DNP3 Device Profile

Based on DNP XML Schema version 2.11.00

Document Name: MHT410 XML File

Document Description: Device Profile for the MHT410

Showing both the Device's Capabilities and its Current Configuration

Revision History

Date	Time	Version	Reason for change	Edited by
2017-11-28		1	First Version	Matti Kokki, Vaisala Oyj

REFERENCE DEVICE:

1 Device Properties

This document is intended to be used for several purposes, including:

- Identifying the capabilities of a DNP3 device (Master Station or Outstation)

- Recording the settings of a specific instance of a device (parameter settings for a specific instance of the device in the user's total DNP3 estate)

- Matching user requirements to product capabilities when procuring a DNP3 device

The document is therefore structured to show, for each technical feature, the capabilities of the device (or capabilities required by the device when procuring).

It is also structured to show the current value (or setting) of each of the parameters that describe a specific instance of the device. This "current value" may also show a functional limitation of the device. For example when implementing secure authentication it is not required that all DNP3 devices accept aggressive mode requests during critical exchanges (see Device Profile 1.12.4), in which case a vendor would mark this current value as "No - does not accept aggressive mode requests".

Additionally, the current value may sometimes be used to show a value that a device can achieve because of hardware or software dependencies. Users should note that if an entry in the capabilities column of the Device Profile is grayed-out then there may be information in the current value column that is pertinent to the device's capabilities.

Unless otherwise noted, multiple boxes in the second column below are selected for each parameter to indicate all capabilities supported or required. Parameters without checkboxes in the second column do not have capabilities and are included so that the current value may be shown in the third column.

The items listed in the capabilities column below may be configurable to any of the options selected, or set to a fixed value when the device was designed. Item 1.1.10 contains a list of abbreviations for the possible ways in which the configurable parameters may be set. Since some parameters may not be accessible by each of these methods supported, an abbreviation for the configuration method supported by each parameter is shown in the fourth column of the tables below.

If this document is used to show the current values, the third column should be filled in even if a fixed parameter is selected in the capabilities section ("N/A" may be entered for parameters that are Not Applicable).

If the document is used to show the current values of parameters, then column 3 applies to a single connection between a master and an outstation.

1.1 DEVICE IDENTIFICATION	Capabilities	Current Value	If configurable list methods
1.1.1 Device Function:			

Masters send DNP requests, while Outstations send DNP responses. If a single physical device can perform both functions, a separate Device Profile Document must be provided for each function.	○ Master ◉ Outstation	○ Master ◉ Outstation	
1.1.2 Vendor Name: *The name of the organization producing the device.* *Note: The current value of this outstation parameter is available remotely using protocol object Group 0 Variation 252.*		Vaisala Oyj	
1.1.3 Device Name: *The model and name of the device, sufficient to distinguish it from any other device from the same organization.* *Note: The current value of this outstation parameter is available remotely using protocol object Group 0 Variation 250.*		MHT410	
1.1.4 Device manufacturer's hardware version string: *Note: The current value of this outstation parameter is available remotely using protocol object Group 0 Variation 243.*		C	
1.1.5 Device manufacturer's software version string: *Note: The current value of this outstation parameter is available remotely using protocol object Group 0 Variation 242.*		1.2.0	
1.1.6 Device Profile Document Version Number: *Version of the Device Profile Document is indicated by a whole number incremented with each new release. This should match the latest version shown in the Revision History at the beginning of this document.*		1	
1.1.7 DNP Levels Supported for: *Indicate each DNP3 Level to which the device conforms fully. For Masters, requests and responses can be indicated independently.*	Outstations Only Requests and Responses ☐ None ☑ Level 1 ☐ Level 2 ☐ Level 3 ☐ Level 4	Level 1	
1.1.8 Supported Function Blocks:	☐ Self Address Support ☐ Data Sets ☐ File Transfer ☐ Virtual Terminal ☐ Mapping to IEC 61850 Object Models defined in a DNP3 XML file ☐ Function code 31, activate configuration ☐ Secure Authentication (if checked then see 1.12)		
1.1.9 Notable Additions: *A brief description intended to quickly identify (for the reader) the most obvious features the device supports in addition to the Highest DNP Level Supported. The complete list of features is described in the Implementation Table.*	Binary Input Object(1) read function, variations 0-2, qualifiers 00, 01 and 06. Analog input Object(30) read function, variations 0-5, qualifiers 00, 01 and 06. Device Attribute Object(0) supported. See Implementation Table for details.		
1.1.10 Methods to set Configurable Parameters:	☐ XML - Loaded via DNP3 File Transfer ☐ XML - Loaded via other transport mechanism ☑ Terminal - ASCII Terminal Command Line ☐ Proprietary file loaded via DNP3 File Transfer ☐ Proprietary file loaded via other transport mechanism ☐ Direct - Keypad on device front panel ☐ Factory - Specified when device is ordered		

	☐ Protocol - Set via DNP3 (e.g. assign class) ☐ Other - explain:		
1.1.11 DNP3 XML files available On-line: *XML configuration file names that can be read or written through DNP3 File Transfer to a device.* *A device's currently running configuration is returned by DNP3 on-line XML file read from the device.* *DNP3 on-line XML file write to a device will update the device's configuration when the Activate Configuration (function code 31) is received.*	Rd Wr Filename — Description of Contents ☐ dnpDP.xml — Complete Device Profile ☐ dnpDPCap.xml — Device Profile Capabilities ☐ dnpDPCfg.xml — Device Profile config values		
1.1.12 External DNP3 XML files available Off-line: *XML configuration file names that can be read or written from an external system, typically from a system that maintains the outstation configuration.* *External off-line XML file read permits an XML definition of a new configuration to be supplied from off-line configuration tools.* *External off-line XML file write permits an XML definition of a new configuration to be supplied to off-line configuration tools.*	Rd Wr Filename — Description of Contents ☐ ☐ dnpDP.xml — Complete Device Profile ☐ ☐ dnpDPCap.xml — Device Profile Capabilities ☐ ☐ dnpDPCfg.xml — Device Profile config values ☑ ☐ MHT410.xml — Complete Device Profile Document	Rd Wr Filename ☐ ☐ dnpDP.xml ☐ ☐ dnpDPCap.xml ☐ ☐ dnpDPCfg.xml ☑ ☐ MHT410.xml	
1.1.13 Connections Supported:	☑ Serial (complete section 1.2) ☐ IP Networking (complete section 1.3) ☐ Other, explain	Serial	
1.1.14 Conformance Testing: *Where conformance testing has been completed for the outstation or master station, specify the version of the published DNP3 test procedures that was successfully passed. If independently tested, identify the organization that performed the test.*	☑ Self-tested, version Ver 2.6 rev 1 ☐ Independently tested, version		

