DNP 3.0
Remote Communication Protocol for REC 523

Technical Description

Industrial IT enabled products from ABB are the building blocks for greater productivity, featuring all the tools necessary for lifecycle product support in consistent electronic form.

Contents

1. Overview of the protocol

The DNP protocol has been developed by Harris Controls based on the early versions of the IEC 60870-5 standard telecontrol protocol specifications. Now the protocol specification is controlled by the DNP Users Group.

The ISO OSI based model supported by this protocol specifies physical, data link and application layers only. This reduced protocol stack is referred to as Enhanced Performance Architecture (EPA). However, to support advanced RTU functions and messages larger than the maximum frame length as defined by the IEC document 60870-5-1, the DNP Version 3 Data Link is intended to be used with a transport pseudo-layer. As a minimum, this transport layer implements message assembly and disassembly services.

1.1. Physical layer

The physical layer that is recommended for the data link is a bit-serial oriented asynchronous physical layer supporting 8-bit data, 1 start bit, 1 stop bit, no parity and RS232C voltage levels and control signals. The modem used for communication using PSN (Public Switched Network) or private leased lines must conform (as a minimum) to the V. 24 standard DCE definition.

The physical layer must provide 5 basic services:

- Send
- Receive
- Connect (when PSN is used for communication)
- Disconnect (when PSN is used for communication)
- Status (for example indication of medium availability)

1.2. Data link layer

The DNP 3.0 data link layer is designed to operate with connection-oriented and connectionless asynchronous or synchronous bit serial physical layers (such as RS-232, RS-485 and fibre-optic transceivers). Fully balanced transmission procedures were adopted to support spontaneous transmissions from outstations.

Data link functions

- Performing message retries
- Synchronizing and handling of FCB bit (Flow Control Bit) in the control octet
- Setting and clearing the DFC bit (Data Flow Control) based on buffer availability
- Automatically establishing a connection based on the destination parameter in a dial-up environment when a directed service is requested by the user
- Disconnecting in a dial-up environment
- Packing user data into the defined frame format and transmitting the data to the physical layer
- Unpacking the frames that are received from the physical layer into user data
- Controlling all aspects of the physical layer

- Performing collision avoidance/detection procedures to ensure the reliable transfer of data across the physical link
- Responding to all valid frames (function codes) received from the physical layer

Data link responsibilities

- Exchange of service data units (SDUs) between peer DNP data links
- Error notification to data link user
- Sequencing of SDUs
- Quality SDU delivery

Quality delivery can be SEND-NO-REPLY or SEND-CONFIRM to indicate whether or not a message acknowledgment is required.

1.3. Transport pseudo-layer

To support advanced RTU functions and messages exceeding the maximum frame length, a transport pseudo-layer which implements (as a minimum) message assembly and disassembly services was introduced.

This pseudo-layer is actually a super-data link transport protocol, which is normally included in some OSI data links.

Transport functions

- Packing user data into one or more frames of the defined DNP data link frame format and transmitting the data to the data link layer
- Unpacking multiple frames that are received from the data link layer into user data
- Controlling all aspects of the data link excluding data link configuration

Transport responsibilities

- Exchange of SDUs between peer DNP transport pseudo layers
- Error notification to transport user
- Sequencing of SDUs

1.4. Application layer

The application layer is responsible for performing operations on data objects defined by the device or on the device itself. These operations can be: returning actual values (read function), assigning new values (write function) if the object represents control points, arming and energizing the output point (select, operate or direct operate functions) if counters are used, storing actual values (freeze functions) and clearing the counters. There are also several functions controlling the device or the state of the application (for example reset device function).

All data objects are assigned to classes. The DNP protocol defines 4 classes: class 0 for static data, class 1 for events produced by data change, class 2 for frozen data and class 3 for events produced by freeze operations. Only static data (assigned to class 0) is always available and can be interrogated using the read function.

An outstation can spontaneously generate so-called unsolicited responses to report event data without being polled by the master station.

1.5. Frame formats

1.5.1. Overall information

Complete DNP frame structure:

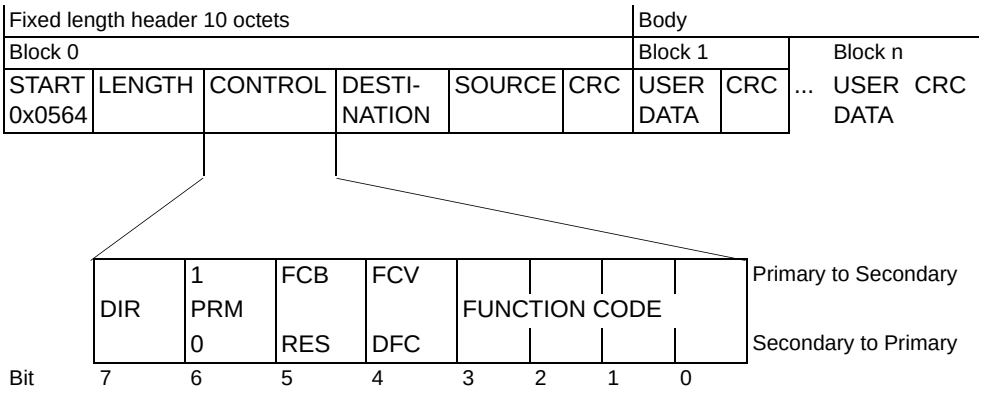
	Byte offset	Description			
		Request		**Response**	
Link layer frame format	0	Start character		Start character	
	1	Start character		Start character	
	2	Length field		Length field	
	3	Control byte		Control byte	
	4	Destination address		Destination address	
	5	Destination address		Destination address	
	6	Source address		Source address	
	7	Source address		Source address	
	8	CRC		CRC	
	9	CRC		CRC	
Transport layer frame format	10	Transport header field		Transport header field	
Application layer frame format	11	Application request header	Appl. control field	Application response header	Appl. control field
	12		Appl. function code		Appl. function code
	13	Object data			Internal indication
	14	Object data			Internal indication
	15	Object data		Object data	
	16	Object data		Object data	
	17	Object data		Object data	
	18	Object data		Object data	
	19	Object data		Object data	
	20	Object data		Object data	
	21	Object data		Object data	
	22	Object data		Object data	
	23	Object data		Object data	
	24	Object data		Object data	
	25	Object data		Object data	
	26	CRC		CRC	
	27	CRC		CRC	
	28	Object data		Object data	
	29	Object data		Object data	
	30	Object data		Object data	
	...	...		...	

Note:

- Data link layer frames without user data are only 10 bytes long
- Object data fields are optional and depend on the chosen application layer function code
- For a detailed description of each field see section below

1.5.2. Data link layer frame format

Frame format:



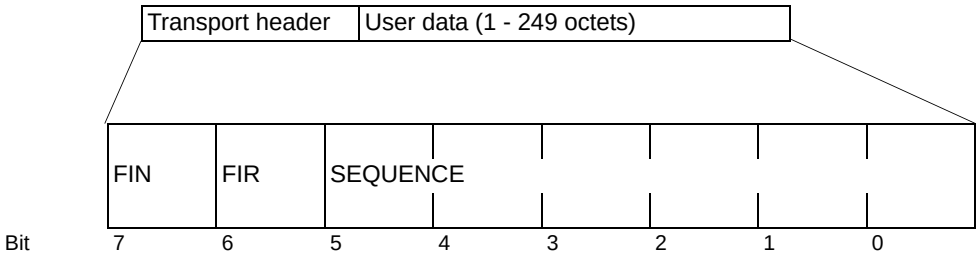
Data link header frame fields:

Field	Sub-field	Description
START		2 starting octets of the header (0x0564)
LENGHT		1 octet count of USER DATA in the header and body. This includes the CONTROL, DESTINATION and SOURCE fields in the header. The CRC fields are not included in the count. The minimum value for LENGTH is 5, which indicates that only the header is present, and the maximum value is 255.
CONTROL		The control field contains the direction of the frame, type of frame and flow control information.
	DIR	The direction bit indicates the physical direction of the frame with relation to the designated master station. Value 1 indicates a frame from the designated master station; value 0 indicates a frame from a non-master station.
	PRM	The primary bit indicates the direction of the frame with relation to the initiating station. Value 1 indicates a frame from the initiating station, 0 indicates a frame from the responding station.
	FCB	The frame count bit is used for suppressing losses and duplication of frames to the secondary station. This bit toggles for each successful SEND-CONFIRM service that is initiated by the same primary station and directed at the same secondary station.
	FCV	The frame count valid bit enables the FCB bit to function. Value 1 means that the FCB is valid and must be checked against the state of the FCB bit of the last frame sent with the FCV bit set. Value 0 indicates that the state of the FCB shall be ignored.
	RES	Reserved always 0
	DFC	The data flow control bit is used to prevent the overflow of buffers in the secondary station. The secondary station returns this bit set to a 1, if the following SEND of user data to this secondary station causes overflow of the data link buffers.
	FUNCTION CODE	The function code indicates type of the frame.
DEST.		2 octet destination address. The first octet is the LSB and the second octet is the MSB.
SOURCE		2 octet source address. The first octet is the LSB and the second octet is the MSB.
CRC		2 octet Cyclic Redundancy Check

Field	Sub-field	Description
USER DATA		Each block following the header has 16 octets of user-defined data, except the last block, which contains 1 to 16 octets as needed.

1.5.3. Transport layer frame format

Frame format:



FIN	The final bit set to 1 indicates that this frame of user data is the last frame of a sequence in a complete user message.
FIR	The first bit set to 1 indicates that the frame is the first in a sequence of frame(s) that comprise a complete message. When a secondary station receives a frame with the FIR bit set, any previously received and not terminated frame sequence is discarded. If a frame is received without the FIR set and no message sequence is currently in progress, then the frame is ignored.
SEQUENCE	The sequence number of the frame is used to check that each frame is being received in sequence. It guards against missing or duplicated frames. All user messages start off with a sequence specified in the first frame that has the FIR bit set (each message may start with any sequence number between 0 and 63). Sequence 63 will be followed by 0.

1.5.4. Application layer frame format

1.5.4.1. Application request format

	DUI	IO...IO		DUI	IO
Request header	Object header	data	...	Object header	data
APCI	ASDU				

Field	Description
Request header	The request header identifies the purpose of the message and consists of APCI (Application Protocol Control Information)
Object header	This header identifies the data objects that follow
Data	Data object(s) of the type specified in the object header

Request header:

Application Control AC								Function Code FC
FIN	FIR	CON	SEQUENCE					
7	6	5	4	3	2	1	0	Bit

Field	Explanation
FIR	If set to one, this bit indicates that the message fragment is the first of a complete application message.
FIN	If set to one, this bit indicates that the message fragment is the final fragment of a complete application message.
CON	If set to one in a received message, this bit indicates that the sending application is expecting a confirmation from the receiving application of the reception of the fragment.
SEQUENCE	Indicates the fragment number. Fragment numbers 0...15 are reserved for master station requests and all outstation responses (NOT Unsolicited Responses). Fragment numbers 16...31 are reserved for unsolicited responses.

1.5.4.2. Application response format

	DUI	IO…IO		DUI	IO
Response header	Object header	data	...	Object header	data
APCI	ASDU				

Field	Description
Response header	The response header identifies the purpose of the message and consists of APCI (Application Protocol Control Information).
Object header	This header identifies the data objects that follow.
Data	Data object(s) of the type specified in the object header.

Response header

Application Control AC			Function Code FC				Internal Indications IIN
FIN	FIR	CON	SEQUENCE				
7	6	5	4	3	2	1	0	Bit

Field	Explanation
FIR	If set to one, this bit indicates that the message fragment is the first of a complete application message.
FIN	If set to one, this bit indicates that the message fragment is the final fragment of a complete application message.
CON	If set to one in a received message, this bit indicates that the sending application is expecting a confirmation from the receiving application of the reception of the fragment.
SEQUENCE	Indicates the fragment number. Fragment numbers 0…15 are reserved for master station requests and all outstation responses (NOT Unsolicited Responses). Fragment numbers 16…31 are reserved for unsolicited responses.

Internal indications

The *Internal Indications* (IIN) field is a two-octet field that follows the function code in all responses. When a request cannot be processed due to formatting errors, or the requested data is not available, the IIN is always returned with the appropriate bits set.

First octet:	
Bit 0	All stations message received
Bit 1	Class 1 data available
Bit 2	Class 2 data available
Bit 3	Class 3 data available
Bit 4	Time synchronization required from the master
Bit 5	Set when some or all of the outstation’s digital output points are in a local state
Bit 6	Device trouble
Bit 7	Device restart
Second octet:	
Bit 0	Function code not implemented
Bit 1	Requested object(s) unknown
Bit 2	Parameters in the qualifier, range or data fields are not valid or out of range
Bit 3	Overflow of event buffer(s), or other application buffers
Bit 4	Request understood but requested operation is already being executed
Bit 5	Current configuration of the outstation is corrupt
Bit 6	Reserved (0)
Bit 7	Reserved (0)

The internal indications field is fully supported by the REC 523 DNP interface.

Object header

The object header of the message specifies the data objects (or IOs) that are either contained in the message or are to be used to respond to this message.

Object	Qualifier	Range

Field	Explanation
Object	Specifies the object group and variation of the objects that follow the header. This is a two-octet field. The object field uniquely identifies the type or class of object which gives the structure (and hence size) of the data object
Qualifier	Specifies the range field. This is a one-octet field.
Range	Indicates the quantity of objects, starting and ending index or identifiers for the objects in question.

Object field

The *Object* field specifies an object group and the variation of the object within the group. The combined object group plus variation uniquely specifies the object to which the message refers.

An object can be assigned to one of four classes. When the *Object* field specifies a data class instead of a specific object type, the *Object* field refers indirectly to all the data objects assigned to that class of data and not to any specific object type.

The *Object* field is two octets in length. The first octet specifies the general type of data (for example analogue inputs) and the second octet specifies the variation of the data type (for example 16-bit analogue inputs or 32-bits analogue inputs). In the request direction, if the object variation is specified as zero, this indicates the default variation for this group. In the response, however, variation 0 cannot be used to specify the object. A specific variation has to be given. By requesting data with variation 0, it is not necessary for the master to know which variations the outstation supports. However, the master must be able to interpret the object headers and have some knowledge of the structure of each variation.

first octet	second octet	
Object group	0 or object variation	Application request header
	object variation	Application response direction

Qualifier field

The *Qualifier* field specifies the *Range* field.

7	6	5	4	3	2	1	0	Bit
R	Index Size			4 bit Qualifier Code				

The *Range* field is used to index data or as an identifier. The structure and use of the *Range* field are dependent on the value in the *Index Size* field and the *Qualifier Code* field.

Index Size (3 bits)

- In a Request Object Header where *Qualifier Code* equals 11

  The *Index Size* bits are valid only when the *Qualifier Code* is 11. These bits indicate the size, in octets, of each entry in the *Range* field.

0 = not valid with *Qualifier Code* 11
1 = 1 octet identifier size
2 = 2 octet identifier size
3 = 4 octet identifier size
4 = reserved
5 = reserved
6 = reserved
7 = reserved

- In a Response or Request Object Header that is part of a message containing data objects

  The 3-bit *Index Size* field specifies the size of an index or the object size prefixing each object.

  0 = objects are packed with no index prefixing them
  1 = objects are prefixed with 1 octet index
  2 = objects are prefixed with 2 octet index
  3 = objects are prefixed with 4 octet index
  4 = objects are prefixed with 1 octet object size
  5 = objects are prefixed with 2 octet object size
  6 = objects are prefixed with 4 octet object size
  7 = reserved

Qualifier Code (4 bits)

The *Qualifier Code* field is used to specify the *Range* field.

0 = 8-bit start and stop indices in the *Range* field
1 = 16-bit start and stop indices in the *Range* field
2 = 32-bit start and stop indices in the *Range* field
3 = 8-bit absolute address identifiers in the *Range* field
4 = 16-bit absolute address identifiers in the *Range* field
5 = 32-bit absolute address identifiers in the *Range* field
6 = no *Range* field (implies all specified objects)
7 = 8-bit single field quantity
8 = 16-bit single field quantity
9 = 32-bit single field quantity
10 = reserved
11 = free format qualifier used to specify objects when other *Qualifier Codes* are inadequate or do not provide enough identifying information.
12 = reserved
13 = reserved
14 = reserved
15 = reserved

Range field for messages without data objects

Qualifier Code 0-5 for describing points in sequence

Qualifier Code 0 or 3, index size 0, points are I1 to I2 inclusive

Start 8 bit I1	Stop 8 bit I2

Qualifier Code 1 or 4, index size 0, points I1 to I2 inclusive

Start 16 bit I1	Stop 16 bit I2

Qualifier Code 2 or 5, index size 0, points I1 to I2 inclusive

Start 32 bit I1	Stop 32 bit I2

Qualifier Code 6 for ALL points of the given type (no range field)

Qualifier Code 7-9 for describing a number of unrelated points

Qualifier Code 7, index size 0, points are 0…Q-1 inclusive

Quantity 8 bit Q

Qualifier Code 7, index size 1, points are I1, I2 … IQ inclusive

Quantity 8 bit Q	Index 8 bit I1	...	Index 8 bit IQ

Qualifier Code 7, index size 2, points are I1, I2 … IQ inclusive

Quantity 8 bit Q	Index 16 bit I1	...	Index 16 bit IQ

Qualifier Code 7, index size 3, points are I1, I2 … IQ inclusive

Quantity 8 bit Q	Index 32 bit I1	...	Index 32 bit IQ

Qualifier Code 8, index size 0, points are 0…Q-1 inclusive

Quantity 16 bit Q

Qualifier Code 8, index size 1, points are I1, I2 … IQ inclusive

Quantity 16 bit Q	Index 8 bit I1	...	Index 8 bit IQ

Qualifier Code 8, index size 2, points are I1, I2 … IQ inclusive

Quantity 16 bit Q	Index 16 bit I1	...	Index 16 bit IQ

Qualifier Code 8, index size 3, points are I1, I2 … IQ inclusive

Quantity 32 bit Q	Index 32 bit I1	...	Index 32 bit IQ

Qualifier Code 9, index size 0, points are 0…Q-1 inclusive

Quantity 32 bit Q

Qualifier Code 9, index size 1, points are I1, I2 … IQ inclusive

Quantity 32 bit Q	Index 8 bit I1	...	Index 8 bit IQ

Qualifier Code 9, index size 2, points are I1, I2 … IQ inclusive

Quantity 32 bit Q	Index 16 bit I1	...	Index 16 bit IQ

Qualifier Code 9, index size 3, points are I1, I2 … IQ inclusive

Quantity 32 bit Q	Index 32 bit I1	...	Index 32 bit IQ

Qualifier Code 11 is used to describe points that have to be uniquely identified by an object identifier such as a File Object Identifier or Configuration Header. The type of identifier is implied by the object type.

Qualifier Code 11, index size 1, octets Oi1…OiN form the object identifier for Object i where 0<=i<Q (quantity)

Quantity 8 bit Q	Size 8 bit N1	O11	O12	...	O1N	...	Size 8 bit NQ	OQ1	...	OQN

Qualifier Code 11, index size 2, octets Oi1…OiN form the object identifier for Object i where 0<=i<Q (quantity)

Quantity 16 bit Q	Size 16 bit N1	O11	O12	...	O1N	...	Size 16 bit NQ	OQ1	...	OQN

Qualifier Code 11, index size 3, octets Oi1...OiN form the object identifier for Object i where 0<=i<Q (quantity)

Quantity 32 bit Q	Size 32 bit N1	O11	O12	...	O1N	...	Size 32 bit NQ	OQ1	...	OQN

Note: Qualifier Code 11 is not supported by the REC 523 DNP interface.

Range field for messages with data objects

Qualifier Code 0-5 for describing points in sequence

Qualifier Code 0 or 3, index size 0, points are I1 to I2 inclusive

Start 8 bit I1	Stop 8bit I2	DO I1	DO I1+1	...	DO I2

Qualifier Code 1 or 4, index size 0, points I1 to I2 inclusive

Start 16 bit I1	Stop 16 bit I2	DO I1	DO I1+1	...	DO I2

Qualifier Code 2 or 5, index size 0, points I1 to I2 inclusive

Start 32 bit I1	Stop 32 bit I2	DO I1	DO I1+1	...	DO I2

Qualifier Code 0 or 3, index size 4, points are I1 to I2 inclusive

Start 8 bit I1	Stop 8bit I2	Size 8 bit S1	DO I1 with size S1	...	Size 8 bit S2	DO I2 with size S2

Note: A 16- and 32-bit object size can also be used by using I size 5 and 6

Qualifier Code 1 or 4, index size 5, points I1 to I2 inclusive

Start 16 bit I1	Stop 16 bit I2	Size 16 bit S1	DO I1 with size S1	...	Size 16 bit S2	DO I2 with size S2

Note: An 8- and 32-bit object size can also be used by using I size 4 and 6

Qualifier Code 2 or 5, index size 0, points I1 to I2 inclusive

Start 32 bit I1	Stop 32 bit I2	Size 32 bit S1	DO I1 with size S1	...	Size 32 bit S2	DO I2 with size S2

Note: An 8- and 16-bit object size can also be used by using I size 4 and 5

Do not use Qualifier Code 6 for describing a message that contains data objects, because the exact number of points is not known and, therefore, the contents of the message cannot be determined.

Qualifier Code 7-9 for describing a number of unrelated points

Qualifier Code 7, index size 0, points are 0...Q-1 inclusive

Quantity 8 bit Q	DO I0	...	DO I(Q-1)

Qualifier Code 7, index size 1, points are I1, I2...IQ inclusive

Quantity 8 bit Q	Index 8 bit I1	DO I1	...	Index 8 bit IQ	DO IQ

Qualifier Code 7, index size 2, points are I1, I2...IQ inclusive

Quantity 8 bit Q	Index 16 bit I1	DO I1	...	Index 16 bit IQ	DO IQ

Qualifier Code 7, index size 3, points are I1, I2...IQ inclusive

Quantity 8 bit Q	Index 32 bit I1	DO I1	...	Index 32 bit IQ	DO IQ

Qualifier Code 8, index size 0, points are 0...Q-1 inclusive

Quantity 16 bit Q	DO I0	...	DO I(Q-1)

Qualifier Code 8, index size 1, points are I1, I2...IQ inclusive

Quantity 16 bit Q	Index 8 bit I1	DO I1	...	Index 8 bit IQ	DO IQ

Qualifier Code 8, index size 2, points are I1, I2...IQ inclusive

Quantity 16 bit Q	Index 16 bit I1	DO I1	...	Index 16 bit IQ	DO IQ

Qualifier Code 8, index size 3, points are I1, I2...IQ inclusive

Quantity 16 bit Q	Index 32 bit I1	DO I1	...	Index 32 bit IQ	DO IQ

Qualifier Code 9, index size 0, points are 0...Q-1 inclusive

Quantity 32 bit Q	DO I0	...	DO I(Q-1)

Qualifier Code 9, index size 1, points are I1, I2...IQ inclusive

Quantity 32 bit Q	Index 8 bit I1	DO I1	...	Index 8 bit IQ	DO IQ

Qualifier Code 9, index size 2, points are I1, I2...IQ inclusive

Quantity 32 bit Q	Index 16 bit I1	DO I1	...	Index 16 bit IQ	DO IQ

Qualifier Code 9, index size 3, points are I1, I2...IQ inclusive

Quantity 32 bit Q	Index 32 bit I1	DO I1	...	Index 32 bit IQ	DO IQ

Qualifier Code 11 is used to describe points that have to be uniquely identified by an object identifier such as a File Object Identifier or Configuration Header. The type of identifier is implied by the object type.

Qualifier Code 11, index size 1, octets Oi1...OiN form the object identifier for Object I, where 0<=i<Q (quantity) which is followed by the object identified. The size of the object is contained in the Object Identifier and thus the application layer must be able to interpret some fields of the object identifier in order to process a message.

Quantity 8 bit Q	Size 8 bit N1	O11	...	O1N	DO ID1	...	Size 8 bit NQ	OQ1	...	OQN	DO IDQ

Qualifier Code 11, index size 2, octets Oi1...OiN form the object identifier for Object I, where 0<=i<Q (quantity) which is followed by the object identified. The size of the object is contained in the Object Identifier and thus the application layer must be able to interpret some fields of the object identifier in order to process a message.

Quantity 16 bit Q	Size 16 bit N1	O11	...	O1N	DO ID1	...	Size 16 bit NQ	OQ1	...	OQN	DO IDQ

Qualifier Code 11, index size 3, octets Oi1...OiN form the object identifier for Object I, where 0<=i<Q (quantity) which is followed by the object identified. The size of the object is contained in the Object Identifier and thus the application layer must be able to interpret some fields of the object identifier in order to process a message.

Quantity 32 bit Q	Size 32 bit N1	O11	...	O1N	DO ID1	...	Size 32 bit NQ	OQ1	...	OQN	DO IDQ

Note: Qualifier Code 11 is not supported by the DNP interface of REC 523.

2. REC 523 profile in DNP 3.0

2.1. Supported functions

2.1.1. Data link layer

Selection of functions supported in frames sent from the primary station (PRM=1).

Function code	Frame type	Service function
0	SEND - CONFIRM expected	Reset of remote link
1	SEND - CONFIRM expected	Reset of user process
2	SEND - CONFIRM expected	Test function for link
3	SEND - CONFIRM expected	User data
4	SEND - NO REPLY expected	Unconfirmed user data
9	REQUEST - RESPOND expected	Request link status

Selection of functions supported in frames sent from the secondary station (PRM=0).

Function code	Frame type	Service function
0	CONFIRM	ACK - positive acknowledgement
1	CONFIRM	NACK – message not accepted, link busy
11	RESPOND	Status of link (DFC=0 or DFC=1)
14	RESPOND	Link service not functioning
15	RESPOND	Link service not used or implemented

Communication in multiple master environment

The REC 523 is able to communicate with multiple master stations using the SEND-NO-REPLAY service. Before using the SEND-CONFIRM service, the data link layers of both the primary and secondary stations have to be reset (*reset of remote link* service function). In this case, REC 523 is able to communicate with one designated master (the address of this station is stored as a parameter) and one “virtual” master. If another master wants to use the SEND-CONFIRM service to communicate with REC 523, it first has to send a *reset of remote link* request. This will enable SEND-CONFIRM communication with this station and disable SEND-CONFIRM communication with the previous “virtual” master.

Communication in a dial-up environment

When using a modem connection through the PSN (Public Switched Network), string parameters are used. These parameters include initialization, hang-up and dialling strings. Refer to the section *“Link parameters” on page 116* for further information. There can be one default and 4 spare dialling strings. The dialling string contains a phone number of the designated master station. The REC 523 unit will open the channel only when communication with the designated master station is needed and the channel is actually closed. If the default master station does not answer the call spare dialling numbers will be used. If all attempts to connect will

fail then the emergency number will be dialled. REC 523 will hung up immediately after connecting. The emergency number can be, for example, operator GSM number.

When dial-up connection is used, the following parameters must be set to configure REC 523 with DNP protocol:

- Parameter “Connection mode” must be set to *dial-up mode*
- Parameter “Modem init str” must be set to parameterize modem (according to manual of the used modem)
- In case of using GSM modem “GSM PIN code” parameter must also be set accordingly

Each modem operation is started by hanging-up any active connection. This includes also the procedure of establishing the connection between REC 523 and SCADA system. Modem configuration/initialization is done every time when the link initialization is performed (this does not apply to entering the GSM modem PIN-code).

In case of using GSM modems, two levels of modem initialization are used:

- Hard initialization after the device start-up, which includes the entering of PIN-code and common modem configuration
- Soft initialization, which includes only modem reconfiguration

If the REC 523 unit is allowed to open the connection – the “reporting flag” in DNP POD should be set to *enabled* for those items that are allowed to cause opening of the connection. For lower priority items that should not cause REC 523 to open the connection the “reporting flag” should be set to *disabled.*

To be able to connect to the master station at least “Modem dial str” must be set to dial master stations number (note that this string must include ATD prefix).

Communication channel is opened only after a request from the protocol software. The algorithm of this operation assumes a predefined number of 6 attempts done with random and increasing intervals between consecutive tries (intervals are given in Figure 2.1.1.-1). It is possible to define more than one telephone number of the SCADA system using separate dialling strings as link handler parameters (1 primary number, up to 4 spare numbers).

During each attempt of establishing a connection all configured dialling numbers from the list will be used one after another (without delays). It is also possible to define one emergency number that is used only when it is not possible to establish the connection with any of the configured numbers (primary and spare numbers) after all attempts. This emergency number can be, for example, the number of the operator's telephone. The idea of using this number is to inform the operator about traffic problem in the telephone switching network or possible error in system configuration. After a call has been made to the emergency number (if defined) or all attempts to all configured numbers has failed, REC 523 initializes the link (and hang-ups the connection) and waits for the master station to connect. Detailed behavior of the dialling algorithm is shown on the figure below:

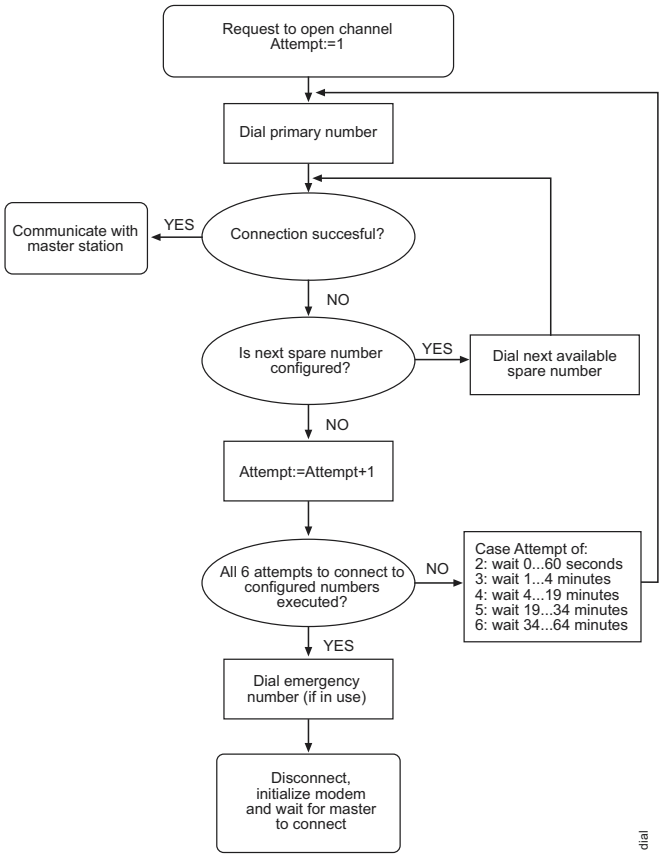


Fig. 2.1.1.-1 The behaviour of the dialing algorithm

When master station dials the number of REC 523 unit and successfully connects between dialling attempts, this situation is treated the same way as if REC 523 would successfully connect.

REC 523 is responsible for closing the communication channel when there is no communication with the master station for a predefined time (no valid frame is received, including also the frames addressed to other units). A watchdog function supervising the incoming valid frames has been added to the protocol software; the watchdog timeout is defined by a configurable parameter “Watchdog TO” in the protocol parameter group.

When communication with another station is required and the communication channel is closed, the transaction fails. The REC 523 unit may only call the designated master station, and a connection with another station must be established by this station.

2.1.2. Transport layer

Transmitted data messages can be segmented when required. In addition, incoming APDUs may be segmented and the transport layer in REC 523 will be prepared to assemble incoming LPDUs into one APDU.

Window size 1 (for one APDU) is assumed on the interface between the transport layer and the application layer.

2.1.3. Application layer

Selection of application functions supported in REC 523:

Code	Function	Description
0	Confirm	Message fragment confirmation used both in requests and responses. No response to this message is required.
1	Read	Requested specified object from an outstation: respond with objects requested if available.
2	Write	Store specified objects in an outstation: respond with status of the operation.
3	Select	Select or arm output points but do not set or produce any output action (controls, setpoints, analogue outputs); respond with the status of the control points selected. The *Operate* function code is required to activate these outputs.
4	Operate	Set or produce output actions on the points previously selected with the *Select* function; respond with the status of the control points.
5	Direct operate	Set or produce output actions on the points; respond with the status of the control points.
6	Direct operate without ACK	Set or produce output actions on the points; do not respond.
13	Cold restart	Perform the desired reset sequence; respond with object indicating time until outstation is available.
14	Warm restart	Perform the desired partial reset sequence; respond with object indicating time until outstation is available.
17	Start application	Start running the specified application(s); respond with the status of the operation.
18	Stop application	Stop the specified application(s); respond with the status of the operation.
20	Enable unsolicited messages	Enable spontaneous reporting of the specified data object(s); respond with status of the operation.
21	Disable unsolicited messages	Disable spontaneous reporting of the specified data object(s); respond with the status of the operation.
22	Assign class	Assign specified data object(s) to a particular class.
23	Delay measurement	Allows the master station to calculate the path delay (or propagation delay) for a particular outstation. The value calculated from this function code should be used to adjust the time of day when the outstation time is set.
129	Response	Response to a request message.
130	Unsolicited message	Unsolicited response that was not prompted by a request.

Important notes:

- Implementation of the *Delay measurement* function in REC 523 does not fully follow the procedure described in the protocol specification. Only an approximated delay value is supported by the outstation.
- Multi-fragment application messages are not supported

2.2. Supported data types

2.2.1. Point numbering overall rules

The following rules apply to the interpretation of the object point number (DNP Application Layer *range* field) in conjunction with objects and variations:

Rule 1

Point **i** of object **x** variation **y** represents the same physical point as point **i**, object **x**, variation **z**, where **y** and **z** are variations of object **x**.

Rule 2

Point **i** of object **x** can be reported in many variations (that is, it can be a 16-bit or 32-bit counter). When reporting to a request for class data or variation 0 of object **x**, there should be only one variation of the object returned. All points of object **x** should be returned using variation **y**, where **y** is the default variation of object **x**. A situation where some points of object **x** are returned using variation **y** and others using variation **z**, when responding to a class scan or to a request with variation 0 in object header, is against this rule. When reported as an event, point **i** can be returned in either one of the variations for that object. The exact variation to be returned is an application-specific decision.

Rule 3

Point **i** within two different objects of the same grouping is not necessarily unique. However, the following rules apply within such groupings as binary inputs, binary outputs, counters, analogue inputs and analogue outputs:

- Point **i** in the static object is the same physical point as point **i** in the event object (this applies to object pairs 1 - 2, 20 - 22 and 30 - 32)
- Point **i** in the frozen object is the same physical point as point **i** in the frozen event object (this applies to object pairs 21 - 23 and 31 - 33)
- Point **i** in the binary output (object 10) is the same physical point as point **i** in the control relay output block (object 12)
- Point **i** in the analogue output status (object 40) is the same physical point as point **i** in the analogue output block object (object 41)

Rule 4

Object groupings which, by definition or due to device limitations, can have only one point per object, or where no point number is needed, should use a range number 0 or quantity equal to 1, when a message format that requires a point number is used.

