65	
		☐	NC	Notification_Class	66	
		☐	NC	Notification_Class	67	
	Technical fault	☐	NC	Notification_Class	96	
		☐	NC	Notification_Class	97	
		☐	NC	Notification_Class	98	
		☐	NC	Notification_Class	99	

System section	BA function	☑	BACnet object			Notes
			Type	Property	Value	
Automation station (AS)	Preventive maintenance notifications	☐	NC	Notification_Class	128	
		☐	NC	Notification_Class	129	
		☐	NC	Notification_Class	130	
		☐	NC	Notification_Class	131	
	Revision notifications	☐	NC	Notification_Class	160	
		☐	NC	Notification_Class	161	
		☐	NC	Notification_Class	162	
		☐	NC	Notification_Class	163	
	Trend Log Events	☐	NC	Notification_Class	192	
		☐	NC	Notification_Class	193	
	Operation or status notification	☐	NC	Notification_Class	224	
		☐	NC	Notification_Class	225	
	CPU	☐	BV	Present_Value	Normal → INACTIVE Error → ACTIVE	Problems with the CPU (e.g. overload) are reported
				Alarm_Value	ACTIVE	
	Monitoring program	☐	PROG	Program_State	-	
	Battery	☐	BV	Present_Value	Normal → INACTIVE Error → ACTIVE	
				Alarm_Value	ACTIVE	
	I/O module	☐	BV	Present_Value	Normal → INACTIVE Error → ACTIVE	
				Alarm_Value	ACTIVE	
	Manual intervention I/O module	☐	BV	Present_Value	Normal → INACTIVE Manual → ACTIVE	
				Alarm_Value	ACTIVE	
	Watchdog/heartbeat	☐	BV	Present_Value	Off → INACTIVE On → ACTIVE	Monitoring by the control system through cyclical status changes, not subject to confirmation
				Alarm_Value	ACTIVE	
				Notification_Class	224	
	BACnet stack	☐	BV	Present_Value	Normal → INACTIVE Error → ACTIVE	
				Alarm_Value	ACTIVE	

System section	BA function	☑	BACnet object			Notes
			Type	Property	Value	
Overarching system functions	Collective notification for object protection	☐	BV	Present_Value	Normal → INACTIVE Triggered → ACTIVE	
				Alarm_Value	ACTIVE	
	Collective notification technical alarm	☐	BV	Present_Value	Normal → INACTIVE Triggered → ACTIVE	
				Alarm_Value	ACTIVE	
	Collective alarm technical fault	☐	BV	Present_Value	Normal → INACTIVE Triggered → ACTIVE	
				Alarm_Value	ACTIVE	
	Collective notification maintenance notifications	☐	BV	Present_Value	Normal → INACTIVE Triggered → ACTIVE	
				Alarm_Value	ACTIVE	
	Local operation	☐	BI	Present_Value	Manual → INACTIVE Normal → ACTIVE	
				Alarm_Value	INACTIVE	
	Alarm suppression	☐	BV	Present_Value	Inactive → INACTIVE Active → ACTIVE	
				Alarm_Value	ACTIVE	
	Operation signalling	☐	BO	Present_Value	Off → INACTIVE On → ACTIVE	
	Collective alarm signalling	☐	BO	Present_Value	Off → INACTIVE On → ACTIVE	
	Local operation signalling	☐	BO	Present_Value	Off → INACTIVE On → ACTIVE	
	Timer switch	☐	SC	-	-	

System section	BA function	☑	BACnet object			Notes
			Type	Property	Value	
System						
1-level system switch	Operation selection	■	MV	Present_Value	Off → 1 On → 2	Auto → NULL on the corresponding level of the Priority Array
				Number_Of_States	2	
	Local operation selection	■	MI	Present_Value	Auto → 1 Off → 2 On → 3	
				Number_Of_States	3	
	Manual operation/not auto	□	BV	Present_Value	Auto → INACTIVE Manual → ACTIVE	
				Alarm_Value	ACTIVE	Message manual operation to OWS
	Timer switch	■	SC	-	-	
2-level system switch	Operation selection	■	MV	Present_Value	Off → 1 Level 1 → 2 Level 2 → 3	Auto → NULL on the corresponding level of the Priority Array
				Number_Of_States	3	
	Local operation selection	■	MI	Present_Value	Auto → 1 Off → 2 Level 1 → 3 Level 2 → 4	
				Number_Of_States	4	
	Manual operation/not AUTO	□	BV	Present_Value	Auto → INACTIVE Manual → ACTIVE	
				Alarm_Value	ACTIVE	Message manual operation to OWS
	Timer switch	■	SC	-	-	
N-level system switch	Operation selection	■	MV	Present_Value	Off → 1 Level 1 → 2 Level 2 → 3 etc.	Auto → NULL on the corresponding level of the Priority Array
				Number_Of_States	N+1	
	Local operation selection	■	MI	Present_Value	Auto → 1 Off → 2 Level 1 → 3 Level 2 → 4 etc.	
				Number_Of_States	N+2	
	Manual operation/not AUTO	□	BV	Present_Value	AUTO → INACTIVE MANUAL → ACTIVE	
				Alarm_Value	ACTIVE	Message manual operation to OWS
	Timer switch	■	SC	-	-	

System section	BA function	☑	BACnet object			Notes
			Type	Property	Value	
1-level drive	Switching command	■	BO	Present_Value	Off → INACTIVE On → ACTIVE	
				Feedback_Value		Operational feedback
				Elapsed_Active_Time	-	Operating time Reset to zero after maintenance
	Recording of operational feedback	☐	TL	-	-	
	Maintenance notification	☐	EE	Object_Property_Reference	-	Reference to Elapsed_Active_Time of the switching command
				Event_Parameters		pHighLimit defines the maintenance interval
				Event_Type	UNSIGNED_ OUT_OF_RANGE	
	Total aggregate operating time	☐	PIV	Present_Value	-	Running sum of the Elapsed_Active_Time Is not reset after maintenance
	Manual operation/not AUTO	☐	BV	Present_Value	Auto → INACTIVE Manual → ACTIVE	
				Alarm_Value	ACTIVE	
	Revision switch	☐	BI	Present_Value	Maintenance → INACTIVE Normal → ACTIVE	
				Alarm_Value	INACTIVE	
	Drive fault	☐	BV	Present_Value	Normal → INACTIVE Triggered → ACTIVE	
				Alarm_Value	ACTIVE	

System section	BA function	☑	BACnet object			Notes
			Type	Property	Value	
2-level drive	Switching command level 1	■	BO	Present_Value	Off → INACTIVE On → ACTIVE	
				Feedback_Value		Operational feedback level 1
				Elapsed_Active_Time	-	Operating time level 1 Reset to zero after maintenance
	Recording of operational feedback level 1	☐	TL	-	-	
	Maintenance notification level 1	☐	EE	Object_Property_Reference	-	Reference to Elapsed_Active_Time of the switching command
				Event_Parameters		pHighLimit defines the maintenance interval
				Event_Type	UNSIGNED_ OUT_OF_RANGE	
	Operating time level 1	☐	PIV	Present_Value	-	Reference to Elapsed_Active_Time of the switching command level 1
	Switching command level 2	■	BO	Present_Value	Off → INACTIVE On → ACTIVE	
				Feedback_Value		Operational feedback level 2
				Elapsed_Active_Time	-	Operating time level 2 Reset to zero after maintenance
	Recording of operational feedback level 2	☐	TL	-	-	
	Maintenance notification level 2	☐	EE	Object_Property_Reference	-	Reference to Elapsed_Active_Time of the switching command
				Event_Parameters		pHighLimit defines the maintenance interval
				Event_Type	UNSIGNED_ OUT_OF_RANGE	
	Operating time level 2	☐	PIV	Present_Value	-	Reference to Elapsed_Active_Time of the switching command level 2
	Total aggregate operating time	☐	PIV	Present_Value	-	Running sum of the Elapsed_Active_Time total Is not reset after maintenance
	Manual operation/not AUTO	☐	BV	Present_Value	Auto → INACTIVE Manual → ACTIVE	
				Alarm_Value	ACTIVE	

System section	BA function	☑	BACnet object			Notes
			Type	Property	Value	
2-level drive	Revision switch	☐	BI	Present_Value	Maintenance → INACTIVE Normal → ACTIVE	
				Alarm_Value	INACTIVE	
	Drive fault	☐	BV	Present_Value	Normal → INACTIVE Triggered → ACTIVE	
				Alarm_Value	ACTIVE	
Continuous drive	Switching command	■	BO	Present_Value	Off → INACTIVE On → ACTIVE	
				Feedback_Value		Operational feedback
				Elapsed_Active_Time	-	Operating time Reset to zero after maintenance
	Recording of operational feedback	☐	TL	-	-	
	Maintenance notification	☐	EE	Object_Property_Reference	-	Reference to Elapsed_Active_Time of the switching command
				Event_Parameters		pHighLimit defines the maintenance interval
				Event_Type	UNSIGNED_ OUT_OF_RANGE	
	Total aggregate operating time	☐	PIV	Present_Value	-	Running sum of the Elapsed_Active_Time Is not reset after maintenance
	Manual operation/not AUTO	☐	BV	Present_Value	Auto → INACTIVE Manual → ACTIVE	
				Alarm_Value	ACTIVE	
	Revision switch	☐	BI	Present_Value	Maintenance → INACTIVE Normal → ACTIVE	
				Alarm_Value	INACTIVE	
	Set point setting	■	AO	Present_Value	-	
	Recording of set point setting	☐	TL	-	-	
	Actual value	☐	AI	Present_Value	-	
	Recording of actual value	☐	TL	-	-	
	Run monitoring	☐	BI	Present_Value	Normal → INACTIVE Triggered → ACTIVE	
				Alarm_Value	ACTIVE	
	Drive fault	☐	BV	Present_Value	Normal → INACTIVE Triggered → ACTIVE	
				Alarm_Value	ACTIVE	