1.2 SERIAL CONNECTIONS	**Capabilities**	**Current Value**	**If configurable list methods**
1.2.1 Port Name: *Name used to reference the communications port defined in this section.*		Not Relevant	
1.2.2 Serial Connection Parameters:	☑ Asynchronous - 8 Data Bits, 1 Start Bit, 1 Stop Bit, No Parity ☐ Other, explain	Asynchronous	
1.2.3 Baud Rate:	☐ Fixed at ☐ Configurable, range to ☑ Configurable, selectable from **300**, **600**, **1200**, **2400**, **4800**, **9600**, **19200**, **38400**, **57600** ☐ Configurable, other, describe	19200	terminal ----------
1.2.4 Hardware Flow Control (Handshaking): *Describe hardware signaling requirements of the interface.* *Where a transmitter or receiver is inhibited until a given control signal is asserted, it is considered to require that signal prior to sending or receiving characters.* *Where a signal is asserted prior to transmitting, that signal will be maintained active until after the end of transmission.* *Where a signal is asserted to enable reception, any data sent to the device when the signal is not active could be discarded.*	☑ None	None	
1.2.5 Interval to Request Link Status:	☑ Not Supported ☐ Fixed at seconds	Not Supported	

Indicates how often to send Data Link Layer status requests on a serial connection. This parameter is separate from the TCP Keep-alive timer.	☐ Configurable, range to seconds ☐ Configurable, selectable from seconds ☐ Configurable, other, describe		
1.2.6 Supports DNP3 Collision Avoidance: *Indicates whether an Outstation uses a collision avoidance algorithm.* *Collision avoidance may be implemented by a back-off timer with two parameters that define the back-off time range or by some other vendor-specific mechanism.* *The recommended back-off time is specified as being a fixed minimum delay plus a random delay, where the random delay has a maximum value specified. This defines a range of delay times that are randomly distributed between the minimum value and the minimum plus the maximum of the random value.* *If a back-off timer is implemented with only a fixed or only a random value, select the Back-off time method and set the parameter that is not supported to "Fixed at 0 ms".*	☑ No ☐ Yes, using Back-off time = (Min + Random) method ☐ Other, explain	No	
1.2.7 Receiver Inter-character Timeout: *When serial interfaces with asynchronous character framing are used, this parameter indicates if the receiver makes a check for gaps between characters. (i.e. extensions of the stop bit time of one character prior to the start bit of the following character within a message). If the receiver performs this check and the timeout is exceeded then the receiver discards the current data link frame. A receiver that does not discard data link frames on the basis of inter-character gaps is considered not to perform this check.* *Where no asynchronous serial interface is fitted this parameter is not applicable. In this case none of the options shall be selected.*	☑ Not Checked ☐ No gap permitted ☐ Fixed at bit times ☐ Fixed at ms ☐ Configurable, range to bit times ☐ Configurable, range to ms ☐ Configurable, selectable from bit times ☐ Configurable, selectable from ms ☐ Configurable, other, describe ☐ Variable, explain	Not Checked	
1.2.8 Inter-character gaps in transmission: *When serial interfaces with asynchronous character framing are used, this parameter indicates whether extra delay is ever introduced between characters in the message, and if so, the maximum width of the gap.* *Where no asynchronous serial interface is fitted this parameter is not applicable. In this case none of the options shall be selected.*	☐ None (always transmits with no inter-character gap) ☐ Maximumbit times ☑ Maximum **2** ms		

1.3 IP NETWORKING	**Capabilities**	**Current Value**	**If configurable list methods**
This section is not included in this Profile.			

1.4 LINK LAYER	**Capabilities**	**Current Value**	**If configurable list methods**
1.4.1 Data Link Address: *Indicates if the link address is configurable over the entire valid range of 0 to 65,519. Data link addresses 0xFFF0 through 0xFFFF are reserved for broadcast or other special purposes.*	☐ Fixed at ☑ Configurable, range **0** to **32767** ☐ Configurable, selectable from ☐ Configurable, other, describe	4	terminal ----------
1.4.2 DNP3 Source Address Validation: *Indicates whether the Outstation will filter out requests not from a specific source address.*	☑ Never ☐ Always, one address allowed (shown in 1.4.3) ☐ Always, any one of multiple addresses allowed (each selectable as shown in 1.4.3) ☐ Sometimes, explain	Never	
1.4.3 DNP3 Source Address(es) expected when Validation is Enabled:	☐ Configurable to any 16 bit DNP Data Link Address value ☐ Configurable, range to		