2.2.2. Standard object types definitions

The following convention was used for describing data:

Data types:
All data can be described as *data type* in their most elementary form. The data types are recognized as standard constructs used in most language compilers. DNP information elements use constructs, as defined by the IEC 60870-5-4 standard, as the basis of their descriptions. The table below lists available data types for this implementation and their meaning.

Data type	Symbol	Meaning
UNSIGNED INTEGER	UI	Positive whole number
INTEGER	I	Positive or negative whole number
BITSTRING	BS	Assembly of independent bits
OCTETSTRING	OS	Assembly of octets

Data size:
Each information element is composed of data type and data size. Data size *i* is noted after the data type symbolic notation, and it is a cardinal number that specifies the length of the data field in bits or octets, as appropriate. Example:

BS12 specifies BITSTRING of 12 bits.

Bit position:
In defining an information object, which is a combination of information elements, the position of individual bits can be significant. The bit position of a specified field of data size n is denoted in square brackets $[p_1...p_n]$ where p_1 and p_n denote the first and the last bits of the field.

2.2.3. Single bit binary input

Data object 1 - Variation 1

Type: static

Description:
The *single bit binary input* object is used to represent the state of a digital input point (hardware or software).

Object coding:
BS1[0...0]
State=BS1[0] <0,1 BIN>

Narrative:
The *single-bit binary input* representation is used to transmit binary input states in a packed format. Data objects are always transmitted in complete octets with unoccupied bit positions set to 0. The following example illustrates the packing of **n** of these data objects.

7	6	5	4	3	2	1	0
15	14	13	12	11	10	9	8
0	0	0	n	n-1	n-2	n-3	n-4

Note: This variation contains no points status information. *On-line, restart,* and such bits which are part of the *binary input with status* variation, are not included in this variation. The use of the *single bit binary input* implies that the point is on-line and all other status bits are cleared (that is, *restart* bit, *communication lost* bit and so on, are cleared).

2.2.4. Binary input with status

Data object 1 - Variation 2

Type: static

Description:
The *binary input with status* object is used to represent the state of a digital input point (hardware or software), and it also indicates the status of the point as follows:

- The on-line bit indicates that the binary input point has been read successfully. If this field is set to off-line, the state of the digital point may not be correct.
- The restart bit indicates that the field device that originated the data object is currently restarting. This device may be the device reporting this data object.
- The communication lost bit indicates that the device reporting this data object has lost communication with the originator of the data object
- The remote forced data bit indicates that the state of the binary input has been forced to its current state at a device other than the end device
- The local forced data bit indicates that the state of the binary input has been forced to its current state at the end device
- The chatter filter bit indicates that the binary input point has been filtered in order to remove unnecessary transitions in the state of the point
- The state bit indicates the current state of the binary input point

Object coding:

7	6	5	4	3	2	1	0

BS8[0...7]

On-line	=	BS1[0] <0, off-line; 1, on-line>
Restart	=	BS1[1] <0, normal; 1, restart>
Communication lost	=	BS1[2] <0, normal; 1, lost>
Remote forced data	=	BS1[3] <0, normal; 1, forced>
Local forced data	=	BS1[4] <0, normal; 1, forced>
Chatter filter	=	BS1[5] <0, normal; 1, filter on>
Reserved	=	BS1[6] <0 >
State	=	BS1[7] <0, 1 BIN>

This variation is used to report the status of controlled objects as follows:

- Object state open (value 10) on-line=1, state=1
- Object state closed (value 01) on-line=1, state=0
- Object state undefined (value 00 on-line=0, state=0
- Object state undefined (value 11) on-line=0, state=1

2.2.5. Binary input change without time

Data object 2 - Variation 1

Type: event

Description:
The *binary input change without time* object is used to represent the changed state of the digital input point (hardware or software). It also indicates the status of the point as follows:

- The on-line bit indicates that the binary input point has been read successfully. If this field is set to off-line, the state of the digital point may not be correct.
- The restart bit indicates that the field device that originated the data object is currently restarting. This device may be the device reporting this data object.
- The communication lost bit indicates that the device reporting this data object has lost communication with the originator of the data object
- The remote forced data bit indicates that the state of the binary input has been forced to its current state at a device other than the end device
- The local forced data bit indicates that the state of the binary input has been forced to its current state at the end device
- The chatter filter bit indicates that the binary input point has been filtered in order to remove unnecessary transitions in the state of the point
- The state bit indicates the current state of the binary input point

Object coding:

7	6	5	4	3	2	1	0

BS8[0...7]

On-line	=	BS1[0] <0, off-line; 1, on-line>
Restart	=	BS1[1] <0, normal; 1, restart>
Communication lost	=	BS1[2] <0, normal; 1, lost>
Remote forced data	=	BS1[3] <0, normal; 1, forced>
Local forced data	=	BS1[4] <0, normal; 1, forced>
Chatter filter	=	BS1[5] <0, normal; 1, filter on>
Reserved	=	BS1[6] <0 >
State	=	BS1[7] <0, 1 BIN>

Note concerning REC 523:
This variation is used to report the status of controlled objects as follows:

Object state open (value 10) on-line=1, state=1

Object state closed (value 01) on-line=1, state=0

Object state undefined (value 00) on-line=0, state=0

Object state undefined (value 11) on-line=0, state=1

2.2.6. Binary input change with time

Data object 2 - Variation 2

Type: event

Description:
The *binary input change with time* object is used to represent the changed state of the digital input point (hardware or software) and the time at which the state changed. It also indicates the status of the point as follows:

- The on-line bit indicates that the binary input point has been read successfully. If this field is set to off-line, the state of the digital point may be incorrect.
- The restart bit indicates that the field device that originated the data object is currently restarting. This device may be the device reporting this data object.
- The communication lost bit indicates that the device reporting this data object has lost communication with the originator of the data object
- The remote forced data bit indicates that the state of the binary input has been forced to its current state at the device other than the end device
- The local forced data bit indicates that the state of the binary input has been forced to its current state at the end device
- The chatter filter bit indicates that the binary input point has been filtered in order to remove unneeded transitions in the state of the point
- The state bit indicates the current state of the binary input point

The *time of occurrence* indicates the absolute time at which the end device detected the change of state. The accuracy of this time will depend on the accuracy of the individual device. Time of occurrence is recorded as milliseconds since midnight, January 1st, 1970, at zero hours, zero minutes, seconds and milliseconds.

Object coding:

FLAG							
7	6	5	4	3	2	1	0
Time of occurrence							
7	6	5	4	3	2	1	0
15	14	13	12	11	10	9	8
23	22	21	20	19	18	17	16
31	30	29	28	27	26	25	24
39	38	37	36	35	34	33	32
47	46	45	44	43	42	41	40

{FLAG	=	BS8[0...7]
Time of occurrence	=	UI48[0...47] <2^{48}-1 ms>
}		
FLAG	=	{
On-line	=	BS1[0] <0, off-line; 1, on-line>
Restart	=	BS1[1] <0, normal; 1, restart>
Communication lost	=	BS1[2] <0, normal; 1, lost>
Remote forced data	=	BS1[3] <0, normal; 1, forced>
Local forced data	=	BS1[4] <0, normal; 1, forced>
Chatter filter	=	BS1[5] <0, normal; 1, filter on>
Reserved	=	BS1[6] <0 >
State	=	BS1[7] <0, 1 BIN>
}		

2.2.7. Binary output

Data object 10 - Variation 1

Type: static

Description:
The *binary output* object is used to control a digital output point (hardware or software). The state bit indicates the desired Logic State of digital output point.

Object coding:
BS1[0...0]
State=BS1[0] <0,1 BIN>

Narrative:
Data objects are always transmitted in complete octets with unoccupied bit positions set to 0. The following example illustrates the packing of **n** of these data objects.

7	6	5	4	3	2	1	0
15	14	13	12	11	10	9	8
0	0	0	n	n-1	n-2	n-3	n-4

2.2.8. Binary output with status

Data object 10 - Variation 2

Type: static

Description:
The *binary output with status* object is used to represent the state of a digital output point (hardware or software), and it also indicates the status of the point as follows:

- The on-line bit indicates that the binary output point has been read successfully. If this field is set to off-line, the state of the digital point may not be correct.
- The restart bit indicates that the field device that originated the data object is currently restarting. This device may be the device reporting this data object.
- The communication lost bit indicates that the device reporting this data object has lost communication with the originator of the data object
- The remote forced data bit indicates that the state of the binary output has been forced to its current state at a device other than the end device
- The local forced data bit indicates that the state of the binary output has been forced to its current state at the end device
- The chatter filter bit indicates that the binary output point has been filtered in order to remove unnecessary transitions in the state of the point
- The state bit indicates the current state of the binary output point

Object coding:

7	6	5	4	3	2	1	0

BS8[0...7]

On-line	=	BS1[0] <0, off-line; 1, on-line>
Restart	=	BS1[1] <0, normal; 1, restart>
Communication lost	=	BS1[2] <0, normal; 1, lost>
Remote forced data	=	BS1[3] <0, normal; 1, forced>
Local forced data	=	BS1[4] <0, normal; 1, forced>
Chatter filter	=	BS1[5] <0, normal; 1, filter on>

Reserved	=	BS1[6] <0 >
State	=	BS1[7] <0, 1 BIN>

2.2.9. Control relay output block

Data object 12 - Variation 1

Type: static

Description:

- The control relay output block information object contains digital output control parameters. These parameters define the type and duration of the digital output.
- The control code field indicates the control function to be performed. The applicability of this code will depend on the type of hardware used in the end device.
- The count field indicates how many times the control operation should be performed in succession
- The on-time field specifies the amount of time the digital output is to be turned on (may not apply to all control types)
- The off-time field specifies the amount of time the digital output is to be turned off (may not apply to all control types)

Object coding:

Control code							
7	6	5	4	3	2	1	0
Count							
7	6	5	4	3	2	1	0
On time							
31							0
Off time							
31							0
Status/Reserved							
7	6	5	4	3	2	1	0

{Control code	=	BS8[0...7]
Count	=	UI[0...7] <0...255>
On-time	=	UI32[0...31] <0...2^{32}-1ms>
Off-time	=	UI32[0...31] <0...2^{32}-1ms>
Status	=	UI7[0...6] <0...127>
Reserved	=	[7...7] <0...1>
}		
Control code	=	{
Code	=	BS4[0...3] <0...15>
Queue	=	BS1[4] <0, normal; 1, requeued>
Clear	=	BS1[5] <0, normal; 1, clear>
Trip/Close	=	BS2[6...7] <00, NUL; 01, Close; 10, Trip>
}		

Trip/Close:
This field determines the control relay to be activated in a system where a trip and close relay pair is used to energize and de-energize the field points. The NUL value in this field can be used to activate the field point select relay only without activating trip or close relays. In a system without field point select relays, the NUL value would not perform any control operation. In a system without trip/close relays, this field should always be NUL to indicate a normal digital control operation where the exact control point is inherently known. This field does not support both the trip and close attributes simultaneously, as this is an illegal operation for the system.

Count:
The count field determines how many times the control operation is executed until completed. If the count is 0, do not execute the control.

Code:
The control block can be used with devices which support control queuing on a point-per-point basis, or devices which have other control mechanisms. In the former case, any control command should be queued for the particular point in question. In the latter case, each control is performed until completion before next control is accepted for that point.

Queue:
Place the operation at the back of the control queue when it is complete. If the control code is NUL then no control operation is queued, and the queue is cleared of all controls including the currently running control, if the clear attribute is set. When a control function is executed and completed, it is removed from the queue. If the control block for that operation had the queue attribute set, the control operation is re-queued (to the end of the queue) for that point.

Clear:
Cancel the currently running operation and remove queued operations on affected points immediately before activating this new operation (if not NUL). If the control operation has the clear attribute set, all control operations, including the currently running control, are removed from the queue and this control operation is performed.
The meaning of the code field and the operation to be performed is determined by the following:

0: NUL operation. No operation specified. Only the R attribute is processed.
1: Pulse On - the point(s) is turned on for the specified on-time, turned off for the specified off-time and left in the off state
2: Pulse Off - The point(s) is turned off for the specified off-time, then turned on for the specified on-time and left in the on state.
3: Latch On - This latches the point(s) on.
4: Latch Off - This latches the point(s) off.
5-15: Undefined

The reserved bit of the control point after the operation can be determined if the control output is on.

The success or failure of the requested control operation is indicated in the status field. The meaning of this field is determined as follows:

0: Request accepted, initiated or queued
1: Request not accepted as the operate message was received after the arm timer timed out. The arm timer was started when the select operation for the same point was received.
2: No previous matching select message (that is, an operate message was sent to activate a control point that was not previously armed with the select message).
3: Request not accepted as there were formatting errors in the control request (either select, operate or direct operate).
4: Control operation not supported for this point.
5: Request not accepted, as the control queue is full or the point is already active.
6: Request not accepted because of control hardware problems.
7-127: Undefined

Note:

- In REC 523, the DNP close command will be interpreted as a close or earth command and the DNP trip command will be interpreted as an open or free command
- Maximal delay between a select and an operate command is by default 20 seconds. After that time, the response to the operate request will contain the value 2 in the status field (*not armed*).
- If the device is in the local state (remote operations on relays are blocked) or control operation for single relay is blocked (block input was activated) the response to the select request will contain the value 4 (*not supported*)

2.2.10. 32-bit binary counter without flag

Data object 20 - Variation 5

Type: static

Description:

- The *32-bit binary counter* represents an accumulated value. This can be accumulated pulses or transitions from a hardware or software point.
- The *value* field shows the current value of the counter at the time of reporting or the last reported value from the originating device. This value will increment indefinitely until a counter clear operation is performed, in which case the value is reset to 0.

Object coding:

Value	
31	0

Value = UI32[0...31] <0...2^{32}-1>

Note: The use of this variation implies that the input point is on-line and that all other flag bits are normal (that is, this variation implies that flag=1: on-line bit is set, the other bits are cleared - see flag field definition given in section “Binary input change with time” on page 26).

2.2.11. 32-bit counter change event without time

Data object 22 - Variation 1

Type: event

Description:
The *32-bit counter change event without time* represents a counter value that has exceeded a configured deadband. This can be accumulated pulses or transitions from a hardware or software point. The current value field shows the value of the counter, which generated the event. The flag field has the same meaning as in the previous objects, with the following inclusion:

- When set, the *rollover* bit indicates that the accumulated value has exceeded the last reported recordable value (2^{32}-1). The counter value has been reset to 0 upon *rollover* and counting has resumed as normal. This bit is cleared when the counter value (plus the *Rollover State*) is reported.

Object coding:

FLAG							
7	6	5	4	3	2	1	0
Value							
31							0

{FLAG	=	BS8[0...7]
Value	=	UI32 [0...31] <0...2^{32}-1>
}		
FLAG	=	{
On-line	=	BS1[0] <0, off-line; 1, on-line>
Restart	=	BS1[1] <0, normal; 1, restart>
Communication lost	=	BS1[2] <0, normal; 1, lost>
Remote forced data	=	BS1[3] <0, normal; 1, forced>
Local forced data	=	BS1[4] <0, normal; 1, forced>
Roll-over	=	BS1[5] <0, normal; 1, roll-over>
Reserved	=	BS1[6] <0 >
}		

2.2.12. 32-bit analogue input without flag

Data object 30 - Variation 3

Type: static

Description:

- The *32-bit analogue input* is an information object used to represent a hardware or software analogue point. The 32-bit signed value could represent a digitized signal or a calculated value.
- The *current value* field shows the current value of the analogue input at the time of reporting, or the last value reported from the originating device

Object coding:

Current value	
31	0

Value = I32[0...31] <-2^{31}...2^{31}-1>

Note: The use of this variation implies that the input point is on-line and that all other flag bits are normal (that is, this variation implies that flag=1: on-line bit is set, the other bits are cleared - see flag field definition given in section “Binary input change with time” on page 26).

2.2.13. 32-bit analogue change event without time

Data object 32 - Variation 1

Type: event

Description:

- The *32-bit analogue change event without time* is an information object used to represent a changed hardware or software analogue point. The 32-bit signed value could represent a digitized signal or a calculated value.
- The *current value* shows the value of the analogue input at the time specified in *time*
- The *flag* field has the same meaning as for previous objects, with these additions:
  - The over-range field indicates that the digitized signal or calculation has exceeded +2^{31}-1 positively, or -2^{31} negatively. The actual value field can be ignored as its value is undefined.
  - The reference check field indicates that the reference signal used to digitize the analogue input is not suitable, and the resulting digitized value may be incorrect.

Object coding:

FLAG							
7	6	5	4	3	2	1	0
Value							
31							0

{FLAG	=	BS8[0...7]
Value	=	UI32 [0...31] <-2^{31}...2^{32}-1>
}		
FLAG	=	{
On-line	=	BS1[0] <0, off-line; 1, on-line>
Restart	=	BS1[1] <0, normal; 1, restart>
Communication lost	=	BS1[2] <0, normal; 1, lost>
Remote forced data	=	BS1[3] <0, normal; 1, forced>
Local forced data	=	BS1[4] <0, normal; 1, forced>
Over-range	=	BS1[5] <0, normal; 1, over-range>
Reference check	=	BS1[6] <0, normal; 1, error>
Reserved	=	BS1[7] <0 >
}		

2.2.14. 32-bit analogue output status

Data object 40 - Variation 1

Type: static

Description:

- The 32-bit analogue output status information object represents the actual value of a hardware DAC analogue output or software point and associated status
- The *actual value* field contains the current value of the analogue output
- The *flag* field has the same meaning as that for the previous object

Object coding:

FLAG							
7	6	5	4	3	2	1	0
Actual value							
31							0

{FLAG	=	BS8 [0...7]
Actual value	=	I32 [0...31] <-2^{31}...2^{32}-1>
}		
FLAG	=	{
On-line	=	BS1[0] <0, off-line; 1, on-line>
Restart	=	BS1[1] <0, normal; 1, restart>
Communication lost	=	BS1[2] <0, normal; 1, lost>
Remote forced data	=	BS1[3] <0, normal; 1, forced>
Local forced data	=	BS1[4] <0, normal; 1, forced>
Reserved	=	BS1[5] <0>
Reserved	=	BS1[6] <0>
Reserved	=	BS1[7] <0>
}		

Narrative:
This object can be returned after an analogue output operation has been performed, in order to determine the success of the operation.

2.2.15. 32-bit analogue output block

Data object 41 - Variation 1

Type: static

Description:

- The 32-bit analogue output block information object represents the desired value of a hardware DAC analogue output or software point. The value represented is merely logical, as the value may be scaled and/or manipulated before any output level is set.
- The requested value field contains the desired value of the analogue output. The actual value of the analogue output is returned in the analogue output status object.

- The control status field indicates the status of the analogue control operation. The meaning of this field is as follows:

  0:Request accepted, initiated, or queued.
  1:Request not accepted as the *operate* message was received after the *arm* timer timed out. The *arm* timer was started when the *select* operation for the same point was received.
  2:No previous matching *select* message (that is, an *operate* message was sent to activate a control point that was not previously armed with the *select* message)
  3:Request not accepted as there were formatting errors in the control request (either *select*, *operate* or *direct operate*)
  4:Control operation not supported for this point.
  5:Request not accepted, as the control queue is full or the point is already active.
  6:Request not accepted because of control hardware problems.
  7-127:Undefined.

Object coding:

Requested value	
31	0
Control status	
7	0

Requested value = I32[0...31] <-2^{31}...2^{31}-1>
Status = UI8 [0...7] <0...255>

2.2.16. Time and date

Data object 50 - Variation 1

Description:
The *time and date* object is an object that represents the absolute time of day and date. This object should be used for time synchronization.

Object coding:

Absolute time							
7	6	5	4	3	2	1	0
15	14	13	12	11	10	9	8
23	22	21	20	19	18	17	16
31	30	29	28	27	26	25	24
39	38	37	36	35	34	33	32
47	46	45	44	43	42	41	40

Absolute time = UI48[0...47] <0...2^{48}-1>

Narrative:
Absolute time is recorded as milliseconds since midnight, January 1st, 1970, at zero hours, zero minutes, zero seconds, and milliseconds.

2.2.17. Time delay coarse

Data object 52 - Variation 1

Description:
The *time delay coarse* information object represents a relative time that indicates a time period starting from the time of message reception. This object can be used to report station availability after cold or warm reset.

Object coding:

Seconds							
7	6	5	4	3	2	1	0
15	14	13	12	11	10	9	8

Seconds = UI16[0...15] <0...65535 Seconds>

2.2.18. Time delay fine

Data object 52 - Variation 2

Description:
The *time delay fine* information object represents a relative time that indicates a time period starting from the time of message reception. This object can be used in time synchronization to perform delay measurement calculations or other functions that require time-based calibration.

Object coding:

Milliseconds							
7	6	5	4	3	2	1	0
15	14	13	12	11	10	9	8

Milliseconds = UI16[0...15] <0...65535 milliseconds>

2.2.19. Internal indications

Data object 80 - Variation 1

Description:
Internal indications is an information element used to convey internal states and diagnostic results of a responding station. This information can be used by a receiving station to perform error recovery or other actions.

Object coding:
BS1[0...0]

State=BS1[0] <0,1 BIN>

Narrative:
Data objects are always transmitted in complete octets with unoccupied bit positions set to 0. The following example illustrates the packing of **n** of these data objects.

7	6	5	4	3	2	1	0
15	14	13	12	11	10	9	8
0	0	0	n	n-1	n-2	n-3	n-4

2.2.20. Application identifier

Data object 90 - Variation 1

Description:
Application identifier is an information object used to represent an application or operating system process within a device. This object is used in conjunction with the application functions of the application layer to control software applications.

Object coding:
This object has no defined format and is simply used as a placeholder. The free-format qualifier of the application layer should be used to identify the application in question. If the application is unknown, the *ALL* qualifier should be used to specify all relevant applications.

2.3. New object types definitions

2.3.1. Byte sequence (string)

Data object 150 - Variation 1

Type: static

Description:
The byte sequence (string) object is an information object that represents strings. This object is intended to be used for transferring string information such as device name string, initialization, dialling or hang-up string for modem, and so on
This is an extension to the DNP 3.0 specification.

Object coding
This is not a fixed format object, but it is a variable format/size object.

Size 8-bit	Data			
n	Byte 0	Byte 1	...	Byte n-1

Note: Value *n* (size) is treated as unsigned and can be 0...255.

2.3.2. SPA message

Data object 151 - Variation 1

Type: static

Description:
The SPA message object is an information object that represents a transparent SPA message. This object is intended to be used for transferring transparent SPA messages.
This is an extension to the DNP 3.0 specification.

Object coding
This is not a fixed format object, but it is a variable format/size object.

Size 8-bit	Data			
n	Byte 0	Byte 1	...	Byte n-1

Transparent SPA communication is a special case. It is divided into two steps. To communicate using transparent SPA messages, the master station must first send a DNP write request to the transparent SPA point in REC 523. This message should contain the desired SPA message. After receiving a DNP response to this request with an internal indications field showing that the SPA message was accepted (format error bit reset), a DNP read request for the same point should be issued. The DNP response to this request will contain a SPA response.

Format of the SPA message used in a DNP write request:

<Address><Command>[<Channel>[/<Channel>]]<Data category>[<Point>[/<Point>]]: <CR>
for example
1RF:*<CR>*
1R200I1/3:*<CR>*

Note: The start character **>** and checksum are omitted.

In the returned response to the DNP read request a complete SPA response message will be included (that is, with start character **<**, checksum and line feed character):

<1D:REC 523:XX*<CR><LF>*
<1D:528.3/528.2/528.3:XX*<CR><LF>*

Note: Value n (size) is treated as unsigned and can be 0...255. Object coding is the same as for a string object. Two different object numbers are used only for distinguishing the semantics of these two types.

3. Protocol interface implementation

3.1. Application to protocol mapping

3.1.1. POD concept

The Protocol Object Dictionary (POD) is a cross-reference table between the REC 523 application and the DNP 3.0 protocol. This table defines the information that can be accessed from the device using the protocol interface. As REC 523 is a programmable device and may run various application setups (different sets of function blocks), the POD is also re-configurable. This re-configurable table (called visible POD) is used during device initialization to create POD used at runtime (called operational POD). The visible POD can cover all possible device application setups. At the start-up, all present function blocks will be automatically detected and only data items of these blocks will be included in the operational POD.

3.1.2. POD configuration

A default version of the visible POD is available in the device software and includes the mapping of process data and events from all available function blocks, and communication interface parameters into the DNP protocol. Application settings, parameters and recorded measurement and disturbance data are not included in this mapping.

The default POD contents can be uploaded for review and modified by using the Protocol Editing Tool available in CAP 505 Tool Box. Following the changes, the new POD contents can be downloaded to the REC 523 unit and activated by storing the changes and resetting the device.

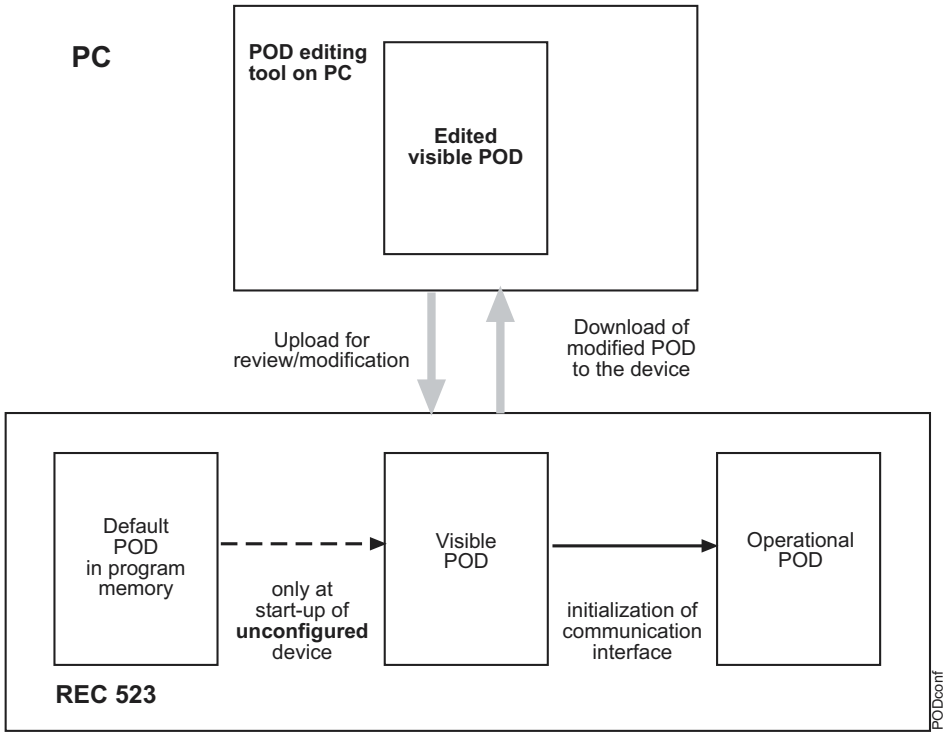


Fig. 3.1.2.-1 POD in REC 523 device

Modifications of the POD contents may be required due to the following situations:

- A different addressing concept is used in the system because of the master station's requirements or limitations in protocol data addressing (re-addressing of mapped application objects)
- Elimination of obsolete function blocks (not used in the application setup)
- Elimination of obsolete data and events from active function blocks (data items not required or not processed by the master station)

3.1.2.1. DNP object map

Object name	Object index	Default variation	Default class
Binary input	1	2	0 or not assigned
Binary input change	2	2	1
Binary output	10	1	0 or not assigned
Binary output block	12	1	Not assigned
Counter	20	5	Not assigned
Counter change event	22	5	3
Analogue input	30	4	0 or not assigned
Analogue input change	32	2	2
Analogue output status	40	2	Not assigned
Analogue output block	41	2	not assigned
Time	50	1	not assigned
Internal indications	80	1	not assigned
String	150	1	not assigned
Transparent SPA	151	1	not assigned

3.1.2.2. DNP classes (default assignment)

Class	Assignment
0 (static data)	The set of static data important from the process point of view is assigned to class 0. This solution makes it possible to read all these values using a single request from the master station (for example to update the master station's database after communications trouble, power loss, and so on).
1 (event data)	All points of type *Binary input change event* are assigned to this class. By default, unsolicited reporting of these points is on.
2 (event data)	All points of type *Analogue input change event* are assigned to this class. By default, unsolicited reporting of these points is on.
3 (event data)	All points of type *Counter change event* are assigned to this class. By default, unsolicited reporting of these points is on.

3.1.3. Defining the POD contents

3.1.3.1. Visible POD entry format

A visible POD may contain maximum 2700 entries. The number of defined entries is revision dependent; for example, the default POD of revision E of REC 523 occupies 2621 entries.

The visible POD can be accessed using Protocol Editing Tool. The attributes in POD table can be divided into two main categories: general and protocol attributes. Protocol attributes of visible POD can be further divided into two categories:

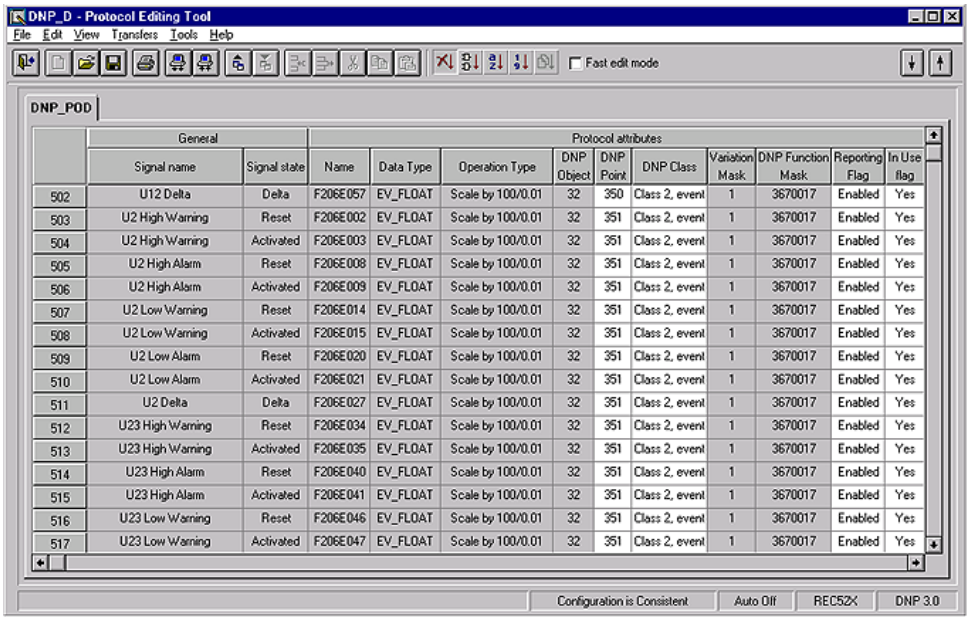
- Attributes of the application (application object name, data type and operation type)
- Attributes of the communication (object, point class, variation mask, function mask and unsolicited reporting flag)

A flag parameter "in use" can be used to facilitate removing (masking) of POD entries from operational POD.

The meaning of each item of a POD entry and its corresponding index is described in the table below:

Index	Name	Description
0	Name of application object	Application name of REC 523 object; in most cases in SPA format, for example, F031I001 (input 1 from channel 31), F031E000 (event 0 from channel 31) and so on with some exceptions as, for example, LONSPAIN
1	Data type	Type of item in the database or type of event
2	Operation type	Type of operation that will be performed when accessing this item
3	DNP object Id	DNP object identifier (for example 1 for binary inputs, 10 for binary outputs, and so on)
4	DNP point	DNP point number
5	DNP class	0 - 3 number of class, 4 - not assigned
6	Variation mask	Mask indicating supported variations: from lowest significant bit 0 - variation 1, (00000001) bit 1 - variation 2, (00000010) and so on
7	DNP function mask	Mask indicating supported functions: from lowest significant bit 0 - function 1 (Read), bit 1 - function 2 (Write), bit 2 - function 3 (Select), and so on **Note:** The mask does not cover function 129 (Response) and 130 (Unsolicited message).
8	Reporting flag	0 – disabled, 1- enabled (applies only to events, for static data always 0)
9	In use flag	0 – not available, 1 – available

The structure of DNP POD is introduced in Fig. 3.1.3.1.-1.



pod

Fig. 3.1.3.1.-1 Protocol Editing Tool with DNP 3.0 POD

The set of generic data types was enumerated for encoding the types of REC 523 application objects in the POD.

Data type codes:

Name	Code	Description
BOOL	0	Boolean value - 0 or 1
DPBOOL	1	Double point value: 00 - middle, 01 -closed (earthed), 10 - opened (freed), 11 - faulty
SINT	2	16-bit signed integer
INT	3	16-bit signed integer
DINT	4	32-bit signed integer
USINT	5	16-bit unsigned integer
UINT	6	16-bit unsigned integer
UDINT	7	32-bit unsigned integer
REAL	8	32-bit floating point
TIME	9	32-bit unsigned integer containing number of milliseconds
TOD	10	32-bit unsigned integer containing time of the day since midnight in 100us units
DATE	11	32-bit unsigned integer containing number of days since 01-01-1980
CLOCK	12	Full time of DNP type used for time synchronization (function)
STRING	13	String value
SPA	14	Transparent SPA message (function)
BYTE	15	8-bit unsigned integer
WORD	16	16-bit unsigned integer
DWORD	17	32-bit unsigned integer
EV_NODAT	18	Event without data
EV_1BIT	19	Event with 1-bit data
EV_2BIT	20	Event with 2-bit data
EV_3BIT	21	Event with 3-bit data (treated as EV_NODAT - phase information will be ignored)
EV_FLOAT	22	Event with floating point value
EV_INT16	23	Event with 16-bit integer value
EV_INT32	24	Event with 32-bit integer value
EV_COUNT	25	Event with counter value
EV_32BIT	26	Event with 32 bit value

Note: The set of supported data types can be extended in future releases.

To enable the required conversion of data items before passing them in DNP messages to the master station or vice versa, a set of operations (conversion routines) has been defined. Each type of operation is assigned a numeric code used by the POD.