System section	BA function	☑	BACnet object			Notes
			Type	Property	Value	
2-point shut-off/actuator	Actuating value	■	BO	Present_Value	Closed → INACTIVE Open → ACTIVE	
	Recording of actuating value	☐	TL	-	-	
	Position feedback CLOSED	☐	BI	Present_Value	Inactive → INACTIVE Closed → ACTIVE	
				Alarm_Value	ACTIVE	
	Position feedback OPEN	☐	BI	Present_Value	Inactive → INACTIVE Open → ACTIVE	
				Alarm_Value	ACTIVE	
	Fault shut-off/actuator	☐	BV	Present_Value	Normal → INACTIVE Fault → ACTIVE	
				Alarm_Value	ACTIVE	
Shut-off/actuator, continuous	Actuating value	■	AO	Present_Value	-	
	Actuating feedback	☐	AI	Present_Value	-	
	Recording of actuating value	☐	TL	-	-	
	Position feedback CLOSED	☐	BI	Present_Value	Inactive → INACTIVE Closed → ACTIVE	
				Alarm_Value	ACTIVE	
	Position feedback OPEN	☐	BI	Present_Value	Inactive → INACTIVE Open → ACTIVE	
				Alarm_Value	ACTIVE	
	Fault shut-off/actuator	☐	BV	Present_Value	Normal → INACTIVE Fault → ACTIVE	
				Alarm_Value	ACTIVE	
3-point shut-off/actuator, continuous	Actuating value CLOSED	■	BO	Present_Value	Inactive → INACTIVE Closed → ACTIVE	
	Actuating value OPEN	■	BO	Present_Value	Inactive → INACTIVE Open → ACTIVE	
	Actuating feedback	☐	AI	Present_Value	-	
	Recording of actuating value	☐	TL	-	-	
	Position feedback CLOSED	☐	BI	Present_Value	Inactive → INACTIVE Closed → ACTIVE	
				Alarm_Value	ACTIVE	
	Position feedback OPEN	☐	BI	Present_Value	Inactive → INACTIVE Open → ACTIVE	
				Alarm_Value	ACTIVE	
	Fault shut-off/actuator	☐	BV	Present_Value	Normal → INACTIVE Fault → ACTIVE	
				Alarm_Value	ACTIVE	

System section	BA function	☑	BACnet object			Notes
			Type	Property	Value	
Continuous transmitter	Actual value	■	AI	Present_Value	-	
				High_Limit	-	Upper limit value for the detection of an excess of operational specifications (main alarm) To disable the property, use the Event_Enable property.
				Low_Limit	-	Lower limit value for the detection of an underrun of operational specifications (main alarm) To disable the property, use the Event_Enable property.
				Max_Present_Value	-	Maximum value of the measurement range for detecting a fault in the transmitter
				Min_Present_Value	-	Minimum value of the measurement range for detecting a fault in the transmitter
	Pre-alarm	☐	EE	Object_Property_Reference	-	Reference to Present_Value of the actual value
				Event_Type	OUT_OF_RANGE	
	Recording of actual value	☐	TL	-	-	
Binary transmitter/monitor	Actual value	■	BI	Present_Value	Normal → INACTIVE Triggered → ACTIVE	
				Alarm_Value	ACTIVE	
	Recording of actual value	☐	TL			
	Fault transmitter/monitor	☐	BV	Present_Value	Normal → INACTIVE Fault → ACTIVE	
				Alarm_Value	ACTIVE	
Control	PI/PID control	■	LP	Setpoint	-	Target value
				Controlled_Variable_Value	-	Actual value
				Error_Limit	-	Value limit for the detection of an excess of control engineering specifications
	Recording of set point	☐	TL	-	-	

System section	BA function	☑	BACnet object			Notes
			Type	Property	Value	
Counter/measurement	Count/measurement value	■	AV	Present_Value	-	
	Counter fault/measurement	☐	BV	Present_Value	Normal → INACTIVE Fault → ACTIVE	
				Alarm_Value	ACTIVE	
	Recording of count/measurement value	☐	TL	-	-	
Parameters	Analogue parameters	☐	AV	-	-	e.g. for setting or monitoring heating curves or offset for consumption groups Can be used several times
	Binary parameters	☐	BV	-	-	e.g. for setting or monitoring system-wide states Can be used several times
	Multi-state parameters	☐	MV	-	-	e.g. for setting or monitoring system-wide states Can be used several times

7.3. Supplementary information on the defined BA functions

Additional information on the BA functions defined in Chapter 7.2 is described here.

Not every BA function is addressed.

7.3.1. System switch

The operation selection of a system is determined by the Priority Array of a multi-state value object. The different control components describe the respective position (see Chapter 6.3.2) of the Priority Array. The operating mode of the system is determined according to the priority mechanism prescribed by BACnet (see Chapter6.3.1). The entries of the Priority Array are defined as follows:

- NULL: Operation selection "Auto" of the controlling application (Relinquish command)
- State 1: Operation selection "Off" of the controlling application
- State 2: Operation selection "On/Level 1" of the controlling application
- State 3: Operation selection "Level 2" of the controlling application [15]
- etc.

The physical switches "Auto" and "On"/"Level N" of the operation selection "local" are to be mapped by a multi-state input object whose present value represents the state of the operation selection locally. The present value of the local operation selection takes the corresponding value for the "Off" state if all physical switches except "Off" (i.e. "Auto", "On"/"Level N" etc.) are inactive. The value of the present value is defined as follows:

- State 1: Operation selection "Auto" of the controlling application
- State 2: Operation selection "Off" of the controlling application
- State 3: Operation selection "On/Level 1" of the controlling application
- State 4: Operation selection "Level 2" of the controlling application [16]
- etc.

Optionally, a binary value object can be used to notify manual operation. If the operation selection is determined by a user's manual intervention, the present value of the object takes on the ACTIVE state.

The functional relationship of the BA functions of the 1-level system switch is shown in Figure 7.

The functional relationship of the BA functions of the N-level system switch is shown in Figure 8.

[15] Only with the system switch when there is more than one level available
[16] Only with the system switch when there is more than one level available

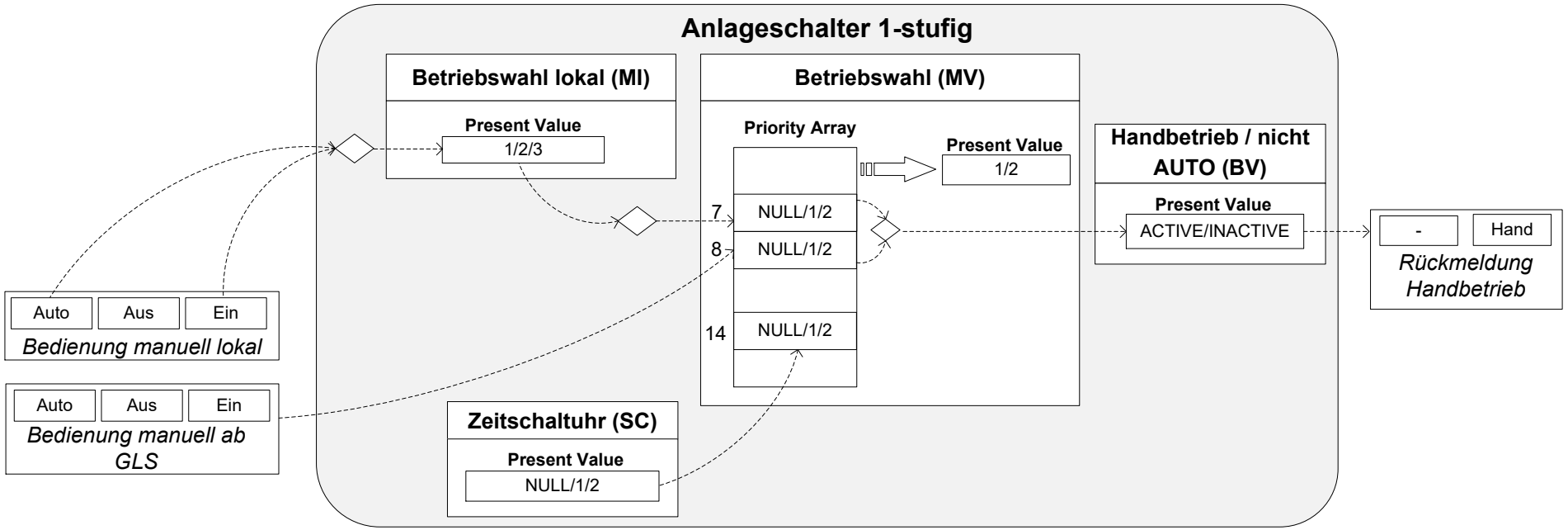


Figure 7: The functional relationship of the BA functions of the 1-level system switch

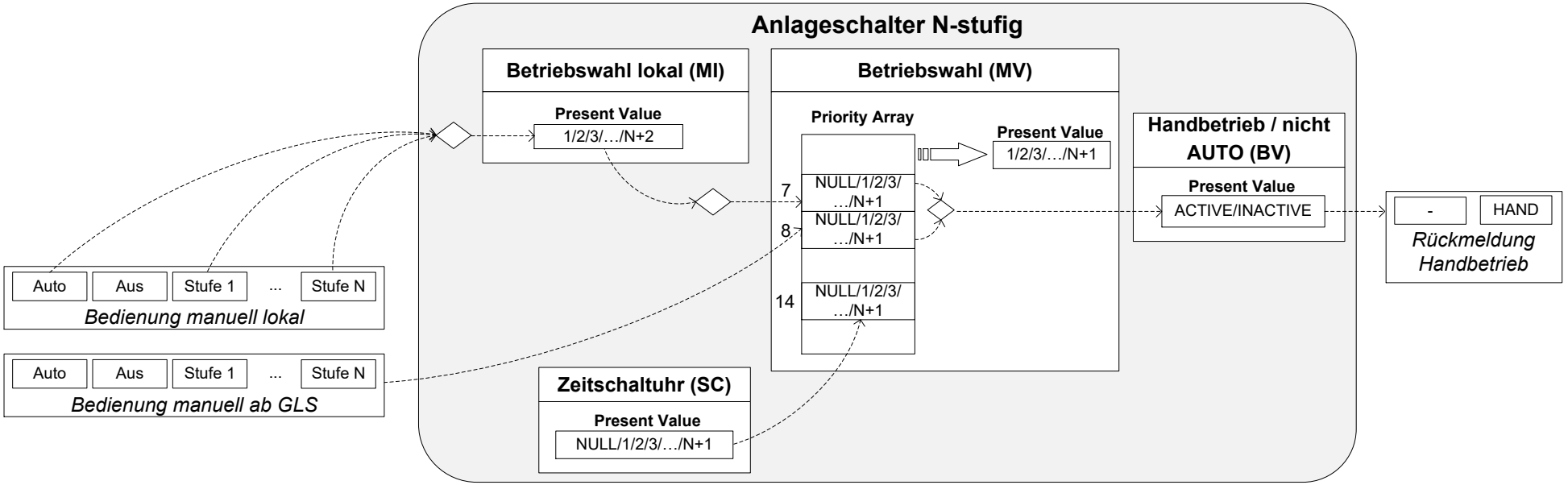


Figure 8: The functional relationship of the BA functions of the N-level system switch

7.3.2. Drive

The BA drive function (1-level, 2-level, continuous) can be used, for example, for motors, pumps, etc.