Selects the allowed source address(es)	☐ Configurable, selectable from ☐ Configurable, other, describe		
1.4.4 Self Address Support using address 0xFFFC: *If an Outstation receives a message with a destination address of 0xFFFC it shall respond normally with its own source address. It must be possible to diasble this feature if supported.*	☐ Yes (only allowed if configurable) ☑ No	No	
1.4.5 Sends Confirmed User Data Frames: *A list of conditions under which the device transmits confirmed link layer services (TEST_LINK_STATES, RESET_LINK_STATES, CONFIRMED_USER_DATA).*	☑ Never ☐ Always ☐ Sometimes, explain	Never	
1.4.6 Data Link Layer Confirmation Timeout: *This timeout applies to any secondary data link message that requires a confirm or response (link reset, link status, user data, etc).*	☑ None ☐ Fixed at ms ☐ Configurable, range to ms ☐ Configurable, selectable from ms ☐ Configurable, other, describe ☐ Variable, explain	None	
1.4.7 Maximum Data Link Retries: *The number of times the device will retransmit a frame that requests Link Layer confirmation.*	☑ None ☐ Fixed at ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe	None	
1.4.8 Maximum number of octets Transmitted in a Data Link Frame: *This number includes the CRCs. With a length field of 255, the maximum size would be 292.*	☑ Fixed at **292** ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe	292	
1.4.9 Maximum number of octets that can be Received in a Data Link Frame: *This number includes the CRCs. With a field length of 255, the maximum size would be 292. The device must be able to receive 292 octets to be compliant.*	☑ Fixed at **292** ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe	292	

1.5 APPLICATION LAYER	**Capabilities**	**Current Value**	**If configurable list methods**
1.5.1 Maximum number of octets Transmitted in an Application Layer Fragment other than File Transfer: *This size does not include any transport or frame octets.* *- Masters must provide a setting less than or equal to 249 to be compliant.* *- Outstations must provide a setting less than or equal to 2048 to be compliant.* *Note: The current value of this outstation parameter is available remotely using protocol object Group 0 Variation 240.*	☑ Fixed at **512** ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe	512	
1.5.2 Maximum number of octets Transmitted in an Application Layer Fragment containing File Transfer:	☐ Same as 1.5.1 ☐ Fixed at ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe Note: Not relevant - DNP3 file transfer not supported.		
1.5.3 Maximum number of octets that can be received in an Application Layer Fragment: *This size does not include any transport or frame octets.* *- Masters must provide a setting greater than or equal to 2048 to be compliant.* *- Outstations must provide a setting greater than or equal to 249 to be compliant.* *Note: The current value of this outstation parameter is available remotely using protocol object Group 0 Variation 241.*	☑ Fixed at **256** ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe	256	

1.5.4 Timeout waiting for Complete Application Layer Fragment: *Timeout if all frames of a message fragment are not received in the specified time. Measured from time first frame of a fragment is received until the last frame is received.*	☐ None ☑ Fixed at ms ☐ Configurable, range to ms ☐ Configurable, selectable from ms ☐ Configurable, other, describe ☐ Variable, explain	15000ms	
1.5.5 Maximum number of objects allowed in a single control request for CROB (Group 12): *Note: The current value of this outstation parameter is available remotely using protocol object Group 0 Variation 216.*	☑ Fixed at **0**(enter 0 if controls are not supported for CROB) ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe ☐ Variable, explain ☐ The number of objects that can be contained in a fragment (as specified in 1.5.3)	0	
1.5.6 Maximum number of objects allowed in a single control request for Analog Outputs (Group 41):	☑ Fixed at **0**(enter 0 if controls are not supported for Analog Outputs) ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe ☐ Variable, explain ☐ The number of objects that can be contained in a fragment (as specified in 1.5.3) Note: Set at zero because Analog Outputs are not supported.		
1.5.7 Maximum number of objects allowed in a single control request for Data Sets (Groups 85, 86, 87):	☑ Fixed at **0**(enter 0 if controls are not supported for Data Sets) ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe ☐ Variable, explain ☐ The number of objects that can be contained in a fragment (as specified in 1.5.3) Note: Set at zero because DNP3 Data Sets are not supported.		
1.5.8 Supports mixed object groups (AOBs, CROBs and Data Sets) in the same control request:	☑ Not applicable - controls are not supported ☐ Yes ☐ No	N/A	
1.5.9 Control Status Codes Supported: *Indicates which control status codes are supported by the device:* *- Masters must indicate which control status codes they accept in outstation responses.* *- Outstations must indicate which control status codes they generate in responses.* *Control status code 0 (success) must be supported by Masters and Outstations.*	☐ 1 - TIMEOUT ☐ 2 - NO_SELECT ☐ 3 - FORMAT_ERROR ☐ 4 - NOT_SUPPORTED ☐ 5 - ALREADY_ACTIVE ☐ 6 - HARDWARE_ERROR ☐ 7 - LOCAL ☐ 8 - TOO_MANY_OBJS ☐ 9 - NOT_AUTHORIZED ☐ 10 - AUTOMATION_INHIBIT ☐ 11 - PROCESSING_LIMITED ☐ 12 - OUT_OF_RANGE ☐ 13 - DOWNSTREAM_LOCAL ☐ 14 - ALREADY_COMPLETE ☐ 15 - BLOCKED ☐ 16 - CANCELLED ☐ 17 - BLOCKED_OTHER_MASTER ☐ 18 - DOWNSTREAM_FAIL ☐ 126 - RESERVED ☐ 127 - UNDEFINED		

1.6 FILL OUT THE FOLLOWING ITEMS FOR MASTERS ONLY	**Capabilities**	**Current Value**	**If configurable list methods**
This section is not included in this Profile.			