Operation type codes associated with data:

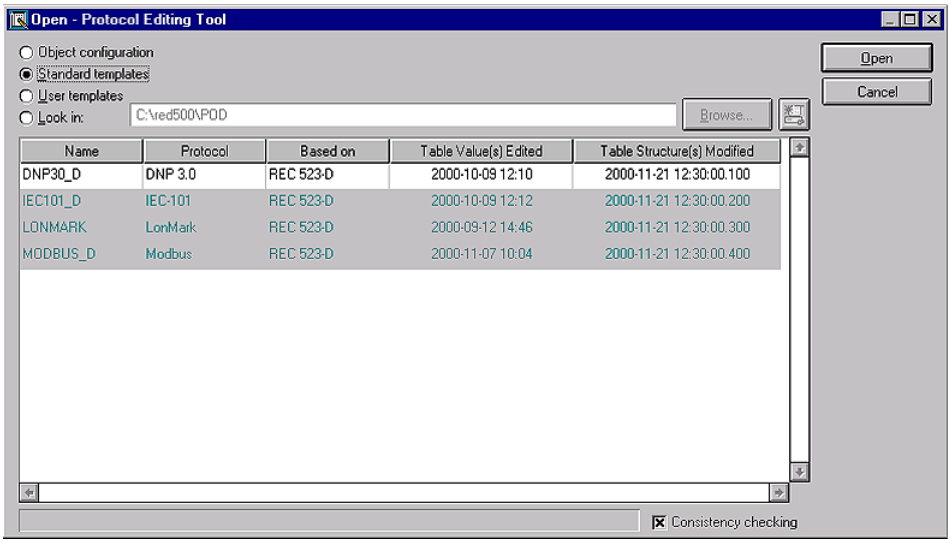
Operation type	Code	Description
No operation	0	No special handling, all actions according to DNP and database type
Select trip	1	Item is used to select trip (open or free) operation
Select close	2	Item is used to select close (close or earth) operation

Operation type	Code	Description
Operate	3	Item is used to perform selected operation
Direct trip	4	Item is used to perform trip (open or free) operation
Direct close	5	Item is used to perform close (close or earth) operation
Cancel selection	6	Item is used to clear previous selection
Scale by 10	7	Value will be multiplied by 10
Scale by 100	8	Value will be multiplied by 100
Scale by 1000	9	Value will be multiplied by 1000
Scale by 0.1	10	Value will be multiplied by 0.1
Scale by 0.01	11	Value will be multiplied by 0.01
Scale by 0.001	12	Value will be multiplied by 0.001
Inverse 1 bit logic	13	0<->1 conversion
Inverse 2 bit logic	14	01<->10 conversion
Always 01 (0 on-line)	15	Conversion for events used to set 01 value
Always 10 (1 on-line)	16	Conversion for events used to set 10 value
Always 00 (0 off-line)	17	Conversion for events used to set 00 value
Always 11 (1 off-line)	18	Conversion for events used to set 11 value
Dummy 0	19	Used for write only items
Operation ACK	20	Meaning is the same as for index 16, but in addition notification will be sent to application layer about accepting requested relay operation
Operation NACK	21	Meaning is the same as for index 16, but in addition notification will be sent to application layer about NOT accepting requested relay operation
Software reset	22	This entry will be used by reset function
Stay silent	23	This entry will be used to set silent flag (this flag is not mapped into the database)
Two point low	24	Low order bit of 2-bit value
Two point high	25	High order bit of 2-bit value

Note: The set of supported operation types can be extended in future releases.

3.1.3.2. POD diagnostics

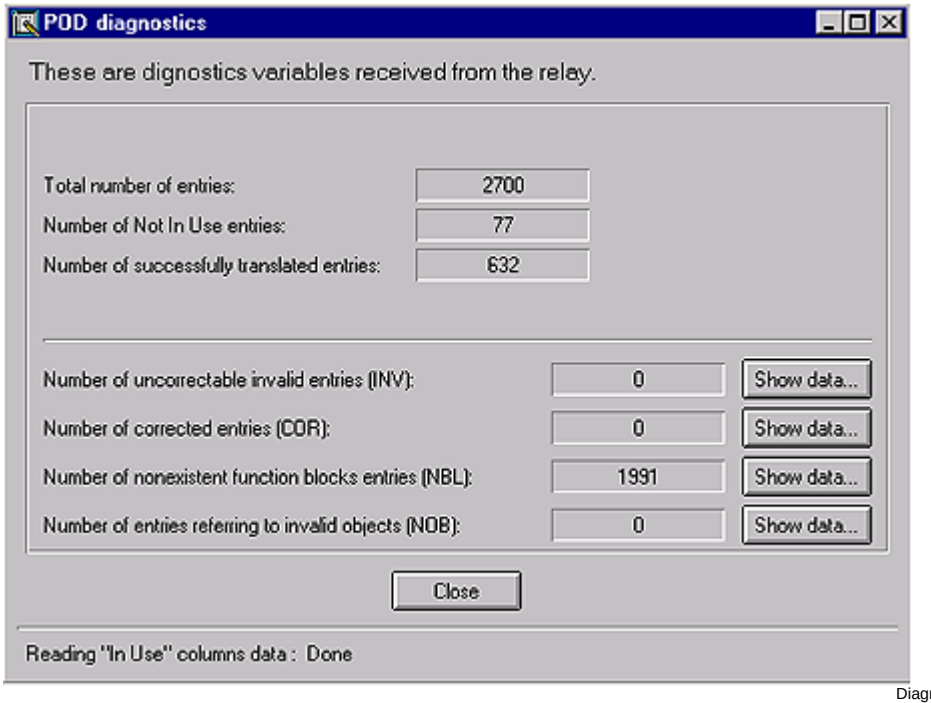
Each POD table that has been downloaded into the unit has an identification string. The identification string is used to check the consistency between the POD stored into REC 523 and the visible POD opened by Protocol Editing Tool. Refer to POD Tool Operator’s Manual for further information.



Prot_openDNP

Fig. 3.1.3.2.-1 Protocol Editing Tool with Open dialog of DNP 3.0 POD

After POD has been downloaded and stored into the unit, it is possible to upload POD diagnostics from the unit.



Diagnostics

Fig. 3.1.3.2.-2 Protocol Editing Tool with POD diagnostics

The meaning of each parameter has been introduced in the table below.

Name	Description	SPA parameter
Total number of entries	Total number of visible POD entries This value is determined by the POD structure size. Both used and unused entries are counted.	F503V060

Name	Description	SPA parameter
Number of Not In Use entries	Number of entries not in use (“in use” field set to 0) This number covers all defined POD entries with the “in use” flag reset as well as all empty POD entries which by default have the “in use” flag also reset.	F503V061
Number of entries translated into operational POD	Translation applies only to the entries with “in use” flag set, correct or corrected contents, and referring to valid objects or events of the function blocks included in the application project.	F503V066
Number of uncorrectable invalid entries (INV)	This checking applies only to the entries with “in use” flag set.	F503V062
Number of corrected entries (COR)	This checking applies only to the entries with “in use” flag set.	F503V063
Number of nonexistent function block entries (NBL)	This checking applies only to the entries with “in use” flag set.	F503V064
Number of entries referring to invalid objects (NOB)	This checking applies only to the entries with “in use” flag set.	F503V065

If seen necessary, one can further analyze the result of diagnostics by selecting “Show data...” (see Fig. 3.1.3.2.-2). Diagnostic details introduces a list of items belonging to the selected category. The list is sorted out based on the row number of the item. Using this information, required changes and corrections can be made to the POD.

3.1.3.3. Examples of mapping application data into the DNP protocol

Example #1: switch state mapping into the protocol

The function block COIND1 is used to report changes in the state of a monitored switch.

Two kinds of information are available from the COIND1 block:

- Current state of the switch - database item F127V001
- Events indicating changes of the switch position: E0, E1, E2 and E3

The switch can be in one of four states: open, closed, middle, faulty.
State information is encoded on 2 bits.

In the DNP protocol, this information is mapped as:

- *Binary input with status* point - for the current state of the switch
- Related *binary input change* points - for events

Two consecutive binary inputs are used to transfer switch state. The following encoding of the switch state is used in the DNP protocol:

- Open values 1/0
- Closed values 0/1
- Middle values 0/0

- faulty values 1/1

Function block[a]	Meaning[a]	DB name	DB type	Op. type	Object	Point	Class	VM	FM	UR	In use
COIND1	Position LO	F127V001	DPBOOL	24	1	1400	0	0x0003	0x00000001	0	1
	Position HI	F127V001	DPBOOL	25	1	1401	0	0x0003	0x00000001	0	1
	Change to open	F127E000	EV_2BIT	15	2	1400	1	0x0002	0x00380001	1	1
	Change to close	F127E001	EV_2BIT	16	2	1400	1	0x0002	0x00380001	1	1
	Change to faulty	F127E002	EV_2BIT	16	2	1400	1	0x0002	0x00380001	1	1
	Change to middle	F127E003	EV_2BIT	15	2	1400	1	0x0002	0x00380001	1	1
	Change to open	F127E000	EV_2BIT	16	2	1401	1	0x0002	0x00380001	1	1
	Change to close	F127E001	EV_2BIT	15	2	1401	1	0x0002	0x00380001	1	1
	Change to faulty	F127E002	EV_2BIT	16	2	1401	1	0x0002	0x00380001	1	1
	Change to middle	F127E003	EV_2BIT	15	2	1401	1	0x0002	0x00380001	1	1

a. These columns are not part of the POD

First two entries: static data - switch position (database object)

- Database type: double-point binary
- Operation type: no operation (data not converted)
- Object: binary input (1)
- DNP points: 1400, 1401
- Data item assigned to class 0 (containing important static data)
- Variation supported: 3 - binary input with status (mask: 00000011)
- Function supported: 1 - read function
- Not reported spontaneously (available only on read request)
- Entry in use

Next 8 entries: event data - switch position change

- Database type: 2-bit event
- Operation type: according to the meaning conversion to on-line value 0, on-line value 1, on-line value 1, on-line value 0, on-line value 1, on-line value 0, on-line value 1, on-line value 0
- Object: binary input change: 2
- DNP points: 1400, 1401 (must be the same as for static data)
- Data item assigned to class 1 (containing all binary input change events)
- Variation supported: 2 - binary input change with time (mask: 00000010)
- DNP functions supported: 1 - read, 22 - assign class, 20 and 21 - spontaneous reporting on and off
- Reported spontaneously
- Entries in use

Example #2: control command mapping to the protocol

The function block CODC1 is used to control and monitor the position of a disconnector switch. Two types of control operations are available:

- One-step *direct* command - F122V004 and F122V005 for direct open and direct close
- Two-step *select/execute* commands - F122V006 and F122V007 to select open and close, F122V011 to execute the selected operation and F122V010 to cancel the selection

Feedback information about the current state of the switch is available from the F122V001 object.

In the DNP protocol these data items are mapped as:

- Control relay output block - for control commands
- Related binary output with status - for the current state of the switch

The following encoding of the switch state is used in the DNP protocol:

- Open - the input is on-line and has the value 1
- Closed - the input is on-line and has the value 0
- Middle - the input is off-line and has the value 0
- Faulty - the input is off-line and has the value 1

The DNP protocol provides close and trip commands (trip command corresponds to open).

Function block[a]	Meaning[a]	DB name	DB type	Op. type	Object	Point	Class	VM	FM	UR	In use
CODC1	Direct open	F122V004	BOOL	4	12	2200	4	0x0001	0x0000003C	0	1
	Direct close	F122V005	BOOL	5	12	2200	4	0x0001	0x0000003C	0	1
	Open select	F122V006	BOOL	1	12	2200	4	0x0001	0x0000003C	0	1
	Close select	F122V007	BOOL	2	12	2200	4	0x0001	0x0000003C	0	1
	Execute	F122V010	BOOL	3	12	2200	4	0x0001	0x0000003C	0	1
	Cancel	F122V011	BOOL	6	12	2200	4	0x0001	0x0000003C	0	1
	Position	F122V001	DPBOOL	0	10	2200	0	0x0002	0x00000001	0	1

a. These columns are not part of the POD

Six entries: control commands

- Database type: binary value
- Operation type: according to the meaning - direct open, direct close, select open, close select, execute, cancel selection
- Object: control relay output block: 12
- DNP point: 2200
- Data item not assigned to any class
- Variation supported: 1 (the only available, mask: 00000001)
- DNP functions supported: 3-select, 4-operate, 5-direct operate and 6-direct operate no ACK
- Not reported spontaneously

- Entries in use

Last entry: static data - position

- Database type: double-point binary value
- Operation type: no operation (data not converted)
- Object: binary output (10)
- DNP point: 2200 must be the same as for command
- Data item assigned to class 0 (containing important static data)
- Variation supported: 2 - binary input with status (mask: 00000010)
- DNP function supported: 1- read
- Not reported spontaneously
- Entry in use

Example #3: mapping of analogue input with limit and delta supervision to the protocol

The MECU1A function block provides neutral current measurement and two methods of supervising this signal - limit (high warning and high alarm) and threshold (delta change).

Two kinds of information are available from the MECU1A block:

- Neutral current value - database item F201I001
- Events that indicate crossing of the limit levels (E0, E1, E2 and E3) or the threshold level (E5)

In the DNP protocol these items are mapped as:

- *Analogue input* point - for static value of neutral current
- Related *analogue input change without time* points - for events

In addition, since the *analogue input change* type does not identify the cause of event (which level has been crossed), the events E0, E1, E2 and E3 are mapped as *binary input change with time* points (separate for warning and for alarm).

Function block[a]	Meaning[a]	DB name	DB type	Op. type	Object	Point	Class	VM	FM	UR	In use
MECU1A	Io	F201I001	REAL	7	30	50	0	0x0004	0x00000001	0	1
	Io HW reset	F201E000	EV_FLOAT	15	1	50	4	0x0003	0x00000001	0	1
	Io HW activated	F201E001	EV_FLOAT	16	1	50	4	0x0003	0x00000001	0	1
	Io HA reset	F201E002	EV_FLOAT	15	1	51	4	0x0003	0x00000001	0	1
	Io HA activated	F201E003	EV_FLOAT	16	1	51	4	0x0003	0x00000001	0	1
	Io HW reset	F201E000	EV_FLOAT	15	2	50	1	0x0002	0x00380001	1	1
	Io HW activated	F201E001	EV_FLOAT	16	2	50	1	0x0002	0x00380001	1	1
	Io HA reset	F201E002	EV_FLOAT	15	2	51	1	0x0002	0x00380001	1	1
	Io HA activated	F201E003	EV_FLOAT	16	2	51	1	0x0002	0x00380001	1	1
	Io HW reset	F201E000	EV_FLOAT	7	32	50	2	0x0001	0x00380001	1	1
	Io HW activated	F201E001	EV_FLOAT	7	32	50	2	0x0001	0x00380001	1	1
	Io HA reset	F201E002	EV_FLOAT	7	32	50	2	0x0001	0x00380001	1	1
	Io HA activated	F201E003	EV_FLOAT	7	32	50	2	0x0001	0x00380001	1	1
	Io delta	F201E005	EV_FLOAT	7	32	50	2	0x0001	0x00380001	1	1

a. These columns are not part of the POD

First entry: analogue static data (DB object)

- Database type: floating point
- Operation type: multiplied by 10 (to achieve maximum accuracy since data will be sent as 32-bit integers)
- Object: analogue input (30)
- Point: 50
- Data item assigned to class 0 containing important static data
- Variation: 3 - 32-bit analogue input without status (mask: 00000100)
- DNP function supported: 1 - read
- Not reported spontaneously
- Entry in use

Last 5 entries: analogue event data

- Database type: floating-point event
- Operation type: value multiplied by 10 (to achieve maximum accuracy since data will be sent as 32-bit integers)
- Object: analogue input change event (32)
- Point: 50 (the same as for static data)
- Data item assigned to class 2 (containing analogue change events)
- Variation supported: 1 - 32-bit analogue input change without time (mask: 00000001)
- DNP functions supported: 1 - read, 22 - assign class, 20 and 21 - spontaneous reporting on and off
- Reported spontaneously
- Entries in use

Entries 2 - 5: binary input data

- Database type: floating-point event
- Operation type: according to the meaning (on line 1 when warning/alarm activated and on line 0 when alarm/warning deactivated)
- Object: binary input (1)
- Points: 50 for warning and 51 for alarm state (note that these point numbers have nothing in common with point numbers for analogue measurements as they represent different kind of information - binary, NOT analogue)
- Data item not assigned to class (4)
- Variation supported: 1 – one bit binary input and 2 - binary input with status (mask: 00000011)
- DNP functions supported: 1 - read
- Not reported spontaneously
- Entries in use

Entries 6 - 9: binary event data

- Database type: floating-point event
- Operation type: according to the meaning (on line 1 when warning/alarm activated and on line 0 when alarm/warning deactivated)
- Object: binary input change event (2)
- Points: 50 for warning and 51 for alarm state (must be the same point numbers as assigned to corresponding binary input data defined in entries 2-5)
- Data item assigned to class 1 (containing binary change events)
- Variation supported: 2 - binary input change with time (mask: 00000010)
- DNP functions supported: 1 - read, 22 - assign class, 20 and 21 - spontaneous reporting on and off
- Reported spontaneously
- Entries in use

Note: REC 523 application provides only dynamic information (events) on warning or alarm condition in analogue signal supervision. These events are mapped to DNP binary input change events (for example entries 6-9 defined above). Static data objects corresponding to the present warning or alarm condition can be, however, supported by the protocol interface with value updates based on the received events. These “shadow” static data objects are mapped to DNP binary inputs (entries 2-5 defined above).

Generally, for any pair of REC 523 events representing on/off state it is possible to define a “shadow” static data object. This extension was made due to some DNP master devices that require corresponding static data for all change events.

3.2. Protocol address map based on default POD

The mapping presented in this section corresponds to the default POD.

For a given application setup, the visible POD can be reconfigured to omit unused function blocks and data items, and to change the point numbers if required. Each data item in the DNP protocol is uniquely addressed using the pair object/point. Object describes the type of the data item (digital input, counter, analogue output, and so on) and point indicates the specific instance of the data item. In this section all data accessible via the DNP interface are placed in separate tables for each REC 523 function block.

Please refer to chapter “Point numbering overall rules” on page 23 for more information about the rule 3, which applies to such groupings as binary inputs and outputs, counters, analogue outputs and inputs.

Function block MEAI1

Description	Name	Object	Point	Variation	Class	Access function	Values
Input MEAI1 value valid/invalid	F213E008 F213E009	1	5400	1,2	-	Read	0 – valid 1 – invalid
Input MEAI1 high warning reset/ activated	F213E000 F213E001	1	5401	1,2	-	Read	0 – reset 1 – activated
Input MEAI1 high alarm reset/ activated	F213E002 F213E003	1	5402	1,2	-	Read	0 – reset 1 – activated

Description	Name	Object	Point	Variation	Class	Access function	Values
Input MEAI1 low warning reset/ activated	F213E004 F213E005	1	5403	1,2	-	Read	0 – reset 1 – activated
Input MEAI1 low alarm reset/ activated	F213E006 F213E007	1	5404	1,2	-	Read	0 – reset 1 – activated
Input MEAI1 value valid/invalid	F213E008 F213E009	2	5400	2	1	Read/Unsolicited response	0 – valid 1 – invalid
Input MEAI1 high warning reset/ activated	F213E000 F213E001	2	5401	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI1 high alarm reset/ activated	F213E002 F213E003	2	5402	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI1 low warning reset/ activated	F213E004 F213E005	2	5403	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI1 low alarm reset/ activated	F213E006 F213E007	2	5404	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI1	F213I001	30	5400	3	0	Read	-10000000...10000000 -10000.000...10000.000
Input MEAI1 delta/high/low/ warning alarm	F213E000 F213E001 F213E002 F213E003 F213E004 F213E005 F213E006 F213E007 F213E011	32	5400	1	2	Read/Unsolicited response	-10000000...10000000 -10000.000...10000.000

Function block MEAI2

Description	Name	Object	Point	Variation	Class	Access function	Values
Input MEAI2 value valid/invalid	F214E008 F214E009	1	5410	1,2	-	Read	0 – valid 1 – invalid
Input MEAI2 high warning reset/ activated	F214E000 F214E001	1	5411	1,2	-	Read	0 – reset 1 – activated
Input MEAI2 high alarm reset/ activated	F214E002 F214E003	1	5412	1,2	-	Read	0 – reset 1 – activated
Input MEAI2 low warning reset/ activated	F214E004 F214E005	1	5413	1,2	-	Read	0 – reset 1 – activated
Input MEAI2 low alarm reset/ activated	F214E006 F214E007	1	5414	1,2	-	Read	0 – reset 1 – activated
Input MEAI2 value valid/invalid	F214E008 F214E009	2	5410	2	1	Read/Unsolicited response	0 – valid 1 – invalid
Input MEAI2 high warning reset/ activated	F214E000 F214E001	2	5411	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI2 high alarm reset/ activated	F214E002 F214E003	2	5412	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI2 low warning reset/ activated	F214E004 F214E005	2	5413	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI2 low alarm reset/ activated	F214E006 F214E007	2	5414	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI2	F214I001	30	5410	3	0	Read	-10000000...10000000 -10000.000...10000.000

Description	Name	Object	Point	Variation	Class	Access function	Values
Input MEAI2 delta/high/low/ warning alarm	F214E000 F214E001 F214E002 F214E003 F214E004 F214E005 F214E006 F214E007 F214E011	32	5410	1	2	Read/Unsolicited response	-10000000...10000000 -10000.000...10000.000

Function block MEAI3

Description	Name	Object	Point	Variation	Class	Access function	Values
Input MEAI3 value valid/invalid	F215E008 F215E009	1	5420	1,2	-	Read	0 – valid 1 – invalid
Input MEAI3 high warning reset/ activated	F215E000 F215E001	1	5421	1,2	-	Read	0 – reset 1 – activated
Input MEAI3 high alarm reset/ activated	F215E002 F215E003	1	5422	1,2	-	Read	0 – reset 1 – activated
Input MEAI3 low warning reset/ activated	F215E004 F215E005	1	5423	1,2	-	Read	0 – reset 1 – activated
Input MEAI3 low alarm reset/ activated	F215E006 F215E007	1	5424	1,2	-	Read	0 – reset 1 – activated
Input MEAI3 value valid/invalid	F215E008 F215E009	2	5420	2	1	Read/Unsolicited response	0 – valid 1 – invalid
Input MEAI3 high warning reset/ activated	F215E000 F215E001	2	5421	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI3 high alarm reset/ activated	F215E002 F215E003	2	5422	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI3 low warning reset/ activated	F215E004 F215E005	2	5423	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI3 low alarm reset/ activated	F215E006 F215E007	2	5424	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI3	F215I001	30	5420	3	0	Read	-10000000...10000000 -10000.000...10000.000
Input MEAI3 delta/high/low/ warning alarm	F215E000 F215E001 F215E002 F215E003 F215E004 F215E005 F215E006 F215E007 F215E011	32	5420	1	2	Read/Unsolicited response	-10000000...10000000 -10000.000...10000.000

Function block MEAI4

Description	Name	Object	Point	Variation	Class	Access function	Values
Input MEAI4 value valid/invalid	F216E008 F216E009	1	5430	1,2	-	Read	0 – valid 1 – invalid
Input MEAI4 high warning reset/ activated	F216E000 F216E001	1	5431	1,2	-	Read	0 – reset 1 – activated
Input MEAI4 high alarm reset/ activated	F216E002 F216E003	1	5432	1,2	-	Read	0 – reset 1 – activated
Input MEAI4 low warning reset/ activated	F216E004 F216E005	1	5433	1,2	-	Read	0 – reset 1 – activated
Input MEAI4 low alarm reset/ activated	F216E006 F216E007	1	5434	1,2	-	Read	0 – reset 1 – activated

Description	Name	Object	Point	Variation	Class	Access function	Values
Input MEAI4 value valid/invalid	F216E008 F216E009	2	5430	2	1	Read/Unsolicited response	0 – valid 1 – invalid
Input MEAI4 high warning reset/ activated	F216E000 F216E001	2	5431	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI4 high alarm reset/ activated	F216E002 F216E003	2	5432	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI4 low warning reset/ activated	F216E004 F216E005	2	5433	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI4 low alarm reset/ activated	F216E006 F216E007	2	5434	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI4	F216I001	30	5430	3	0	Read	-10000000...10000000 -10000.000...10000.000
Input MEAI4 delta/high/low/ warning alarm	F216E000 F216E001 F216E002 F216E003 F216E004 F216E005 F216E006 F216E007 F216E011	32	5430	1	2	Read/Unsolicited response	-10000000...10000000 -10000.000...10000.000

Function block MEAI5

Description	Name	Object	Point	Variation	Class	Access function	Values
Input MEAI5 value valid/invalid	F217E008 F217E009	1	5440	1,2	-	Read	0 – valid 1 – invalid
Input MEAI5 high warning reset/ activated	F217E000 F217E001	1	5441	1,2	-	Read	0 – reset 1 – activated
Input MEAI5 high alarm reset/ activated	F217E002 F217E003	1	5442	1,2	-	Read	0 – reset 1 – activated
Input MEAI5 low warning reset/ activated	F217E004 F217E005	1	5443	1,2	-	Read	0 – reset 1 – activated
Input MEAI5 low alarm reset/ activated	F217E006 F217E007	1	5444	1,2	-	Read	0 – reset 1 – activated
Input MEAI5 value valid/invalid	F217E008 F217E009	2	5440	2	1	Read/Unsolicited response	0 – valid 1 – invalid
Input MEAI5 high warning reset/ activated	F217E000 F217E001	2	5441	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI5 high alarm reset/ activated	F217E002 F217E003	2	5442	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI5 low warning reset/ activated	F217E004 F217E005	2	5443	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI5 low alarm reset/ activated	F217E006 F217E007	2	5444	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI5	F217I001	30	5440	3	0	Read	-10000000...10000000 -10000.000...10000.000
Input MEAI5 delta/high/low/ warning alarm	F217E000 F217E001 F217E002 F217E003 F217E004 F217E005 F217E006 F217E007 F217E011	32	5440	1	2	Read/Unsolicited response	-10000000...10000000 -10000.000...10000.000

Function block MEAI6

Description	Name	Object	Point	Variation	Class	Access function	Values
Input MEAI6 value valid/invalid	F218E008 F218E009	1	5450	1,2	-	Read	0 – valid 1 – invalid
Input MEAI6 high warning reset/ activated	F218E000 F218E001	1	5451	1,2	-	Read	0 – reset 1 – activated
Input MEAI6 high alarm reset/ activated	F218E002 F218E003	1	5452	1,2	-	Read	0 – reset 1 – activated
Input MEAI6 low warning reset/ activated	F218E004 F218E005	1	5453	1,2	-	Read	0 – reset 1 – activated
Input MEAI6 low alarm reset/ activated	F218E006 F218E007	1	5454	1,2	-	Read	0 – reset 1 – activated
Input MEAI6 value valid/invalid	F218E008 F218E009	2	5450	2	1	Read/Unsolicited response	0 – valid 1 – invalid
Input MEAI6 high warning reset/ activated	F218E000 F218E001	2	5451	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI6 high alarm reset/ activated	F218E002 F218E003	2	5452	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI6 low warning reset/ activated	F218E004 F218E005	2	5453	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI6 low alarm reset/ activated	F218E006 F218E007	2	5454	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI6	F218I001	30	5450	3	0	Read	-10000000...10000000 -10000.000...10000.000
Input MEAI6 delta/high/low/ warning alarm	F218E000 F218E001 F218E002 F218E003 F218E004 F218E005 F218E006 F218E007 F218E011	32	5450	1	2	Read/Unsolicited response	-10000000...10000000 -10000.000...10000.000

Function block MEAI7

Description	Name	Object	Point	Variation	Class	Access function	Values
Input MEAI7 value valid/invalid	F219E008 F219E009	1	5460	1,2	-	Read	0 – valid 1 – invalid
Input MEAI7 high warning reset/ activated	F219E000 F219E001	1	5461	1,2	-	Read	0 – reset 1 – activated
Input MEAI7 high alarm reset/ activated	F219E002 F219E003	1	5462	1,2	-	Read	0 – reset 1 – activated
Input MEAI7 low warning reset/ activated	F219E004 F219E005	1	5463	1,2	-	Read	0 – reset 1 – activated
Input MEAI7 low alarm reset/ activated	F219E006 F219E007	1	5464	1,2	-	Read	0 – reset 1 – activated
Input MEAI7 value valid/invalid	F219E008 F219E009	2	5460	2	1	Read/Unsolicited response	0 – valid 1 – invalid
Input MEAI7 high warning reset/ activated	F219E000 F219E001	2	5461	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI7 high alarm reset/ activated	F219E002 F219E003	2	5462	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI7 low warning reset/ activated	F219E004 F219E005	2	5463	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI7 low alarm reset/ activated	F219E006 F219E007	2	5464	2	1	Read/Unsolicited response	0 – reset 1 – activated

Description	Name	Object	Point	Variation	Class	Access function	Values
Input MEAI7	F219I001	30	5460	3	0	Read	-10000000...10000000 -10000.000...10000.000
Input MEAI7 delta/high/low/ warning alarm	F219E000 F219E001 F219E002 F219E003 F219E004 F219E005 F219E006 F219E007 F219E011	32	5460	1	2	Read/Unsolicited response	-10000000...10000000 -10000.000...10000.000

Function block MEAI8

Description	Name	Object	Point	Variation	Class	Access function	Values
Input MEAI8 value valid/invalid	F220E008 F220E009	1	5470	1,2	-	Read	0 – valid 1 – invalid
Input MEAI8 high warning reset/ activated	F220E000 F220E001	1	5471	1,2	-	Read	0 – reset 1 – activated
Input MEAI8 high alarm reset/ activated	F220E002 F220E003	1	5472	1,2	-	Read	0 – reset 1 – activated
Input MEAI8 low warning reset/ activated	F220E004 F220E005	1	5473	1,2	-	Read	0 – reset 1 – activated
Input MEAI8 low alarm reset/ activated	F220E006 F220E007	1	5474	1,2	-	Read	0 – reset 1 – activated
Input MEAI8 value valid/invalid	F220E008 F220E009	2	5470	2	1	Read/Unsolicited response	0 – valid 1 – invalid
Input MEAI8 high warning reset/ activated	F220E000 F220E001	2	5471	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI8 high alarm reset/ activated	F220E002 F220E003	2	5472	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI8 low warning reset/ activated	F220E004 F220E005	2	5473	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI8 low alarm reset/ activated	F220E006 F220E007	2	5474	2	1	Read/Unsolicited response	0 – reset 1 – activated
Input MEAI8	F220I001	30	5470	3	0	Read	-10000000...10000000 -10000.000...10000.000
Input MEAI8 delta/high/low/ warning alarm	F220E000 F220E001 F220E002 F220E003 F220E004 F220E005 F220E006 F220E007 F220E011	32	5470	1	2	Read/Unsolicited response	-10000000...10000000 -10000.000...10000.000

Function block MECU1A

Description	Name	Object	Point	Variation	Class	Access function	Values
Io high warning reset/activated	F201E000 F201E001	1	50	1, 2	-	Read	0 – reset 1- activated
Io high alarm reset/activated	F201E002 F201E003	1	51	1, 2	-	Read	0 – reset 1- activated
Io high warning reset/activated	F201E000 F201E001	2	50	2	1	Read/Unsolicited response	0 – reset 1- activated
Io high alarm reset/activated	F201E002 F201E003	2	51	2	1	Read/Unsolicited response	0 – reset 1- activated

Description	Name	Object	Point	Variation	Class	Access function	Values
Io	F201I001	30	50	3	0	Read	0...200000 0.0A...20000.0A
Io delta/high warning/alarm	F201E000 F201E001 F201E002 F201E003 F201E005	32	50	1	2	Read/Unsolicited response	0..200000 0.0A...20000.0A

Function block MECU1B

Description	Name	Object	Point	Variation	Class	Access function	Values
Io high warning reset/activated	F203E000 F203E001	1	150	1, 2	-	Read	0 - reset 1- activated
Io high alarm reset/activated	F203E002 F203E003	1	151	1, 2	-	Read	0 - reset 1- activated
Io high warning reset/activated	F203E000 F203E001	2	150	2	1	Read/Unsolicited response	0 - reset 1- activated
Io high alarm reset/activated	F203E002 F203E003	2	151	2	1	Read/Unsolicited response	0 - reset 1- activated
Io (LV side)	F203I001	30	150	3	0	Read	0...200000 0.0A..20000.0A
Io delta/high warning/alarm	F203E000 F203E001 F203E002 F203E003 F203E005	32	150	1	2	Read/Unsolicited response	0...200000 0.0A...20000.0A

Function block MECU3A

Description	Name	Object	Point	Variation	Class	Access function	Values
IL1 high warning reset/activated	F200E000 F200E001	1	200	1, 2	-	Read	0 – reset 1- activated
IL2 high warning reset/activated	F200E002 F200E003	1	201	1, 2	-	Read	0 – reset 1- activated
IL3 high warning reset/activated	F200E004 F200E005	1	202	1, 2	-	Read	0 – reset 1- activated
IL1 high alarm reset/activated	F200E006 F200E007	1	203	1, 2	-	Read	0 – reset 1- activated
IL2 high alarm reset/activated	F200E008 F200E009	1	204	1, 2	-	Read	0 – reset 1- activated
IL3 high alarm reset/activated	F200E010 F200E011	1	205	1, 2	-	Read	0 – reset 1- activated
IL1 low warning reset/activated	F200E012 F200E013	1	206	1, 2	-	Read	0 – reset 1- activated
IL2 low warning reset/activated	F200E014 F200E015	1	207	1, 2	-	Read	0 – reset 1- activated
IL3 low warning reset/activated	F200E016 F200E017	1	208	1, 2	-	Read	0 – reset 1- activated
IL1 low alarm reset/activated	F200E018 F200E019	1	209	1, 2	-	Read	0 – reset 1- activated
IL2 low alarm reset/activated	F200E020 F200E021	1	210	1, 2	-	Read	0 – reset 1- activated
IL3 low alarm reset/activated	F200E022 F200E023	1	211	1, 2	-	Read	0 – reset 1- activated
IL1 high warning reset/activated	F200E000 F200E001	2	200	2	1	Read/Unsolicited response	0 – reset 1- activated
IL2 high warning reset/activated	F200E002 F200E003	2	201	2	1	Read/Unsolicited response	0 – reset 1- activated