The Present_Value of a binary output object is to be used as switching command for each level of the drive. For the same binary output object, the Feedback_Value object is used for monitoring the operational feedback of the drive and the Elapsed_Active_Time object for the operating time of the respective level. These operating hours are reset after the drive has been replaced.

With a separate Positive Integer Value object, the total operating hours of the aggregate can be recorded as an option. This recorded operating time is not reset after replacement of a drive.

Notifications for the repair of a part can be triggered with an event enrolment object. In the case of a 2-level drive, two event enrolment objects are used to trigger notifications for maintenance per level. The property of the Event Enrolment object references the Elapsed_Active_Time property of the operational feedback for the respective level. UNSIGNED_OUT_OF_RANGE is to be used as the Event_Type, since the data type of the Elapsed_Active_Time is an Unsigned32 and thus no data type conversion is necessary.

The correct functioning of a drive can also be monitored with the BA function run monitoring.

The functional relationship of the 1-level BA functions of the drive is shown in Figure 9.

The functional relationship of the 2-level BA functions of the drive is shown in Figure 10.

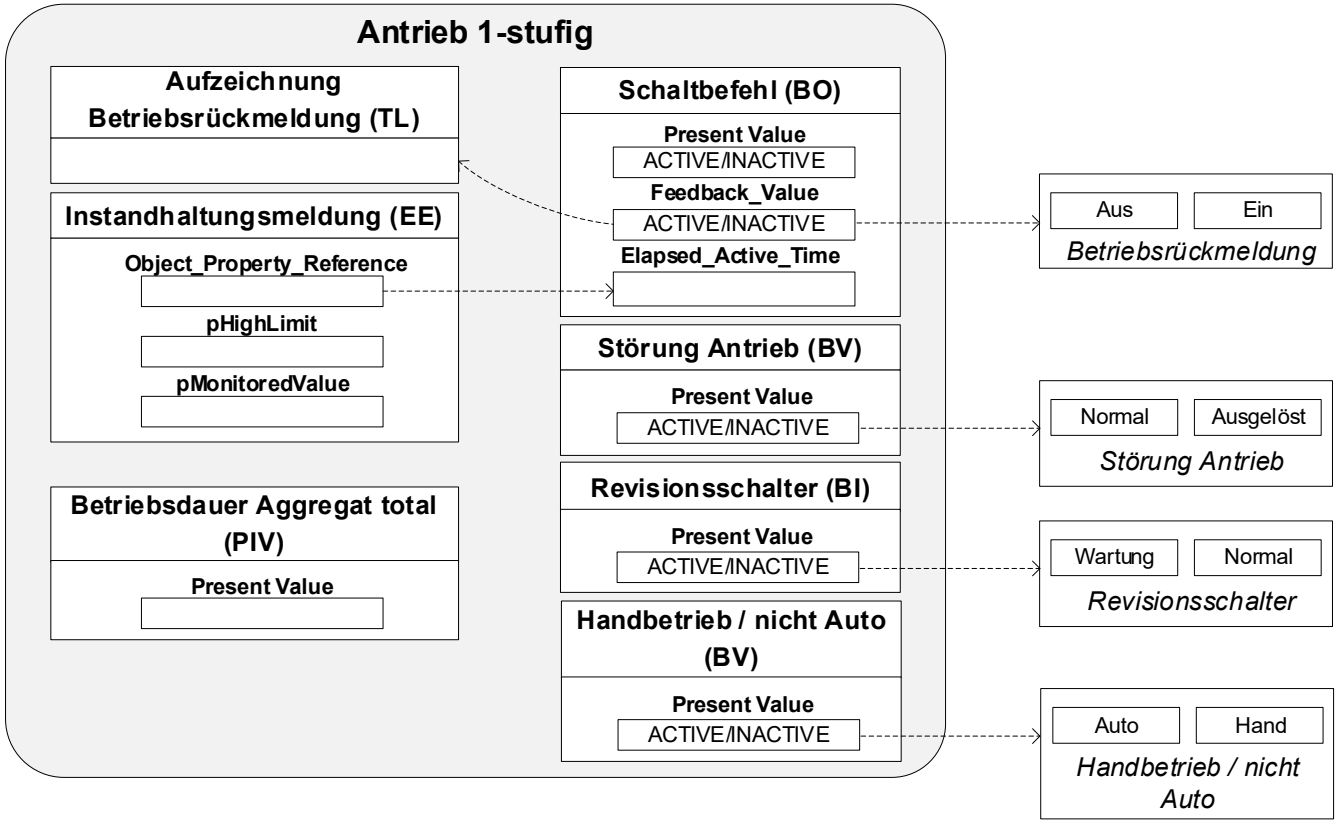


Figure 9: The functional relationship of the BA functions of the 1-level drive

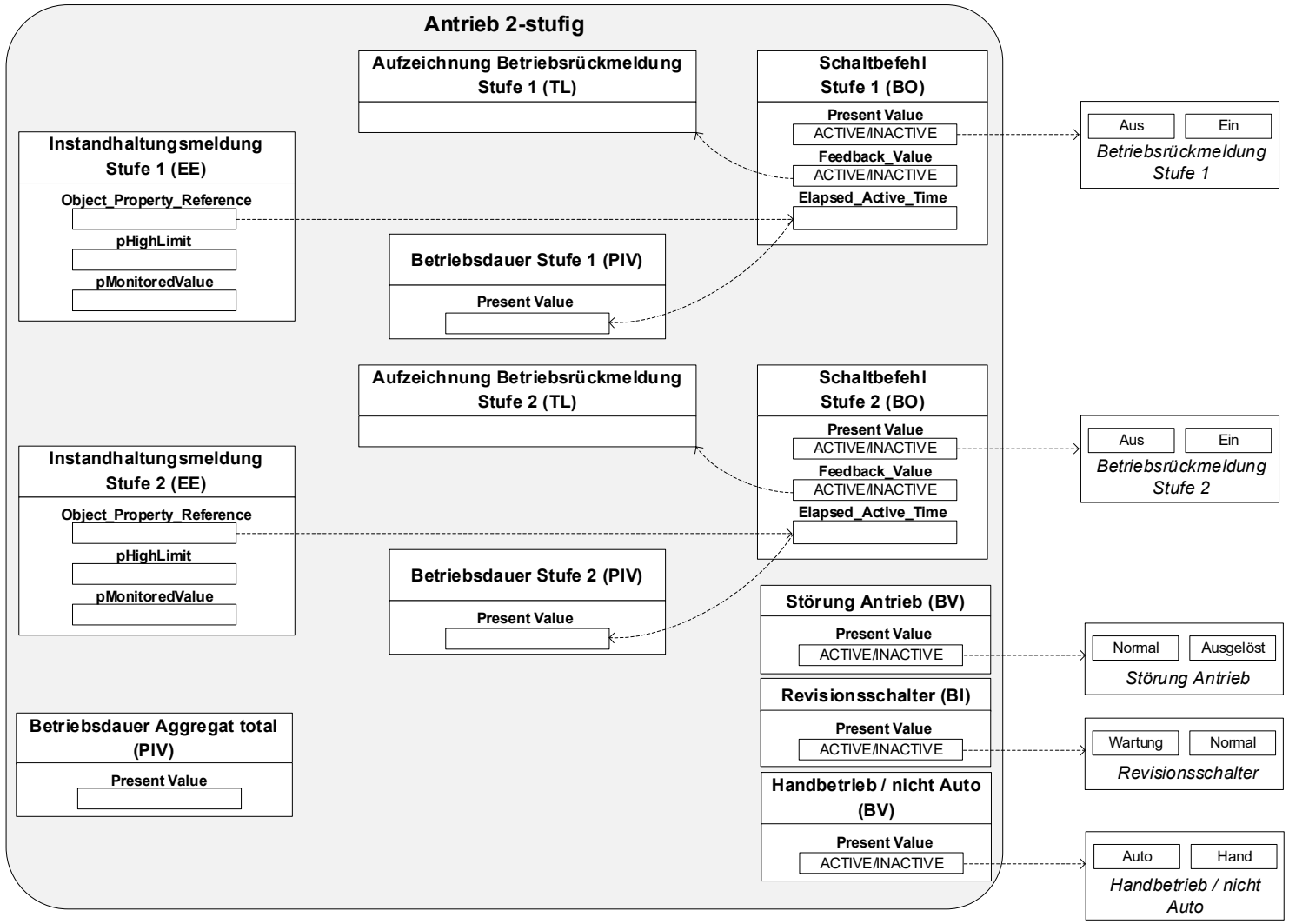


Figure 10: The functional relationship of the BA functions of the 2-level drive

7.3.3. Shut-off/actuator

The BA shut-off/actuator function (2-point, 3-point continuous, continuous) can be used, for example, for dampers, pumps, etc.

A binary output object must be used for the actuating value of the shut-off/actuator.

If a position feedback is used, a separate binary input object must be used for each state ("closed", "open").

The functional relationship of the BA functions of the 2-point shut-off/actuator is shown in Figure 11.