1.7 FILL OUT THE FOLLOWING ITEMS FOR OUTSTATIONS ONLY	**Capabilities**	**Current Value**	**If configurable list methods**
1.7.1 Timeout waiting for Application Confirm of solicited response message:	☑ None ☐ Fixed at ms ☐ Configurable, range to ms ☐ Configurable, selectable from ms	None	

	☐ Configurable, other, describe ☐ Variable, explain		
1.7.2 How often is time synchronization required from the master: *Details of when the master needs to perform a time synchronization to ensure that the outstation clock does not drift outside of an acceptable tolerance. If the option to relate this to IIN1.4 is used then details of when IIN1.4 is asserted are in section 1.10.2.*	☑ Never needs time ☐ Within seconds after IIN1.4 is set ☐ Periodically, fixed at seconds ☐ Periodically, between and seconds	Never	
1.7.3 Device Trouble Bit IIN1.6: *If IIN1.6 device trouble bit is set under certain conditions, explain the possible causes.*	☐ Never used ☑ Reason for setting **Device's permanent error prevents measurement**	Used as described	
1.7.4 File Handle Timeout: *If there is no activity referencing a file handle for a configurable length of time, the outstation must do an automatic close on the file. The timeout value must be configurable up to 1 hour. When this condition occurs the outstation will send a File Transport Status Object (obj grp 70 var 6) using a status code value of handle expired (0x02).*	☑ Not applicable, files not supported ☐ Fixed at ms ☐ Configurable, range to ms ☐ Configurable, selectable from ms ☐ Configurable, other, describe ☐ Variable, explain	Not applicable	
1.7.5 Event Buffer Overflow Behavior:	☐ Discard the oldest event ☐ Discard the newest event ☐ Other, explain		
1.7.6 Event Buffer Organization: *Explain how event buffers are arranged (per Object Group, per Class, single buffer, etc) and specify the number of events that can be buffered.*	☐ Per Object Group (see part 3) ☐ Per Class Class 1: ☐ Fixed at ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe Class 2: ☐ Fixed at ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe Class 3: ☐ Fixed at ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe ☐ Single Buffer ☐ Fixed at ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe ☐ Other, describe		
1.7.7 Sends Multi-Fragment Responses: *Indicates whether an Outstation sends multi-fragment responses (Masters do not send multi-fragment requests).*	☐ Yes ☑ No	No	
1.7.8 Last Fragment Confirmation: *Indicates whether the Outstation requests confirmation of the last fragment of a multi-fragment response.*	☐ Always ☐ Sometimes, explain ☑ Never		
1.7.9 DNP Command Settings preserved through a device restart: *If any of these settings are written through the DNP protocol and they are not preserved through a restart of the Outstation, the Master will have to write them again after it receives a response in which the Restart IIN bit is set.*	☐ Assign Class ☐ Analog Deadbands ☐ Data Set Prototypes ☐ Data Set Descriptors ☐ Function Code 31 Activate Configuration		
1.7.10 Supports configuration signature:	☐ Configuration signature supported		

Indicates whether an Outstation supports the Group 0 device attribute "Configuration signature" (variation 200). If yes, list the vendor-defined name(s) of the algorithm(s) available to calculate the signature. *Note: The algorithm used for calculating the signature is identified by name in a string that can be determined remotely using protocol object Group 0 Variation 201. If only a single algorithm is available, identifying that algorithm in this object is optional.*	If configuration signature is supported, then the following algorithm(s) are available for calculating the signature:		
1.7.11 Requests Application Confirmation: *Indicate if application confirmation is requested:* *- when responding with events* *- when sending non-final fragments of multi-fragment responses* *Note: to be compliant both must be selected as "yes".*	For event responses: ○ Yes ○ No ○ Configurable For non-final fragments: ○ Yes ○ No ○ Configurable		
1.7.12 Supports DNP3 Clock Management: *Indicates whether the Outstation supports the DNP3 clock management functionality:* *- supports timestamped object variations required for its subset level with a time accuracy that is consistent with section 10 of this Device Profile* *- if the outstation asserts IIN1.4 [NEED_TIME], it shall support DNP3 time synchronization functionality*	☐ Yes ☑ No		

1.8 OUTSTATION UNSOLICITED RESPONSE SUPPORT	**Capabilities**	**Current Value**	**If configurable list methods**
1.8.1 Supports Unsolicited Reporting: *When the unsolicited response mode is configured "off", the device is to behave exactly like an equivalent device that has no support for unsolicited responses. If set to "on", the Outstation will send a null Unsolicited Response after it restarts, then wait for an Enable Unsolicited Response command from the master before sending additional Unsolicited Responses containing event data.*	☐ Yes ☑ No ☐ Configurable, selectable from On and Off		
1.8.2 Master Data Link Address: *The destination address of the master device where the unsolicited responses will be sent.*	☐ Fixed at ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe		
1.8.3 Unsolicited Response Confirmation Timeout: *This is the amount of time that the outstation will wait for an Application Layer confirmation back from the master indicating that the master received the unsolicited response message. As a minimum, the range of configurable values must include times from one second to one minute. This parameter may be the same one that is used for normal, solicited, application confirmation timeouts, or it may be a separate parameter.*	☐ Fixed at ms ☐ Configurable, range to ms ☐ Configurable, selectable from ms ☐ Configurable, other, describe ☐ Variable, explain		
1.8.4 Number of Unsolicited Retries: *This is the number of retries that an outstation transmits in each unsolicited response series if it does not receive confirmation back from the master. The configured value includes identical and regenerated retry messages. One of the choices must provide for an indefinite (and potentially infinite) number of transmissions.*	☐ None ☐ Fixed at ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe ☐ Unlimited		

1.9 OUTSTATION UNSOLICITED RESPONSE TRIGGER CONDITIONS	**Capabilities**	**Current Value**	**If configurable list methods**

This section is not included in this Profile.