Description	Name	Object	Point	Variation	Class	Access function	Values
IL3 high warning reset/activated	F200E004 F200E005	2	202	2	1	Read/Unsolicited response	0 – reset 1- activated
IL1 high alarm reset/activated	F200E006 F200E007	2	203	2	1	Read/Unsolicited response	0 – reset 1- activated
IL2 high alarm reset/activated	F200E008 F200E009	2	204	2	1	Read/Unsolicited response	0 – reset 1- activated
IL3 high alarm reset/activated	F200E010 F200E011	2	205	2	1	Read/Unsolicited response	0 – reset 1- activated
IL1 low warning reset/activated	F200E012 F200E013	2	206	2	1	Read/Unsolicited response	0 – reset 1- activated
IL2 low warning reset/activated	F200E014 F200E015	2	207	2	1	Read/Unsolicited response	0 – reset 1- activated
IL3 low warning reset/activated	F200E016 F200E017	2	208	2	1	Read/Unsolicited response	0 – reset 1- activated
IL1 low alarm reset/activated	F200E018 F200E019	2	209	2	1	Read/Unsolicited response	0 – reset 1- activated
IL2 low alarm reset/activated	F200E020 F200E021	2	210	2	1	Read/Unsolicited response	0 – reset 1- activated
IL3 low alarm reset/activated	F200E022 F200E023	2	211	2	1	Read/Unsolicited response	0 – reset 1- activated
IL1	F200I001	30	200	3	0	Read	0...200000 0.0A...20000.0A
IL2	F200I002	30	201	3	0	Read	0...200000 0.0A...20000.0A
IL3	F200I003	30	202	3	0	Read	0...200000 0.0A...20000.0A
IL1 delta/high/low/warning/alarm	F200E000 F200E001 F200E006 F200E007 F200E012 F200E013 F200E018 F200E019 F200E025	32	200	1	2	Read/Unsolicited response	0...200000 0.0A...20000.0A
IL2 delta/high/low/warning/alarm	F200E002 F200E003 F200E008 F200E009 F200E014 F200E015 F200E020 F200E021 F200E027	32	201	1	2	Read/Unsolicited response	0...200000 0.0A...20000.0A
IL3 delta/high/low/warning/alarm	F200E004 F200E005 F200E010 F200E011 F200E016 F200E017 F200E022 F200E023 F200E029	32	202	1	2	Read/Unsolicited response	0...200000 0.0A...20000.0A

Function block MECU3B

Description	Name	Object	Point	Variation	Class	Access function	Values
IL1 high warning reset/activated	F202E000 F202E001	1	250	1, 2	-	Read	0 – reset 1- activated
IL2 high warning reset/activated	F202E002 F202E003	1	251	1, 2	-	Read	0 – reset 1- activated
IL3 high warning reset/activated	F202E004 F202E005	1	252	1, 2	-	Read	0 – reset 1- activated
IL1 high alarm reset/activated	F202E006 F202E007	1	253	1, 2	-	Read	0 – reset 1- activated
IL2 high alarm reset/activated	F202E008 F202E009	1	254	1, 2	-	Read	0 – reset 1- activated
IL3 high alarm reset/activated	F202E010 F202E011	1	255	1, 2	-	Read	0 – reset 1- activated
IL1 low warning reset/activated	F202E012 F202E013	1	256	1, 2	-	Read	0 – reset 1- activated
IL2 low warning reset/activated	F202E014 F202E015	1	257	1, 2	-	Read	0 – reset 1- activated
IL3 low warning reset/activated	F202E016 F202E017	1	258	1, 2	-	Read	0 – reset 1- activated
IL1 low alarm reset/activated	F202E018 F202E019	1	259	1, 2	-	Read	0 – reset 1- activated
IL2 low alarm reset/activated	F202E020 F202E021	1	260	1, 2	-	Read	0 – reset 1- activated
IL3 low alarm reset/activated	F202E022 F202E023	1	261	1, 2	-	Read	0 – reset 1- activated
IL1 high warning reset/activated	F202E000 F202E001	2	250	2	1	Read/Unsolicited response	0 – reset 1- activated
IL2 high warning reset/activated	F202E002 F202E003	2	251	2	1	Read/Unsolicited response	0 – reset 1- activated
IL3 high warning reset/activated	F202E004 F202E005	2	252	2	1	Read/Unsolicited response	0 – reset 1- activated
IL1 high alarm reset/activated	F202E006 F202E007	2	253	2	1	Read/Unsolicited response	0 – reset 1- activated
IL2 high alarm reset/activated	F202E008 F202E009	2	254	2	1	Read/Unsolicited response	0 – reset 1- activated
IL3 high alarm reset/activated	F202E010 F202E011	2	255	2	1	Read/Unsolicited response	0 – reset 1- activated
IL1 low warning reset/activated	F202E012 F202E013	2	256	2	1	Read/Unsolicited response	0 – reset 1- activated
IL2 low warning reset/activated	F202E014 F202E015	2	257	2	1	Read/Unsolicited response	0 – reset 1- activated
IL3 low warning reset/activated	F202E016 F202E017	2	258	2	1	Read/Unsolicited response	0 – reset 1- activated
IL1 low alarm reset/activated	F202E018 F202E019	2	259	2	1	Read/Unsolicited response	0 – reset 1- activated
IL2 low alarm reset/activated	F202E020 F202E021	2	260	2	1	Read/Unsolicited response	0 – reset 1- activated
IL3 low alarm reset/activated	F202E022 F202E023	2	261	2	1	Read/Unsolicited response	0 – reset 1- activated
IL1 (LV side)	F202I001	30	250	3	0	Read	0...200000 0.0A...20000.0A
IL2 (LV side)	F202I002	30	251	3	0	Read	0...200000 0.0A...20000.0A
IL3 (LV side)	F202I003	30	252	3	0	Read	0...200000 0.0A...20000.0A

Description	Name	Object	Point	Variation	Class	Access function	Values
IL1 delta/high/low/warning/alarm	F202E000 F202E001 F202E006 F202E007 F202E012 F202E013 F202E018 F202E019 F202E025	32	250	1	2	Read/Unsolicited response	0...200000 0.0A...20000.0A
IL2 delta/high/low/warning/alarm	F202E002 F202E003 F202E008 F202E009 F202E014 F202E015 F202E020 F202E021 F202E027	32	251	1	2	Read/Unsolicited response	0...200000 0.0A...20000.0A
IL3 delta/high/low/warning/alarm	F202E004 F202E005 F202E010 F202E011 F202E016 F202E017 F202E022 F202E023 F202E029	32	252	1	2	Read/Unsolicited response	0...200000 0.0A...20000.0A

Function block MEDREC 16

Description	Name	Object	Point	Variation	Class	Access function	Values
Recorder memory is full off/on	F225E000 F225E001	2	800	2	1	Read/Unsolicited response	0 – off 1- on
Overwrite of recording	F225E003	2	801	2	1	Read/Unsolicited response	1- overwritten
Configuration error	F225E005	2	802	2	1	Read/Unsolicited response	1- error
Recorder triggered	F225E031	2	803	2	1	Read/Unsolicited response	1- triggered
Reset memory	F225M002	10/12	804	1	-	Read/Write	1 or trip - reset

Function block MEFR1

Description	Name	Object	Point	Variation	Class	Access function	Values
Frequency high warning reset/ activated	F208E000 F208E001	1	700	1,2	-	Read	0 – reset 1- activated
Frequency high alarm reset/ activated	F208E002 F208E003	1	701	1,2	-	Read	0 – reset 1- activated
Frequency low warning reset/ activated	F208E004 F208E005	1	702	1,2	-	Read	0 – reset 1- activated
Frequency low alarm reset/ activated	F208E006 F208E007	1	703	1,2	-	Read	0 – reset 1- activated
Frequency high warning reset/ activated	F208E000 F208E001	2	700	2	1	Read/Unsolicited response	0 – reset 1- activated
Frequency high alarm reset/ activated	F208E002 F208E003	2	701	2	1	Read/Unsolicited response	0 – reset 1- activated
Frequency low warning reset/ activated	F208E004 F208E005	2	702	2	1	Read/Unsolicited response	0 – reset 1- activated

Description	Name	Object	Point	Variation	Class	Access function	Values
Frequency low alarm reset/ activated	F208E006 F208E007	2	703	2	1	Read/Unsolicited response	0 – reset 1- activated
Frequency	F208I001	30	700	3	0	Read	1000...7500 10.00Hz...75.00Hz
Frequency delta/high/low/warning alarm	F208E000 F208E001 F208E002 F208E003 F208E004 F208E005 F208E006 F208E007 F208E009	32	700	1	2	Read/Unsolicited response	1000...7500 10.00Hz...75.00Hz

Function block MEPE7

Description	Name	Object	Point	Variation	Class	Access function	Values
Reset flag	F207V418	1	400	1,2	-	Read	0= All values valid 1= "Last save Pos." values valid
P3 high warning reset/activated	F207E000 F207E001	1	401	1,2	-	Read	0 – reset 1- activated
P3 high alarm reset/activated	F207E002 F207E003	1	402	1,2	-	Read	0 – reset 1- activated
Q3 high warning reset/activated	F207E004 F207E005	1	403	1,2	-	Read	0 – reset 1- activated
Q3 high alarm reset/activated	F207E006 F207E007	1	404	1,2	-	Read	0 – reset 1- activated
P3 low warning reset/activated	F207E008 F207E009	1	405	1,2	-	Read	0 – reset 1- activated
P3 low alarm reset/activated	F207E010 F207E011	1	406	1,2	-	Read	0 – reset 1- activated
Q3 low warning reset/activated	F207E012 F207E013	1	407	1,2	-	Read	0 – reset 1- activated
Q3 low alarm reset/activated	F207E014 F207E015	1	408	1,2	-	Read	0 – reset 1- activated
P3 high warning reset/activated	F207E000 F207E001	2	401	2	1	Read/Unsolicited response	0 – reset 1- activated
P3 high alarm reset/activated	F207E002 F207E003	2	402	2	1	Read/Unsolicited response	0 – reset 1- activated
Q3 high warning reset/activated	F207E004 F207E005	2	403	2	1	Read/Unsolicited response	0 – reset 1- activated
Q3 high alarm reset/activated	F207E006 F207E007	2	404	2	1	Read/Unsolicited response	0 – reset 1- activated
P3 low warning reset/activated	F207E008 F207E009	2	405	2	1	Read/Unsolicited response	0 – reset 1- activated
P3 low alarm reset/activated	F207E010 F207E011	2	406	2	1	Read/Unsolicited response	0 – reset 1- activated
Q3 low warning reset/activated	F207E012 F207E013	2	407	2	1	Read/Unsolicited response	0 – reset 1- activated
Q3 low alarm reset/activated	F207E014 F207E015	2	408	2	1	Read/Unsolicited response	0 - reset 1- activated
P3	F207I001	30	400	3	0	Read	-999999... 999999 -999999kW... 999999kW

Description	Name	Object	Point	Variation	Class	Access function	Values
Q3	F207I002	30	401	3	0	Read	-999999... 999999 -999999kvar... 999999kvar
Power factor PDF	F207I003	30	404	3	-	Read	-100...100 -1.00...1.00
Power factor PF	F207I004	30	405	3	-	Read	-100..100 -1.00..1.00
P3 demand	F207I005	30	406	3	-	Read	-999999... 999999 -999999kW... 999999kW
Q3 demand	F207I006	30	407	3	-	Read	-999999... 999999 -999999kvar... 999999kvar
Last registered active energy	F207V414	30	408	3	-	Read	0...999999 0...999999 kWh
Last registered reversed active energy	F207V415	30	409	3	-	Read	0...999999 0...999999 kWh
Last registered reactive energy	F207V416	30	410	3	-	Read	0...999999 0...999999 kvah
Last registered reversed reactive energy	F207V417	30	411	3	-	Read	0...999999 0...999999 kvah
P3 delta/high/low/warning/alarm	F207E000 F207E001 F207E002 F207E003 F207E008 F207E009 F207E010 F207E011 F207E017	32	400	1	2	Read/Unsolicited response	-999999... 999999 -999999kW... 999999kW
Q3 delta/high/low/warning/alarm	F207E004 F207E005 F207E006 F207E007 F207E012 F207E013 F207E014 F207E015 F207E019	32	401	1	2	Read/Unsolicited response	-999999... 999999 -999999kvar... 999999kvar
S3 delta	F207E021	32	402	1	2	Read/Unsolicited response	-999999...999999 -999999 kVa
DPF delta	F207E023	32	404	1	2	Read/Unsolicited response	-100...100 -1.00...1.00
Active energy delta	F207E025	32	408	1	2	Read/Unsolicited response	0...899999 0 kWh...999999
Reversed active energy delta	F207E027	32	409	1	2	Read/Unsolicited response	0...899999 0 kWh...999999
Reactive energy delta	F207E029	32	410	1	2	Read/Unsolicited response	0...899999 0 kVarh...999999
Reversed reactive energy delta	F207E030	32	411	1	2	Read/Unsolicited response	0...899999 0 kVarh...999999

Function block MEVO1A

Description	Name	Object	Point	Variation	Class	Access function	Values
Uo high warning reset/activated	F205E000 F205E001	1	100	1, 2	-	Read	0 - reset 1- activated
Uo high alarm reset/activated	F205E002 F205E003	1	101	1, 2	-	Read	0 - reset 1- activated
Uo high warning reset/activated	F205E000 F205E001	2	100	2	1	Read/Unsolicited response	0 - reset 1- activated
Uo high alarm reset/activated	F205E002 F205E003	2	101	2	1	Read/Unsolicited response	0 - reset 1- activated
Uo	F205I001	30	100	3	0	Read	0...150000 0.000kV...150.000kV
Uo delta/high alarm/warning	F205E000 F205E001 F205E002 F205E003 F205E005	32	100	1	2	Read/Unsolicited response	0...150000 0.000kV...150.000kV

Function block MEVO1B

Description	Name	Object	Point	Variation	Class	Access function	Values
Uo high warning reset/activated	F226E000 F226E001	1	120	1, 2	-	Read	0 - reset 1- activated
Uo high alarm reset/activated	F226E002 F226E003	1	121	1, 2	-	Read	0 - reset 1- activated
Uo high warning reset/activated	F226E000 F226E001	2	120	2	1	Read/Unsolicited response	0 - reset 1- activated
Uo high alarm reset/activated	F226E002 F226E003	2	121	2	1	Read/Unsolicited response	0 - reset 1- activated
Uo (LV side)	F226I001	30	120	3	0	Read	0...150000 0.000kV...150.000kV
Uo delta/high alarm/warning	F226E000 F226E001 F226E002 F226E003 F226E005	32	120	1	2	Read/Unsolicited response	0...150000 0.000kV...150.000kV

Function block MEVO3A

Description	Name	Object	Point	Variation	Class	Access function	Values
U1 high warning reset/activated	F204E000 F204E001	1	300	1, 2	-	Read	0 – reset 1- activated
U2 high warning reset/activated	F204E002 F204E003	1	301	1, 2	-	Read	0 – reset 1- activated
U3 high warning reset/activated	F204E004 F204E005	1	302	1, 2	-	Read	0 – reset 1- activated
U1 high alarm reset/activated	F204E006 F204E007	1	303	1, 2	-	Read	0 – reset 1- activated
U2 high alarm reset/activated	F204E008 F204E009	1	304	1, 2	-	Read	0 – reset 1- activated
U3 high alarm reset/activated	F204E010 F204E011	1	305	1, 2	-	Read	0 – reset 1- activated
U1 low warning reset/activated	F204E012 F204E013	1	306	1, 2	-	Read	0 – reset 1- activated
U2 low warning reset/activated	F204E014 F204E015	1	307	1, 2	-	Read	0 – reset 1- activated

Description	Name	Object	Point	Variation	Class	Access function	Values
U3 low warning reset/activated	F204E016 F204E017	1	308	1, 2	-	Read	0 – reset 1- activated
U1 low alarm reset/activated	F204E018 F204E019	1	309	1, 2	-	Read	0 – reset 1- activated
U2 low alarm reset/activated	F204E020 F204E021	1	310	1, 2	-	Read	0 – reset 1- activated
U3 low alarm reset/activated	F204E022 F204E023	1	311	1, 2	-	Read	0 – reset 1- activated
U12 high warning reset/activated	F204E032 F204E033	1	300	1, 2	-	Read	0 – reset 1- activated
U23 high warning reset/activated	F204E034 F204E035	1	301	1, 2	-	Read	0 – reset 1- activated
U31 high warning reset/activated	F204E036 F204E037	1	302	1, 2	-	Read	0 – reset 1- activated
U12 high alarm reset/activated	F204E038 F204E039	1	303	1, 2	-	Read	0 – reset 1- activated
U23 high alarm reset/activated	F204E040 F204E041	1	304	1, 2	-	Read	0 – reset 1- activated
U31 high alarm reset/activated	F204E042 F204E043	1	305	1, 2	-	Read	0 – reset 1- activated
U12 low warning reset/activated	F204E044 F204E045	1	306	1, 2	-	Read	0 – reset 1- activated
U23 low warning reset/activated	F204E046 F204E047	1	307	1, 2	-	Read	0 – reset 1- activated
U31 low warning reset/activated	F204E048 F204E049	1	308	1, 2	-	Read	0 – reset 1- activated
U12 low alarm reset/activated	F204E050 F204E051	1	309	1, 2	-	Read	0 – reset 1- activated
U23 low alarm reset/activated	F204E052 F204E053	1	310	1, 2	-	Read	0 – reset 1- activated
U31 low alarm reset/activated	F204E054 F204E055	1	311	1, 2	-	Read	0 – reset 1- activated
U1 high warning reset/activated	F204E000 F204E001	2	300	2	1	Read/Unsolicited response	0 – reset 1- activated
U2 high warning reset/activated	F204E002 F204E003	2	301	2	1	Read/Unsolicited response	0 – reset 1- activated
U3 high warning reset/activated	F204E004 F204E005	2	302	2	1	Read/Unsolicited response	0 – reset 1- activated
U1 high alarm reset/activated	F204E006 F204E007	2	303	2	1	Read/Unsolicited response	0 – reset 1- activated
U2 high alarm reset/activated	F204E008 F204E009	2	304	2	1	Read/Unsolicited response	0 – reset 1- activated
U3 high alarm reset/activated	F204E010 F204E011	2	305	2	1	Read/Unsolicited response	0 – reset 1- activated
U1 low warning reset/activated	F204E012 F204E013	2	306	2	1	Read/Unsolicited response	0 – reset 1- activated
U2 low warning reset/activated	F204E014 F204E015	2	307	2	1	Read/Unsolicited response	0 – reset 1- activated
U3 low warning reset/activated	F204E016 F204E017	2	308	2	1	Read/Unsolicited response	0 – reset 1- activated
U1 low alarm reset/activated	F204E018 F204E019	2	309	2	1	Read/Unsolicited response	0 – reset 1- activated
U2 low alarm reset/activated	F204E020 F204E021	2	310	2	1	Read/Unsolicited response	0 – reset 1- activated
U3 low alarm reset/activated	F204E022 F204E023	2	311	2	1	Read/Unsolicited response	0 – reset 1- activated
U12 high warning reset/activated	F204E032 F204E033	2	300	2	1	Read/Unsolicited response	0 – reset 1- activated

Description	Name	Object	Point	Variation	Class	Access function	Values
U23 high warning reset/activated	F204E034 F204E035	2	301	2	1	Read/Unsolicited response	0 – reset 1- activated
U31 high warning reset/activated	F204E036 F204E037	2	302	2	1	Read/Unsolicited response	0 – reset 1- activated
U12 high alarm reset/activated	F204E038 F204E039	2	303	2	1	Read/Unsolicited response	0 – reset 1- activated
U23 high alarm reset/activated	F204E040 F204E041	2	304	2	1	Read/Unsolicited response	0 – reset 1- activated
U31 high alarm reset/activated	F204E042 F204E043	2	305	2	1	Read/Unsolicited response	0 – reset 1- activated
U12 low warning reset/activated	F204E044 F204E045	2	306	2	1	Read/Unsolicited response	0 – reset 1- activated
U23 low warning reset/activated	F204E046 F204E047	2	307	2	1	Read/Unsolicited response	0 – reset 1- activated
U31 low warning reset/activated	F204E048 F204E049	2	308	2	1	Read/Unsolicited response	0 – reset 1- activated
U12 low alarm reset/activated	F204E050 F204E051	2	309	2	1	Read/Unsolicited response	0 – reset 1- activated
U23 low alarm reset/activated	F204E052 F204E053	2	310	2	1	Read/Unsolicited response	0 – reset 1- activated
U31 low alarm reset/activated	F204E054 F204E055	2	311	2	1	Read/Unsolicited response	0 – reset 1- activated
U1 U12	F204I001	30	300	3	0	Read	0...99999 0.00kV...999.99kV
U2 U23	F204I002	30	301	3	0	Read	0..99999 0.00kV...999.99kV
U3 U31	F204I003	30	302	3	0	Read	0..99999 0.00kV...999.99kV
U1 delta/high/low/warning/alarm	F204E000 F204E001 F204E006 F204E007 F204E012 F204E013 F204E018 F204E019	32	300	1	2	Read/Unsolicited response	0...99999 0.00kV...999.99kV
U2 delta/high/low/warning/alarm	F204E002 F204E003 F204E008 F204E009 F204E014 F204E015	32	301	1	2	Read/Unsolicited response	0...99999 0.00kV...999.99kV
U3 delta/high/low/warning/alarm	F204E004 F204E005 F204E010 F204E011 F204E016 F204E017 F204E020 F204E021 F204E022 F204E023	32	302	1	2	Read/Unsolicited response	0...99999 0.00kV...999.99kV

Description	Name	Object	Point	Variation	Class	Access function	Values
U12 delta/high/low/warning/alarm	F204E032 F204E033 F204E038 F204E039 F204E044 F204E045 F204E050 F204E051 F204E057	32	300	1	2	Read/Unsolicited response	0...99999 0.00kV...999.99kV
U23 delta/high/low/warning/alarm	F204E034 F204E035 F204E040 F204E041 F204E046 F204E047 F204E052 F204E053 F204E059	32	301	1	2	Read/Unsolicited response	0...99999 0.00kV...999.99kV
U31 delta/high/low/warning/alarm	F204E036 F204E037 F204E042 F204E043 F204E048 F204E049 F204E054 F204E055 F204E061	32	302	1	2	Read/Unsolicited response	0...99999 0.00kV...999.99kV

Function block MEVO3B

Description	Name	Object	Point	Variation	Class	Access function	Values
U1 high warning reset/activated	F206E000 F206E001	1	350	1, 2	-	Read	0 – reset 1- activated
U2 high warning reset/activated	F206E002 F206E003	1	351	1, 2	-	Read	0 – reset 1- activated
U3 high warning reset/activated	F206E004 F206E005	1	352	1, 2	-	Read	0 – reset 1- activated
U1 high alarm reset/activated	F206E006 F206E007	1	353	1, 2	-	Read	0 – reset 1- activated
U2 high alarm reset/activated	F206E008 F206E009	1	354	1, 2	-	Read	0 – reset 1- activated
U3 high alarm reset/activated	F206E010 F206E011	1	355	1, 2	-	Read	0 – reset 1- activated
U1 low warning reset/activated	F206E012 F206E013	1	356	1, 2	-	Read	0 – reset 1- activated
U2 low warning reset/activated	F206E014 F206E015	1	357	1, 2	-	Read	0 – reset 1- activated
U3 low warning reset/activated	F206E016 F206E017	1	358	1, 2	-	Read	0 – reset 1- activated
U1 low alarm reset/activated	F206E018 F206E019	1	359	1, 2	-	Read	0 – reset 1- activated
U2 low alarm reset/activated	F206E020 F206E021	1	360	1, 2	-	Read	0 – reset 1- activated
U3 low alarm reset/activated	F206E022 F206E023	1	361	1, 2	-	Read	0 – reset 1- activated
U12 high warning reset/activated	F206E032 F206E033	1	350	1, 2	-	Read	0 – reset 1- activated
U23 high warning reset/activated	F206E034 F206E035	1	351	1, 2	-	Read	0 – reset 1- activated

Description	Name	Object	Point	Variation	Class	Access function	Values
U31 high warning reset/activated	F206E036 F206E037	1	352	1, 2	-	Read	0 – reset 1- activated
U12 high alarm reset/activated	F206E038 F206E039	1	353	1, 2	-	Read	0 – reset 1- activated
U23 high alarm reset/activated	F206E040 F206E041	1	354	1, 2	-	Read	0 – reset 1- activated
U31 high alarm reset/activated	F206E042 F206E043	1	355	1, 2	-	Read	0 – reset 1- activated
U12 low warning reset/activated	F206E044 F206E045	1	356	1, 2	-	Read	0 – reset 1- activated
U23 low warning reset/activated	F206E046 F206E047	1	357	1, 2	-	Read	0 – reset 1- activated
U31 low warning reset/activated	F206E048 F206E049	1	358	1, 2	-	Read	0 – reset 1- activated
U12 low alarm reset/activated	F206E050 F206E051	1	359	1, 2	-	Read	0 – reset 1- activated
U23 low alarm reset/activated	F206E052 F206E053	1	360	1, 2	-	Read	0 – reset 1- activated
U31 low alarm reset/activated	F206E054 F206E055	1	361	1, 2	-	Read	0 – reset 1- activated
U1 high warning reset/activated	F206E000 F206E001	2	350	2	1	Read/Unsolicited response	0 – reset 1- activated
U2 high warning reset/activated	F206E002 F206E003	2	351	2	1	Read/Unsolicited response	0 – reset 1- activated
U3 high warning reset/activated	F206E004 F206E005	2	352	2	1	Read/Unsolicited response	0 – reset 1- activated
U1 high alarm reset/activated	F206E006 F206E007	2	353	2	1	Read/Unsolicited response	0 – reset 1- activated
U2 high alarm reset/activated	F206E008 F206E009	2	354	2	1	Read/Unsolicited response	0 – reset 1- activated
U3 high alarm reset/activated	F206E010 F206E011	2	355	2	1	Read/Unsolicited response	0 – reset 1- activated
U1 low warning reset/activated	F206E012 F206E013	2	356	2	1	Read/Unsolicited response	0 – reset 1- activated
U2 low warning reset/activated	F206E014 F206E015	2	357	2	1	Read/Unsolicited response	0 – reset 1- activated
U3 low warning reset/activated	F206E016 F206E017	2	358	2	1	Read/Unsolicited response	0 – reset 1- activated
U1 low alarm reset/activated	F206E018 F206E019	2	359	2	1	Read/Unsolicited response	0 – reset 1- activated
U2 low alarm reset/activated	F206E020 F206E021	2	360	2	1	Read/Unsolicited response	0 – reset 1- activated
U3 low alarm reset/activated	F206E022 F206E023	2	361	2	1	Read/Unsolicited response	0 – reset 1- activated
U12 high warning reset/activated	F206E032 F206E033	2	350	2	1	Read/Unsolicited response	0 – reset 1- activated
U23 high warning reset/activated	F206E034 F206E035	2	351	2	1	Read/Unsolicited response	0 – reset 1- activated
U31 high warning reset/activated	F206E036 F206E037	2	352	2	1	Read/Unsolicited response	0 – reset 1- activated
U12 high alarm reset/activated	F206E038 F206E039	2	353	2	1	Read/Unsolicited response	0 – reset 1- activated
U23 high alarm reset/activated	F206E040 F206E041	2	354	2	1	Read/Unsolicited response	0 – reset 1- activated
U31 high alarm reset/activated	F206E042 F206E043	2	355	2	1	Read/Unsolicited response	0 – reset 1- activated
U12 low warning reset/activated	F206E044 F206E045	2	356	2	1	Read/Unsolicited response	0 – reset 1- activated

Description	Name	Object	Point	Variation	Class	Access function	Values
U23 low warning reset/activated	F206E046 F206E047	2	357	2	1	Read/Unsolicited response	0 – reset 1- activated
U31 low warning reset/activated	F206E048 F206E049	2	358	2	1	Read/Unsolicited response	0 – reset 1- activated
U12 low alarm reset/activated	F206E050 F206E051	2	359	2	1	Read/Unsolicited response	0 – reset 1- activated
U23 low alarm reset/activated	F206E052 F206E053	2	360	2	1	Read/Unsolicited response	0 – reset 1- activated
U31 low alarm reset/activated	F206E054 F206E055	2	361	2	1	Read/Unsolicited response	0 – reset 1- activated
U1 U12 (LV side)	F206I001	30	350	3	0	Read	0...99999 0.00kV...999.99kV
U2 U23 (LV side)	F206I002	30	351	3	0	Read	0...99999 0.00kV...999.99kV
U3 U31 (LV side)	F206I003	30	352	3	0	Read	0...99999 0.00kV...999.99kV
U1 delta/high/low/warning/alarm	F206E000 F206E001 F206E006 F206E007 F206E012 F206E013 F206E018 F206E019 F206E025	32	350	1	2	Read/Unsolicited response	0...99999 0.00kV...999.99kV
U2 delta/high/low/warning/alarm	F206E002 F206E003 F206E008 F206E009 F206E020 F206E021 F206E014 F206E015 F206E027	32	351	1	2	Read/Unsolicited response	0...99999 0.00kV...999.99kV
U3 delta/high/low/warning/alarm	F206E004 F206E005 F206E010 F206E011 F206E016 F206E017 F206E022 F206E023 F206E029	32	352	1	2	Read/Unsolicited response	0...99999 0.00kV...999.99kV
U12 delta/high/low/warning/alarm	F206E032 F206E033 F206E038 F206E039 F206E044 F206E045 F206E050 F206E051 F206E057	32	350	1	2	Read/Unsolicited response	0...99999 0.00kV...999.99kV
U23 delta/high/low/warning/alarm	F206E034 F206E035 F206E040 F206E041 F206E046 F206E047 F206E052 F206E053 F206E059	32	351	1	2	Read/Unsolicited response	0...99999 0.00kV...999.99kV

Description	Name	Object	Point	Variation	Class	Access function	Values
U31 delta/high/low/warning/alarm	F206E036 F206E037 F206E042 F206E043 F206E048 F206E049 F206E054 F206E055 F206E061	32	352	1	2	Read/Unsolicited response	0...99999 0.00kV...999.99kV

Function block AR5FUNC

Description	Name	Object	Point	Variation	Class	Access function	Values
Status of LOCKOUT signal	F080O014	1	5100	1,2	-	Read	0 – Not active 1 - Active
AR-function currently in use or not	F080S004	1	5101	1,2	-	Read	0 – Not in use 1 – In use
Auto-reclosing sequence Ended/ Started	F080E000 F080E001	2	5102	2	1	Read/Unsolicited response	0 – ended 1 – started
AR (shots 1...5) initiated by AR1 -	F080E002	2	5103	2	1	Read/Unsolicited response	1 – initiated
AR (shots 1...5) initiated by AR2 -	F080E003	1	5104	2	1	Read/Unsolicited response	1 – initiated
AR (shots 1...5) initiated by AR3 -	F080E004	2	5105	2	1	Read/Unsolicited response	1 – initiated
AR (shots 1...5) initiated by AR4 -	F080E005	2	5106	2	1	Read/Unsolicited response	1 – initiated
AR sequence initiated by AR1 successful	F080E013	2	5107	2	1	Read/Unsolicited response	1 – successful
AR sequence initiated by AR2 successful	F080E014	2	5108	2	1	Read/Unsolicited response	1 – successful
AR sequence initiated by AR3 successful	F080E015	2	5109	2	1	Read/Unsolicited response	1 – successful
AR sequence initiated by AR4 successful	F080E016	2	5110	2	1	Read/Unsolicited response	1 – successful
CB opening failed via auto-recloser	F080E026	2	5111	2	1	Read/Unsolicited response	1 – failed
CB closing failed via auto-recloser	F080E027	1	5112	2	1	Read/Unsolicited response	1 – failed
CB closing inhibited	F080E028	2	5113	2	1	Read/Unsolicited response	1 – inhibited
AR not in use/in use	F080E034 F080E034	2	5101	2	1	Read/Unsolicited response	0 – used 1 – not in use
LOCKOUT Reset/activated	F080E044 F080E045	2	5100	2	1	Read/Unsolicited response	0 – reset 1 – activated
Reset Register	F080V013	10/12	5100	2/1	-	Read/Select/ Operate/ Direct operate	1or trip – reset
AR5Func status	F080V001	30	5100	1,2	-	Read	0...5
Current value of Shot Pointer	F080V002	30	5101	1,2	-	Read	1...7
Operation mode of AR-function	F080S003	40/41	5100	1	-	Read/Select/ Operate/ Direct operate	0 – OFF 1 – ON 2 – selected by ON input
Auto-reclose shot 1 Concluded/In progress	F081E000 F081E001	2	5140	2	1	Read/Unsolicited response	Concluded In progress
AR shot 1 initiated via AR1	F081E002	2	5141	2	1	Read/Unsolicited response	1 – initiated

Description	Name	Object	Point	Variation	Class	Access function	Values
AR shot 1 initiated via AR2	F081E003	2	5142	2	1	Read/Unsolicited response	1 – initiated
AR shot 1 initiated via AR3	F081E004	2	5143	2	1	Read/Unsolicited response	1 – initiated
AR shot 1 initiated via AR4	F081E005	2	5144	2	1	Read/Unsolicited response	1 – initiated
AR short 1 successful	F081E006	2	5145	2	1	Read/Unsolicited response	1 – successful
Auto-reclose shot 2 Concluded/In progress	F082E000 F082E001	2	5150	2	1	Read/Unsolicited response	0 - Concluded 1 - In progress
AR shot 2 initiated via AR1	F082E002	2	5151	2	1	Read/Unsolicited response	1 – initiated
AR shot 2 initiated via AR2	F082E003	2	5152	2	1	Read/Unsolicited response	1 – initiated
AR shot 2 initiated via AR3	F082E004	2	5153	2	1	Read/Unsolicited response	1 – initiated
AR shot 2 initiated via AR4	F082E005	2	5154	2	1	Read/Unsolicited response	1 – initiated
AR short 2 successful	F082E006	2	5155	2	1	Read/Unsolicited response	1 – successful
Auto-reclose shot 3 Concluded/In progress	F083E000 F083E001	2	5160	2	1	Read/Unsolicited response	0 -Concluded 1 –In progress
AR shot 3 initiated via AR1	F083E002	2	5161	2	1	Read/Unsolicited response	1 – initiated
AR shot 3 initiated via AR2	F083E003	2	5162	2	1	Read/Unsolicited response	1 – initiated
AR shot 3 initiated via AR3	F083E004	2	5163	2	1	Read/Unsolicited response	1 – initiated
AR shot 3 initiated via AR4	F083E005	2	5164	2	1	Read/Unsolicited response	1 – initiated
AR short 3 successful	F083E006	2	5165	2	1	Read/Unsolicited response	1 – successful
Auto-reclose shot 4 Concluded/In progress	F084E000 F084E001	2	5170	2	1	Read/Unsolicited response	0 - Concluded 1 - In progress
AR shot 4 initiated via AR1	F084E002	2	5171	2	1	Read/Unsolicited response	1 – initiated
AR shot 4 initiated via AR2	F084E003	2	5172	2	1	Read/Unsolicited response	1 – initiated
AR shot 4 initiated via AR3	F084E004	2	5173	2	1	Read/Unsolicited response	1 – initiated
AR shot 4 initiated via AR4	F084E005	2	5174	2	1	Read/Unsolicited response	1 – initiated
AR short 4 successful	F084E006	2	5175	2	1	Read/Unsolicited response	1 – successful
Auto-reclose shot 5 Concluded/In progress	F085E000 F085E001	2	5180	2	1	Read/Unsolicited response	0 - Concluded 1 - In progress
AR shot 5 initiated via AR1	F085E002	2	5181	2	1	Read/Unsolicited response	1 – initiated
AR shot 5 initiated via AR2	F085E003	2	5182	2	1	Read/Unsolicited response	1 – initiated
AR shot 5 initiated via AR3	F085E004	2	5183	2	1	Read/Unsolicited response	1 – initiated
AR shot 5 initiated via AR4	F085E005	2	5184	2	1	Read/Unsolicited response	1 – initiated
AR short 5 successful	F085E006	2	5185	2	1	Read/Unsolicited response	1 – successful
Final trip	F086E000	2	5190	2	1	Read/Unsolicited response	1- trip