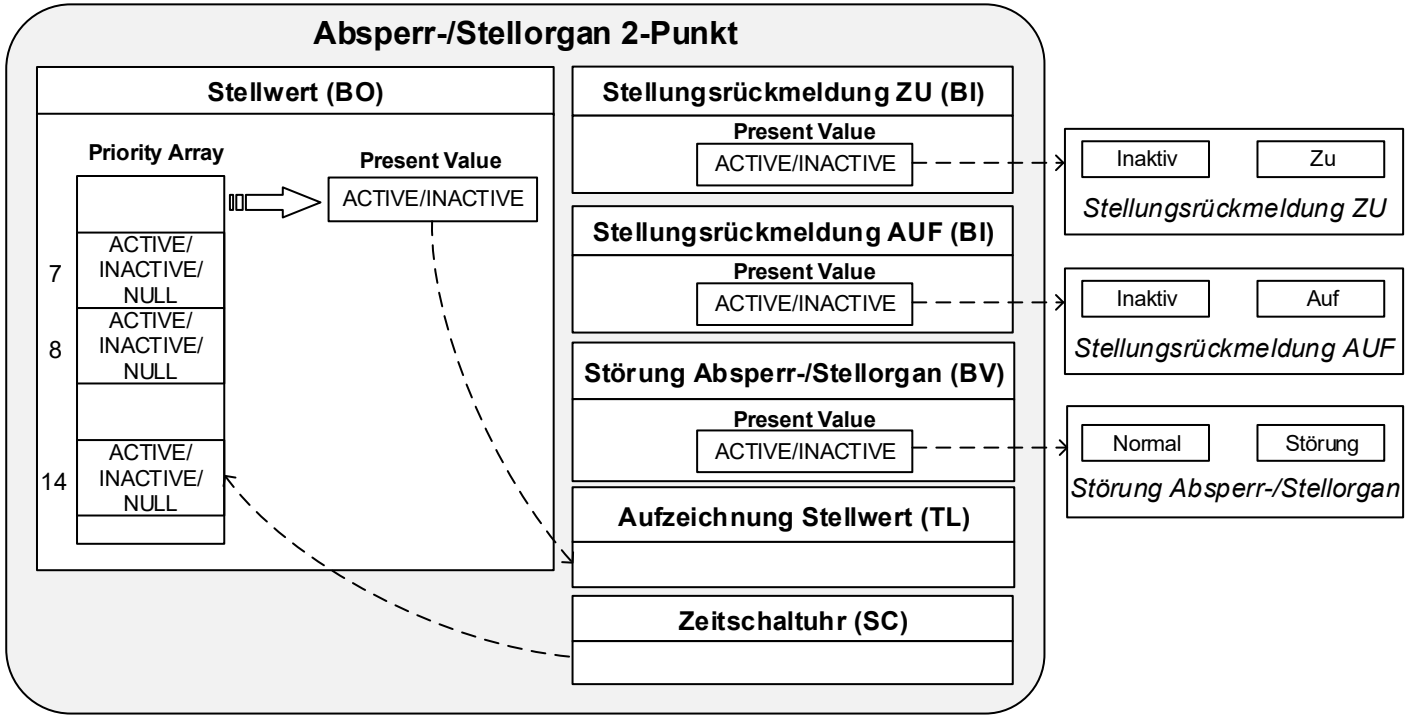


Figure 11: The functional relationship of the BA functions of the 2-point shut-off/actuator

8. BACnet networks

Different network cards can be used for data transport based on BACnet. BACnet also offers the possibility of linking different types of network cards.

8.1. Network structure

The BACnet network structure is to be created in consultation with the project developer.

8.2. Ethernet MAC address

The ethernet MAC addresses of the devices used in the BACnet network must be disclosed to the project developer.

8.3. Transmission technology

BACnet defines a simplified form of the OSI model, which consists only of the application layer, the network layer, the data link layer and the physical layer. For the physical and data link layers, BACnet offers a selection of different technologies that can be used.

Figure 12 illustrates the simplified BACnet architecture.

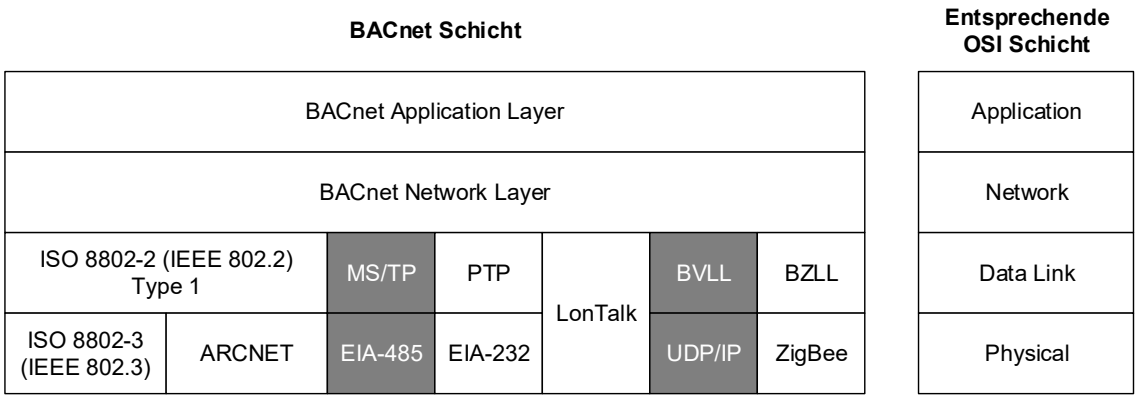


Figure 12: Simplified BACnet architecture (according to [1])

Only the following technologies may be used for the physical and data link OIS layers (shaded grey in Figure 12):

- EIA-485 with MS/TP
- BVLL with UDP/IP

The use of the corresponding technologies must also be defined in consultation with the project developer.

8.3.1. BACnet IP

Normally the BACnet devices used in the BACnet network use UDP port 47808 (hexadecimal X'BAC0') for both direct communication and broadcasts when using BACnet IP. This is also to be supported by all devices.

If additional UDP ports are used, these must be specified in consultation with the project developer.

8.4. BBMD (BACnet Broadcast Management Device)

With the help of a BBMD, IP broadcasts used by certain BACnet services can be transmitted across the boundaries of local networks/subnets. One example is the Who-Is service, which uses an IP broadcast to find other BACnet devices. If a BACnet device sends a Who-Is message, it is sent to the local network via a broadcast. All BACnet devices in this network receive the message and can respond accordingly.
However, IP routers that forward to other IP subnets do not forward these messages. To solve this problem, the BBMD service was introduced. In a local network, only one device can be configured with BBMD functionality, which forwards IP broadcasts to remote IP subnets using a broadcast distribution table (BDT).

There are two methods for forwarding BBMD messages, known as one-hop and two-hop. In the two-hop procedure, a BBMD device forwards broadcasts to another BBMD in the remote IP subnet. This in turn distributes the messages in its local network as IP broadcasts of its IP subnet. In the one-hop procedure, the local BBMD forwards the message directly to the remote devices. For this, though, the forwarding IP routers must support the forwarding of IP broadcast messages to remote IP subnets. However, this procedure is hardly ever used in practice because the IT departments have to specially configure the routers for it.

With the foreign device procedure, remote devices that connect, e.g. via a foreign network/subnet, can dynamically connect to a BACnet configuration. Special BACnet services exist for this purpose in order to create an entry in the foreign device table (FDT). As with the BDT, a BBMD forwards IP broadcasts to all entries in the FDT. Unlike the BDT, entries in the FDT have a limited lifetime. The entry must therefore be renewed after the time to live (TTL) has elapsed.

The conception of the BBMD is to be defined in consultation with the project developer.

9. Information on planning and implementing BACnet systems

The following Chapter explains information to be observed by the project developer when planning and executing BACnet systems. The information is not binding and, depending on the BACnet system, can be followed up by the project developer himself at his own discretion and according to necessity.

9.1. Prerequisite for providers

As a prerequisite for the providers of BACnet systems, the following points must be observed:

- The devices must be BACnet certified by an officially accredited certification laboratory (e.g. BTL, WSPCert).
- PICS must be enclosed.
- EDE files of all systems are to be supplied in XLS or CSV format at the project developer's request. The EDE files must comply with the BIG-EU recommendations.

9.2. Planning process with BACnet specifications

During the building automation planning process, the BACnet specifications must be taken into account in various construction phases[17]. In some cases, the present document is even part of the delivery items. Figure 13 shows the construction phases relevant for the BACnet specifications and lists the respective delivery objects or services for which the present document is an integral part or for which the BACnet specifications must at least be taken into account.

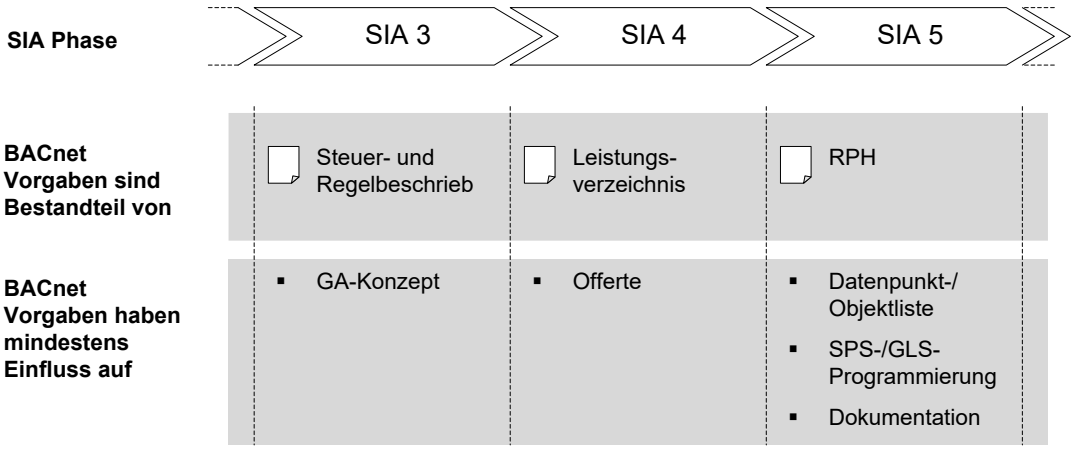


Figure 13: Construction phases according to SIA with the influence of BACnet specifications on the delivery objects or services of the respective phases

[17] The construction phrases refer to the SIA standard 112 construction planning model (see [5])

A. Objects

The objects supported according to Chapter 5.2 are assigned to the device profiles defined in Chapter 5.1. In addition, the specifications of the BACnet Standard are listed as a reference.

The profile columns list the read and write rights according to Chapter 3.2. If conformities of the BACnet Standard are supplemented with an "*", the respective object is subject to additional conditions (see BACnet Standard [1]).

A.1. Device

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
System_Status	System status	R	**R**	**R**
Vendor_Name	Name of the device manufacturer	R	**R**	**R**
Vendor_Identifier	Number of the device manufacturer	R	**R**	**R**
Model_Name	BACnet device model designation	R	**R**	**R**
Firmware_Revision	Firmware revision status	R	**R**	**R**
Application_Software_Version	Application program version	R	**R**	**R**
Location	Device installation location	O	**R**	**R**
Description	Device description	O	**W**	**W**
Protocol_Version	Protocol version	R	**R**	**R**
Protocol Revision	Protocol revision	R	**R**	**R**
Protocol_Services_Supported	BACnet services supported	R	**R**	**R**
Protocol_Object_Types_Supported	BACnet object types supported	R	**R**	**R**
Object_List	Object list	R	**R**	**R**
Structured_Object_List	Structured object list	O		
Max_APDU_Length_Supported	Maximum processable APDU length	R	**R**	**R**
Segmentation_Supported	Segmentation support	R	**R**	**R**
Max_Segments_Accepted	Maximum number of accepted segments	O*	**R**	**R**
VT_Classes_Supported	Supported VT classes	O*		
Active_VT_Sessions	Supported VT sessions	O*		
Local_Time	Local time	O*	**R**	**R**
Local_Date	Local date	O*	**R**	**R**
UTC_Offset	Time difference relative to UTC	O*	**R**	**R**
Daylight_Savings_Status	Daylight saving time status	O*	**R**	**R**
APDU_Segment_Timeout	APDU segment timeout	O*	**R**	**R**
APDU_Timeout	APDU timeout	R	**R**	**R**
Number_Of_APDU_Retries	Number of APDU transmission attempts	R	**R**	**R**
Time_Synchronization_Recipients[18]	Time synchronisation recipient	O*	**W**	**W**
Max_Master	Maximum number of master nodes	O*		
Max_Info_Frames	Maximum number of data packages	O*		
Device_Address_Binding	Device address binding	R	**R**	**R**
Database_Revision	Database revision number	R	**R**	**R**
Configuration_Files	Configuration files	O*	**R**	**R**
Last_Restore_Time	Last restore time	O*	**R**	**R**
Backup_Failure_Timeout	Backup failure timeout	O*	**R**	**R**

[18] Only the time master may contain the conformation code W. All other objects in the BACnet network may contain only the conformation code R.