1.10 OUTSTATION PERFORMANCE	Capabilities	Current Value	If configurable list methods
1.10.1 Maximum Time Base Drift (milliseconds per minute): *If the device is synchronized by DNP, what is the clock drift rate over the full operating temperature range.*	☐ Fixed at ms ☐ Range to ms ☐ Selectable from ms ☐ Other, describe		
1.10.2 When does outstation set IIN1.4: *When does the outstation set the internal indication IIN1.4 NEED_TIME*	☑ Never ☐ Asserted at startup until first Time Synchronization request received ☐ Periodically every seconds ☐ Periodically, range to seconds ☐ Periodically, selectable from seconds ☐ seconds after last time sync ☐ Range to seconds after last time sync ☐ Selectable from seconds after last time sync ☐ When time error may have drifted by ms ☐ When time error may have drifted by range to ms ☐ When time error may have drifted by selectable from ms	Never	
1.10.3 Maximum Internal Time Reference Error when set via DNP (ms): *The difference between the time set in DNP Write Time message, and the time actually set in the outstation.*	☐ Fixed at ms ☐ Range to ms ☐ Selectable from ms ☐ Other, describe		
1.10.4 Maximum Delay Measurement Error (ms): *The difference between the time reported in the delay measurement response and the actual time between receipt of the delay measurement request and issuing the delay measurement reply.*	☐ Fixed at ms ☐ Range to ms ☐ Selectable from ms ☐ Other, describe		
1.10.5 Maximum Response Time (ms): *The amount of time an outstation will take to respond upon receipt of a valid request. This does not include the message transmission time.*	☑ Fixed at **200**ms ☐ Range to ms ☐ Selectable from ms ☐ Other, describe Note: Typically 30ms to 70ms, maximum 200ms	200 ms	
1.10.6 Maximum time from start-up to IIN 1.4 assertion (ms):	☐ Fixed at ms ☐ Range to ms ☐ Selectable from ms ☐ Other, describe		
1.10.7 Maximum Event Time-tag error for local Binary and Double Bit I/O (ms): *The error between the time-tag reported and the absolute time of the physical event. This error includes the Internal Time Reference Error. Note: The current value of this parameter is available remotely using protocol object Group 0 Variation 217.*	☐ Fixed at ms ☐ Range to ms ☐ Selectable from ms ☐ Other, describe		
1.10.8 Maximum Event Time-tag error for local I/O other than Binary and Double Bit data types (ms):	☐ Fixed at ms ☐ Range to ms ☐ Selectable from ms ☐ Other, describe		

1.11 INDIVIDUAL FIELD OUTSTATION PARAMETERS	Value of Current Setting	If configurable list methods
This section is not included in this Profile.		

1.12 SECURITY PARAMETERS	Capabilities	Current Value	If configurable list methods
This section is not included in this Profile.			

1.13 BROADCAST FUNCTIONALITY	Capabilities	Current Value	If configurable list methods
This section indicates which functions are supported by the device when using broadcast addresses. Note that this section shows only entries that may have a meaningful purpose when used with broadcast requests.			
1.13.1 Support for broadcast functionality:	◉ Disabled ○ Enabled ○ Configurable		

2 Mapping to IEC 61850 Object Models

This optional section allows each configuration parameter or point in the DNP Data map to be tied to an attribute in the IEC 61850 object models.

Earlier versions of this section (up to version 2.07) used mappings based on an "access point" (section 2.1.1 and then a series of XPath references (section 2.1.2). Section 2.1.2 has been superseded in version 2.08 onwards with mappings defined using either predefined rules (section 2.1.3) or specified as an equation (section 2.1.4). The list of pre-defined rules is found in the IEEE 1815-1 document.

This section is not included in this Profile.

3 Capabilities and Current Settings for Device Database (Outstation only)

The following tables identify the capabilities and current settings for each DNP3 data type. Details defining the data points available in the device are shown in part 5 of this Device Profile.

3.1 BINARY INPUTS **Static (Steady-State) Group Number: 1** **Event Group Number: 2**			
.	**Capabilities (leave tick-boxes blank if this data type is not supported)**	**Current Value**	**If configurable list methods**
3.1.1 Static Variation reported when variation 0 requested or in response to Class polls:	☑ Variation 1 - packed format ☑ Variation 2 - with flag ☐ Based on point index (add column to table in part 5)	One	
3.1.2 Event Variation reported when variation 0 requested or in response to Class polls: *Note: The support for binary input events can be determined remotely using protocol object Group 0 Variation 237.*	☐ Variation 1 - without time ☐ Variation 2 - with absolute time ☐ Variation 3 - with relative time ☐ Based on point index (add column to table in part 5)		
3.1.3 Event reporting mode: *When responding with event data and more than one event has occurred for a data point, an Outstation may include all events or only the most recent event.* *"All events" must be checked to be compliant.*	☐ Only most recent ☐ All events ☐ Based on point index (add column to table in part 5)		
3.1.4 Binary Inputs included in Class 0 response:	☑ Always ☐ Never ☐ Only if point is assigned to a class ☐ Based on point index (add column to table in part 5)	Always	
3.1.5 Binary Inputs Event Buffer Organization: *When event buffers are allocated per object group (see part 1.7.6), indicate the number of events that can be buffered for Binary Inputs. If event buffers are not allocated per object group then set "Fixed at 0".*	☑ Fixed at **0** ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe		

3.2 DOUBLE-BIT BINARY INPUTS **Static (Steady-State) Group Number: 3** **Event Group Number: 4**			
.	**Capabilities (leave tick-boxes blank if this data type is not supported)**	**Current Value**	**If configurable list methods**

This section is not included in this Profile.

3.3 BINARY OUTPUT STATUS AND CONTROL RELAY OUTPUT BLOCK

Binary Output Status Group Number: 10
Binary Output Event Group Number: 11
CROB Group Number: 12
Binary Output Command Event Group Number: 13

.	**Capabilities (leave tick-boxes blank if this data type is not supported)**	**Current Value**	**If configurable list methods**
This section is not included in this Profile.			

3.4 COUNTERS / FROZEN COUNTERS

Counter Group Number: 20
Frozen Counter Group Number: 21
Counter Event Group Number: 22
Frozen Counter Event Group Number: 23

.	**Capabilities (leave tick-boxes blank if this data type is not supported)**	**Current Value**	**If configurable list methods**
This section is not included in this Profile.			