Description	Name	Object	Point	Variation	Class	Access function	Values
Final trip via AR1	F086E001	2	5191	2	1	Read/Unsolicited response	1- trip
Final trip via AR2	F086E002	2	5192	2	1	Read/Unsolicited response	1- trip
Final trip via AR3	F086E003	2	5193	2	1	Read/Unsolicited response	1- trip
Final trip via AR4	F086E004	2	5194	2	1	Read/Unsolicited response	1- trip

Function block CUB3LOW

Description	Name	Object	Point	Variation	Class	Access function	Values
START signal from I > stage	F051O001	1	1100	1,2	-	Read	0 – reset 1 - activated
TRIP signal from I > stage	F051O002	1	1101	1,2	-	Read	0 – reset 1 – activated
CBFP signal from I > stage	F051O003	1	1102	1,2	-	Read	0 – reset 1 – activated
BS1 signal of I > stage	F051I005	1	1103	1,2	-	Read	0 – reset 1 – activated
BS2 signal of I > stage	F051I006	1	1104	1,2	-	Read	0 – reset 1 – activated
START signal from I > stage reset/activated	F051E000 F051E001	2	1100	2	1	Read/Unsolicited response	0 – reset 1 - activated
TRIP signal from I > stage reset/activated	F051E002 F051E003	2	1101	2	1	Read/Unsolicited response	0 – reset 1 – activated
CBFP signal from I > stage reset/activated	F051E004 F051E005	2	1102	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS1 signal of I > stage reset/ activated	F051E006 F051E007	2	1103	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS2 signal of I > stage reset/ activated	F051E008 F051E009	2	1104	2	1	Read/Unsolicited response	0 – reset 1 – activated
Test mode of I > stage off/on	F051E010 F051E011	2	1114	2	1	Read/Unsolicited response	0 – off 1 – on

Function block DEF2HIGH

Description	Name	Object	Point	Variation	Class	Access function	Values
START signal from Io >>→	F041O001	1	1350	1,2	-	Read	0 – reset 1 - activated
TRIP signal from Io >>→	F041O002	1	1351	1,2	-	Read	0 – reset 1 – activated
CBFP signal from Io >>→	F041O003	1	1352	1,2	-	Read	0 – reset 1 – activated
BS1 signal of Io >>→	F041I005	1	1353	1,2	-	Read	0 – reset 1 – activated
BS2 signal of Io >>→	F041I006	1	1354	1,2	-	Read	0 – reset 1 – activated
START signal from Io >>→ reset/ activated	F041E000 F041E001	2	1350	2	1	Read/Unsolicited response	0 – reset 1 - activated
TRIP signal from Io >>→ reset/ activated	F041E002 F041E003	2	1351	2	1	Read/Unsolicited response	0 – reset 1 – activated
CBFP signal from Io >>→ reset/ activated	F041E004 F041E005	2	1352	2	1	Read/Unsolicited response	0 – reset 1 – activated

Description	Name	Object	Point	Variation	Class	Access function	Values
BS1 signal of Io >>→ reset/ activated	F041E006 F041E007	2	1353	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS2 signal of Io >>→ reset/ activated	F041E008 F041E009	2	1354	2	1	Read/Unsolicited response	0 – reset 1 – activated
Test mode of Io >>→ off/on	F041E010 F041E011	2	1355	2	1	Read/Unsolicited response	0 – off 1 – on

Function block DEF2LOW

Description	Name	Object	Point	Variation	Class	Access function	Values
START signal from Io >→	F040O001	1	1300	1,2	-	Read	0 – reset 1 - activated
TRIP signal from Io >→	F040O002	1	1301	1,2	-	Read	0 – reset 1 – activated
CBFP signal from Io >→	F040O003	1	1302	1,2	-	Read	0 – reset 1 – activated
BS1 signal of Io >→	F040I005	1	1303	1,2	-	Read	0 – reset 1 – activated
BS2 signal of Io >→	F040I006	1	1304	1,2	-	Read	0 – reset 1 – activated
START signal from Io >→ reset/ activated	F040E000 F040E001	2	1300	2	1	Read/Unsolicited response	0 – reset 1 - activated
TRIP signal from Io >→ reset/ activated	F040E002 F040E003	2	1301	2	1	Read/Unsolicited response	0 – reset 1 – activated
CBFP signal from Io >→ reset/ activated	F040E004 F040E005	2	1302	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS1 signal of Io >→ reset/ activated	F040E006 F040E007	2	1303	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS2 signal of Io >→ reset/ activated	F040E008 F040E009	2	1304	2	1	Read/Unsolicited response	0 – reset 1 – activated
Test mode of Io >→ off/on	F040E010 F040E011	2	1320	2	1	Read/Unsolicited response	0 – off 1 – on

Function block DOC6HIGH

Description	Name	Object	Point	Variation	Class	Access function	Values
START signal from 3I >>→ stage	F036O003	1	1250	1,2	-	Read	0 – reset 1 - activated
TRIP signal from 3I >>→ stage	F036O004	1	1251	1,2	-	Read	0 – reset 1 – activated
CBFP signal from 3I >>→stage	F036O005	1	1252	1,2	-	Read	0 – reset 1 – activated
DIRECTION signal from 3I >>→ stage	F036O001	1	1253	1,2	-	Read	0 – reset 1 – activated
BSOUT signal from 3I >>→ stage	F036O002	1	1254	1,2	-	Read	0 – reset 1 – activated
BS1 signal of 3I >>→ stage	F036I016	1	1255	1,2	-	Read	0 – reset 1 – activated
BS2 signal of 3I >>→ stage	F036I017	1	1256	1,2	-	Read	0 – reset 1 – activated
START signal from 3I >>→stage reset/activated	F036E000 F036E001	2	1250	2	1	Read/Unsolicited response	0 – reset 1 - activated

Description	Name	Object	Point	Variation	Class	Access function	Values
TRIP signal from 3I >>→stage reset/activated	F036E002 F036E003	2	1251	2	1	Read/Unsolicited response	0 – reset 1 – activated
CBFP signal from 3I >>→stage reset/activated	F036E004 F036E005	2	1252	2	1	Read/Unsolicited response	0 – reset 1 – activated
DIRECTION signal from 3I >>→stage reset/activated	F036E008 F036E009	2	1253	2	1	Read/Unsolicited response	0 – reset 1 – activated
BSOUT signal from 3I >>→stage reset/activated	F036E006 F036E007	2	1254	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS1 signal of 3I >>→ stage reset/activated	F036E010 F036E011	2	1255	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS2 signal of 3I >>→ stage reset/activated	F036E012 F036E013	2	1256	2	1	Read/Unsolicited response	0 – reset 1 – activated
Test mode of 3I >>→ stage off/on	F036E014 F036E015	2	1257	2	1	Read/Unsolicited response	0 – off 1 – on

Function block DOC6LOW

Description	Name	Object	Point	Variation	Class	Access function	Values
START signal from 3I >→stage	F035O002	1	1200	1,2	-	Read	0 – reset 1 - activated
TRIP signal from 3I >→ stage	F035O003	1	1201	1,2	-	Read	0 – reset 1 – activated
CBFP signal from 3I >→ stage	F035O004	1	1202	1,2	-	Read	0 – reset 1 – activated
DIRECTION signal from 3I >→stage	F035O001	1	1203	1,2	-	Read	0 – reset 1 – activated
BS1 signal of 3I >→ stage	F035I016	1	1204	1,2	-	Read	0 – reset 1 – activated
BS2 signal of 3I >→ stage	F035I017	1	1205	1,2	-	Read	0 – reset 1 – activated
START signal from 3I >→stage reset/activated	F035E000 F035E001	2	1200	2	1	Read/Unsolicited response	0 – reset 1 - activated
TRIP signal from 3I >→ stage reset/activated	F035E002 F035E003	2	1201	2	1	Read/Unsolicited response	0 – reset 1 – activated
CBFP signal from 3I >→ stage reset/activated	F035E004 F035E005	2	1202	2	1	Read/Unsolicited response	0 – reset 1 – activated
DIRECTION signal from 3I >→ stage reset/activated	F035E006 F035E007	2	1203	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS1 signal of 3I >→ stage reset/ activated	F035E008 F035E009	2	1204	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS2 signal of 3I >→ stage reset/ activated	F035E010 F035E011	2	1205	2	1	Read/Unsolicited response	0 – reset 1 – activated
Test mode of 3I >→ stage off/on	F035E012 F035E013	2	1206	2	1	Read/Unsolicited response	0 – off 1 – on

Function block INRUSH3

Description	Name	Object	Point	Variation	Class	Access function	Values
START signal from Inrush3 stage	F034O001	1	5300	1,2	-	Read	0 – reset 1 – activated
START signal from Inrush3 stage change	F034E000 F034E001	2	5300	2	1	Read/Unsolicited response	0 – reset 1 – activated
Test mode of Inrush3 stage off/on	F034E002 F034E003	2	5301	2	1	Read/Unsolicited response	0 – reset 1 – activated

Function block NEF1HIGH

Description	Name	Object	Point	Variation	Class	Access function	Values
START signal from Io >> stage	F039O001	1	1050	1,2	-	Read	0 – reset 1 - activated
TRIP signal from Io >> stage	F039O002	1	1051	1,2	-	Read	0 – reset 1 – activated
CBFP signal from Io >> stage	F039O003	1	1052	1,2	-	Read	0 – reset 1 – activated
BS1 signal of Io >> stage	F039I002	1	1053	1,2	-	Read	0 – reset 1 – activated
BS2 signal of Io >> stage	F039I003	1	1054	1,2	-	Read	0 – reset 1 – activated
START signal from Io >> stage Reset/activated	F039E000 F039E001	2	1050	2	1	Read/Unsolicited response	0 – reset 1 - activated
TRIP signal from Io >> stage Reset/activated	F039E002 F039E003	2	1051	2	1	Read/Unsolicited response	0 – reset 1 – activated
CBFP signal from Io >> stage Reset/activated	F039E004 F039E005	2	1052	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS1 signal of Io >> stage reset/ activated	F039E006 F039E007	2	1053	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS2 signal of Io >> stage reset/ activated	F039E008 F039E009	2	1054	2	1	Read/Unsolicited response	0 – reset 1 – activated
Test mode of Io >> stage off/on	F039E010 F039E011	2	1055	2	1	Read/Unsolicited response	0 – off 1 – on

Function block NEF1LOW

Description	Name	Object	Point	Variation	Class	Access function	Values
START signal from Io > stage	F038O001	1	1000	1,2	-	Read	0 – reset 1 - activated
TRIP signal from Io > stage	F038O002	1	1001	1,2	-	Read	0 – reset 1 – activated
CBFP signal from Io > stage	F038O003	1	1002	1,2	-	Read	0 – reset 1 – activated
BS1 signal of Io > stage	F038I002	1	1003	1,2	-	Read	0 – reset 1 – activated
BS2 signal of Io > stage	F038I003	1	1004	1,2	-	Read	0 – reset 1 – activated
START signal from Io > stage Reset/activated	F038E000 F038E001	2	1000	2	1	Read/Unsolicited response	0 – reset 1 - activated
TRIP signal from Io > stage Reset/activated	F038E002 F038E003	2	1001	2	1	Read/Unsolicited response	0 – reset 1 – activated
CBFP signal from Io > stage Reset/activated	F038E004 F038E005	2	1002	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS1 signal of Io > stage reset/ activated	F038E006 F038E007	2	1003	2	1	Read/Unsolicited response	0 – reset 1 – activated

Description	Name	Object	Point	Variation	Class	Access function	Values
BS2 signal of Io > stage reset/ activated	F038E008 F038E009	2	1004	2	1	Read/Unsolicited response	0 – reset 1 – activated
Test mode of Io > stage off/on	F038E010 F038E011	2	1014	2	1	Read/Unsolicited response	0 – off 1 – on

Function block NOC3HIGH

Description	Name	Object	Point	Variation	Class	Access function	Values
START signal from 3I >> stage	F032O002	1	950	1,2	-	Read	0 – reset 1 - activated
TRIP signal from 3I >> stage	F032O003	1	951	1,2	-	Read	0 – reset 1 – activated
CBFP signal from 3I >> stage	F032O004	1	952	1,2	-	Read	0 – reset 1 – activated
BSOUT signal from 3I >> stage	F032O001	1	953	1,2	-	Read	0 – reset 1 – activated
BS1 signal of 3I >> stage	F032I004	1	954	1,2	-	Read	0 – reset 1 – activated
BS2 signal of 3I >> stage	F032I005	1	955	1,2	-	Read	0 – reset 1 – activated
START signal from 3I >> stage Reset/activated	F032E000 F032E001	2	950	2	1	Read/Unsolicited response	0 – reset 1 – activated
TRIP signal from 3I >> stage Reset/activated	F032E002 F032E003	2	951	2	1	Read/Unsolicited response	0 – reset 1 – activated
CBFP signal from 3I >> stage reset/activated	F032E004 F032E005	2	952	2	1	Read/Unsolicited response	0 – reset 1 – activated
BSOUT signal from 3I >> stage reset/activated	F032E006 F032E007	2	953	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS1 signal of 3I >> stage reset/ activated	F032E008 F032E009	2	954	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS2 signal of 3I >> stage reset/ activated	F032E010 F032E011	2	955	2	1	Read/Unsolicited response	0 – reset 1 – activated
Test mode of 3I >> stage off/on	F032E012 F032E013	2	956	2	1	Read/Unsolicited response	0 – off 1 – on

Function block NOC3LOW

Description	Name	Object	Point	Variation	Class	Access function	Values
START signal from 3I > stage	F031O001	1	900	1,2	-	Read	0 – reset 1 - activated
TRIP signal from 3I > stage	F031O002	1	901	1,2	-	Read	0 – reset 1 – activated
CBFP signal from 3I > stage	F031O003	1	902	1,2	-	Read	0 – reset 1 – activated
BS1 signal of 3I > stage	F031I004	1	903	1,2	-	Read	0 – reset 1 – activated
BS2 signal of 3I > stage	F031I005	1	904	1,2	-	Read	0 – reset 1 – activated
START signal from 3I > stage reset/activated	F031E000 F031E001	2	900	2	1	Read/Unsolicited response	0 – reset 1 - activated
TRIP signal from 3I > stage reset/activated	F031E002 F031E003	2	901	2	1	Read/Unsolicited response	0 – reset 1 – activated
CBFP signal from 3I > stage reset/activated	F031E004 F031E005	2	902	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS1 signal of 3I > stage reset/ activated	F031E006 F031E007	2	903	2	1	Read/Unsolicited response	0 – reset 1 – activated

Description	Name	Object	Point	Variation	Class	Access function	Values
BS2 signal of 3I > stage reset/ activated	F031E008 F031E009	2	904	2	1	Read/Unsolicited response	0 – reset 1 – activated
Test mode of 3I > stage off/on	F031E010 F031E011	2	917	2	1	Read/Unsolicited response	0 – off 1 – on

Function block UV3HIGH

Description	Name	Object	Point	Variation	Class	Access function	Values
START signal from 3U<< stage	F065O001	1	5200	1,2	-	Read	0 – reset 1 – activated
TRIP signal from 3U<< stage	F065O002	1	5201	1,2	-	Read	0 – reset 1 – activated
BS1 signal of 3U<< stage	F065I004	1	5202	1,2	-	Read	0 – reset 1 – activated
BS2 signal of 3U<< stage	F065I005	1	5203	1,2	-	Read	0 – reset 1 – activated
START signal from 3U<< stage change	F065E000 F065E001	2	5200	2	1	Read/Unsolicited response	0 – reset 1 – activated
TRIP signal from 3U<< stage change	F065E002 F065E003	2	5201	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS1 signal of 3U<< stage change	F065E004 F065E005	2	5202	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS2 signal of 3U<< stage change	F065E006 F065E007	2	5203	2	1	Read/Unsolicited response	0 – reset 1 – activated
Test mode of 3U<< stage off/on	F065E008 F065E009	2	5204	2	1	Read/Unsolicited response	0 – reset 1 – activated

Function block UV3LOW

Description	Name	Object	Point	Variation	Class	Access function	Values
START signal from 3U< stage	F064O001	1	5250	1,2	-	Read	0 – reset 1 – activated
TRIP signal from 3U< stage	F064O002	1	5251	1,2	-	Read	0 – reset 1 – activated
BS1 signal of 3U< stage	F064I004	1	5252	1,2	-	Read	0 – reset 1 – activated
BS2 signal of 3U< stage	F064I005	1	5253	1,2	-	Read	0 – reset 1 – activated
START signal from 3U< stage change	F064E000 F064E001	2	5250	2	1	Read/Unsolicited response	0 – reset 1 – activated
TRIP signal from 3U< stage change	F064E002 F064E003	2	5251	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS1 signal of 3U< stage change	F064E004 F064E005	2	5252	2	1	Read/Unsolicited response	0 – reset 1 – activated
BS2 signal of 3U< stage change	F064E006 F064E007	2	5253	2	1	Read/Unsolicited response	0 – reset 1 – activated
Test mode of 3U< stage off/on	F064E008 F064E009	2	5254	2	1	Read/Unsolicited response	0 – reset 1 – activated

Function block CO3DC1

Description	Name	Object	Point	Variation	Class	Access function	Values
Opening time alarm status	F139O005	1	2700	1,2	-	Read	0 – normal 1 – alarm
Closing time alarm status	F139O006	1	2701	1,2	-	Read	0 – normal 1 – alarm

Description	Name	Object	Point	Variation	Class	Access function	Values
Earthing time alarm status	F139O007	1	2702	1,2	-	Read	0 – normal 1 – alarm
Freeing time alarm status	F139O008	1	2703	1,2	-	Read	0 – normal 1 – alarm
Position open/close*	F139V001	1	2704 2705	1,2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Position earth/free*	F139V002	1	2706 2707	1,2	0	Read	01 – earth 10 – free 00 – middle 11 – faulty
Interlock close	F139V030	1	2708	1,2	0	Read	0 – disabled 1 – enabled
Interlock open	F139V031	1	2709	1,2	0	Read	0 – disabled 1 – enabled
Interlock earth	F139V032	1	2710	1,2	0	Read	0 – disabled 1 – enabled
Interlock free	F139V033	1	2711	1,2	0	Read	0 – disabled 1 – enabled
Invalid state	F139V034	1	2712	1,2	-	Read	0 – inactive 1 – active
Command blocking status	F139V035	1	2713	1,2	0	Read	0 – deactivated 1 – activated
Position open/close change to: open/close/faulty/middle*	F139E000 F139E001 F139E002 F139E003	2	2704 2705	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Open command enabled/disabled	F139E004 F139E005	2	2709	2	1	Read/Unsolicited response	0 – disabled 1 – enabled
Close command enabled/disabled	F139E006 F139E007	2	2708	2	1	Read/Unsolicited response	0 – disabled 1 – enabled
Invalid state inactive/active	F139E008 F139E009	2	2712	2	1	Read/Unsolicited response	0 – inactive 1 – active
Command sequence completed/ started	F139E010 F139E011	2	2714	2	1	Read/Unsolicited response	0 – completed 1 – started
Open output deactivated/ activated	F139E012 F139E013	2	2715	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Close output deactivated/ activated	F139E014 F139E015	2	2716	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Opening time normal/alarm	F139E016 F139E017	2	2700	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Closing time normal/alarm	F139E018 F139E019	2	2701	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Command status NACK/ACK	F139E024 F139E025	2	2717	2	1	Read/Unsolicited response	0 – NACK 1 – ACK
Command blocking inactive/active	F139E026 F139E027	2	2713	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Command unsuccessful	F139E028	2	2718	2	1	Read/Unsolicited response	1 – failed
Earth output deactivated/activated	F139E030 F139E032	2	2719	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Free output deactivated/activated	F139E032 F139E033	2	2720	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Earthing time normal/alarm	F139E034 F139E035	2	2702	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Freeing time normal/alarm	F139E036 F139E037	2	2703	2	1	Read/Unsolicited response	0 – normal 1 – alarm

Description	Name	Object	Point	Variation	Class	Access function	Values
Position earth/free change to: open/close/faulty/middle*	F139E038 F139E039 F139E040 F139E041	2	2706 2707	2	1	Read/Unsolicited response	01 – earth 10 – free 00 – middle 11 – faulty
Earth command enabled/disabled	F139E042 F139E043	2	2710	2	1	Read/Unsolicited response	0 – disabled 1 – enabled
Free command enabled/disabled	F139E044 F139E045	2	2711	2	1	Read/Unsolicited response	0 – disabled 1 – enabled
Open/close relay**	F139V001 F139V004 F139V005 F139V006 F139V007 F139V010 F139V011	10/12	2700	1,2/1	0/-	Read/Select/ Operate/Direct operate	0 – closed 1 – open close – close trip – open
Earth/free relay**	F139V002 F139V020 F139V021 F139V022 F139V023 F139V010 F139V011	10/12	2701	1,2/1	0/-	Read/Select/ Operate/Direct operate	0 – earth 1 – free close – close trip – open
Alarm ACK***	F139V099	10/12	2702	1,2/1	-/-	Read/Select/ Operate/Direct operate	1 or trip – ACK

* Because this item provides double-point information, two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

** Binary output status is read only, and provides only one point information about state of the disconnector switch: 1-open (freed) or faulty, 0-closed (earthed) or middle. Full information about the state is available from binary inputs 2704 and 2705 (O/C position) or from binary inputs 2706 and 2707 (F/E position).

*** Because this point is write only, a dummy 0 value will be reported while reading.

Function block CO3DC2

Description	Name	Object	Point	Variation	Class	Access function	Values
Opening time alarm status	F140O005	1	2800	1,2	-	Read	0 – normal 1 – alarm
Closing time alarm status	F140O006	1	2801	1,2	-	Read	0 – normal 1 – alarm
Earthing time alarm status	F140O007	1	2802	1,2	-	Read	0 – normal 1 – alarm
Freeing time alarm status	F140O008	1	2803	1,2	-	Read	0 – normal 1 – alarm
Position open/close*	F140V001	1	2804 2805	2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Position earth/free*	F140V002	1	2806 2807	2	0	Read	01 – earth 10 – free 00 – middle 11 – faulty
Interlock close	F140V030	1	2808	1,2	0	Read	0 – disabled 1 – enabled
Interlock open	F140V031	1	2809	1,2	0	Read	0 – disabled 1 – enabled
Interlock earth	F140V032	1	2810	1,2	0	Read	0 – disabled 1 – enabled

Description	Name	Object	Point	Variation	Class	Access function	Values
Interlock free	F140V033	1	2811	1,2	0	Read	0 – disabled 1 – enabled
Invalid state	F140V034	1	2812	1,2	-	Read	0 – inactive 1 – active
Command blocking status	F140V035	1	2813	1,2	0	Read	0 – deactivated 1 – activated
Position open/close change to: free/earth/faulty/middle*	F140E000 F140E001 F140E002 F140E003	2	2804 2805	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Open command enabled/disabled	F140E004 F140E005	2	2809	2	1	Read/Unsolicited response	0 – disabled 1 – enabled
Close command enabled/disabled	F140E006 F140E007	2	2808	2	1	Read/Unsolicited response	0 – disabled 1 – enabled
Invalid state inactive/active	F140E008 F140E009	2	2812	2	1	Read/Unsolicited response	0 – inactive 1 – active
Command sequence completed/ started	F140E010 F140E011	2	2814	2	1	Read/Unsolicited response	0 – completed 1 – started
Open output deactivated/ activated	F140E012 F140E013	2	2815	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Close output deactivated/ activated	F140E014 F140E015	2	2816	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Opening time normal/alarm	F140E016 F140E017	2	2800	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Closing time normal/alarm	F140E018 F140E019	2	2801	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Command status NACK/ACK	F140E024 F140E025	2	2817	2	1	Read/Unsolicited response	0 – NACK 1 – ACK
Command blocking inactive/active	F140E026 F140E027	2	2813	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Command unsuccessful	F140E028	2	2818	2	1	Read/Unsolicited response	1 – failed
Earth output deactivated/activated	F140E030 F140E032	2	2819	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Free output deactivated/activated	F140E032 F140E033	2	2820	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Earthing time normal/alarm	F140E034 F140E035	2	2802	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Freeing time normal/alarm	F140E036 F140E037	2	2803	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Position earth/free change to: Free/earth/faulty/middle*	F140E038 F140E039 F140E040 F140E041	2	2806 2807	2	1	Read/Unsolicited response	01 – earth 10 – free 00 – middle 11 – faulty
Earth command enabled/disabled	F140E042 F140E043	2	2810	2	1	Read/Unsolicited response	0 – disabled 1 – enabled
Free command enabled/disabled	F140E044 F140E045	2	2811	2	1	Read/Unsolicited response	0 – disabled 1 – enabled
Open/close relay**	F140V001 F140V004 F140V005 F140V006 F140V007 F140V010 F140V011	10/12	2800	2/1	0/-	Read/Select/ Operate/Direct operate	0 – closed 1 – open close – close trip – open

Description	Name	Object	Point	Variation	Class	Access function	Values
Earth/free relay**	F140V002 F140V020 F140V021 F140V022 F140V023 F140V010 F140V011	10/12	2801	1,2/1	0/-	Read/Select/ Operate/Direct operate	0 – earth 1 – free close – close trip – open
Alarm ACK***	F140V099	10/12	2802	1,2/1	-/-	Read/Select/ Operate/Direct operate	1 or trip – ACK

* Because this item provides double-point information, two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.
** Binary output status is read only, and provides only one point information about state of the disconnector switch: 1-open (freed) or faulty, 0-closed (earthed) or middle. Full information about the state is available from binary inputs 2804 and 2805 (O/C position) or from binary inputs 2806 and 2807 (F/E position).
*** Because this point is write only, a dummy 0 value will be reported while reading.

Function block COCB1

Description	Name	Object	Point	Variation	Class	Access function	Values
Position*	F120V001	1	2900 2901	1,2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Opening time alarm status	F120O003	1	2902	1,2	-	Read	0 – normal 1 – alarm
Closing time alarm status	F120O004	1	2903	1,2	-	Read	0 – normal 1 – alarm
Inactive time alarm status	F120O005	1	2904	1,2	-	Read	0 – normal 1 – alarm
Cycle count alarm status	F120O006	1	2905	1,2	-	Read	0 – normal 1 – alarm
Open command	F120V031	1	2906	1,2	0	Read	0 – disabled 1 – enabled
Close command	F120V030	1	2907	1,2	0	Read	0 – disabled 1 – enabled
Invalid state	F120V034	1	2908	1,2	-	Read	0 – off 1 – on
Control blocking	F120V035	1	2909	1,2	-	Read	0 – deactivated 1 – activated
Position change to: open/close/faulty/middle*	F120E000 F120E001 F120E002 F120E003	2	2900 2901	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Open command enabled/disabled	F120E004 F120E005	2	2906	2	1	Read/Unsolicited response	0 – disabled 1 – enabled
Close command enabled/disabled	F120E006 F120E007	2	2907	2	1	Read/Unsolicited response	0 – disabled 1 – enabled
Invalid state on/off	F120E008 F120E009	2	2908	2	1	Read/Unsolicited response	0 – off 1 – on
Command sequence completed/ started	F120E010 F120E011	2	2910	2	1	Read/Unsolicited response	0 – completed 1 – started
Open output activated/ deactivated	F120E012 F120E013	2	2911	2	1	Read/Unsolicited response	0 – inactive 1 – active
Close output activated/ deactivated	F120E014 F120E015	2	2912	2	1	Read/Unsolicited response	0 – inactive 1 – active

Description	Name	Object	Point	Variation	Class	Access function	Values
Opening time normal/alarm	F120E016 F120E017	2	2902	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Closing time normal/alarm	F120E018 F120E019	2	2903	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Inactive time normal/alarm	F120E020 F120E021	2	2904	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Cycle count normal/alarm	F120E022 F120E023	2	2905	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Command status NACK/ACK	F120E024 F120E025	2	2914	2	1	Read/Unsolicited response	0 – NACK 1 – ACK
Control blocking inactive/active	F120E026 F120E027	2	2909	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Command failed	F120E028	2	2913	2	1	Read/Unsolicited response	1 – failed
Open/close relay**	F120V001 F120V004 F120V005 F120V006 F120V007 F120V010 F120V011	10/12	2900	2/1	0/-	Read/Select/ Operate/Direct operate	0 – close 1 – open close – close trip – open
Alarm ACK***	F20V099	10/12	2901	1,2/1	-/-	Read/Select/ Operate/Direct operate	1 or trip – ACK

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

** Binary output status is read only, and provides only one point information about state of the breaker: 1-open or faulty, 0-closed or middle. Full information about the state is available from binary inputs 2900 and 2901.

*** Because this point is write only, a dummy 0 value will be reported while reading

Function block COCB2

Description	Name	Object	Point	Variation	Class	Access function	Values
Position*	F121V001	1	3000 3001	2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Opening time alarm status	F121O003	1	3002	1,2	-	Read	0 – normal 1 – alarm
Closing time alarm status	F121O004	1	3003	1,2	-	Read	0 – normal 1 – alarm
Inactive time alarm status	F121O005	1	3004	1,2	-	Read	0 – normal 1 – alarm
Cycle count alarm status	F121O006	1	3005	1,2	-	Read	0 – normal 1 – alarm
Open command	F121V031	1	3006	1,2	0	Read	0 – disabled 1 – enabled
Close command	F121V030	1	3007	1,2	0	Read	0 – disabled 1 – enabled
Invalid state	F121V034	1	3008	1,2	-	Read	0 – off 1 – on
Control blocking	F121V035	1	3009	1,2	-	Read	0 – deactivated 1 – activated
Position change to: open/close/faulty/middle*	F121E000 F121E001 F121E002 F121E003	2	3000 3001	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty

Description	Name	Object	Point	Variation	Class	Access function	Values
Open command enabled/disabled	F121E004 F121E005	2	3006	2	1	Read/Unsolicited response	0 – disabled 1 – enabled
Close command enabled/disabled	F121E006 F121E007	2	3007	2	1	Read/Unsolicited response	0 – disabled 1 – enabled
Invalid state on/off	F121E008 F121E009	2	3008	2	1	Read/Unsolicited response	0 – off 1 – on
Command sequence completed/ started	F121E010 F121E011	2	3010	2	1	Read/Unsolicited response	0 – completed 1 – started
Open output activated/ deactivated	F121E012 F121E013	2	3011	2	1	Read/Unsolicited response	0 – inactive 1 – active
Close output activated/ deactivated	F121E014 F121E015	2	3012	2	1	Read/Unsolicited response	0 – inactive 1 – active
Opening time normal/alarm	F121E016 F121E017	2	3002	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Closing time normal/alarm	F121E018 F121E019	2	3003	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Inactive time normal/alarm	F121E020 F121E021	2	3004	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Cycle count normal/alarm	F121E022 F121E023	2	3005	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Command status NACK/ACK	F121E024 F121E025	2	3014	2	1	Read/Unsolicited response	0 – NACK 1 – ACK
Control blocking inactive/active	F121E026 F121E027	2	3009	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Command failed	F121E028	2	3013	2	1	Read/Unsolicited response	1 – failed
Open/close relay**	F121V001 F121V004 F121V005 F121V006 F121V007 F121V010 F121V011	10/12	3000	2/1	0/-	Read/Select/ Operate/Direct operate	0 – close 1 – open close – close trip – open
Alarm ACK***	F121V099	10/12	3001	1,2/1	-/-	Read/Select/ Operate/Direct operate	1 or trip – ACK

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.
** Binary output status is read only, and provides only one point information about state of the breaker: 1-open or faulty, 0-closed or middle. Full information about the state is available from binary inputs 3000 and 3001.
*** Because this point is write only, a dummy 0 value will be reported while reading

Function block CODC1

Description	Name	Object	Point	Variation	Class	Access function	Values
Opening time alarm status	F122O003	1	2200	1,2	-	Read	0 – normal 1 – alarm
Closing time alarm status	F122O004	1	2201	1,2	-	Read	0 – normal 1 – alarm
Position*	F122V001	1	2202 2203	2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Open command	F122V030	1	2204	1,2	0	Read	0 – enabled 1 – disabled

Description	Name	Object	Point	Variation	Class	Access function	Values
Close command	F122V031	1	2205	1,2	0	Read	0 – enabled 1 – disabled
Invalid state	F122V034	1	2206	1,2	-	Read	0 – off 1 – on
Control blocking	F122V035	1	2207	1,2	0	Read	0 – deactivated 1 – activated
Position change to: open/close/faulty/ middle*	F122E000 F122E001 F122E002 F122E003	2	2202 2203	2	1	Read/ Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Open command enabled/disabled	F122E004 F122E005	2	2204	2	1	Read/ Unsolicited response	0 – disabled 1 – enabled
Close command enabled/disabled	F122E006 F122E007	2	2205	2	1	Read/ Unsolicited response	0 – disabled 1 – enabled
Invalid state on/off	F122E008 F122E009	2	2206	2	1	Read/ Unsolicited response	0 – off 1 – on
Command sequence completed/ started	F122E010 F122E011	2	2208	2	1	Read/ Unsolicited response	0 – completed 1 – started
Open output activated/ deactivated	F122E012 F122E013	2	2209	2	1	Read/ Unsolicited response	0 – inactive 1 – active
Close output activated/ deactivated	F122E014 F122E015	2	2210	2	1	Read/ Unsolicited response	0 – inactive 1 – active
Opening time normal/alarm	F122E016 F122E017	2	2200	2	1	Read/ Unsolicited response	0 – normal 1 – alarm
Closing time normal/alarm	F122E018 F122E019	2	2201	2	1	Read/ Unsolicited response	0 – normal 1 – alarm
Control blocking inactive/active	F122E026 F122E027	2	2207	2	1	Read/ Unsolicited response	0 – deactivated 1 – activated
Command failed	F122E028	2	2211	2	1	Read/ Unsolicited response	1 – failed
Command NACK/ACK	F122E024 F122E025	2	2212	2	1	Read/Unsolicited response	0 – NACK 1 - ACK
Open/close relay**	F122V001 F122V004 F122V005 F122V006 F122V007 F122V010 F122V011	10/12	2200	1,2/1	0/-	Read/Select/ Operate/ Direct operate	0 – close 1 – open close – close trip – open
Alarm ACK***	F122V099	10/12	2201	1,2/1	-/-	Read/Select/ Operate/ Direct operate	1 or trip - ACK

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

** Binary output status is read only, and provides only one point information about state of the disconnector: 1-open or faulty, 0-closed or middle. Full information about the state is available from binary inputs 2202 and 2203.