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Backup_Preparation_Time	Backup preparation time	O		
Restore_Preparation_Time	Restore preparation time	O		
Restore_Completion_Time	Restore completion time	O		
Backup_And_Restore_State	Backup and restore status	O		
Active_COV_Subscriptions	Active COV subscriptions	O*	**R**	**R**
Slave_Proxy_Enable	Slave proxy capability	O*		
Manual_Slave_Address_Binding	Manual MS/TP address binding	O*		
Auto_Slave_Discovery	Automatic slave discovery on MS/TP port	O*		
Slave_Address_Binding	MS/TP slave address binding	O*		
Last_Restart_Reason	Reason for last restart	O*		
Time_Of_Device_Restart	Time of last restart	O*	**R**	**R**
Restart_Notification_Recipients	Recipient of restart notification	O*	**W**	**W**
UTC_Time_Synchronization_Recipients	Time synchronisation recipient	O*	**W**	**W**
Time_Synchronization_Interval	Time synchronisation interval	O*	**W**	
Align_Intervals	Time synchronisation capability	O*	**R**	
Interval_Offset	Time synchronisation offset	O*	**R**	
Serial_Number	Serial number	O		
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.2. Analog Input

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Present_Value	Present value	R*	**W**	**W**
Description	Object description	O	**W**	**W**
Device_Type	Designation of the physical input unit	O	**R**	**R**
Status_Flags	Status indication	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Reliability	Reliability	O	**R**	**R**
Out_Of_Service	Object function out of service	R	**R**	**R**
Update_Interval	Update time	R	**R**	**R**
Units	Physical unit	R	**R**	**R**
Min_Pres_Value	Lower range limit	O	**R**	**R**
Max_Pres_Value	Upper range limit	O	**R**	**R**
Resolution	Resolution	O	**R**	**R**
COV_Increment	COV change increment	O*	**W**	**W**
Time_Delay	Notification delay	O*	**W**	**W**
Notification_Class	Notification class	O*	**W**	**W**
High_Limit	Upper limit	O*	**W**	**W**
Low_Limit	Lower limit	O*	**W**	**W**
Deadband	Deadband	O*	**W**	**W**
Limit_Enable	Limit monitoring active	O*	**W**	**W**
Event_Enable	Event notification active	O*	**W**	**W**
Acked_Transitions	Acknowledgement of status change	O*	**R**	**R**
Notify_Type	Alarm identifier	O*	**W**	**W**
Event_Time_Stamps	Event timestamp	O*	**R**	**R**
Event_Message_Texts	Event message texts	O*	**R**	**R**
Event_Message_Texts_Config	Event message text configuration	O*	**W**	**W**
Event_Detection_Enable	Event detection	O*	**R**	**R**
Event_Algorithm_Inhibit_Ref	Prevent event reference	O*	**R**	**R**
Event_Algorithm_Inhibit	Prevent event	O*	**R**	**R**
Time_Delay_Normal	Normal time delay	O*	**W**	**W**
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*	**W**	**W**
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.3. Analog Output

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Present_Value	Present value	W	**W**	**W**
Description	Object description	O	**W**	**W**
Device_Type	Designation of the physical output unit	O	**R**	**R**
Status_Flags	Status indication	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Reliability	Reliability	O	**R**	**R**
Out_Of_Service	Object function out of service	R	**R**	**R**
Units	Physical unit	R	**R**	**R**
Min_Pres_Value	Lower range limit	O	**R**	**R**
Max_Pres_Value	Upper range limit	O	**R**	**R**
Resolution	Resolution	O	**R**	**R**
Priority_Array	Priority list	R	**R**	**R**
Relinquish_Default	Default value	R	**W**	**W**
COV_Increment	COV change increment	O*	**W**	**W**
Time_Delay	Notification delay	O*	**W**	**W**
Notification_Class	Notification class	O*	**W**	**W**
High_Limit	Upper limit	O*	**W**	**W**
Low_Limit	Lower limit	O*	**W**	**W**
Deadband	Deadband	O*	**W**	**W**
Limit_Enable	Limit monitoring active	O*	**W**	**W**
Event_Enable	Event notification active	O*	**W**	**W**
Acked_Transitions	Acknowledgement of status change	O*	**R**	**R**
Notify_Type	Alarm identifier	O*	**W**	**W**
Event_Time_Stamps	Event timestamp	O*	**R**	**R**
Event_Message_Texts	Event message texts	O*	**R**	**R**
Event_Message_Texts_Config	Event message text configuration	O*	**W**	**W**
Event_Detection_Enable	Event detection	O*	**R**	**R**
Event_Algorithm_Inhibit_Ref	Prevent event reference	O*	**R**	**R**
Event_Algorithm_Inhibit	Prevent event	O*	**R**	**R**
Time_Delay_Normal	Normal time delay	O*	**W**	**W**
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*	**W**	**W**
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.4. Analog Value

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Present_Value	Present value	R*	**W**	**W**
Description	Object description	O	**W**	**W**
Status_Flags	Status indication	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Reliability	Reliability	O	**R**	**R**
Out_Of_Service	Object function out of service	R	**R**	**R**
Units	Physical unit	R	**R**	**R**
Priority_Array	Priority list	O*	**R**	**R**
Relinquish_Default	Default value	O*	**W**	**W**
COV_Increment	COV change increment	O*	**W**	**W**
Time_Delay	Notification delay	O*	**W**	**W**
Notification_Class	Notification class	O*	**W**	**W**
High_Limit	Upper limit	O*	**W**	**W**
Low_Limit	Lower limit	O*	**W**	**W**
Deadband	Deadband	O*	**W**	**W**
Limit_Enable	Limit monitoring active	O*	**W**	**W**
Event_Enable	Event notification active	O*	**W**	**W**
Acked_Transitions	Acknowledgement of status change	O*	**R**	**R**
Notify_Type	Alarm identifier	O*	**W**	**W**
Event_Time_Stamps	Event timestamp	O*	**R**	**R**
Event_Message_Texts	Event message texts	O*	**R**	**R**
Event_Message_Texts_Config	Event message text configuration	O*	**W**	**W**
Event_Detection_Enable	Event detection	O*	**R**	**R**
Event_Algorithm_Inhibit_Ref	Prevent event reference	O*	**R**	**R**
Event_Algorithm_Inhibit	Prevent event	O*	**R**	**R**
Time_Delay_Normal	Normal time delay	O*	**W**	**W**
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*	**W**	**W**
Min_Pres_Value	Lower range limit	O	**R**	**R**
Max_Pres_Value	Upper range limit	O	**R**	**R**
Resolution	Resolution	O	**R**	**R**
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.5. Binary Input

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Present_Value	Present value	R*	**W**	**W**
Description	Object description	O	**W**	**W**
Device_Type	Designation of the physical input unit	O	**R**	**R**
Status_Flags	Status indication	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Reliability	Reliability	O	**R**	**R**
Out_Of_Service	Object function out of service	R	**R**	**R**
Polarity	Polarity	R	**R**	**R**
Inactive_Text	Inactive state text	O*	**R**	**R**
Active_Text	Active state text	O*	**R**	**R**
Change_Of_State_Time	Time of change of state	O*	**R**	**R**
Change_Of_State_Count	Change of state counter	O*	**R**	**R**
Time_Of_State_Count_Reset	Change of state counter reset time	O*	**R**	**R**
Elapsed_Active_Time	Operating hours counter	O*	**R**	**R**
Time_Of_Active_Time_Reset	Operating hours counter reset time	O*	**R**	**R**
Time_Delay	Notification delay	O*	**W**	**W**
Notification_Class	Notification class	O*	**W**	**W**
Alarm_Value	Alarm value	O*	**R**	**R**
Event_Enable	Event notification active	O*	**W**	**W**
Acked_Transitions	Acknowledgement of status change	O*	**R**	**R**
Notify_Type	Alarm identifier	O*	**W**	**W**
Event_Time_Stamps	Event timestamp	O*	**R**	**R**
Event_Message_Texts	Event message texts	O*	**R**	**R**
Event_Message_Texts_Config	Event message text configuration	O*	**W**	**W**
Event_Detection_Enable	Event detection	O*	**R**	**R**
Event_Algorithm_Inhibit_Ref	Prevent event reference	O*	**R**	**R**
Event_Algorithm_Inhibit	Prevent event	O*	**R**	**R**
Time_Delay_Normal	Normal time delay	O*	**W**	**W**
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*	**W**	**W**
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.6. Binary Output

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Present_Value	Present value	W	**W**	**W**
Description	Object description	O	**W**	**W**
Device_Type	Designation of the physical output unit	O	**R**	**R**
Status_Flags	Status indication	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Reliability	Reliability	O	**R**	**R**
Out_Of_Service	Object function out of service	R	**R**	**R**
Polarity	Polarity	R	**R**	**R**
Inactive_Text	Inactive state text	O*	**R**	**R**
Active_Text	Active state text	O*	**R**	**R**
Change_Of_State_Time	Time of change of state	O*	**R**	**R**
Change_Of_State_Count	Change of state counter	O*	**R**	**R**
Time_Of_State_Count_Reset	Change of state counter reset time	O*	**R**	**R**
Elapsed_Active_Time	Operating hours counter	O*	**R**	**R**
Time_Of_Active_Time_Reset	Operating hours counter reset time	O*	**R**	**R**
Minimum_Off_Time	Minimum off time	O	**R**	**R**
Minimum_On_Time	Minimum on time	O	**R**	**R**
Priority_Array	Priority list	R	**R**	**R**
Relinquish_Default	Default value	R	**W**	**W**
Time_Delay	Notification delay	O*	**W**	**W**
Notification_Class	Notification class	O*	**W**	**W**
Feedback_Value	Feedback value	O*	**R**	**R**
Event_Enable	Event notification active	O*	**W**	**W**
Acked_Transitions	Acknowledgement of status change	O*	**R**	**R**
Notify_Type	Alarm identifier	O*	**W**	**W**
Event_Time_Stamps	Event timestamp	O*	**R**	**R**
Event_Message_Texts	Event message texts	O*	**R**	**R**
Event_Message_Texts_Config	Event message text configuration	O*	**W**	**W**
Event_Detection_Enable	Event detection	O*	**R**	**R**
Event_Algorithm_Inhibit_Ref	Prevent event reference	O*	**R**	**R**
Event_Algorithm_Inhibit	Prevent event	O*	**R**	**R**
Time_Delay_Normal	Normal time delay	O*	**W**	**W**
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*	**W**	**W**
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.7. Binary Value