3.5 ANALOG INPUTS / FROZEN ANALOG INPUTS

Static (Steady-State) Group Number: 30
Static Frozen Group Number: 31
Event Group Number: 32
Frozen Analog Input Event Group Number: 31
Deadband Group Number: 34

.	**Capabilities (leave tick-boxes blank if this data type is not supported)**	**Current Value**	**If configurable list methods**
3.5.1 Static Variation reported when variation 0 requested or in response to Class polls:	☑ Variation 1 - 32-bit with flag ☑ Variation 2 - 16-bit with flag ☑ Variation 3 - 32-bit without flag ☑ Variation 4 - 16-bit without flag ☑ Variation 5 - single-precision floating point with flag ☐ Variation 6 - double-precision floating point with flag ☐ Based on point index (add column to table in part 5)	Two	
3.5.2 Event Variation reported when variation 0 requested or in response to Class polls: *Note: The support for analog input events can be determined remotely using protocol object Group 0 Variation 231.*	☐ Variation 1 - 32-bit without time ☐ Variation 2 - 16-bit without time ☐ Variation 3 - 32-bit with time ☐ Variation 4 - 16-bit with time ☐ Variation 5 - single-precision floating point w/o time ☐ Variation 6 - double-precision floating point w/o time ☐ Variation 7 - single-precision floating point with time ☐ Variation 8 - double-precision floating point with time ☐ Based on point index (add column to table in part 5)		
3.5.3 Event reporting mode: *When responding with event data and more than one event has occurred for a data point, an Outstation may include all events or only the most recent event. Only the most recent event is typically reported for Analog Inputs. When reporting only the most recent event the analog value returned in the response may be either the value at the time that the event is queued or it may be the value at the time of the response.*	☐ A: Only most recent (value at time of event) ☐ B: Only most recent (value at time of response) ☐ C: All events ☐ Based on point index (add column to table in part 5)		
3.5.4 Analog Inputs included in Class 0 response:	☑ Always ☐ Never ☐ Only if point is assigned to a class ☐ Based on point index (add column to table in part 5)	Always	
3.5.5 How Deadbands are set:	☐ A. Global Fixed ☐ B. Configurable through DNP ☐ C. Configurable via other means		

	☐ D. Other, explain: ☐ Based on point index - column in part 5 specifies which of the options applies, B, C, or D		
3.5.6 Analog Deadband Algorithm: simple- just compares the difference from the previous reported value integrating- keeps track of the accumulated change other- indicating another algorithm	☐ Simple ☐ Integrating ☐ Other, explain: ☐ Based on point index (add column to table in part 5)		
3.5.7 Static Frozen Analog Input Variation reported when variation 0 requested or in response to Class polls:	☐ Variation 1 - 32-bit with flag ☐ Variation 2 - 16-bit with flag ☐ Variation 3 - 32-bit with time-of-freeze ☐ Variation 4 - 16-bit with time-of-freeze ☐ Variation 5 - 32-bit without flag ☐ Variation 6 - 16-bit without flag ☐ Variation 7 - single-precision floating point with flag ☐ Variation 8 - double-precision floating point with flag ☐ Based on point index (add column to table in part 5)		
3.5.8 Frozen Analog Input Event Variation reported when variation 0 requested or in response to Class polls: *Note: The support for frozen analog input events can be determined remotely using protocol object Group 0 Variation 230.*	☐ Variation 1 - 32-bit without time ☐ Variation 2 - 16-bit without time ☐ Variation 3 - 32-bit with time ☐ Variation 4 - 16-bit with time ☐ Variation 5 - single-precision floating point w/o time ☐ Variation 6 - double-precision floating point w/o time ☐ Variation 7 - single-precision floating point with time ☐ Variation 8 - double-precision floating point with time ☐ Based on point index (add column to table in part 5)		
3.5.9 Frozen Analog Inputs included in Class 0 response:	☐ Always ☐ Never ☐ Only if point is assigned to a class ☐ Based on point index (add column to table in part 5)		
3.5.10 Frozen Analog Input Event reporting mode: *When responding with event data and more than one event has occurred for a data point, an Outstation may include all events or only the most recent event. All events are typically reported for Frozen Analog Inputs.*	☐ Only most recent frozen value ☐ All frozen values ☐ Based on point index (add column to table in part 5)		
3.5.11 Analog Inputs Event Buffer Organization: *When event buffers are allocated per object group (see part 1.7.6), indicate the number of events that can be buffered for Analog Inputs. If event buffers are not allocated per object group then set "Fixed at 0".*	☑ Fixed at **0** ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe		
3.5.12 Frozen Analog Inputs Event Buffer Organization: *When event buffers are allocated per object group (see part 1.7.6), indicate the number of events that can be buffered for Frozen Analog Inputs. If event buffers are not allocated per object group then set "Fixed at 0".*	☑ Fixed at **0** ☐ Configurable, range to ☐ Configurable, selectable from ☐ Configurable, other, describe		

3.6 ANALOG OUTPUTS / ANALOG OUTPUT COMMANDS

Analog Output Status Group Number: 40
Analog Outputs Group Number: 41
Analog Output Events Group Number: 42
Analog Output Command Events Group Number: 43

.	**Capabilities (leave tick-boxes blank if this data type is not supported)**	**Current Value**	**If configurable list methods**

This section is not included in this Profile.

3.7 FILE CONTROL
Group Number: 70

.	Capabilities	Current Value	If configurable list methods
This section is not included in this Profile.			

3.8 OCTET STRING AND EXTENDED OCTET STRING POINTS
Static (Steady-State) Group Number: 110, 114
Event Group Number: 111, 115

.	Capabilities	Current Value	If configurable list methods
This section is not included in this Profile.			

3.9 VIRTUAL TERMINAL PORT NUMBERS (POINTS)
Static (Steady-State) Group Number: 112
Event Group Number: 113

.	Capabilities	Current Value	If configurable list methods
This section is not included in this Profile.			