*** Because this point is write only, a dummy 0 value will be reported while reading

Function block CODC2

Description	Name	Object	Point	Variation	Class	Access function	Values
Opening time alarm status	F123O003	1	2300	1,2	-	Read	0 – normal 1 – alarm
Closing time alarm status	F123O004	1	2301	1,2	-	Read	0 – normal 1 – alarm

Description	Name	Object	Point	Variation	Class	Access function	Values
Position*	F123V001	1	2302 2303	2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Open command	F123V030	1	2304	1,2	0	Read	0 – enabled 1 – disabled
Close command	F123V031	1	2305	1,2	0	Read	0 – enabled 1 – disabled
Invalid state	F123V034	1	2306	1,2	-	Read	0 – off 1 – on
Control blocking	F123V035	1	2307	1,2	-	Read	0 – deactivated 1 – activated
Position change to: open/close/faulty/ middle*	F123E000 F123E001 F123E002 F123E003	2	2302 2303	2	1	Read/ Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Open command enabled/disabled	F123E004 F123E005	2	2304	2	1	Read/ Unsolicited response	0 – enabled 1 – disabled
Close command enabled/disabled	F123E006 F123E007	2	2305	2	1	Read/ Unsolicited response	0 – enabled 1 – disabled
Invalid state on/off	F123E008 F123E009	2	2306	2	1	Read/ Unsolicited response	0 – off 1 – on
Command sequence completed/ started	F123E010 F123E011	2	2308	2	1	Read/ Unsolicited response	0 – completed 1 – started
Open output activated/ deactivated	F123E012 F123E013	2	2309	2	1	Read/ Unsolicited response	0 – inactive 1 – active
Close output activated/ deactivated	F123E014 F123E015	2	2310	2	1	Read/ Unsolicited response	0 – inactive 1 – active
Opening time normal/alarm	F123E016 F123E017	2	2300	2	1	Read/ Unsolicited response	0 – normal 1 – alarm
Closing time normal/alarm	F123E018 F123E019	2	2301	2	1	Read/ Unsolicited response	0 – normal 1 – alarm
Control blocking inactive/active	F123E026 F123E027	2	2307	2	1	Read/ Unsolicited response	0 – deactivated 1 – activated
Command failed	F123E028	2	2311	2	1	Read/ Unsolicited response	1 – failed
Command NACK/ACK	F123E024 F123E025	2	2312	2	1	Read/Unsolicited response	0 – NACK 1 - ACK
Open/close relay**	F123V001 F123V004 F123V005 F123V006 F123V007 F123V010 F123V011	10/12	2300	2/1	0/-	Read/ Select/ Operate/ Direct operate	0 – close 1 – open close – close trip – open
Alarm ACK***	F123V099	10/12	2301	1,2/1	-/-	Read/ Select/ Operate/ Direct operate	1 or trip - ACK

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

** Binary output status is read only, and provides only one point information about state of the disconnector: 1-open or faulty, 0-closed or middle. Full information about the state is available from binary inputs 2302 and 2303.

*** Because this point is write only, a dummy 0 value will be reported while reading

Function block CODC3

Description	Name	Object	Point	Variation	Class	Access function	Values
Opening time alarm status	F124O003	1	2400	1,2	-	Read	0 – normal 1 – alarm
Closing time alarm status	F124O004	1	2401	1,2	-	Read	0 – normal 1 – alarm
Position*	F124V001	1	2402 2403	2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Open command	F124V030	1	2404	1,2	0	Read	0 – enabled 1 – disabled
Close command	F124V031	1	2405	1,2	0	Read	0 – enabled 1 – disabled
Invalid state	F124V034	1	2406	1,2	-	Read	0 – off 1 – on
Control blocking	F124V035	1	2407	1,2	-	Read	0 – deactivated 1 – activated
Position change to: open/close/faulty/middle*	F124E000 F124E001 F124E002 F124E003	2	2402 2403	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Open command enabled/disabled	F124E004 F124E005	2	2404	2	1	Read/Unsolicited response	0 – enabled 1 – disabled
Close command enabled/disabled	F124E006 F124E007	2	2405	2	1	Read/Unsolicited response	0 – enabled 1 – disabled
Invalid state on/off	F124E008 F124E009	2	2406	2	1	Read/Unsolicited response	0 – off 1 – on
Command sequence completed/ started	F124E010 F124E011	2	2408	2	1	Read/Unsolicited response	0 – completed 1 – started
Open output activated/ deactivated	F124E012 F124E013	2	2409	2	1	Read/Unsolicited response	0 – inactive 1 – active
Close output activated/ deactivated	F124E014 F124E015	2	2410	2	1	Read/Unsolicited response	0 – inactive 1 – active
Opening time normal/alarm	F124E016 F124E017	2	2400	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Closing time normal/alarm	F124E018 F124E019	2	2401	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Control blocking inactive/active	F124E026 F124E027	2	2407	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Command failed	F124E028	2	2411	2	1	Read/Unsolicited response	1 – failed
Command NACK/ACK	F124E024 F124E025	2	2412	2	1	Read/Unsolicited response	0 – NACK 1 - ACK
Open/close relay**	F124V001 F124V004 F124V005 F124V006 F124V007 F124V010 F124V011	10/12	2400	1,2/1	0/-	Read/Select/ Operate/Direct operate	0 – close 1 – open close – close trip – open
Alarm ACK***	F124V099	10/12	2401	1,2/1	-/-	Read/Select/ Operate/Direct operate	1 or trip - ACK

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

** Binary output status is read only, and provides only one point information about state of the disconnector: 1-open or faulty, 0-closed or middle. Full information about the state is available from

binary inputs 2402 and 2403.
*** Because this point is write only, a dummy 0 value will be reported while reading

Function block CODC4

Description	Name	Object	Point	Variation	Class	Access function	Values
Opening time alarm status	F125O003	1	2500	1,2	-	Read	0 – normal 1 – alarm
Closing time alarm status	F125O004	1	2501	1,2	-	Read	0 – normal 1 – alarm
Position*	F125V001	1	2502 2503	2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Open command	F125V030	1	2504	1,2	0	Read	0 – enabled 1 – disabled
Close command	F125V031	1	2505	1,2	0	Read	0 – enabled 1 – disabled
Invalid state	F125V034	1	2506	1,2	-	Read	0 – off 1 – on
Control blocking	F125V035	1	2507	1,2	-	Read	0 – deactivated 1 – activated
Position change to: open/close/faulty/middle*	F125E000 F125E001 F125E002 F125E003	2	2502 2503	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Open command enabled/disabled	F125E004 F125E005	2	2504	2	1	Read/Unsolicited response	0 – enabled 1 – disabled
Close command enabled/disabled	F125E006 F125E007	2	2505	2	1	Read/Unsolicited response	0 – enabled 1 – disabled
Invalid state on/off	F125E008 F125E009	2	2506	2	1	Read/Unsolicited response	0 – off 1 – on
Command sequence completed/ started	F125E010 F125E011	2	2508	2	1	Read/Unsolicited response	0 – completed 1 – started
Open output activated/ deactivated	F125E012 F125E013	2	2509	2	1	Read/Unsolicited response	0 – inactive 1 – active
Close output activated/ deactivated	F125E014 F125E015	2	2510	2	1	Read/Unsolicited response	0 – inactive 1 – active
Opening time normal/alarm	F125E016 F125E017	2	2500	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Closing time normal/alarm	F125E018 F125E019	2	2501	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Control blocking inactive/active	F125E026 F125E027	2	2507	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Command failed	F125E028	2	2511	2	1	Read/Unsolicited response	1 – failed
Command NACK/ACK	F125E024 F125E025	2	2512	2	1	Read/Unsolicited response	0 – NACK 1 - ACK
Open/close relay**	F125V001 F125V004 F125V005 F125V006 F125V007 F125V010 F125V011	10/12	2500	1,2/1	0/-	Read/Select/ Operate/Direct operate	0 – close 1 – open close – close trip – open
Alarm ACK***	F125V099	10/12	2501	1,2/1	-/-	Read/Select/ Operate/Direct operate	1 or trip - ACK

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

** Binary output status is read only, and provides only one point information about state of the disconnector: 1-open or faulty, 0-closed or middle. Full information about the state is available from binary inputs 2502 and 2503.
*** Because this point is write only, a dummy 0 value will be reported while reading

Function block CODC5

Description	Name	Object	Point	Variation	Class	Access function	Values
Opening time alarm status	F126O003	1	2600	1,2	-	Read	0 – normal 1 – alarm
Closing time alarm status	F126O004	1	2601	1,2	-	Read	0 – normal 1 – alarm
Position*	F126V001	1	2602 2603	2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Open command	F126V030	1	2604	1,2	0	Read	0 – enabled 1 – disabled
Close command	F126V031	1	2605	1,2	0	Read	0 – enabled 1 – disabled
Invalid state	F126V034	1	2606	1,2	-	Read	0 – off 1 – on
Control blocking	F126V035	1	2607	1,2	-	Read	0 – deactivated 1 – activated
Position change to: open/close/faulty/middle*	F126E000 F126E001 F126E002 F126E003	2	2602 2603	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Open command enabled/disabled	F126E004 F126E005	2	2604	2	1	Read/Unsolicited response	0 – enabled 1 – disabled
Close command enabled/disabled	F126E006 F126E007	2	2605	2	1	Read/Unsolicited response	0 – enabled 1 – disabled
Invalid state on/off	F126E008 F126E009	2	2606	2	1	Read/Unsolicited response	0 – off 1 – on
Command sequence completed/ started	F126E010 F126E011	2	2608	2	1	Read/Unsolicited response	0 – completed 1 – started
Open output activated/ deactivated	F126E012 F126E013	2	2609	2	1	Read/Unsolicited response	0 – inactive 1 – active
Close output activated/ deactivated	F126E014 F126E015	2	2610	2	1	Read/Unsolicited response	0 – inactive 1 – active
Opening time normal/alarm	F126E016 F126E017	2	2600	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Closing time normal/alarm	F126E018 F126E019	2	2601	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Control blocking inactive/active	F126E026 F126E027	2	2607	2	1	Read/Unsolicited response	0 – deactivated 1 – activated
Command failed	F126E028	2	2611	2	1	Read/Unsolicited response	1 – failed
Command NACK/ACK	F126E024 F126E025	2	2612	2	1	Read/Unsolicited response	0 – NACK 1 - ACK
Open/close relay**	F126V001 F126V004 F126V005 F126V006 F126V007 F126V010 F126V011	10/12	2600	1,2/1	0/-	Read/Select/ Operate/Direct operate	0 – close 1 – open close – close trip – open
Alarm ACK***	F126V099	10/12	2601	1,2/1	-/-	Read/Select/ Operate/Direct operate	1 or trip - ACK

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.
** Binary output status is read only, and provides only one point information about state of the disconnector: 1-open or faulty, 0-closed or middle. Full information about the state is available from binary inputs 2602 and 2603.
*** Because this point is write only, a dummy 0 value will be reported while reading

Function block COIND1

Description	Name	Object	Point	Variation	Class	Access function	Values
Position*	F127V001	1	1400 1401	1,2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state	F127V034	1	1401	1,2	-	Read	0 – off 1 – on
Position change to: Open/close/faulty/middle*	F127E000 F127E001 F127E002 F127E003	2	1400 1401	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state on/off	F127E008 F127E009	2	1402	2	1	Read/Unsolicited response	0 – off 1 – on

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

Function block COIND2

Description	Name	Object	Point	Variation	Class	Access function	Values
Position*	F128V001	1	1500 1501	1,2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state	F128V034	1	1502	1,2	-	Read	0 – off 1 – on
Position change to: open/close/faulty/middle*	F128E000 F128E001 F128E002 F128E003	2	1500 1501	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state on/off	F128E008 F128E009	2	1502	2	1	Read/Unsolicited response	0 – off 1 – on

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

Function block COIND3

Description	Name	Object	Point	Variation	Class	Access function	Values
Position*	F129V001	1	1600 1601	1,2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state	F129V034	1	1602	1,2	-	Read	0 – off 1 – on
Position change to: open/close/faulty/middle*	F129E000 F129E001 F129E002 F129E003	2	1600 1601	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state on/off	F129E008 F129E009	2	1602	2	1	Read/Unsolicited response	0 – off 1 – on

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

Function block COIND4

Description	Name	Object	Point	Variation	Class	Access function	Values
Position*	F130V001	1	1700 1701	1,2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state	F130V034	1	1702	1,2	-	Read	0 – off 1 – on
Position change to: open/close/faulty/middle*	F130E000 F130E001 F130E002 F130E003	2	1700 1701	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state on/off	F130E008 F130E009	2	1702	2	1	Read/Unsolicited response	0 – off 1 – on

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

Function block COIND5

Description	Name	Object	Point	Variation	Class	Access function	Values
Position*	F131V001	1	1800 1801	1,2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state	F131V034	1	1802	1,2	-	Read	0 – off 1 – on
Position change to: open/close/faulty/middle*	F131E000 F131E001 F131E002 F131E003	2	1800 1801	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state on/off	F131E008 F131E009	2	1802	2	1	Read/Unsolicited response	0 – off 1 – on

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

Function block COIND6

Description	Name	Object	Point	Variation	Class	Access function	Values
Position*	F132V001	1	1900 1901	1,2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state	F132V034	1	1902	1,2	-	Read	0 – off 1 – on
Position change to: open/close/faulty/middle*	F132E000 F132E001 F132E002 F132E003	2	1900 1901	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state on/off	F132E008 F132E009	2	1902	2	1	Read/Unsolicited response	0 – off 1 – on

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with

higher address has value 0 and point with lower address has value 1.

Function block COIND7

Description	Name	Object	Point	Variation	Class	Access function	Values
Position	F133V001	1	2000 2001	1,2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state	F133V034	1	2002	1,2	-	Read	0 – off 1 – on
Position change to: open/close/faulty/middle*	F133E000 F133E001 F133E002 F133E003	2	2000 2001	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state on/off	F133E008 F133E009	2	2002	2	1	Read/Unsolicited response	0 – off 1 – on

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

Function block COIND8

Description	Name	Object	Point	Variation	Class	Access function	Values
Position*	F134V001	1	2100 2101	1,2	0	Read	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state	F134V034	1	2102	1,2	-	Read	0 – off 1 – on
Position change to: open/close/faulty/middle*	F134E000 F134E001 F134E002 F134E003	2	2100 2101	2	1	Read/Unsolicited response	01 – closed 10 – open 00 – middle 11 – faulty
Invalid state on/off	F134E008 F134E009	2	2102	2	1	Read/Unsolicited response	0 – off 1 – on

* Because this data item provides double-point information two consecutive DNP points are used to represent its value. Values in last column of the table should be read as follows: 01 means point with higher address has value 0 and point with lower address has value 1.

Function block COLOCAT

Description	Name	Object	Point	Variation	Class	Access function	Values
Logic position setting	F142V001	1	4600	1,2	-	Read	0 – inactive 1 – active
Logic position setting inactive/ active	F142E000 F142E001	2	4600	2	1	Read/Unsolicited response	0 – inactive 1 – active

Function block COPFC

Description	Name	Object	Point	Variation	Class	Access function	Values
P3 (kW)	F143I001	30	6000	3	-	Read	-999999...999999
Q3 (kvar)	F143I002	30	6001	3	-	Read	-999999...999999
Power factor PDF	F143I004	30	6002	3	-	Read	0.00...1.00
Connected banks	F143I003	30	6003	3	-	Read	0...65535
Block	F143I005	1	6000	1,2	-	Read	0 – Not active 1 – Active
Day/night phi switch	F143I006	1	6001	1,2	-	Read	0 - Day target PF 1 - Night target PF

Description	Name	Object	Point	Variation	Class	Access function	Values
Disconnect	F143I007	1	6002	1,2	-	Read	0 – Not active 1 – Active
Reset	F143I008	1	6003	1,2	-	Read	0 – Not active 1 – Active
REQ_UP	F143O001	1	6004	1,2	-	Read	0 – Not active 1 – Active
REQ_DOWN	F143O002	1	6005	1,2	-	Read	0 – Not active 1 – Active
Control operation status	F143O003	1	6006	1,2	-	Read	0 – Not active 1 – Active
Q not within limits indication	F143O004	1	6007	1,2	-	Read	0 – Not active 1 – Active
Pumping situation alarm status	F143O005	1	6008	1,2	-	Read	0 – Not active 1 – Active
Automatic testing mode status	F143O006	1	6009	1,2	-	Read	0 - Not activated 1 - In progress
Manual commands allowed indication	F143V015	1	6010	1,2	-	Read	0 – Disabled 1 – Enabled
Control operation failed reset / activated	F143E000 F143E001	2	6006	2	1	Read/Unsolicited response	0 – Reset 1 – Activated
Q not within limits indication reset / activated	F143E002 F143E003	2	6007	2	1	Read/Unsolicited response	0 – Reset 1 – Activated
Pumping situation alarm reset / activated	F143E004 F143E005	2	6008	2	1	Read/Unsolicited response	0 – Reset 1 – Activated
Not discharged yet reset / activated	F143E006 F143E007	2	6011	2	1	Read/Unsolicited response	0 – Reset 1 – Activated
Automatic testing mode reset / activated	F143E008 F143E009	2	6009	2	1	Read/Unsolicited response	0 – Reset 1 – Activated
Testing finished OK / failed	F143E010 F143E011	2	6012	2	1	Read/Unsolicited response	0 – Reset 1 – Activated
Overvoltage inhibition reset / activated	F143E012 F143E013	2	6013	2	1	Read/Unsolicited response	0 – Reset 1 – Activated
BLOCK signal reset / activated	F143E014 F143E015	2	6000	2	1	Read/Unsolicited response	0 – Reset 1 – Activated
DISCONNECT signal reset / activated	F143E016 F143E017	2	6002	2	1	Read/Unsolicited response	0 – Reset 1 – Activated
Number of switching operations per day	F143V011	30	6000	3	-	Read	0...65535
Operation mode	F143V001	40 / 41	6000	1	-	Read/Select/ Operate/ Direct operate	0 - Not in use 1 - Automatic mode 2 - Manual mode 3 - Testing mode
Day&night switch	F143V006	40 / 41	6001	1	-	Read/Select/ Operate/ Direct operate	0 - Not in use 1 - Binary input 2 - Internal clock 3 - By setting
Day & night command	F143V008	40 / 41	6002	1	-	Read/Select/ Operate/ Direct operate	0 - Not activated 1 - Day target PF 2 - Night target PF

Function block CMBWEAR1

Description	Name	Object	Point	Variation	Class	Access function	Values
Alarm state	F187O001	1	3500	1,2	0	Read	0 – normal 1 – alarm
Breaker electric wear alarm reset/ activated	F187E000 F187E001	2	3500	2	1	Read/Unsolicited response	0 – normal 1 – alarm

Description	Name	Object	Point	Variation	Class	Access function	Values
Alarm ACK	F187V099	10/12	3500	1,2/1	-	Read*/Write/Select/ Operate/Direct operate	1 or trip – ACK
Accumulated breaker wear at pole 1	F187V001	40/41	3500	1	-	Read/Select/ Operate/ Direct operate	0...10000
Accumulated breaker wear at pole 2	F187V002	40/41	3523	1	-	Read/Select/ Operate/ Direct operate	0...10000
Accumulated breaker wear at pole 3	F187V003	40/41	3502	1	-	Read/Select/ Operate/ Direct operate	0...10000

* Because this point is write only, a dummy 0 value will be reported while reading

Function block CMBWEAR2

Description	Name	Object	Point	Variation	Class	Access function	Values
Alarm state	F188O001	1	3600	1,2	0	Read	0 – normal 1 – alarm
Breaker electric wear alarm reset/ activated	F188E000 F188E001	2	3600	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Alarm ACK	F188V099	10/12	3600	1,2/1	-	Read*/Write/Select/ Operate/Direct operate	1 or trip – ACK
Accumulated breaker wear at pole 1	F188V001	40/41	3600	1	-	Read/Select/ Operate/ Direct operate	0...10000
Accumulated breaker wear at pole 2	F188V002	40/41	3601	1	-	Read/Select/ Operate/ Direct operate	0...10000
Accumulated breaker wear at pole 3	F188V003	40/41	3602	1	-	Read/Select/ Operate/ Direct operate	0...10000

* Because this point is write only, a dummy 0 value will be reported while reading

Function block CMCU3

Description	Name	Object	Point	Variation	Class	Access function	Values
Input current circuit alarm	F181O001	1	3200	1,2	0	Read	0 – normal 1 – alarm
Input current circuit alarm off/on	F181E000 F181E001	2	3200	2	1	Read/Unsolicited response	0 – normal 1 – alarm

Function block CMGAS1

Description	Name	Object	Point	Variation	Class	Access function	Values
Low gas density alarm state	F186O001	1	3400	1,2	0	Read	0 – normal 1 – alarm
Gas pressure invalid	F186I001	1	3401	1,2	-	Read	1 – invalid 0 – valid
Low gas density alarm reset/ activated	F186E000 F186E001	2	3400	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Low gas density warning inactive/ active	F186E002 F182E003	2	3401	2	1	Read/Unsolicited response	0 – normal 1 – warning
Alarm ACK*	F186V099	10/12	3400	1,2/1	-	Read/Write/Select/ Operate/Direct operate	1 or trip – ACK

* Because this point is write only, a dummy 0 value will be reported while reading

Function block CMGAS3

Description	Name	Object	Point	Variation	Class	Access function	Values
Alarm state	F194O001	1	6300	1,2	0	Read	0 – Inactive 1 – Active
Gas pressure L1	F194I001	1	6301	1,2	-	Read	1 – Invalid 0 – Valid
Gas pressure L2	F194I002	1	6302	1,2	-	Read	1 – Invalid 0 – Valid
Gas pressure L3	F194I003	1	6303	1,2	-	Read	1 – Invalid 0 – Valid
Low gas density alarm reset / activated	F194E000 F194E001	2	6300	2	1	Read/Unsolicited response	0 – Reset 1 – Activated
Low gas density warning L1 inactive / active	F194E002 F194E003	2	6301	2	1	Read/Unsolicited response	0 – Inactive 1 – Active
Low gas density warning L2 inactive / active	F194E004 F194E005	2	6302	2	1	Read/Unsolicited response	0 – Inactive 1 – Active
Low gas density warning L3 inactive / active	F194E006 F194E007	2	6303	2	1	Read/Unsolicited response	0 – Inactive 1 – Active
Alarm ACK*	F194V099	10/12	6300	1,2 / 1	-	Read/Write/Select/ Operate/Direct operate	1 or trip – ACK

* Because this point is write only, a dummy 0 value will be reported while reading

Function block CMSCHED

Description	Name	Object	Point	Variation	Class	Access function	Values
Scheduled maintenance alarm state	F189O001	1	3700	1,2	0	Read	0 – normal 1 – alarm
Scheduled maintenance alarm reset/activated	F189E000 F189E001	2	3700	2	1	Read/Unsolicited response	0 – normal 1 – alarm
Alarm ACK*	F189V099	10/12	3700	1,2/1	-	Read/Write/Select/ Operate/Direct operate	1 or trip - ACK

* Because this point is write only, a dummy 0 value will be reported while reading

Function block CMSPRC1

Description	Name	Object	Point	Variation	Class	Access function	Values
Spring 1 max. charging alarm state	F190O002	1	4900	1,2	0	Read	0 – inactive 1 – active
Spring 1 min. charging alarm state	F190O003	1	4901	1,2	0	Read	0 – inactive 1 – active
Spring 1 charge status	F190I002	1	4902	1,2	-	Read	0 – uncharged 1 – charged
Alarm ACK*	F190V099	10/12	4900	1,2/1	-	Read/Write/Select/ Operate/Direct operate	1 or trip – ACK
Spring 1 max. charging alarm inactive/active	F190E002 F190E003	2	4900	2	1	Read/Unsolicited response	0 – reset 1 – activated
Spring 1 min. charging alarm inactive/active	F190E004 F190E005	2	4901	2	1	Read/Unsolicited response	0 – inactive 1 – active
Spring 1 charge status uncharged/charged	F190E008 F190E009	2	4902	2	1	Read/Unsolicited response	0 – uncharged 1 – charged
Spring 1 charging motor active/ inactive	F190E000 F190E001	2	4903	2	1	Read/Unsolicited response	0 – inactive 1 – active

Description	Name	Object	Point	Variation	Class	Access function	Values
Spring 1 charge command activated	F190E007	2	4904	2	1	Read/Unsolicited response	1 – activated

* Because this point is write only, while reading a dummy 0 value will be reported

Function block CMTIME1

Description	Name	Object	Point	Variation	Class	Access function	Values
Accumulated time 1 alarm state	F184O001	1	4800	1,2	0	Read	0 – reset 1 – activated
Accumulated time 1 measurement state	F184I001	1	4801	1,2	-	Read	0 – inactive 1 – active
Alarm ACK*	F184V099	10/12	4800	1,2/1	-	Read/Write/Select/ Operate/Direct operate	1 or trip – ACK
Accumulated time 1 alarm reset/ activated	F184E000 F184E001	2	4800	2	1	Read/Unsolicited response	0 – reset 1 – activated
Accumulated time 1 measurement inactive/active	F184E002 F184E003	2	4801	2	1	Read/Unsolicited response	0 – inactive 1 – active

* Because this point is write only, while reading a dummy 0 value will be reported

Function block CMTIME2

Description	Name	Object	Point	Variation	Class	Access function	Values
Accumulated time 2 alarm state	F185O001	1	4850	1,2	0	Read	0 – reset 1 – activated
Accumulated time 2 measurement state	F185I001	1	4851	1,2	-	Read	0 – inactive 1 – active
Alarm ACK*	F185V099	10/12	4850	1,2/1	-	Read/Write/Select/ Operate/Direct operate	1 or trip – ACK
Accumulated time 2 alarm reset/ activated	F185E000 F185E001	2	4850	2	1	Read/Unsolicited response	0 – reset 1 – activated
Accumulated time 2 measurement inactive/active	F185E002 F185E003	2	4851	2	1	Read/Unsolicited response	0 – inactive 1 – active

* Because this point is write only, while reading a dummy 0 value will be reported

Function block CMTRAV1

Description	Name	Object	Point	Variation	Class	Access function	Values
Breaker 1 open travel alarm	F193O001	1	5500	1,2	0	Read	0 – inactive 1 – active
Breaker 1 close travel alarm	F193O002	1	5501	1,2	0	Read	0 – inactive 1 – active
Breaker 1 open travel alarm	F193E000 F193E001	2	5500	2	1	Read/Unsolicited response	0 – inactive 1 – active
Breaker 1 close travel alarm	F193E002 F193E003	2	5501	2	1	Read/Unsolicited response	0 – inactive 1 – active
Alarm ACK*	F193V099	10/12	5500	1,2/1	-	Read/Write/Select/ Operate/Direct operate	1 or trip - ACK

* Because this point is write only, while reading a dummy 0 value will be reported

Function block CMVO3

Description	Name	Object	Point	Variation	Class	Access function	Values
Input voltage circuit alarm	F182O001	1	3300	1,2	0	Read	0 – normal 1 – alarm
Input voltage circuit alarm off/on	F182E000 F182E001	2	3300	2	1	Read/Unsolicited response	0 – normal 1 – alarm

Function block PQCU3H

Description	Name	Object	Point	Variation	Class	Access function	Values
Status of output HAR_HIGH	F512O001	1	6100	1,2	0	Read	0 - Not active 1 - Active
Status of output CUM_HIGH	F512O002	1	6101	1,2	0	Read	0 - Not active 1 - Active
Current harmonic limit reset / exceeded	F512E000 F512E001	2	6100	2	1	Read, Unsolicited response	0 – reset 1 – exceeded
Current cum. limit	F512E002	2	6101	2	1	Read, Unsolicited response	1 – exceeded
Observation period near end	F512E003	2	6102	2	1	Read, Unsolicited response	1 – near end
Observation period ended	F512E004	2	6103	2	1	Read, Unsolicited response	1 – ended
Reset registers*	F512V025	10 / 12	6100	1,2 / 1	-/-	Read, Write/Select, Operate, Direct operate	1 or trip – reset
THD 3s average value	F512I002	30	6100	3	-	Read	0.0...1000.0
Fundamental component 3s average value	F512I003	30	6101	3	-	Read	0.0...1000.0
2nd harmonic 3s average value	F512I004	30	6102	3	-	Read	0.0...1000.0
3rd harmonic 3s average value	F512I005	30	6103	3	-	Read	0.0...1000.0
4th harmonic 3s average value	F512I006	30	6104	3	-	Read	0.0...1000.0
5th harmonic 3s average value	F512I007	30	6105	3	-	Read	0.0...1000.0
6th harmonic 3s average value	F512I008	30	6106	3	-	Read	0.0...1000.0
7th harmonic 3s average value	F512I009	30	6107	3	-	Read	0.0...1000.0
8th harmonic 3s average value	F512I010	30	6108	3	-	Read	0.0...1000.0
9th harmonic 3s average value	F512I011	30	6109	3	-	Read	0.0...1000.0
10th harmonic 3s average value	F512I012	30	6110	3	-	Read	0.0...1000.0
11th harmonic 3s average value	F512I013	30	6111	3	-	Read	0.0...1000.0
12th harmonic 3s average value	F512I014	30	6112	3	-	Read	0.0...1000.0
13th harmonic 3s average value	F512I015	30	6113	3	-	Read	0.0...1000.0
THD short time sliding average value	F512I018	30	6114	3	-	Read	0.0...1000.0
2nd harmonic short time sliding average value	F512I019	30	6115	3	-	Read	0.0...1000.0
3rd harmonic short time sliding average value	F512I020	30	6116	3	-	Read	0.0...1000.0
4th harmonic short time sliding average value	F512I021	30	6117	3	-	Read	0.0...1000.0
5th harmonic short time sliding average value	F512I022	30	6118	3	-	Read	0.0...1000.0
6th harmonic short time sliding average value	F512I023	30	6119	3	-	Read	0.0...1000.0

Description	Name	Object	Point	Variation	Class	Access function	Values
7th harmonic short time sliding average value	F512I024	30	6120	3	-	Read	0.0...1000.0
8th harmonic short time sliding average value	F512I025	30	6121	3	-	Read	0.0...1000.0
9th harmonic short time sliding average value	F512I026	30	6122	3	-	Read	0.0...1000.0
10th harmonic short time sliding average value	F512I027	30	6123	3	-	Read	0.0...1000.0
11th harmonic short time sliding average value	F512I028	30	6124	3	-	Read	0.0...1000.0
12th harmonic short time sliding average value	F512I029	30	6125	3	-	Read	0.0...1000.0
13th harmonic short time sliding average value	F512I030	30	6126	3	-	Read	0.0...1000.0
Max. THD at last obs. period	F512V206	30	6127	3	-	Read	0.0...1000.0
Max. THD at active obs. period	F512V306	30	6128	3	-	Read	0.0...1000.0
THD	F512V404	30	6129	3	-	Read	0.0...1000.0

* Because this point is write only, a dummy 0 value will be reported while reading

Function block PQVO3H

Description	Name	Object	Point	Variation	Class	Access function	Values
Status of output HAR_HIGH	F513O001	1	6200	1,2	0	Read	0 - Not active 1 - Active
Status of output CUM_HIGH	F513O002	1	6201	1,2	0	Read	0 - Not active 1 - Active
Harmonic limit reset / exceeded	F513E000 F513E001	2	6200	2	1	Read, Unsolicited response	0 – reset 1 – exceeded
Cumulative limit exceeded	F513E002	2	6201	2	1	Read, Unsolicited response	1 – exceeded
Observation period near end	F513E003	2	6202	2	1	Read, Unsolicited response	1 – near end
Observation period ended	F513E004	2	6203	2	1	Read, Unsolicited response	1 – ended
Reset registers*	F513V024	10 / 12	6200	1,2 / 1	-/-	Read, Write / Select, Operate, Direct operate	1 or trip – reset
THD 3s average value	F513I002	30	6200	3	-	Read	0.0...120.0
Fundamental component 3s average value	F513I003	30	6201	3	-	Read	0.0...120.0
2nd harmonic 3s average value	F513I004	30	6202	3	-	Read	0.0...120.0
3rd harmonic 3s average value	F513I005	30	6203	3	-	Read	0.0...120.0
4th harmonic 3s average value	F513I006	30	6204	3	-	Read	0.0...120.0
5th harmonic 3s average value	F513I007	30	6205	3	-	Read	0.0...120.0
6th harmonic 3s average value	F513I008	30	6206	3	-	Read	0.0...120.0
7th harmonic 3s average value	F513I009	30	6207	3	-	Read	0.0...120.0
8th harmonic 3s average value	F513I010	30	6208	3	-	Read	0.0...120.0
9th harmonic 3s average value	F513I011	30	6209	3	-	Read	0.0...120.0
10th harmonic 3s average value	F513I012	30	6210	3	-	Read	0.0...120.0
11th harmonic 3s average value	F513I013	30	6211	3	-	Read	0.0...120.0
12th harmonic 3s average value	F513I014	30	6212	3	-	Read	0.0...120.0
13th harmonic 3s average value	F513I015	30	6213	3	-	Read	0.0...120.0

Description	Name	Object	Point	Variation	Class	Access function	Values
THD short time sliding average value	F513I018	30	6214	3	-	Read	0.0...120.0
2nd harmonic short time sliding average value	F513I019	30	6215	3	-	Read	0.0...120.0
3rd harmonic short time sliding average value	F513I020	30	6216	3	-	Read	0.0...120.0
4th harmonic short time sliding average value	F513I021	30	6217	3	-	Read	0.0...120.0
5th harmonic short time sliding average value	F513I022	30	6218	3	-	Read	0.0...120.0
6th harmonic short time sliding average value	F513I023	30	6219	3	-	Read	0.0...120.0
7th harmonic short time sliding average value	F513I024	30	6220	3	-	Read	0.0...120.0
8th harmonic short time sliding average value	F513I025	30	6221	3	-	Read	0.0...120.0
9th harmonic short time sliding average value	F513I026	30	6222	3	-	Read	0.0...120.0
10th harmonic short time sliding average value	F513I027	30	6223	3	-	Read	0.0...120.0
11th harmonic short time sliding average value	F513I028	30	6224	3	-	Read	0.0...120.0
12th harmonic short time sliding average value	F513I029	30	6225	3	-	Read	0.0...120.0
13th harmonic short time sliding average value	F513I030	30	6226	3	-	Read	0.0...120.0
Max. THD at last obs. period	F513V206	30	6227	3	-	Read	0.0...120.0
Max. THD at active obs. period	F513V306	30	6228	3	-	Read	0.0...120.0
THD	F513V404	30	6229	3	-	Read	0.0...120.0