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Present_Value	Present value	R*	**W**	**W**
Description	Object description	O	**W**	**W**
Status_Flags	Status indication	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Reliability	Reliability	O	**R**	**R**
Out_Of_Service	Object function out of service	R	**R**	**R**
Inactive_Text	Inactive state text	O*	**R**	**R**
Active_Text	Active state text	O*	**R**	**R**
Change_Of_State_Time	Time of change of state	O*	**R**	**R**
Change_Of_State_Count	Change of state counter	O*	**R**	**R**
Time_Of_State_Count_Reset	Change of state counter reset time	O*	**R**	**R**
Elapsed_Active_Time	Operating hours counter	O*	**R**	**R**
Time_Of_Active_Time_Reset	Operating hours counter reset time	O*	**R**	**R**
Minimum_Off_Time	Minimum off time	O	**R**	**R**
Minimum_On_Time	Minimum on time	O	**R**	**R**
Priority_Array	Priority list	O*	**R**	**R**
Relinquish_Default	Default value	O*	**W**	**W**
Time_Delay	Notification delay	O*	**W**	**W**
Notification_Class	Notification class	O*	**W**	**W**
Alarm_Value	Alarm value	O*	**R**	**R**
Event_Enable	Event notification active	O*	**W**	**W**
Acked_Transitions	Acknowledgement of status change	O*	**R**	**R**
Notify_Type	Alarm identifier	O*	**W**	**W**
Event_Time_Stamps	Event timestamp	O*	**R**	**R**
Event_Message_Texts	Event message texts	O*	**R**	**R**
Event_Message_Texts_Config	Event message text configuration	O*	**W**	**W**
Event_Detection_Enable	Event detection	O*	**R**	**R**
Event_Algorithm_Inhibit_Ref	Prevent event reference	O*	**R**	**R**
Event_Algorithm_Inhibit	Prevent event	O*	**R**	**R**
Time_Delay_Normal	Normal time delay	O*	**W**	**W**
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*	**W**	**W**
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.8. Multi-state Input

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Present_Value	Present value	R*	**W**	**W**
Description	Object description	O	**W**	**W**
Status_Flags	Status indication	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Reliability	Reliability	O*	**R**	**R**
Out_Of_Service	Object function out of service	R	**R**	**R**
Number_Of_States	Number of states	R	**R**	**R**
State_Text	State text	O	**R**	**R**
Time_Delay	Notification delay	O*	**W**	**W**
Notification_Class	Notification class	O*	**W**	**W**
Alarm_Value	Alarm value	O*	**R**	**R**
Fault_Values	Fault values	O*	**R**	**R**
Event_Enable	Event notification active	O*	**W**	**W**
Acked_Transitions	Acknowledgement of status change	O*	**R**	**R**
Notify_Type	Alarm identifier	O*	**W**	**W**
Event_Time_Stamps	Event timestamp	O*	**R**	**R**
Event_Message_Texts	Event message texts	O*	**R**	**R**
Event_Message_Texts_Config	Event message text configuration	O*	**W**	**W**
Event_Detection_Enable	Event detection	O*	**R**	**R**
Event_Algorithm_Inhibit_Ref	Prevent event reference	O*	**R**	**R**
Event_Algorithm_Inhibit	Prevent event	O*	**R**	**R**
Time_Delay_Normal	Normal time delay	O*	**W**	**W**
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*	**W**	**W**
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.9. Multi-state Output

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Present_Value	Present value	R*	**W**	**W**
Description	Object description	O	**W**	**W**
Status_Flags	Status indication	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Reliability	Reliability	O*	**R**	**R**
Out_Of_Service	Object function out of service	R	**R**	**R**
Number_Of_States	Number of states	R	**R**	**R**
State_Text	State text	O	**R**	**R**
Priority_Array	Priority list	O*	**R**	**R**
Relinquish_Default	Default value	O*	**W**	**W**
Time_Delay	Notification delay	O*	**W**	**W**
Notification_Class	Notification class	O*	**W**	**W**
Feedback_Value	Feedback value	O*	**R**	**R**
Event_Enable	Event notification active	O*	**W**	**W**
Acked_Transitions	Acknowledgement of status change	O*	**R**	**R**
Notify_Type	Alarm identifier	O*	**W**	**W**
Event_Time_Stamps	Event timestamp	O*	**R**	**R**
Event_Message_Texts	Event message texts	O*	**R**	**R**
Event_Message_Texts_Config	Event message text configuration	O*	**W**	**W**
Event_Detection_Enable	Event detection	O*	**R**	**R**
Event_Algorithm_Inhibit_Ref	Prevent event reference	O*	**R**	**R**
Event_Algorithm_Inhibit	Prevent event	O*	**R**	**R**
Time_Delay_Normal	Normal time delay	O*	**W**	**W**
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*	**W**	**W**
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.10. Multi-state Value

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Present_Value	Present value	R*	**W**	**W**
Description	Object description	O	**W**	**W**
Status_Flags	Status indication	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Reliability	Reliability	O*	**R**	**R**
Out_Of_Service	Object function out of service	R	**R**	**R**
Number_Of_States	Number of states	R	**R**	**R**
State_Text	State text	O	**R**	**R**
Priority_Array	Priority list	O*	**R**	**R**
Relinquish_Default	Default value	O*	**W**	**W**
Time_Delay	Notification delay	O*	**W**	**W**
Notification_Class	Notification class	O*	**W**	**W**
Alarm_Value	Alarm value	O*	**R**	**R**
Fault_Values	Fault values	O*	**R**	**R**
Event_Enable	Event notification active	O*	**W**	**W**
Acked_Transitions	Acknowledgement of status change	O*	**R**	**R**
Notify_Type	Alarm identifier	O*	**W**	**W**
Event_Time_Stamps	Event timestamp	O*	**R**	**R**
Event_Message_Texts	Event message texts	O*	**R**	**R**
Event_Message_Texts_Config	Event message text configuration	O*	**W**	**W**
Event_Detection_Enable	Event detection	O*	**R**	**R**
Event_Algorithm_Inhibit_Ref	Prevent event reference	O*	**R**	**R**
Event_Algorithm_Inhibit	Prevent event	O*	**R**	**R**
Time_Delay_Normal	Normal time delay	O*	**W**	**W**
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*	**W**	**W**
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.11. Calendar

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Description	Object description	O	**W**	**W**
Present_Value	Present value	R	**R**	**R**
Date_List	Date list	R	**W**	**W**
Property_List	List of properties	R	**R**	**R**
Profile_Name		O		

A.12. Event Enrolment

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Description	Object description	O	**W**	**W**
Event_Type	Event type	R	**R**	**R**
Notify_Type	Alarm identifier	R	**W**	**W**
Event_Parameters	Event parameters	R	**W**	**W**
Object_Property_Reference	Object property reference	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Event_Enable	Event notification active	R	**R**	**R**
Acked_Transitions	Acknowledgement of status change	R	**R**	**R**
Notification_Class	Notification class	R	**W**	**W**
Event_Time_Stamps	Event timestamp	R	**R**	**R**
Event_Message_Texts	Event message texts	O*	**R**	**R**
Event_Message_Texts_Config	Event message text configuration	O	**W**	**W**
Event_Detection_Enable	Event detection	R	**R**	**R**
Event_Algorithm_Inhibit_Ref	Prevent event reference	O	**R**	**R**
Event_Algorithm_Inhibit	Prevent event	O*	**R**	**R**
Time_Delay_Normal	Normal time delay	O	**W**	**W**
Status_Flags	Status indication	R	**R**	**R**
Reliability	Reliability	R	**R**	**R**
Fault_Type	Fault type	O*		
Fault_Parameters	Fault parameters	O*		
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O		
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.13. File

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Description	Object description	O	**W**	**W**
File_Type	File type	R	**R**	**R**
File_Size	File size	R*	**R**	**R**
Modification_Date	Modification date	R	**R**	**R**
Archive	File archived	W	**W**	**W**
Read_Only	Read-only	R	**R**	**R**
File_Access_Method	File access method	R	**R**	**R**
Record_Count	Number of data blocks	O*		
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.14. Loop

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Present_Value	Present value	R	**R**	**R**
Description	Device description	O	**W**	**W**
Status_Flags	Status indication	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Reliability	Reliability	O	**R**	**R**
Out_Of_Service	Object function out of service	R	**R**	**R**
Update_Interval	Update time	O	**R**	**R**
Output_Units	Physical unit of the manipulated variable	R	**R**	**R**
Manipulated_Variable_Reference	Manipulated variable address	R	**R**	**R**
Controlled_Variable_Reference	Controlled variable address	R	**R**	**R**
Controlled_Variable_Value	Controlled variable value	R	**R**	**R**
Controlled_Variable_Units	Physical unit of the controlled variable	R	**R**	**R**
Setpoint_Reference	Setpoint address	R	**R**	**R**
Setpoint	Setpoint value	R	**R**	**R**
Action	Control direction of operation	R	**R**	**R**
Proportional_Constant	Proportional constant	O*	**W**	**W**
Proportional_Constant_Units	Physical unit of the proportional constant	O*	**R**	**R**
Integral_Constant	Integral constant	O*	**W**	**W**
Integral_Constant_Units	Physical unit of the integral constant	O*	**R**	**R**
Derivative_Constant	Differential constant	O*	**W**	**W**
Derivative_Constant_Units	Physical unit of the differential constant	O*	**R**	**R**
Bias	Output default setting	O	**W**	**W**
Maximum_Output	Manipulated variable upper limit	O	**W**	**W**
Minimum_Output	Manipulated variable lower limit	O	**W**	**W**
Priority_For_Writing	Priority for writing	R	**R**	**R**
COV_Increment	COV change increment	O*	**W**	**W**
Time_Delay	Notification delay	O*	**W**	**W**
Notification_Class	Notification class	O*	**W**	**W**
Error_Limit	Maximum control deviation	O*	**W**	**W**
Deadband	Deadband	O*		
Event_Enable	Event message release	O*	**W**	**W**
Acked_Transitions	Acknowledged status change	O*	**R**	**R**
Notify_Type	Alarm identifier	O*	**W**	**W**
Event_Time_Stamps	Event timestamp	O*	**R**	**R**
Event_Message_Texts	Event message texts	O*	**R**	**R**
Event_Message_Texts_Config	Event message text configuration	O*	**W**	**W**
Event_Detection_Enable	Event detection	O*	**R**	**R**
Prevent event reference	Prevent event reference	O*	**R**	**R**
Prevent event	Prevent event	O*	**R**	**R**
Time_Delay_Normal	Normal time delay	O*	**W**	**W**
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*	**W**	**W**
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.15. Notification Class