3.10 DATA SET PROTOTYPE
Group Number: 85
Variation Number: 1

.	Capabilities	Current Value	If configurable list methods

This version of the Device Profile has no requirement for describing Data Set Prototype capabilities and current settings. This page is intentionally left blank, existing as placeholder for future use.

3.11 DATA SET DESCRIPTOR CONTENTS AND CHARACTERISTICS
Group Number: 86
Variation Numbers: 1 and 2

This version of the Device Profile has no requirement for describing Data Set Descriptor capabilities and current settings. This page is intentionally left blank, existing as placeholder for future use.

4 Implementation Table

The following implementation table identifies which object groups and variations, function codes and qualifiers the device supports in both requests and responses. The *Request* columns identify all requests that may be sent by a Master, or all requests that must be parsed by an Outstation. The *Response* columns identify all responses that must be parsed by a Master, or all responses that may be sent by an Outstation.

DNP OBJECT GROUP & VARIATION			REQUEST Master may issue Outstation must parse		RESPONSE Master must parse Outstation may issue	
Object Group Number	**Variation Number**	**Description**	**Function Codes (dec)**	**Qualifier Codes (hex)**	**Function Codes (dec)**	**Qualifier Codes (hex)**
0	212	Device Attributes - Number of master-defined data set prototypes	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	213	Device Attributes - Number of outstation-defined data set prototypes	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	214	Device Attributes - Number of master-defined data sets	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	215	Device Attributes - Number of outstation-defined data sets	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	221	Device Attributes - Number of Number of analog outputs	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	224	Device Attributes - Number of Number of binary outputs	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	231	Device Attributes - Support for analog input events	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	232		1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*

		Device Attributes - Maximum analog input index				
0	233	Device Attributes - Number of analog input points	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	237	Device Attributes - Support for binary input events	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	238	Device Attributes - Max binary input index	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	239	Device Attributes - Number of binary input points	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	240	Device Attributes - Max transmit fragment size	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	241	Device Attributes - Max receive fragment size	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	242	Device Attributes - Device manufacturer’s software version	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	243	Device Attributes - Device manufacturer’s hardware version	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	248	Device Attributes - Device serial number	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	249	Device Attributes - DNP3 subset and conformance	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	250	Device Attributes - Device manufacturer’s product name and model	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	252	Device Attributes - Device manufacturer’s name	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	254	Device Attributes - Non-specific all attributes request	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
0	255	Device Attributes - List of attribute variations	1 *(read)*	00 *(start-stop)*	*(Response)*	00 *(start-stop)*
1	0	Binary Input - any variation	1 *(read)*	06 *(no range, or all)*		
1	1	Binary Input - Packed format	1 *(read)*	00, 01 *(start-stop)*, 06 *(no range, or all)*	*(Response)*	00, 01 *(start-stop)*
1	2	Binary Input - with flags	1 *(read)*	00, 01 *(start-stop)*, 06 *(no range, or all)*	*(Response)*	00, 01 *(start-stop)*
10	0	Continuous Control - any variation	1 *(read)*	06 *(no range, or all)*		
10	2	Continuous Control - Output status with flags			*(Response)*	00 *(start-stop)*
12	1	Pulsed Control - control relay output block	3,4,5,6	17, 28 *(index)*		echo of request
30	0	Analog Input - any variation	1 *(read)*	06 *(no range, or all)*	*(Response)*	00 *(start-stop)*
30	1	Analog Input - 32-bit	1 *(read)*	00, 01 *(start-stop)*, 06 *(no range, or all)*	*(Response)*	00, 01 *(start-stop)*
30	2	Analog Input - 16-bit	1 *(read)*	00, 01 *(start-stop)*, 06 *(no range, or all)*	*(Response)*	00, 01 *(start-stop)*
30	3	Analog Input - 32-bit without flag	1 *(read)*	00, 01 *(start-stop)*, 06 *(no range, or all)*	*(Response)*	00, 01 *(start-stop)*
30	4	Analog Input - 16-bit without flag	1 *(read)*	00, 01 *(start-stop)*, 06 *(no range, or all)*	*(Response)*	00, 01 *(start-stop)*
30	5	Analog Input - Short floating point	1 *(read)*	00, 01 *(start-stop)*, 06 *(no range, or all)*	*(Response)*	00, 01 *(start-stop)*
40	0	Analog Output Status - any variation	1 *(read)*	06 *(no range, or all)*		
41	2	Analog Output - 16-bit	3,4,5,6	17, 28 *(index)*		echo of request
50	1	Time and Date - absolute time	2 *(write)*	07 *(limited qty = 1)*		
60	1	Class Objects - class 0 data	1 *(read)*	06 *(no range, or all)*		
60	2	Class Objects - class 1 data	1 *(read)*	06 *(no range, or all)*, 07, 08 *(limited qty)*		
60	3	Class Objects - class 2 data	1 *(read)*	06 *(no range, or all)*, 07, 08 *(limited qty)*		
60	4	Class Objects - class 3 data	1 *(read)*	06 *(no range, or all)*, 07, 08 *(limited qty)*		
80	1	Internal Indications - packed format	2 *(write)*			
No object (function code only)			0 *(confirm)*			
No object (function code only)			13 *(cold restart)*			
No object (function code only)			23 *(delay meas.)*			

5 Data Points List (outstation only)

This part of the Device Profile shows, for each data type, a table defining the data points available in the device or a description of how this information can be obtained if the database is configurable.