* Because this point is write only, a dummy 0 value will be reported while reading

Function block BIO

Description	Name	Object	Point	Variation	Class	Access function	Values
Binary input 1 state	F013I001	1	4500	1,2	-	Read	0 – reset 1 - activated
Binary input 2 state	F013I002	1	4501	1,2	-	Read	0 – reset 1 – activated
Binary input 3 state	F013I003	1	4502	1,2	-	Read	0 – reset 1 – activated
Binary input 4 state	F013I004	1	4503	1,2	-	Read	0 – reset 1 – activated
Binary input 5 state	F013I005	1	4504	1,2	-	Read	0 – reset 1 – activated
Binary input 6 state	F013I006	1	4505	1,2	-	Read	0 – reset 1 – activated
Binary input 7 state	F013I007	1	4506	1,2	-	Read	0 – reset 1 – activated
Binary input 8 state	F013I008	1	4507	1,2	-	Read	0 – reset 1 – activated
Binary input 9 state	F013I009	1	4508	1,2	-	Read	0 – reset 1 – activated
Binary input 10 state	F013I010	1	4509	1,2	-	Read	0 – reset 1 – activated

Description	Name	Object	Point	Variation	Class	Access function	Values
Binary input 11 state	F013I011	1	4510	1,2	-	Read	0 – reset 1 – activated
Binary input 12 state	F013I012	1	4511	1,2	-	Read	0 – reset 1 – activated
Binary output 1 state	F013O001	1	4512	1,2	-	Read	0 – reset 1 – activated
Binary output 2 state	F013O002	1	4513	1,2	-	Read	0 – reset 1 – activated
Binary output 3 state	F013O003	1	4514	1,2	-	Read	0 – reset 1 – activated
Binary output 4 state	F013O004	1	4515	1,2	-	Read	0 – reset 1 – activated
Binary output 5 state	F013O005	1	4516	1,2	-	Read	0 – reset 1 – activated
Binary output 6 state	F013O006	1	4517	1,2	-	Read	0 – reset 1 – activated
Binary input 1 oscillate	F013I021	1	4518	1,2	-	Read	0 – stop 1 – start
Binary input 2 oscillate	F013I022	1	4519	1,2	-	Read	0 – stop 1 – start
Binary input 3 oscillate	F013I023	1	4520	1,2	-	Read	0 – stop 1 – start
Binary input 4 oscillate	F013I024	1	4521	1,2	-	Read	0 – stop 1 – start
Binary input 5 oscillate	F013I025	1	4522	1,2	-	Read	0 – stop 1 – start
Binary input 6 oscillate	F013I026	1	4523	1,2	-	Read	0 – stop 1 – start
Binary input 7 oscillate	F013I027	1	4524	1,2	-	Read	0 – stop 1 – start
Binary input 8 oscillate	F013I028	1	4525	1,2	-	Read	0 – stop 1 – start
Binary input 9 oscillate	F013I029	1	4526	1,2	-	Read	0 – stop 1 – start
Binary input 10 oscillate	F013I030	1	4527	1,2	-	Read	0 – stop 1 – start
Binary input 11 oscillate	F013I031	1	4528	1,2	-	Read	0 – stop 1 – start
Binary input 12 oscillate	F013I032	1	4529	1,2	-	Read	0 – stop 1 – start
Binary input 1 reset/activated	F013E000 F013E001	2	4500	2	1	Read/Unsolicited response	0 – reset 1 - activated
Binary input 2 reset/activated	F013E002 F013E003	2	4501	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary input 3 reset/activated	F013E004 F013E005	2	4502	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary input 4 reset/activated	F013E006 F013E007	2	4503	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary input 5 reset/activated	F013E008 F013E009	2	4504	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary input 6 reset/activated	F013E010 F013E011	2	4505	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary input 7 reset/activated	F013E012 F013E013	2	4506	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary input 8 reset/activated	F013E014 F013E015	2	4507	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary input 9 reset/activated	F013E016 F013E017	2	4508	2	1	Read/Unsolicited response	0 – reset 1 – activated

Description	Name	Object	Point	Variation	Class	Access function	Values
Binary input 10 reset/activated	F013E018 F013E019	2	4509	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary input 11 reset/activated	F013E020 F013E021	2	4510	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary input 12 reset/activated	F013E022 F013E023	2	4511	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary output 1 reset/activated	F013E024 F013E025	2	4512	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary output 2 reset/activated	F013E026 F013E027	2	4513	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary output 3 reset/activated	F013E028 F013E029	2	4514	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary output 4 reset/activated	F013E030 F013E031	2	4515	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary output 5 reset/activated	F013E032 F013E033	2	4516	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary output 6 reset/activated	F013E034 F013E035	2	4517	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary input 1 oscillate stop/start	F013E036 F013E037	2	4518	2	1	Read/Unsolicited response	0 – stop 1 – start
Binary input 2 oscillate stop/start	F013E038 F013E039	2	4519	2	1	Read/Unsolicited response	0 – stop 1 – start
Binary input 3 oscillate stop/start	F013E040 F013E041	2	4520	2	1	Read/Unsolicited response	0 – stop 1 – start
Binary input 4 oscillate stop/start	F013E042 F013E043	2	4521	2	1	Read/Unsolicited response	0 – stop 1 – start
Binary input 5 oscillate stop/start	F013E044 F013E045	2	4522	2	1	Read/Unsolicited response	0 – stop 1 – start
Binary input 6 oscillate stop/start	F013E046 F013E047	2	4523	2	1	Read/Unsolicited response	0 – stop 1 – start
Binary input 7 oscillate stop/start	F013E048 F013E049	2	4524	2	1	Read/Unsolicited response	0 – stop 1 – start
Binary input 8 oscillate stop/start	F013E050 F013E051	2	4525	2	1	Read/Unsolicited response	0 – stop 1 – start
Binary input 9 oscillate stop/start	F013E052 F013E053	2	4526	2	1	Read/Unsolicited response	0 – stop 1 – start
Binary input 10 oscillate stop/start	F013E054 F013E055	2	4527	2	1	Read/Unsolicited response	0 – stop 1 – start
Binary input 11 oscillate stop/start	F013E056 F013E057	2	4528	2	1	Read/Unsolicited response	0 – stop 1 – start
Binary input 12 oscillate stop/start	F013E058 F013E059	2	4529	2	1	Read/Unsolicited response	0 – stop 1 – start

CH000, CH001 and CH002

Description	Name	Object	Point	Variation	Class	Access function	Values
Analogue configuration error	F000E048	2	3801	2	1	Read/Unsolicited response	1 – error
Module startup	F000E050	2	3802	2	1	Read/Unsolicited response	1- startup
Event buffer overflow	F000E051	2	3803	2	1	Read/Unsolicited response	1 – overflow
IRF error reset/activated	F000E056 F000E057	2	3800	2	1	Read/Unsolicited response	0 – reset 1 – activated
Watchdog error	F000E059	2	3804	2	1	Read/Unsolicited response	1 – error

Description	Name	Object	Point	Variation	Class	Access function	Values
Store	F000V151	40/41	3800	1	-	Read/Select/ Operate/ Direct operate	0 – store completed 1 – store in progress 2 – error 160 – fast store in progress
Reset indication	F001V011	10/12	3900	1,2/1	-	Read*/Write/Select/ Operate/Direct operate	1 or trip – reset
Reset outputs	F001V012	10/12	3901	1,2/1	-	Read*/Write/Select/ Operate/Direct operate	1 or trip – reset
Reset registers	F001V013	10/12	3902	1,2/1	-	Read*/Write/Select/ Operate/Direct operate	1 or trip – reset
IRF error state	F001V015	1	3800	1,2	0	Read	0 – reset 1 – activated
Recent control position	F002V005	1	4700	2	-	Read	onLine 0 – local onLine 1 – remote offLine 0 – disable
Interlocking bypass mode	F002V004	1	4701	1,2	-	Read	0 – inactive 1 – active
Recent control position	F002E000 F002E001 F002E002	2	4700	2	1	Read/Unsolicited response	onLine 0 – local onLine 1 – remote offLine 0 – disable
Interlocking bypass mode	F002E004 F002E005	2	4701	2	1	Read/Unsolicited response	0 – inactive 1 – active

* Because this point is write only, a dummy 0 value will be reported while reading

Function block PSC1

Description	Name	Object	Point	Variation	Class	Access function	Values
Binary output 1 off/on status	F017O001	1	4200	1,2	-	Read	0 – reset 1 – activated
Binary output 2 off/on status	F017O002	1	4201	1,2	-	Read	0 – reset 1 – activated
Binary output 3 off/on status	F017O003	1	4202	1,2	-	Read	0 – reset 1 – activated
Binary input 1 off/on status	F017I001	1	4203	1,2	-	Read	0 – reset 1 – activated
Binary input 2 off/on status	F017I002	1	4204	1,2	-	Read	0 – reset 1 – activated
Binary input 3 off/on status	F017I003	1	4205	1,2	-	Read	0 – reset 1 – activated
AC status	F017I004	1	4206	1,2	-	Read	0 – OK 1 – fail
Overheat status	F017I005	1	4207	1,2	-	Read	0 – OK 1 – overheated
Battery status	F017I006	1	4208	1,2	-	Read	0 – good 1 – low
Heating status	F017I009	1	4209	1,2	-	Read	0 – off 1 – on
Binary input 1 stop/start status	F017I021	1	4210	1,2	-	Read	0 – stop 1 – start
Binary input 2 stop/start status	F017I022	1	4211	1,2	-	Read	0 – stop 1 – start
Binary input 3 stop/start status	F017I023	1	4212	1,2	-	Read	0 – stop 1 – start

Description	Name	Object	Point	Variation	Class	Access function	Values
Battery test status	F017I010	1	4213	1,2	-	Read	0 – not active 1 – active
Binary input 1 reset/activated	F017E000 F017E001	2	4203	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary input 2 reset/activated	F017E002 F017E003	2	4204	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary input 3 reset/activated	F017E004 F017E005	2	4205	2	1	Read/Unsolicited response	0 – reset 1 – activated
AC fail reset/activated	F017E006 F017E007	2	4206	2	1	Read/Unsolicited response	0 – reset 1 – activated
Overheat temperature reset/ activated	F017E008 F017E009	2	4207	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary output 1 reset/activated	F017E010 F017E011	2	4200	2	1	Read/Unsolicited response	0 – reset 1 – activated
Binary output 2 reset/activated	F017E012 F017E013	2	4201	2	1	Read/Unsolicited response	0 – OK 1 – fail
Binary output 3 reset/activated	F017E014 F017E015	2	4202	2	1	Read/Unsolicited response	0 – OK 1 – overheated
Binary input 1 stop/start	F017E016 F017E017	2	4210	2	1	Read/Unsolicited response	0 – good 1 – low
Binary input 2 stop/start	F017E018 F017E019	2	4211	2	1	Read/Unsolicited response	0 – off 1 – on
Binary input 3 stop/start	F017E020 F017E021	2	4212	2	1	Read/Unsolicited response	0 – stop 1 – start
Battery voltage good/low	F017E022 F017E023	2	4208	2	1	Read/Unsolicited response	0 – stop 1 – start
Heating status off/on	F017E024 F017E025	2	4209	2	1	Read/Unsolicited response	0 – stop 1 – start
Battery test	F001V011	10/12	4200	1,2/1	-	Read/Write/Select/ Operate/Direct operate	1 or trip – start test
Temperature updated	F017I007	30	4200	3	-	Read	-40...60 -40°C...+60°C
Battery voltage updated	F017II008	30	4201	3	-	Read	150...300 15.0Vdc...30.0Vdc
Temperature changed	F017E026	32	4200	1	2	Read/Unsolicited response	-40...60 -40°C...+60°C
Battery voltage changed	F017E027	32	4201	1	2	Read/Unsolicited response	180..330 18.0Vdc...33.0Vdc
Read/reset recorded minimum battery voltage	F017I011	40/41	4200	1	-	Read/Select/ Operate/ Direct operate	180...330 18.0Vdc...33.0Vdc

SWITCH groups

Description	Name	Object	Point	Variation	Class	Access function	Values
Actual checksum SWGRP1	F030S001	30	7100	3	-	Read	0...255
Actual checksum SWGRP2	F030S002	30	7101	3	-	Read	0...255
Actual checksum SWGRP3	F030S003	30	7102	3	-	Read	0...255
Actual checksum SWGRP4	F030S004	30	7103	3	-	Read	0...255
Actual checksum SWGRP5	F030S005	30	7104	3	-	Read	0...255
Actual checksum SWGRP6	F030S006	30	7105	3	-	Read	0...255
Actual checksum SWGRP7	F030S007	30	7106	3	-	Read	0...255
Actual checksum SWGRP8	F030S008	30	7107	3	-	Read	0...255
Actual checksum SWGRP9	F030S009	30	7108	3	-	Read	0...255
Actual checksum SWGRP10	F030S010	30	7109	3	-	Read	0...255
Actual checksum SWGRP11	F030S011	30	7110	3	-	Read	0...255

Description	Name	Object	Point	Variation	Class	Access function	Values
Actual checksum SWGRP12	F030S012	30	7111	3	-	Read	0...255
Actual checksum SWGRP13	F030S013	30	7112	3	-	Read	0...255
Actual checksum SWGRP14	F030S014	30	7113	3	-	Read	0...255
Actual checksum SWGRP15	F030S015	30	7114	3	-	Read	0...255
Actual checksum SWGRP16	F030S016	30	7115	3	-	Read	0...255
Actual checksum SWGRP17	F030S017	30	7116	3	-	Read	0...255
Actual checksum SWGRP18	F030S018	30	7117	3	-	Read	0...255
Actual checksum SWGRP19	F030S019	30	7118	3	-	Read	0...255
Actual checksum SWGRP20	F030S020	30	7119	3	-	Read	0...255
Group 1 checksum SWGRP1	F030S041	40/41	7100	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP2	F030S042	40/41	7101	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP3	F030S043	40/41	7102	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP4	F030S044	40/41	7103	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP5	F030S045	40/41	7104	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP6	F030S046	40/41	7105	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP7	F030S047	40/41	7106	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP8	F030S048	40/41	7107	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP9	F030S049	40/41	7108	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP10	F030S050	40/41	7109	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP11	F030S051	40/41	7110	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP12	F030S052	40/41	7111	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP13	F030S053	40/41	7112	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP14	F030S054	40/41	7113	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP15	F030S055	40/41	7114	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP16	F030S056	40/41	7115	1	-	Read/Select, Operate, Direct operate	0...255

Description	Name	Object	Point	Variation	Class	Access function	Values
Group 1 checksum SWGRP17	F030S057	40/41	7116	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP18	F030S058	40/41	7117	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP19	F030S059	40/41	7118	1	-	Read/Select, Operate, Direct operate	0...255
Group 1 checksum SWGRP20	F030S060	40/41	7119	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP1	F030S071	40/41	7120	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP2	F030S072	40/41	7121	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP3	F030S073	40/41	7122	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP4	F030S074	40/41	7123	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP5	F030S075	40/41	7124	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP6	F030S076	40/41	7125	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP7	F030S077	40/41	7126	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP8	F030S078	40/41	7127	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP9	F030S079	40/41	7128	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP10	F030S080	40/41	7129	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP11	F030S081	40/41	7130	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP12	F030S082	40/41	7131	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP13	F030S083	40/41	7132	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP14	F030S084	40/41	7133	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP15	F030S085	40/41	7134	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP16	F030S086	40/41	7135	1	-	Read/Select, Operate, Direct operate	0...255

Description	Name	Object	Point	Variation	Class	Access function	Values
Group 2 checksum SWGRP17	F030S087	40/41	7136	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP18	F030S088	40/41	7137	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP19	F030S089	40/41	7138	1	-	Read/Select, Operate, Direct operate	0...255
Group 2 checksum SWGRP20	F030S090	40/41	7139	1	-	Read/Select, Operate, Direct operate	0...255
Group selection for SWGRP1	F030V001	40/41	7140	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP2	F030V002	40/41	7141	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP3	F030V003	40/41	7142	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP4	F030V004	40/41	7143	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP5	F030V005	40/41	7144	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP6	F030V006	40/41	7145	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP7	F030V007	40/41	7146	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP8	F030V008	40/41	7147	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP9	F030V009	40/41	7148	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP10	F030V010	40/41	7149	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP11	F030V011	40/41	7150	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP12	F030V012	40/41	7151	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP13	F030V013	40/41	7152	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP14	F030V014	40/41	7153	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP15	F030V015	40/41	7154	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP16	F030V016	40/41	7155	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input

Description	Name	Object	Point	Variation	Class	Access function	Values
Group selection for SWGRP17	F030V017	40/41	7156	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP18	F030V018	40/41	7157	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP19	F030V019	40/41	7158	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input
Group selection for SWGRP20	F030V020	40/41	7159	1	-	Read/Select, Operate, Direct operate	0 = checksum1 1 = checksum2 2 = group input

REC-CH231 (LON events)

Description	Name	Object	Point	Variation	Class	Access function	Values
LON problem	F231E000	2	4300	2	1	Read/Unsolicited response	1 – LON problem

RECCH025 and RECCH026 (LON virtual inputs and outputs)

Description	Name	Object	Point	Variation	Class	Access function	Values
COMM IN1	F025I001	30/32	7000	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN2	F025I002	30/32	7001	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN3	F025I003	30/32	7002	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN4	F025I004	30/32	7003	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN5	F025I005	30/32	7004	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN6	F025I006	30/32	7005	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN7	F025I007	30/32	7006	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN8	F025I008	30/32	7007	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN9	F025I009	30/32	7008	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN10	F025I010	30/32	7009	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN11	F025I011	30/32	7010	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN12	F025I012	30/32	7011	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN13	F025I013	30/32	7012	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN14	F025I014	30/32	7013	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN15	F025I015	30/32	7014	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN16	F025I016	30/32	7015	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN17	F026I001	30/32	7016	3/1	-/2	Read/Read, Unsolicited response	0...65535

Description	Name	Object	Point	Variation	Class	Access function	Values
COMM IN18	F026I002	30/32	7017	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN19	F026I003	30/32	7018	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN20	F026I004	30/32	7019	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN21	F026I005	30/32	7020	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN22	F026I006	30/32	7021	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN23	F026I007	30/32	7022	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN24	F026I008	30/32	7023	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN25	F026I009	30/32	7024	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN26	F026I010	30/32	7015	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN27	F026I011	30/32	7026	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN28	F026I012	30/32	7027	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN29	F026I013	30/32	7028	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN30	F026I014	30/32	7029	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN31	F026I015	30/32	7030	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN32	F026I016	30/32	7031	3/1	-/2	Read/Read, Unsolicited response	0...65535
COMM IN33	F025I017	1/2	7032	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN34	F025I018	1/2	7033	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN35	F025I019	1/2	7034	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN36	F025I020	1/2	7035	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN37	F025I021	1/2	7036	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN38	F025I022	1/2	7037	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN39	F025I023	1/2	7038	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN40	F025I024	1/2	7039	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN41	F025I025	1/2	7040	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN42	F025I026	1/2	7041	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN43	F025I027	1/2	7042	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN44	F025I028	1/2	7043	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN45	F025I029	1/2	7044	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN46	F025I030	1/2	7045	1,2/1	-/1	Read/Read, Unsolicited response	0...1

Description	Name	Object	Point	Variation	Class	Access function	Values
COMM IN47	F025I031	1/2	7046	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN48	F025I032	1/2	7047	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN49	F026I017	1/2	7048	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN50	F026I018	1/2	7049	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN51	F026I019	1/2	7050	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN52	F026I020	1/2	7051	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN53	F026I021	1/2	7052	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN54	F026I022	1/2	7053	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN55	F026I023	1/2	7054	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN56	F026I024	1/2	7055	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN57	F026I025	1/2	7056	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN58	F026I026	1/2	7057	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN59	F026I027	1/2	7058	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN60	F026I028	1/2	7059	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN61	F026I029	1/2	7060	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN62	F026I030	1/2	7061	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN63	F026I031	1/2	7062	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM IN64	F026I032	1/2	7063	1,2/1	-/1	Read/Read, Unsolicited response	0...1
COMM OUT1	F025O001	40/41	7000	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT2	F025O002	40/41	7001	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT3	F025O003	40/41	7002	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT4	F025O004	40/41	7003	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT5	F025O005	40/41	7004	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT6	F025O006	40/41	7005	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT7	F025O007	40/41	7006	1	-	Read/Select, Operate, Direct operate	0...65535

Description	Name	Object	Point	Variation	Class	Access function	Values
COMM OUT8	F025O008	40/41	7007	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT9	F025O009	40/41	7008	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT10	F025O010	40/41	7009	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT11	F025O011	40/41	7010	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT12	F025O012	40/41	7011	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT13	F025O013	40/41	7012	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT14	F025O014	40/41	7013	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT15	F025O015	40/41	7014	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT16	F025O016	40/41	7015	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT17	F026O001	40/41	7016	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT18	F026O002	40/41	7017	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT19	F026O003	40/41	7018	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT20	F026O004	40/41	7019	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT21	F026O005	40/41	7020	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT22	F026O006	40/41	7021	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT23	F026O007	40/41	7022	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT24	F026O008	40/41	7023	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT25	F026O009	40/41	7024	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT26	F026O010	40/41	7025	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT27	F026O011	40/41	7026	1	-	Read/Select, Operate, Direct operate	0...65535

Description	Name	Object	Point	Variation	Class	Access function	Values
COMM OUT28	F026O012	40/41	7027	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT29	F026O013	40/41	7028	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT30	F026O014	40/41	7029	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT31	F026O015	40/41	7030	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT32	F026O016	40/41	7031	1	-	Read/Select, Operate, Direct operate	0...65535
COMM OUT33	F025O017	10/12	7032	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT34	F025O018	10/12	7033	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT35	F025O019	10/12	7034	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT36	F025O020	10/12	7035	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT37	F025O021	10/12	7036	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT38	F025O022	10/12	7037	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT39	F025O023	10/12	7038	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT40	F025O024	10/12	7039	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT41	F025O025	10/12	7040	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT42	F025O026	10/12	7041	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT43	F025O027	10/12	7042	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT44	F025O028	10/12	7043	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT45	F025O029	10/12	7044	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT46	F025O030	10/12	7045	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT47	F025O031	10/12	7046	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip

Description	Name	Object	Point	Variation	Class	Access function	Values
COMM OUT48	F025O032	10/12	7047	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT49	F026O017	10/12	7048	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT50	F026O018	10/12	7049	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT51	F026O019	10/12	7050	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT52	F026O020	10/12	7051	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT53	F026O021	10/12	7052	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT54	F026O022	10/12	7053	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT55	F026O023	10/12	7054	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT56	F026O024	10/12	7055	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT57	F026O025	10/12	7056	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT58	F026O026	10/12	7057	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT59	F026O027	10/12	7058	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT60	F026O028	10/12	7059	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT61	F026O029	10/12	7060	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT62	F026O030	10/12	7061	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT63	F026O031	10/12	7062	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip
COMM OUT64	F026O032	10/12	7063	1,2/1	-	Read, Write/Select, Operate, Direct operate	0...1 / Close...Trip

Link handler

Description	Name	Object	Point	Variation	Class	Access function	Values
Remote protocol CTS usage	F500V217	10/12	4000	1,2/1	-	Read/Write/Select/ Operate/Direct operate	0 – not used 1 – in use

Description	Name	Object	Point	Variation	Class	Access function	Values
Remote protocol RTS usage	F500V218	10/12	4001	1,2/1	-	Read/Write/Select/ Operate/Direct operate	0 – not used 1 – in use
Remote protocol connection mode	F500V220	10/12	4002	1,2/1	-	Read/Write/Select/ Operate/Direct operate	0 – fixed line 1 – dial up
Remote protocol baud rate	F500V211	40/41	4000	1	-	Read/Write/Select/ Operate/Direct operate	300/600/1200/4800/9600/ 19200/38400 bps
Remote protocol stop bits	F500V212	40/41	4001	1	-	Read/Write/Select/ Operate/Direct operate	0...2
Remote protocol CTS delay	F500V213	40/41	4002	1	-	Read/Write/Select/ Operate/Direct operate	0...10000 0ms...10000ms
Remote protocol RTS delay	F500V214	40/41	4003	1	-	Read/Write/Select/ Operate/Direct operate	0...10000 0ms...10000ms
Remote protocol next character timeout	F500V215	40/41	4004	1	-	Read/Write/Select/ Operate/Direct operate	0...10000 0 – not in use 1ms...10000ms
Remote protocol end of frame timeout	F500V216	40/41	4005	1	-	Read/Write/Select/ Operate/Direct operate	1...10000 1ms...10000ms
Remote protocol parity	F500V230	40/41	4006	1	-	Read/Select, Operate, Direct operate	0...2 0 – no parity 1 – odd parity 2 – even parity
Remote protocol data bits	F500V231	40/41	4007	1	-	Read/Select, Operate, Direct operate	5...8
Remote protocol modem initialization string	F500V221	150	4000	1	-	Read, Write	75 characters
Remote protocol modem primary dialling string	F500V222	150	4001	1	-	Read, Write	20 characters
Remote protocol modem hang up string	F500V223	150	4002	1	-	Read, Write	20 characters
Remote protocol modem 1st spare dialling string	F500V224	150	4003	1	-	Read, Write	20 characters
Remote protocol modem 2nd spare dialling string	F500V225	150	4004	1	-	Read, Write	20 characters
Remote protocol modem 3rd spare dialling string	F500V226	150	4005	1	-	Read, Write	20 characters
Remote protocol modem 4th spare dialling string	F500V227	150	4006	1	-	Read, Write	20 characters
Remote protocol modem emergency dialling string	F500V228	150	4007	1	-	Read, Write	20 characters
PIN code string	F500V229	150	4008	1	-	Read, Write	40 characters

DNP protocol

Description	Name	Object	Point	Variation	Class	Access function	Values
Stay silent	SILENTFL	10/12	4100	1, 2 / 1	-	Read, Write/ Select, Operate, Direct operate	0 or close – normal operation* 1 or trip – stay silent
Station address	F503V001	40/41	4100	1	-	Read, Write/ Select, Operate, Direct operate	0...65534

Description	Name	Object	Point	Variation	Class	Access function	Values
Designated master address	F503V002	40/41	4101	1	-	Read, Write/ Select, Operate, Direct operate	0...65534
Data link layer response timeout	F503V003	40/41	4102	1	-	Read, Write/ Select, Operate, Direct operate	0...65535 0ms...65535ms
Data link layer retry count	F503V004	40/41	4103	1	-	Read, Write/ Select, Operate, Direct operate	0...65535
Data link layer transmitter timeout	F503V005	40/41	4104	1	-	Read, Write/ Select, Operate, Direct operate	0...65535 0ms...65535ms
Application layer response timeout	F503V006	40/41	4105	1	-	Read, Write/ Select, Operate, Direct operate	0...65535 0ms...65535ms
Application layer retry count	F503V007	40/41	4106	1	-	Read, Write/ Select, Operate, Direct operate	0...65535
DNP confirmation type selector	F503V009	40/41	4108	1	-	Read, Write/ Select, Operate, Direct operate	0...5 0 – no data link layer ACK, no application layer confirmation 1 – data link layer ACK, no application layer confirmation 2 – no data link layer ACK, unsolicited responses confirmation 3 – data link layer ACK, unsolicited responses confirmation 4 – no data link layer ACK, all responses confirmation 5 – data link layer ACK, all responses confirmation
Channel idle watchdog	F503V008	40/41	4107	1	-	Read, Write/ Select, Operate, Direct operate	0...65535 0s...65535s

Time synchronization

Description	Name	Object	Point	Variation	Class	Access function	Values
Device time	DEVCLK	50	0	1	-	Read/Write	ms since 1970-01-01 00:00:00.000

Internal indications

Description	Name	Object	Point	Variation	Class	Access function	Values
All stations message received	INTINDIC	80	0	1	-	Write	1 – received
Class 1 data available	INTINDIC	80	1	1	-	Write	1 - available
Class 2 data available	INTINDIC	80	2	1	-	Write	1 – available
Class 3 data available	INTINDIC	80	3	1	-	Write	1 – available
Time sync. Required	INTINDIC	80	4	1	-	Write	1 - required
Outputs in local state	INTINDIC	80	5	1	-	Write	1 – local state
Device trouble	INTINDIC	80	6	1	-	Write	1 – device trouble
Device restart	INTINDIC	80	7	1	-	Write	1 – device restarted
Function not implemented	INTINDIC	80	8	1	-	Write	1 – function not implemented

Description	Name	Object	Point	Variation	Class	Access function	Values
Object unknown	INTINDIC	80	9	1	-	Write	1 – object unknown
Format error	INTINDIC	80	10	1	-	Write	1 – format error
Buffer overflow	INTINDIC	80	11	1	-	Write	1 – buffer overflow
Operation in progress	INTINDIC	80	12	1	-	Write	1 – operation in progress
Invalid configuration	INTINDIC	80	13	1	-	Write	1 – invalid configuration
Reserved for future use	INTINDIC	80	14	1	-	Write	0
Reserved for future use	INTINDIC	80	15	1	-	Write	0

Internal indications cannot be read directly. The current state of the internal indications field is returned in every application layer response (function code 129 or 130) as a part of the response header and follows function code field (see chapter 1.5.4.2 “*Application response format*”). Although every bit of internal indications can be written it is not recommended to clear other bits than *Device restart*, because important information about the current status of the device can be lost.

Application

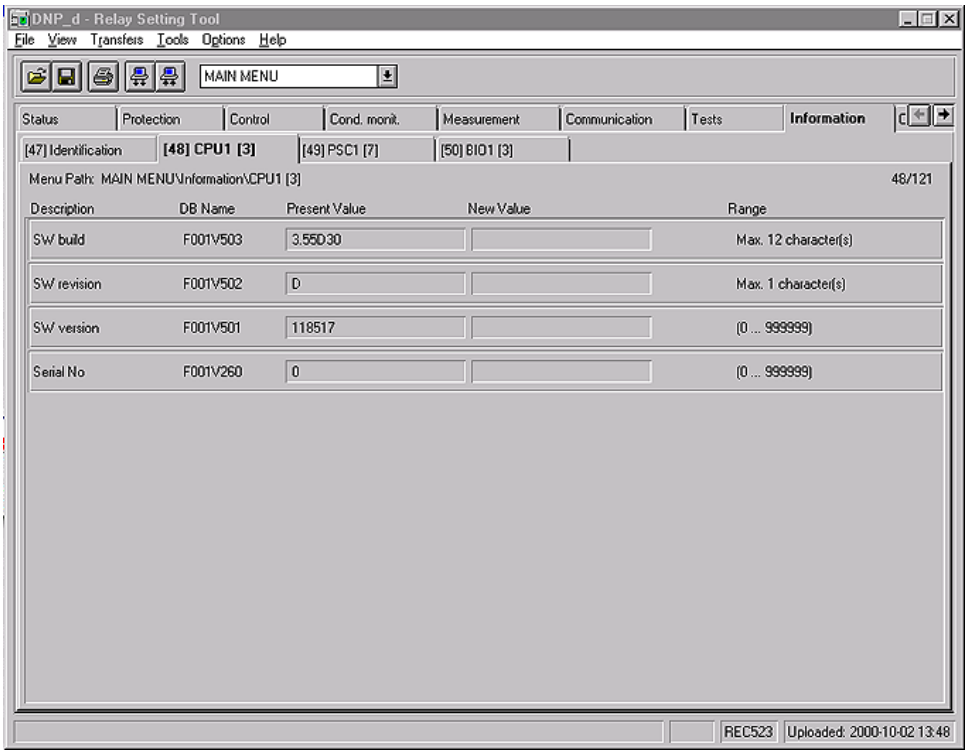
Description	Name	Object	Point	Variation	Class	Access function	Values
Application	APPLICAT	90	0	1	-	Start/Stop application	-

Transparent SPA

Description	Name	Object	Point	Variation	Class	Access function	Values
Transparent SPA message	LONSPAIN	151[a]	0	1	-	Read/Write	SPA message, for example, “>1RF:<CR>”

a. Note that object 151 is an extension to the protocol and the use of this type can be limited by the capabilities of the master station.

3.3. Protocol software version



SWvers

Fig. 3.3.-1 Software version

Name	Description of coding scheme
Software build	System software version (for example 3.00) followed by a letter indicating the remote protocol included (D – for DNP protocol) and remote protocol version (for example 20 for the initial version 2.0)
Software revision	Revision letter (for example “C”)
Software version	The number of the CPU card delivered with the DNP 3.0 protocol
CPU card number	Serial number of the CPU card

3.4. Interface configuration

This section describes the communication parameters required to configure REC 523 to communicate using the DNP 3.00 protocol over a given link.

These parameters can be uploaded, reviewed and modified using the Relay Setting Tool from the CAP 501/505 package by choosing the Communication library and the General, Link Handler or DNP pages.

3.4.1. Communication start-up procedure

Before the start-up of the DNP 3.0 based communication with REC 523, the link and protocol parameters should be verified using the Relay Setting Tool from the CAP 501/505 package. To properly configure the interface of REC 523, it is necessary to know the setup of the master station and the characteristics of the utilized communication channel. At the end of the configuration process the tool should enforce storing of updated parameters in the non-volatile memory, after which the

REC 523 unit must be reset to activate the new parameters. In some cases it may also be required to modify the application mapping in the POD table using a Protocol Editing Tool.

3.4.2. Port assignment

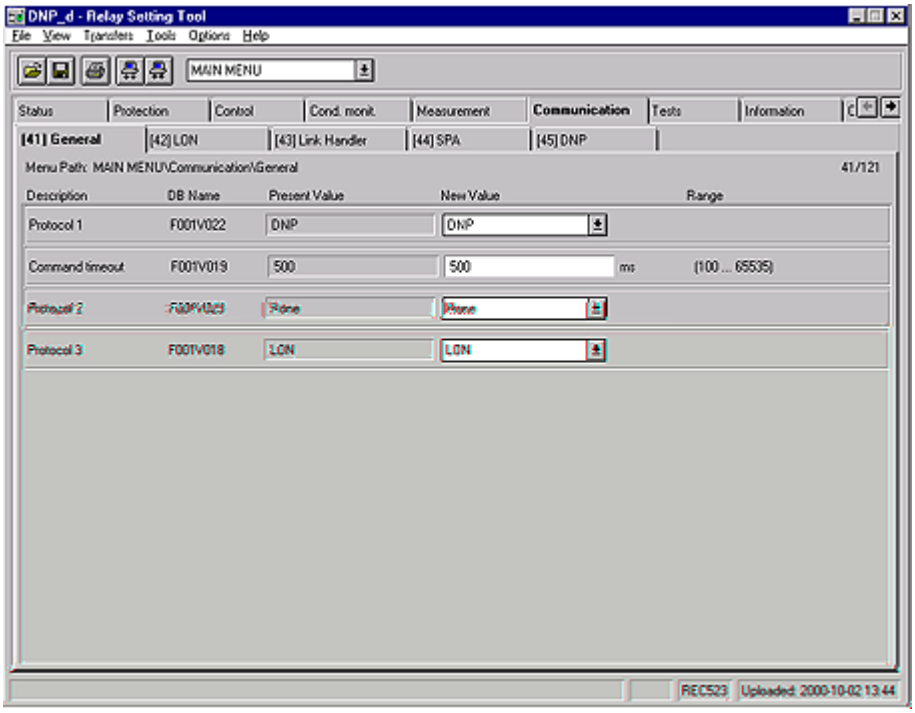
There are three communication ports in REC 523: two RS 232 and one RS 485. DNP 3.0 protocol can be assigned to each one of them (but only one at a time). The port assignment to the protocol can be done by choosing the Communication library and the General pages in the Relay Setting Tool. Default values for the REC 523 ports are as follows:

Port X5.1: DNP 3.0

Port X5.2: None

Port X5.3: LON.