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Description	Object description	O	**W**	**W**
Notification_Class	Notification class	R	**R**	**R**
Priority	Priority	R	**R**	**R**
Ack_Required	Acknowledgement confirmation	R	**R**	**R**
Recipient_List	Recipient list	R	**W**	**W**
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.16. Program

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Program_State	Program state	R	**R**	**R**
Program_Change	Program change	W	**W**	**W**
Reason_For_Halt	Reason for program halt	O*	**R**	**R**
Description_Of_Halt	Description of program halt	O*	**R**	**R**
Program_Location	Program location	O	**R**	**R**
Description	Object description	O	**W**	**W**
Instance_Of	Instance	O	**R**	**R**
Status_Flags	Status identifier	R	**R**	**R**
Reliability	Reliability	O	**R**	**R**
Out_Of_Service	Object function out of service	R	**R**	**R**
Event_Detection_Enable	Event detection	O*		
Notification_Class	Notification class	O*		
Event_Enable	Event message release	O*		
Event_State	Event state	O*		
Acked_Transitions	Acknowledged status change	O*		
Notify_Type	Alarm identifier	O*		
Event_Time_Stamps	Event timestamp	O*		
Event_Message_Texts	Event message texts	O*		
Event_Message_Texts_Config	Event message text configuration	O*		
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*		
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.17. Schedule

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Present_Value	Present value	R	**R**	**R**
Description	Object description	O	**W**	**W**
Effective_Period	Effective period	R	**W**	**W**
Weekly_Schedule	Weekly schedule	O*	**W**	**W**
Exception_Schedule	Special schedule	O*	**W**	**W**
Schedule_Default	Default value for schedule	R	**R**	**R**
List_Of_Object_Property_References	Reference list of properties to be described	R	**R**	**R**
Priority_For_Writing	Write priority	R	**R**	**R**
Status_Flags	Status indication	R	**R**	**R**
Reliability	Reliability	R	**R**	**R**
Out_Of_Service	Operating status of the object	R	**R**	**R**
Event_Detection_Enable	Event detection	O*		
Notification_Class	Notification class	O*		
Event_Enable	Event message release	O*		
Event_State	Event state	O*		
Acked_Transitions	Acknowledged status change	O*		
Notify_Type	Alarm identifier	O*		
Event_Time_Stamps	Event timestamp	O*		
Event_Message_Texts	Event message texts	O*		
Event_Message_Texts_Config	Event message text configuration	O*		
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O		
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.18. Trend Log

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Description	Object description	O	**W**	**W**
Enable	Recording active	W	**W**	**W**
Start_Time	Recording start time	O*	**W**	**W**
Stop_Time	Recording stop time	O*	**W**	**W**
Log_DeviceObjectProperty	Recording property address	O*	**R**	**R**
Log_Interval	Recording interval	O*	**W**	**W**
COV_Resubscription_Interval	Renewal interval for COV subscription	O	**R**	**R**
Client_COV_Increment	Change threshold for COV recording	O	**W**	**W**
Stop_When_Full	Stop when buffer full	R	**W**	**W**
Buffer_Size	Buffer size	R	**R**	**R**
Log_Buffer	Log buffer	R	**R**	**R**
Record_Count	Number of data blocks	W	**W**	**W**
Total_Record_Count	Sum of recorded data blocks	R	**R**	**R**
Logging_Type	Recording type	R	**R**	**R**
Align_Intervals	Interval alignment	O*		
Interval_Offset	Interval offset	O*		
Trigger	Trigger	O		
Status_Flags	Status identifier	R	**R**	**R**
Reliability	Reliability	O		
Notification_Threshold	Notification threshold	O*	**W**	**W**
Records_Since_Notification	Number of records since notification	O*	**R**	**R**
Last_Notify_Record	Last record after event notification	O*	**R**	**R**
Event_State	Event state	R	**R**	**R**
Notification_Class	Notification class	O*		
Event_Enable	Event message release	O*		
Acked_Transitions	Acknowledged status notification	O*		
Notify_Type	Alarm identifier	O*		
Event_Time_Stamps	Event timestamp	O*		
Event_Message_Texts	Event notification text	O*		
Event_Message_Texts_Config	Event message text configuration	O*		
Event_Detection_Enable	Event detection	O*		
Event_Algorithm_Inhibit_Ref	Prevent event reference	O*		
Event_Algorithm_Inhibit	Prevent event	O*		
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*		
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

A.19. Event Log

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Property_List	List of properties	R	**R**	**R**
Description	Object description	O	**W**	**W**
Status_Flags	Status identifier	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Reliability	Reliability	O	**R**	**R**
Enable	Recording active	W	**W**	**W**
Start_Time	Recording start time	O*	**R**	**R**
Stop_Time	Recording stop time	O*	**R**	**R**
Stop_When_Full	Stop when buffer full	R	**R**	**R**
Buffer_Size	Buffer size	R	**R**	**R**
Log_Buffer	Log buffer	R	**R**	**R**
Record_Count	Number of data blocks	W	**W**	**W**
Total_Record_Count	Sum of recorded data blocks	R	**R**	**R**
Notification_Threshold	Notification threshold	O*	**R**	**R**
Records_Since_Notification	Number of records since notification	O*	**R**	**R**
Last_Notify_Record	Last record after event notification	O*	**R**	**R**
Notification_Class	Notification class	O*		
Event_Enable	Event message release	O*		
Acked_Transitions	Acknowledged status notification	O*		
Notify_Type	Alarm identifier	O*		
Event_Time_Stamps	Event timestamp	O*		
Event_Message_Texts	Event message texts	O*		
Event_Message_Texts_Config	Event message text configuration	O*		
Event_Detection_Enable	Event detection	O*		
Event_Algorithm_Inhibit_Ref	Prevent event reference	O*		
Event_Algorithm_Inhibit	Prevent event	O*		
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*		
Profile_Name	Profile name	O		

A.20. Positive Integer Value

Property Identifier (Standard)	Property Identifier (Informative)	Profile		
		BACnet	OWS-CH	AS-CH
Object_Identifier	Designation of the object instance	R	**R**	**R**
Object_Name	Object name	R	**R**	**R**
Object_Type	Object type	R	**R**	**R**
Description	Object description	O	**W**	**W**
Present_Value	Present value	R*	**W**	**W**
Status_Flags	Status indication	R	**R**	**R**
Event_State	Event state	R	**R**	**R**
Reliability	Reliability	O	**R**	**R**
Out_Of_Service	Object function out of service	R	**R**	**R**
Units	Physical unit	R	**R**	**R**
Priority_Array	Priority list	O*	**R**	**R**
Relinquish_Default	Default value	O*	**W**	**W**
COV_Increment	COV change increment	O*	**W**	**W**
Time_Delay	Notification delay	O*	**W**	**W**
Notification_Class	Notification class	O*	**W**	**W**
High_Limit	Upper limit	O*	**W**	**W**
Low_Limit	Lower limit	O*	**W**	**W**
Deadband	Deadband	O*	**W**	**W**
Limit_Enable	Limit monitoring active	O*	**W**	**W**
Event_Enable	Event notification active	O*	**W**	**W**
Acked_Transitions	Acknowledgement of status change	O*	**R**	**R**
Notify_Type	Alarm identifier	O*	**W**	**W**
Event_Time_Stamps	Event timestamp	O*	**R**	**R**
Event_Message_Texts	Event message texts	O*	**R**	**R**
Event_Message_Texts_Config	Event message text configuration	O*	**W**	**W**
Event_Detection_Enable	Event detection	O*	**R**	**R**
Event_Algorithm_Inhibit_Ref	Prevent event reference	O*	**R**	**R**
Event_Algorithm_Inhibit	Prevent event	O*	**R**	**R**
Time_Delay_Normal	Normal time delay	O*	**W**	**W**
Reliability_Evaluation_Inhibit	Prevent reliability evaluation	O*	**W**	**W**
Min_Pres_Value	Lower range limit	O	**R**	**R**
Max_Pres_Value	Upper range limit	O	**R**	**R**
Resolution	Resolution	O	**R**	**R**
Property_List	List of properties	R	**R**	**R**
Profile_Name	Profile name	O		

B. BIBBs

B.1. Data Sharing (DS) – object access, data exchange, data sharing

BIBBs		Profile			
Abbreviation	Designation	B-AWS	B-BC	OWS-CH	AS-CH
DS-RP-A	DS-ReadProperty-A	■	■	■	■
DS-RP-B	DS-ReadProperty-B	■	■	■	■
DS-RPM-A	DS-ReadPropertyMultiple-A	■	■	■	■
DS-RPM-B	DS-ReadPropertyMultiple-B		■		■
DS-WP-A	DS-WriteProperty-A	■	■	■	■
DS-WP-B	DS-WriteProperty-B		■		■
DS-WPM-A	DS-WritePropertyMultiple-A	■		■	
DS-WPM-B	DS-WritePropertyMultiple-B		■		■
DS-COV-A	DS-COV-Support-A				■
DS-COV-B	DS-COV-Support-B				■
DS-COVP-A	DS-COV-Property-A				
DS-COVP-B	DS-COV-Property-B				■
DS-COVU-A	DS-COV-Unsolicited-A				
DS-COVU-B	DS-COV-Unsolicited-B				
DS-V-A	DS-DataSharing-View-A				
DS-AV-A	DS-AdvancedView-A	■		■	
DS-M-A	DS-Modify-A				
DS-AM-A	DS-AdvancedModify-A	■		■	
DS-WG-A	DS-WriteGroup-A				
DS-WG-I-B	DS-WriteGroup-Internal-B				
DS-WG-E-B	DS-WriteGroup-External-B				

B.2. Alarm and event management (AE)