5.1 Definition of Binary Input Point List: *List of addressable points. Points that do not exist (for example, because an option is not installed) are omitted from the table.* *Note: the number of binary inputs present in the device, and the maximum binary input index, are available remotely using object Group 0 Variations 239 and 238.*	☑ Fixed, list shown in table below ☐ Configurable (current list may be shown in table below) ☐ Other, explain:

Binary Input points list:

Point Index	Name	Event Class Assigned (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
0	Critical error	none	OK	Error	Set when service is needed
1	Error	none	OK	Error	Set when it is possible to recover from error
2	RH measurement error	none	OK	Error	Set when there is no reliable moisture measurement
3	T measurement error	none	OK	Error	Set when there is no reliable temperature measurement
4	Hydrogen measurement error	none	OK	Error	Set when there is no reliable hydrogen measurement
5	Other error	none	OK	Error	Set when there is unspefied error
6	H2 alarm level exceeded	none	False	True	Set when H2 level is above alarm level

5.2 Definition of Double-bit Input Point List: *List of addressable points. Points that do not exist (for example, because an option is not installed) are omitted from the table.* *Note: the number of double-bit inputs present in the device, and the maximum double-bit input index, are available remotely using object Group 0 Variations 236 and 235.*	☐ Fixed, list shown in table below ☐ Configurable (current list may be shown in table below) ☐ Other, explain:

This section is not included in this Profile.

5.3 Definition of Binary Output Status / Control Relay Output Block Points List: *List of addressable points. Points that do not exist (for example, because an option is not installed) are omitted from the table.* *Note: the number of binary outputs present in the device, and the maximum binary output index, are available remotely using object Group 0 Variations 224 and 223.*	☐ Fixed, list shown in table below ☐ Configurable (current list may be shown in table below) ☐ Other, explain:

This section is not included in this Profile.

5.4 Definition of Counter / Frozen Counter Point List: *List of addressable points. Points that do not exist (for example, because an option is not installed) are omitted from the table.* *Note: the number of counters present in the device, and the maximum counter index, are available remotely using object Group 0 Variations 229 and 228.*	☐ Fixed, list shown in table below ☐ Configurable (current list may be shown in table below) ☐ Other, explain:

This section is not included in this Profile.

5.5 Definition of Analog Input Point List: *List of addressable points. Points that do not exist (for example, because an option is not installed) are omitted from the table.*	☑ Fixed, list shown in table below ☐ Configurable (current list may be shown in table below) ☐ Other, explain:

Note: the number of analog inputs present in the device, and the maximum analog input index, are available remotely using object Group 0 Variations 233 and 232.	

Analog Input points list:

.					Transmitted Value		Scaling		.		
Point Index	Name	Event Class Assigned (1, 2, 3 or none)	Frozen Analog Exists (Yes or No)	Event Class Assigned to Frozen Analog Events (1, 2, 3 or none)	Min int / flt	Max int / flt	Multiplier	Offset	Units	Resolution	Description
0	Hydrogen, 1h average	none			0	5000			ppm	1	
1	Hydrogen, 24h average	none			0	5000			ppm	1	
2	Hydrogen, Daily ROC	none			-5000	5000			ppm	1	
3	Hydrogen, Weekly ROC	none			-5000	5000			ppm	1	
4	Hydrogen, Monthly ROC	none			-5000	5000			ppm	1	
5	Oil moisture, Relative saturatiom	none			0	100			%RS	1	
6	Oil moisture, Current	none			0	5000			ppm	1	
7	Oil moisture, 24h average	none			0	5000			ppm	1	
8	Oil moisture, Daily ROC	none			-1000	1000			ppm	1	
9	Oil moisture, Weekly ROC	none			-1000	1000			ppm	1	
10	Oil moisture, Monthly ROC	none			-1000	1000			ppm	1	
11	Oil temperature	none			-50	120			°C	1	
12	Oil temperature	none			-58	248			°F	1	

5.6 Definition of Analog Output Status / Analog Output Block Point List: *List of addressable points. Points that do not exist (for example, because an option is not installed) are omitted from the table.* *Note: the number of analog outputs present in the device, and the maximum analog output index, are available remotely using object Group 0 Variations 221 and 220.*	☐ Fixed, list shown in table below ☐ Configurable (current list may be shown in table below) ☐ Other, explain:

This section is not included in this Profile.

5.7 Definition of File Names that may be read or written:	☐ Fixed, list shown in table below ☐ Configurable (current list may be shown in table below) ☐ Other, explain:

This section is not included in this Profile.

5.8 Definition of Octet String and Extended Octet String Point List: *List of addressable points. Points that do not exist (for example, because an option is not installed) are omitted from the table.*	☐ Fixed, list shown in table below ☐ Configurable (current list may be shown in table below) ☐ Other, explain:

This section is not included in this Profile.

5.9 Definition of Virtual Terminal Port Numbers: *List of addressable points. Points that do not exist (for example, because an option is not installed) are omitted from the table.*	☐ Fixed, list shown in table below ☐ Configurable (current list may be shown in table below) ☐ Other, explain:

This section is not included in this Profile.

5.10 Definition of Data Set Prototypes: *List of all data set prototypes. The following table is repeated for each Data Set Prototype defined.* *Note: the number of data set prototypes known to the device are available remotely using object Group 0 Variations 212 and 213.*	☐ Fixed, list shown in table below ☐ Configurable (current list may be shown in table below) ☐ Other, explain:

This section is not included in this Profile.

5.11 Definition of Data Set Descriptors: *List of all data set descriptors. The following table is repeated for each Data Set Descriptor defined.* *Note: the number of data sets known to the device are available remotely using object Group 0 Variations 214 and 215.*	☐ Fixed, list shown in table below ☐ Configurable (current list may be shown in table below) ☐ Other, explain:

This section is not included in this Profile.

5.12 Data Set Descriptors - Point Index Attributes *The following table is optional and correlates data set elements to point indexes of standard DNP3 Data Objects. The element number below refers to the position in the present value object (object 87) or event (object 88) data set and will not match the element number in the data set descriptor or data set prototype tables above.*

This section is not included in this Profile.

---------- End of Device Profile for Reference Device ----------

------------------------------ End of Complete Device Profile ------------------------------