BIBBs		Profile			
Abbreviation	Designation	B-AWS	B-BC	OWS-CH	AS-CH
AE-N-A	AE-Notification-A	■		■	
AE-N-I-B	AE-Notification Internal B		■		■
AE-N-E-B	AE-Notification External B				■
AE-ACK-A	AE-ACK-A	■		■	
AE-ACK-B	AE-ACK-B		■		■
AE-ASUM-A	AE-Summary-A				
AE-ASUM-B	AE-AlarmSummary-B				
AE-ESUM-A	AE-EnrolmentSummary-A				
AE-ESUM-B	AE-EnrolmentSummary-B		■		■
AE-INFO-A	AE-Information-A				
AE-INFO-B	AE-Information-B		■		■
AE-LS-A	AE-Lifesafety-A				
AE-LS-B	AE-Lifesafety-B				
AE-VN-A	AE-ViewNotifications-A				
AE-AVN-A	AE-AdvancedViewNotifications-A	■		■	
AE-VM-A	AE-ViewandModify-A				
AE-AVM-A	AE-AdvancedViewandModify-A	■		■	
AE-AS-A	AE-AlarmSummaryView-A	■		■	
AE-ELV-A	AE-EventLogView-A				
AE-ELVM-A	AE-EventLogViewandModify-A	■		■	
AE-EL-I-B	AE-EventLog-Internal-B				■
AE-EL-E-B	AE-EventLog-External-B				
AE-NF-B	AE-Notification Forwarder-B				
AE-NF-I-B	AE-Notification Forwarder-Internal-B				

B.3. Scheduling (SCHED)

BIBBs		Profile			
Abbreviation	Designation	B-AWS	B-BC	OWS-CH	AS-CH
SCHED-A	SCHED-A				
SCHED-I-B	SCHED-Internal-B				■
SCHED-E-B	SCHED-External-B		■		■
SCHED-R-B	SCHED-Scheduling-Readonly-B				
SCHED-AVM-A	SCHED-AdvancedViewandModify-A	■		■	
SCHED-VM-A	SCHED-ViewandModify-A				
SCHED-WS-A	SCHED-WeeklySchedule-A				
SCHED-WS-I-B	SCHED-WeeklyScheduleInternal-B				

B.4. Trending (T)

BIBBs		Profile			
Abbreviation	Designation	B-AWS	B-BC	OWS-CH	AS-CH
T-VMT-A	T-ViewingandModifyingTrends-A				
T-VMT-I-B	T-ViewingandModifyingTrends- Internal-B		■		■
T-VMT-E-B	T-ViewingandModifyingTrends- External-B				■
T-ATR-A	T-AutomatedTrendRetrieval-A				
T-ATR-B	T-AutomatedTrendRetrieval-B		■		■
T-VMMV-A	T-ViewingandModifyingMultiple Values-A				
T-VMMV-I-B	T-ViewingandModifyingMultipleValues-Internal-B				
T-VMMV-E-B	T-ViewingandModifyingMultipleValues-External-B				
T-AMVR-A	T-AutomatedMultipleValueRetrieval-A				
T-AMVR-B	T-AutomatedMultipleValueRetrieval-B				
T-V-A	T-View-A				
T-AVM-A	T-AdvancedViewandModify-A	■		■	
T-A-A	T-Archival-A				

B.5. Device and network management (DN/NM)

BIBBs		Profile			
Abbreviation	Designation	B-AWS	B-BC	OWS-CH	AS-CH
DM-DDB-A	DM-DynamicDeviceBinding-A	■	■	■	■
DM-DDB-B	DM-DynamicDeviceBinding-B	■	■	■	■
DM-DOB-A	DM-DynamicObjectBinding-A				
DM-DOB-B	DM-DynamicObjectBinding-B	■	■	■	■
DM-DCC-A	DM-DeviceCommunicationControl-A	■		■	
DM-DCC-B	DM-DeviceCommunicationControl-B		■		■
DM-TM-A	DM-TextMessage-A				
DM-TM-B	DM-TextMessage-B				
DM-TS-A	DM-TimeSynchronization-A				
DM-TS-B	DM-TimeSynchronization-B				
DM-UTC-A	DM-UTCTimeSynchronization-A				
DM-UTC-B	DM-UTCTimeSynchronization-B		■		■
DM-RD-A	DM-ReinitializeDevice-A	■		■	
DM-RD-B	DM-ReinitializeDevice-B		■		■
DM-BR-A	DM-BackupandRestore-A	■		■	
DM-BR-B	DM-BackupandRestore-B		■		■
DM-R-A	DM-Restart-A				
DM-R-B	DM-Restart-B				
DM-LM-A	DM-ListManipulation-A				
DM-LM-B	DM-ListManipulation-B				■
DM-OCD-A	DM-ObjectCreationandDeletion-A	■		■	
DM-OCD-B	DM-ObjectCreationandDeletion-B				■
DM-VT-A	DM-VirtualTerminal-A				
DM-VT-B	DM-VirtualTerminal-B				
NM-CE-A	NM-ConnectionEstablishment-A				
NM-CE-B	NM-ConnectionEstablishment-B				
NM-RC-A	NM-RouterConfiguration-A				
NM-RC-B	NM-RouterConfiguration-B				
DM-ANM-A	DM-AutomaticNetworkMapping-A	■		■	
DM-ADM-A	DM-AutomaticDeviceMapping-A	■		■	
DM-ATS-A	DM-AutomaticTimeSynchronization-A				
DM-MTS-A	DM-ManualTimeSynchronization-A	■		■	
NS-SD[19]	NS-Secure Device				
NS-ED[20]	NS-Encrypted Devic				
NS-MAD[21]	NS-Multi-Application Device				
NS-DMK-A[22]	NS-Device Master Key-A				
NS-DMK-B[23]	NS-Device Master Key-B				
NS-KS[24]	NS-Network Security-Key Serve				
NS-TKS[25]	NS-Temporary Key Server				
NS-SR[26]	NS-Secure Router				
NS-SP[27]	NS-Security Proxy				

[19] Not applicable in the next BACnet Secure Connect revision
[20] Not applicable in the next BACnet Secure Connect revision
[21] Not applicable in the next BACnet Secure Connect revision
[22] Not applicable in the next BACnet Secure Connect revision
[23] Not applicable in the next BACnet Secure Connect revision
[24] Not applicable in the next BACnet Secure Connect revision
[25] Not applicable in the next BACnet Secure Connect revision
[26] Not applicable in the next BACnet Secure Connect revision
[27] Not applicable in the next BACnet Secure Connect revision

List of modifications

Version	Date	Description
1.0	13.02.2017	First full version after consultation by KBOB
1.1	15.09.2017	• General: *Spelling mistake correction* • Referenced documents: o ~~Directive for Building Control Systems (BCS)~~ o Guidelines on KBOB recommendation on using BACnet • Chapter 1.3.: *Supplement and reference to the guidelines and corresponding amendment of Figure 2* • Chapter 5.2.3.: *Rewording of the entire chapter.* • Chapter 5.3.: *Rewording of the entire first paragraph.* o Annex A lists the minimum requirements of the properties to be used for the respective requirement profiles per BACnet object type. • Table 6: *"-" replaced by no specifications* • *Chapter 5.3.3.:* ~~In Chapter 9.1 a recommendation is however made for a labelling and addressing concept for the object name.~~ • *Table 8:* The profile name may be used, but not for the exchange of relevant information. • *Chapter* 6.3.2.: The priority of the controlling application (e.g. from the system switch) is to be inherited by all aggregates (e.g. fans, valves, pumps). • Table 10: o Manual from ~~BCS~~ OWS o Time circuits, central ~~Regelung~~ controls To be used for BIBB scheduling ~~und Dämmerungsgrad von Beleuchtungen//~~central controls • Chapter 6.6.1.1.: If no project developer specifications are made, a default of 15 minutes is to be used for time triggered trending. Table 13 shows an example of use. • Table 14: Air pressure Pa +/- 20 • Chapter 7.2.: o *All NCs of the automation station (AS) changed to optional* o *Drive continuously supplemented by recording of set point input and recording of actual value* • Chapter 9.1.: *Chapter deleted*
2.0	20.07.2021	• General: Various spelling mistakes corrected and formatting adjusted • Chapter 2.1.: o Revision number modified • Chapter 3.7.: o Additional explanation of the device profiles • Chapter 3.9.: o Additional information on further properties of the EDE files • Chapter 4.1.: o Revision number modified • Chapter 5.2.1.: o The use of Multi-State Input is now mandatory o Positive Integer Value is now optional

		• Chapter 6.2.1.:
		  ○ Term "measurement notifications" replaced by "Trend Log Events"
		• Chapter 6.2.2.:
		  ○ Sentence on the prioritisation of messages on the OWS deleted
		  ○ Term "measurement notifications" replaced by "Trend Log Events"
		  ○ Footnote on Acked_Transition added
		• Chapter 6.2.5.:
		New specifications
		• Chapter 6.2.6.:
		New chapter
		• Chapter 6.3.1.:
		  ○ Corrections on control commands with Priority Array
		  ○ Additions on the use of target values
		• Chapter 6.3.2.:
		  ○ Description/example for Priority 1 corrected
		  ○ Description/example for Priority 6 corrected
		  ○ Sentence on commanding applications corrected
		• Chapter 6.5.:
		  ○ Additions on the use of the services "DeviceCommunicationControl" and "ReinitializeDevice"
		• Chapter 6.6.1.:
		  ○ Recommendation on trend logs reworded
		  ○ Corrections on Buffer Ready event settings
		• Chapter 6.6.1.1.:
		  ○ Additions on the settings and applications of "Align_Intervals" and "Interval_Offset"
		• Chapter 6.6.1.2.:
		  ○ Default value for room temperature adjusted
		  ○ Definition of Clients_COV_Increment values supplemented
		• Chapter 6.7.1.:
		  ○ Half days added to the calendar
		• Chapter 6.7.2.:
		  ○ Specification for schedule objects reduced
		  ○ CAL supplemented
		• Chapter 6.7.3.:
		  ○ CAL added to diagram
		• Chapter 7.2.:
		  ○ Specifications reduced to recommendation
		• CAL objects supplemented
		  ○ Term "measurement notifications" replaced by "Trend Log Events"
		  ○ 1-level drive modified
		  ○ 2-level drive modified
		• Chapter 7.3.2.:
		  ○ Drive modified (incl. diagram)
		• Chapter 8.4.:
		New chapter
		• Annex A:
		  ○ All objects adapted to revision number 14
		  ○ Device objects
		  ▪ Conformation Code Location: R
		  ▪ Conformation Code Description: W
		  ▪ Conformation Code Time_Synchronization_Recipients: W
		  ▪ Conformation Code Time_Of_Device_Restart: R
		  ▪ Conformation Code Restart_Notification_Recipients: W

		▪ Conformation Code UTC_Time_Synchronization_Recipients: W o Positive Integer Value object supplemented • Annex B: o All BIBBs adapted to revision number 14