In Relay Setting Tool, the parameter “Protocol1” refers to the REC 523 port X5.1, “Protocol2” to the port X5.2 and “Protocol3” to the port X5.3.



General

Fig. 3.4.2.-1 General pages

Note that the port assignments for protocols are revision dependent. This product supports only following protocols: DNP 3.0, SPA and LON. Refer to Technical Reference Manual for revision history.

3.4.3. Link parameters

The link parameters of REC 523 can be accessed by choosing the Communication library and the Link Handler pages in the Relay Setting Tool.

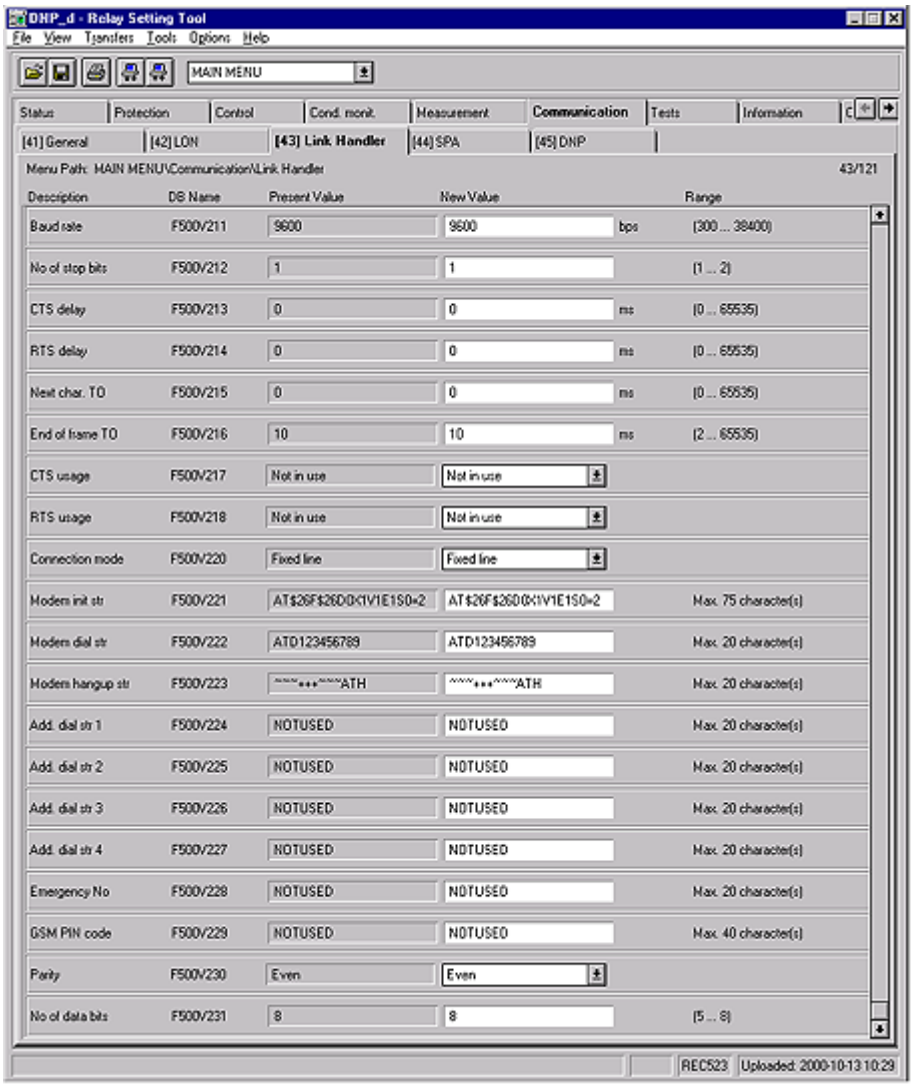
Group description	Object name	Description	Notes
Transmission settings	F500V220	Connection mode 0 – fixed line 1 – dial-up	0 - in case of fixed line or leased line connection (with preconfigured modems) 1 – in case of dial-up connection (modem controlled by REC 523)
	F500V211	Communication speed (in bps) Baud rate	The same as configured in the master station (fixed line) or in the modem (dial-up).
	F500V212	Number of stop bits	The same as configured in the master station (fixed line) or in the modem (dial-up).
	F500V230	Parity 0 – no parity 1 – odd parity 2 – even parity (standard)	The same as configured in the master station (normally even parity, but with some modems no parity may be used).
	F500V231	Number of data bits	8 is a default value for the DNP protocol as defined by the protocol
Timeout settings (frame transmission delays)	F500V215	Next character timeout (in ms): maximum allowed time gap between received characters of the same frame; 0 – not in use.	Not in use in the DNP protocol.
	F500V216	End of frame timeout (in ms): minimum idle time following the frame transmission to REC 523	Must be tuned according to the link characteristics, recommended minimum: longer than the character transmission time.
Handshaking settings (connection to DCE)	F500V217	CTS usage 0 – not used 1 – in use	In use if required by the DCE (modem in half duplex mode) and supported by the connection cable.
	F500V218	RTS usage 0 – not used 1 – in use	In use if required by the DCE (modem in half duplex mode) and supported by the connection cable.
	F500V213	CTS delay value (in ms)	In REC 523 controlled by hardware, set to 0.
	F500V214	RTS delay value (in ms)	In REC 523 controlled by hardware, set to 0.

Group description	Object name	Description	Notes
Modem settings (only to be used in dial-up connection mode)	F500V221	Modem initialization string (max. 75 characters)	According to the modem type (refer to the modem manual).
	F500V222	Modem dialling string (max. 20 characters) **Note:** This parameter will be used only if REC 523 is permitted to activate the dial-up connection with the master station (unsolicited reporting of events will be allowed).	According to the modem type (refer to the modem manual).
	F500V223	Modem hang-up string (max. 20 characters) **Note:** This parameter will be used in case of enforced interface restart or unknown modem state.	According to the modem type (refer to the modem manual).
	F500V224	1st spare modem dialling string (max. 20 characters) **Note:** This parameter will be used only if REC 523 is permitted to activate the dial-up connection with the master station (unsolicited reporting of events will be allowed). Add dial str 1	According to the modem type (refer to the modem manual). Set to “NOTUSED” if not in use.
	F500V225	2nd spare modem dialling string (max. 20 characters) **Note:** This parameter will be used only if REC 523 is permitted to activate the dial-up connection with the master station (unsolicited reporting of events will be allowed). Add dial str 2	According to the modem type (refer to the modem manual). Set to “NOTUSED” if not in use.
	F500V226	3rd spare modem dialling string (max. 20 characters) **Note:** This parameter will be used only if REC 523 is permitted to activate the dial-up connection with the master station (unsolicited reporting of events will be allowed). Add dial str 3	According to the modem type (refer to the modem manual). Set to “NOTUSED” if not in use.

Group description	Object name	Description	Notes
	F500V227	4th spare modem dialling string (max. 20 characters) **Note:** This parameter will be used only if REC 523 is permitted to activate the dial-up connection with the master station (unsolicited reporting of events will be allowed). Add dial str 4	According to the modem type (refer to the modem manual). Set to “NOTUSED” if not in use.
	F500V228	Emergency dialling string (max. 20 characters) **Note:** This parameter will be used only if REC 523 is permitted to activate the dial-up connection with the master station (unsolicited reporting of events will be allowed).	According to the modem type (refer to the modem manual). Set to “NOTUSED” if not in use.
	F500V229	PIN code string (max. 40 characters) **Note:** This parameter is used only with GSM modems.	According to the modem type (refer to the modem manual). Set to “NOTUSED” if not in use.

According to the specification of the protocol, the following transmission parameters are required (when using fixed line connection):

- 8 data bits
- Parity odd, even or none
- 1 or 2 stop bits
- Next character timeout - not active
- End of frame timeout 10 ms
- Baud rate in the range supported by the REC 523 link handler



LinkHandler

Fig. 3.4.3.-1 LinkHandler

3.4.4. Protocol parameters

The DNP 3.0 protocol parameters can be accessed by choosing the communication library and the DNP page in the Relay Setting Tool.

For a consistent setup, the protocol parameters can be analysed in two groups:

- Address parameters
- Timeout and delay parameters

Group description	Object name	Description	Notes
Address parameters	F503V001	Station address 0...65534 Unit Address	The same as configured in the master station. Address of the REC 523 unit in the DNP network
	F503V002	Master station address (destination address for unsolicited responses) 0...65534 Master Address	The same as configured in the master station. Address of the REC 523 unit in the DNP network
Timeout and delay parameters	F503V003	Data link layer primary timeout Link TO	Must be greater than time needed to process the data link frame in the master station and transmit acknowledgment. This timeout is activated whenever REC 523 is acting as a primary station and sending LPDU using confirmed service. Value in milliseconds.
	F503V004	Number of retries of the data link layer when the unit is acting as a primary station Link retrans. No	Irrelevant if unconfirmed data link layer service is used, otherwise must be set to value greater than 0. Number of retries of the data link layer when the unit is acting as a primary station
	F503V005	Line idle timeout (used to avoid collision of frames) Transmit idle No	Can be set to 0 when unsolicited reporting of events is not used and the link is not multidrop. For other cases see next section. Minimum delay (in milliseconds) after frame receipt or sending before a data link layer frame can be transmitted. This timeout is activated whenever REC 523 is sending or receiving data. Before the end of this timeout, the station will not send any data link layer frames to the link handler. Value in milliseconds.
	F503V006	Application layer confirmation timeout Apl TO	Must be greater than time needed to transmit the whole application layer frame, process it in the master station and transmit confirmation. This timeout is activated whenever REC 523 is acting as a primary station and sending APDU with confirmation bit set. Value in milliseconds.

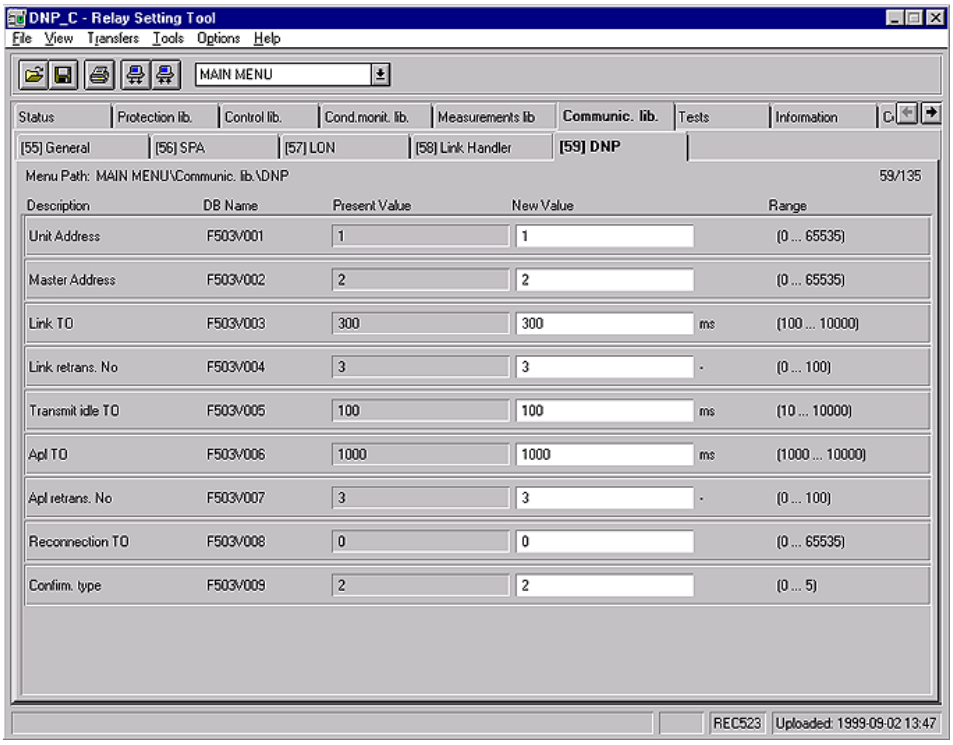
	F503V007	Number of retries of the application layer when CON bit is set. Apl. retrans. No	Irrelevant if CON bit is not used, otherwise must be set to value greater than 0 Number of retries of the application layer when CON bit is set.
	F503V009	Type of confirmation supported: 0...5 Confirm type	Depends on quality of the used link. See next section Type of confirmation supported: 0: data link conf:0 application conf: 0 1: data link conf:1 application conf: 0 2: data link conf:0 application conf: 1 3: data link conf:1 application conf: 1 4: data link conf:0 application conf: 2 5: data link conf:1 application conf: 2 See table below.
	F503V008	Channel idle timeout (in seconds). Reconnection TO	Set according to the expected master station request send interval. In the dial-up environment: After this time of channel inactivity connection will be closed by REC 523. Parameter unit is 1s. When set to 0 – not in use.

Confirmation setup (explanation to the parameter F503V009):

Type of confirmation	**Min.**	**Max.**	**Description**
Data link layer user data confirmation	0	1	If the value is 1 then confirmation on the data link layer is enabled. This means that *User Data With Confirm* and *ACK* will be used for all user data transmissions to the host. Otherwise, *Unconfirmed User Data* frames will be used.
Application layer confirmation	0	2	If the value is 2 then confirmation for all outgoing data on the application layer is enabled. This means that CON bit will be set in the application control byte for all response headers sent by REC 523. The value 1 enables confirmations only for unsolicited responses. The value 0 disables application layer confirmation.

Note: Event mask 1 in the function block parameters should be used to select events for being reported via DNP protocol.

- This item is handled internally by the protocol and is not accessible via SPA. The given name is used only in POD configuration.



RST_DNP

Fig. 3.4.4.-1 Relay Setting Tool with DNP 3.0 parameters

3.4.4.1. Recommendations for parameter tuning due to specific medium or link characteristics

Fixed line (RS-232) 1 to 1 connection:

There is no risk of frame collisions on the link. Unsolicited responses from REC 523 can be enabled and the data link layer transmit after receive timeout can be set to 0. Depending on the link reliability and capabilities of the master station, different data transfer security levels can be chosen:

- Minimum security – when connection can be trusted 100% - no data link layer acknowledgements and no application layer confirmations (confirmation type selector set to 0)
- Maximum security on the data link layer – when the master station does not support application layer confirmations - data link layer acknowledgements but no application layer acknowledgements (confirmation type selector set to 1)
- Average security on application layer – when the master station supports application layer confirmations – no data link layer acknowledgements, and application layer confirmations used only for unsolicited responses (confirmation type selector set to 2). This situation is optimum from the link load point of view (all messages containing process data will be protected: when an unsolicited response has been lost there will be no confirmation, when a response to the master station request has been lost, the master station will repeat the request).
- Full security on the application layer – when the master station supports application layer confirmations, but does not support request retransmissions – no

data link layer acknowledgements, and application layer confirmations used for all responses (confirmation type selector set to 4)

- Full security on both layers - when the master station supports application layer confirmations and the connection is of very poor quality - data link layer acknowledgements and application layer confirmations used for all responses (confirmation type selector set to 5)

  Note: If confirmations or acknowledgements are used, the number of retransmissions on the link layer or on the application layer must be set to a value greater than 0 (otherwise, the configuration will be the same as with the confirmation type selector 0)

Fixed line bus topology:

Many RTUs can be connected to one (or more) master stations. Collisions on the link are possible. To limit the risk of collisions caused by simultaneous responses from different REC 523 units, the “data link layer transmit after receive timeout” parameter can be used to assign time slots for every REC 523 unit. The most privileged unit can have this timeout set to 0 ms and each next unit to a multiple of the time needed to transmit a link layer frame of maximum size. For example, if we have one master station connected to three REC 523 units at a speed of 9600 bps, then we should assign a 0 ms timeout to the first REC 523 unit (the most privileged), 300 ms timeout to the second and 600 ms to the third (the least privileged). 300 ms is the time needed to transmit the biggest possible link layer frame (292 bytes) at 9600 bps.

This approach can only be applied when it is possible to set this timeout in all secondary (controlled) stations. Otherwise, acknowledgements or confirmations have to be relied on (the best solution for this case is to use the confirmation type selector 2 because of the minimal use of the link throughput).

Dial-up connection – requesting connection to master station not allowed:

Only the master station can initiate the connection (dial the number). Unsolicited reporting should be switched off (by setting the unsolicited reporting flag for all events to 0 in the POD). There is no risk of frame collisions on the link.

If the master station supports request retransmissions, the confirmation type selector can be set to 0. Otherwise, data link layer acknowledgements (confirmation type selector 1) or application confirmations (confirmation type selector 4) have to be used.

Dial-up connection – requesting connection to master station allowed:

Unsolicited reporting can be switched on. REC 523 will try to connect again in random intervals after an unsuccessful attempt. There is no risk of frame collisions on the link. If the master station supports request retransmissions, the confirmation type selector can be set to 0. Otherwise, data link layer acknowledgements (confirmation type selector 1) or application confirmations (confirmation type selector 4) have to be used.

Dial-up connection with backup master station – requesting connection to master station allowed:

Unsolicited reporting can be switched on. REC 523 will try to connect again in random intervals after an unsuccessful attempt. To connect to the backup master station 1st spare dialling string should be used. There is no risk of frame collisions on the link. If the master station supports request retransmissions, the confirmation type selector can be set to 0. Otherwise, data link layer acknowledgements (confirmation type selector 1) or application confirmations (confirmation type selector 4) have to be used.

Note:

- For communication over leased line, REC 523 should be configured as in the fixed line connection mode. The utilized modem must be set up from the terminal program. For this kind of communication, the end of frame timeout should be set according to the channel characteristics.
- For communication in the dial-up connection mode, the utilized modem is configured by REC 523. The modem initialization string must not include any command that establishes connection with the remote modem. Only the dialling string shall be used for this purpose.
- The longest processing time (approx. 440 ms) is required to build a response to the request for data of all classes. The application layer timeout set on the DNP master end must take into account this maximum latency and the required transmission time for both request and response.
- Emergency dialling string can be used to indicate that REC 523 could not connect to the master station. In this string telephone number of the operator GSM phone should be included. Caller identification feature should be supported in the network to make it usable.
- If GSM modem is used and it requires PIN code after start-up then PIN code string should be used for this purpose. Modem initialization string should not include any command that send PIN code to the modem.
- If modem signals are to be used only port X5.1 can be used
- RS485 can be used only in balanced mode (event reporting should be disabled). To make possible communication via this port RTS signal must be used

3.4.4.2. Application mapping review

In most of the system configurations the application mapping defined by the default POD should be acceptable. However, there might occur some cases when the modification of the visible POD table is necessary:

- When a different addressing concept is used in the system because of the master station’s requirements or limitations in the protocol data addressing (re-addressing of mapped application objects)
- To eliminate obsolete data and events from active function blocks (data items not required or not processed by the master station)

The visible POD table can be uploaded, reviewed and modified using a Protocol Editing Tool. The most common operations are:

- Removing selected data items from the mapping – this can be done by setting the “in use” flag (column 10) to 0

- Disabling spontaneous reporting for selected events – this can be done by setting the “unsolicited reporting flag” (column 9) to 0
- Removing the assignment of selected static data items to class 0 – this can be done by setting the “class” value (column 6) to 4

In the default POD the mapped function blocks occupy the assigned ranges of addresses (DNP point numbers). Therefore, for a downloaded application the overall addressing of data will not be continuous. Some master stations, however, may accept only a continuous address map. In this case the addresses of data items will have to be changed. When doing this, a certain rule must be obeyed. For further information about the rule, please refer to the rule 3 in chapter “Point numbering overall rules” on page 23.

A detailed description of the contents of visible POD and examples of mapping are given in section “Defining the POD contents” on page 41.

After changing the contents of the visible POD, the table can be downloaded to REC 523 and the tool will enforce the storing of data in the non-volatile memory followed by the device reset. In this way the updated table will be used to generate the operational POD.

3.4.4.3. DNP/LON gateway function

It is possible to use REC 523 as DNP/LON gateway. There are 32 analogue inputs, 32 analogue outputs, 32 binary inputs and 32 binary outputs (from DNP point of view) that represent LON network variables. Change of any input network variable (seen from DNP side as an analogue or binary input) will be reported as a change event on DNP side. Setting a new value of binary output or analogue output will result in sending an appropriate output network variable update message on LON side.

DNP/LON gateway function can be used in two ways:

- Directly - by using LON network variables as data points (data from channels 25 and 26)
- As remote I/O - by connecting LON network variables to inputs and outputs of function blocks in the application.

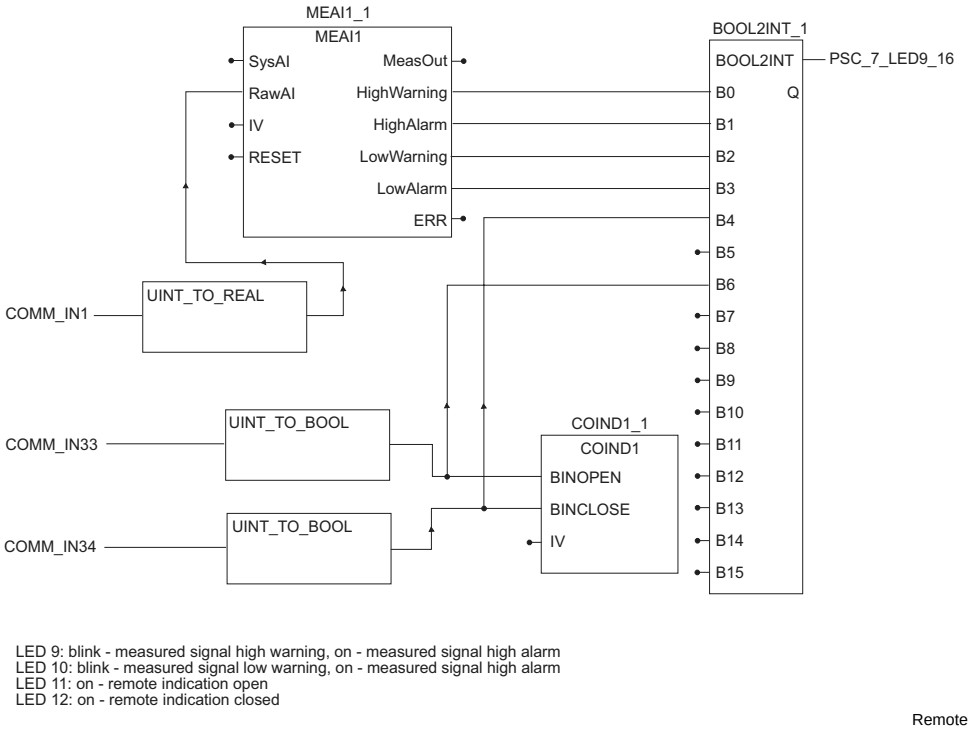


Fig. 3.4.4.3.-1 Example of using remote I/O.

Note: LON interface must be properly configured to use DNP/LON gateway function.

4. Appendix A: Profile checklist

<table>
<tr><td colspan="3">DNP V3.00

DEVICE PROFILE DOCUMENT</td></tr>
<tr><td colspan="3">Vendor Name: ABB Oy Distribution Automation
Device Name: REC 523 rev. E</td></tr>
<tr><td></td><td>Highest DNP Level Supported:

For Requests: L2
For Responses: L2</td><td>Device Function:
☒ Slave</td></tr>
<tr><td colspan="3">Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table):
Additions to level 2 are marked as shaded in the implementation table</td></tr>
<tr><td></td><td>Maximum Data Link Frame Size (octets):

Transmitted 292
Received (must be 292)</td><td>Maximum Application Fragment Size (octets):

Transmitted 2048
Received 2048</td></tr>
<tr><td></td><td>Maximum Data Link Re-tries:

Configurable, range from 0 to 255 with primary data link layer retransmission count</td><td>Maximum Application Layer Re-tries:

Configurable, range from 0 to 255 with application layer retransmission count</td></tr>
<tr><td colspan="3">Requires Data Link Layer Confirmation:
Configurable, with confirmation type selector, default NO ACK</td></tr>
<tr><td colspan="3">Requires Application Layer Confirmation:
☒ Configurable with confirmation type selector when reporting Event Data (Slave devices only)
☒ Always after response to reset request
☐ Always when sending multi-fragment responses (Slave devices only)
☒ Configurable, with confirmation type selector</td></tr>
<tr><td colspan="3">Timeouts while waiting for:</td></tr>
<tr><td>Data Link Confirm</td><td colspan="2">Configurable with primary data link layer timeout, not relevant when no ACK</td></tr>
<tr><td>Complete Appl. Fragment</td><td colspan="2">No, multi-fragment application frames not supported</td></tr>
<tr><td>Application Confirm</td><td colspan="2">Configurable with application layer timeout</td></tr>
<tr><td>Complete Appl. Response</td><td colspan="2">No, not relevant in slave</td></tr>
</table>

Sends/Executes Control Operations:	
WRITE Binary Outputs	☒ Only for software points
SELECT/OPERATE	☒ Always
DIRECT OPERATE	☒ Always
DIRECT OPERATE - NO ACK	☒ Always
Count	Always 1
Code	1, 2 or 3
Trip/Close	1,2 according direction
Pulse On	Ignored
Queue	Always 0
Clear Queue	0 or 1

FILL OUT THE FOLLOWING ITEMS FOR SLAVE DEVICES ONLY:

	Reports Binary Input Change Events when no specific variation requested: ☐ Never ☒ Only time-tagged ☐ Only non-time-tagged ☐ Configurable to send both, one or the other (attach explanation)	Reports time-tagged Binary Input Change Events when no specific variation requested: ☐ Never ☒ Binary Input Change With Time ☐ Binary Input Change With Relative Time ☐ Configurable, depends of objects basic variation. (variation used at initialisation)
	Sends Unsolicited Responses: ☐ Never ☒ Configurable, by UR flag in POD ☐ Only certain objects ☐ Sometimes (attach explanation) ☒ ENABLE/DISABLE UNSOLICITED Function codes supported	Sends Static Data in Unsolicited Responses: ☒ Never ☐ When Device Restarts ☐ When Status Flags Change No other options are permitted.
	Default Counter Object/Variation: ☐ No Counters Reported ☐ Configurable, default object and variation ☒ Default Object 20 ☐ Default Variation 5 ☐ Point-by-point list attached	Counters Roll Over at: ☐ No Counters Reported ☐ Configurable (attach explanation) ☐ 16 Bits ☒ 32 Bits, but roll-over bits not used ☐ Other Value _____ ☐ Point-by-point list attached
Sends Multi-Fragment Responses: ☐ Yes ☒ No		

Supported function codes

Code	Function	Description	Supported
Transfer function codes			
0	Confirm	Message fragment confirmation No response	Yes
1	Read	Request objects from outstation Respond with requested objects	Yes
2	Write	Store specified objects to outstation Respond with status of operation	Yes
Control function codes			
3	Select	Select output point of outstation Respond with status of control point	Yes
4	Operate	Set output that has previously selected Respond with status of control point	Yes
5	Direct operate	Set output directly Respond with status of control point	Yes
6	Direct operate - no ack	Set output directly No response	Yes
Freeze function codes			
7	Immediate Freeze	Copy specified objects to freeze buffer Respond with status of operation	No
8	Immediate Freeze -no ack	Copy specified objects to freeze buffer No response	No
9	Freeze and Clear	Copy specified objects to freeze buffer and clear objects Respond with status of operation	No
10	Freeze and Clear -no ack	Copy specified objects to freeze buffer and clear objects No response	No
11	Freeze with time	Copy specified objects to freeze buffer at specified time Respond with status of operation	No
12	Freeze with time -no ack	Copy specified objects to freeze buffer at specified time No response	No
Application control function codes			
13	Cold Restart	Perform desired reset sequence Respond with a time object	Yes
14	Warm Restart	Perform desired partial reset operation Respond with a time object	Yes
15	Initialise Data to Defaults	Initialise the specified data to default Respond with status of operation	No
16	Initialise Application	Ready the specified application to run Respond with status of operation	No
17	Start Application	Start the specified application to run Respond with status of operation	Yes
18	Stop Application	Stop the specified application to run Respond with status of operation	Yes
Configuration function codes			
19	Save configuration	Save configuration Respond with status of operation	No

Code	Function	Description	Supported
20	Enable Unsolicited Messages	Enable Unsolicited Messages Respond with status of operation	Yes
21	Disable Unsolicited Messages	Disable Unsolicited Messages Respond with status of operation	Yes
22	Assign Class	Assign specified objects to a class Respond with status of operation	Yes
Time synchronisation function codes			
23	Delay Measurement	Perform propagation delay measurement	Yes
Response function codes			
0	Confirm	Message fragment confirmation	Yes
129	Response	Response to request message	Yes
130	Unsolicited Message	Spontaneous message without request	Yes

Supported objects:

Object			Request (slave must parse)		Response (master must parse)	
Obj	**Var**	**Description**	**Func. codes (dec)**	**Qual. codes (hex)**	**Func. codes (dec)**	**Qual. codes (hex)**
1	0	Binary Input - All Variations	1	06	129	27
1	1	Binary Input	1	all except 0B and 06	129	same as in request
1	2	Binary Input with Status	1	all except 0B	129	27 when all points were requested otherwise same as in request
2	0	Binary Input Change - All Variations	1	06		
2	1	Binary Input Change without Time	1,20, 21, 22	06	129, 130	27
2	2	Binary Input Change with Time	1,20, 21, 22	06	129, 130	27
2	3	Binary Input Change with Relative Time				
10	0	Binary Output - All Variations	1,20, 21, 22	06	129, 130	27
10	1	Binary Output	1 2	all except 0B and 06	129	same as in request
10	2	Binary Output Status	1 2	all except 0B and 06 in case of function 2	129	27 when all points were requested otherwise same as in request
12	0	Control Block - All Variations				
12	1	Control Relay Output Block	3, 4, 5, 6	17, 27,28	129	echo of request + status
12	2	Pattern Control Block				
12	3	Pattern Mask				

Object			Request (slave must parse)		Response (master must parse)	
Obj	**Var**	**Description**	**Func. codes (dec)**	**Qual. codes (hex)**	**Func. codes (dec)**	**Qual. codes (hex)**
20	0	Binary Counter - All Variations	1	06	129	27
20	1	32-Bit Binary Counter				
20	2	16-Bit Binary Counter				
20	3	32-Bit Delta Counter				
20	4	16-Bit Binary Counter				
20	5	32-Bit Binary Counter without Flag	1 2	all except 0B	129	27 when all points were requested otherwise same as in request
20	6	16-Bit Binary Counter without Flag				
20	7	32-Bit Delta Counter without Flag				
20	8	16-Bit Delta Counter without Flag				
21	0	Frozen Counter - All Variations				
21	1	32-Bit Frozen Counter				
21	2	16-Bit Frozen Counter				
21	3	32-Bit Frozen Delta Counter				
21	4	16-Bit Frozen Delta Counter				
21	5	32-Bit Frozen Counter with Time of Freeze				
21	6	16-Bit Frozen Counter with Time of Freeze				
21	7	32-Bit Frozen Delta Counter with Time of Freeze				
21	8	16-Bit Frozen Delta Counter with Time of Freeze				
21	9	32-Bit Frozen Counter without Flag				
21	10	16-Bit Frozen Counter without Flag				
21	11	32-Bit Frozen Delta Counter without Flag				
21	12	16-Bit Frozen Delta Counter without Flag				
22	0	Counter Change Event - All Variations	1,20, 21, 22	06	129,130	27
22	1	32-Bit Counter Change Event without Time				
22	2	16-Bit Counter Change Event without Time				
22	3	32-Bit Delta Counter Change Event without Time	1 20, 21, 22	06	129, 130	27
22	4	16-Bit Delta Counter Change Event without Time				
22	5	32-Bit Counter Change Event with Time				

Object			Request (slave must parse)		Response (master must parse)	
Obj	**Var**	**Description**	**Func. codes (dec)**	**Qual. codes (hex)**	**Func. codes (dec)**	**Qual. codes (hex)**
22	6	16-Bit Counter Change Event with Time				
22	7	32-Bit Delta Counter Change Event with Time				
22	8	16-Bit Delta Counter Change Event with Time				
23	0	Frozen Counter Event - All Variations				
23	1	32-Bit Frozen Counter Event without Time				
23	2	16-Bit Frozen Counter Event without Time				
23	3	32-Bit Frozen Delta Counter Event without Time				
23	4	16-Bit Frozen Delta Counter Event without Time				
23	5	32-Bit Frozen Counter Event with Time				
23	6	16-Bit Frozen Counter Event with Time				
23	7	32-Bit Frozen Delta Counter Event with Time				
23	8	16-Bit Frozen Delta Counter Event with Time				
30	0	Analogue Input - All Variations	1	06	129	27
30	1	32-Bit Analogue Input				
30	2	16-Bit Analogue Input				
30	3	32-Bit Analogue Input without Flag	1	all except 0B	129	27 when all points were requested otherwise same as in request
30	4	16-Bit Analogue Input without Flag				
31	0	Frozen Analogue Input - All Variations				
31	1	32-Bit Frozen Analogue Input				
31	2	16-Bit Frozen Analogue Input				
31	3	32-Bit Frozen Analogue Input with Time of Freeze				
31	4	16-Bit Frozen Analogue Input with Time of Freeze				
31	5	32-Bit Frozen Analogue Input without Flag				
31	6	16-Bit Frozen Analogue Input without Flag				
32	0	Analogue Change Event - All Variations	1, 20, 21, 22	06	129,129	27
32	1	32-Bit Analogue Change Event without Time	1 20, 21, 22	06	129,130	27
32	2	16-Bit Analogue Change Event without Time				

Object			Request (slave must parse)		Response (master must parse)	
Obj	**Var**	**Description**	**Func. codes (dec)**	**Qual. codes (hex)**	**Func. codes (dec)**	**Qual. codes (hex)**
32	3	32-Bit Analogue Change Event with Time				
32	4	16-Bit Analogue Change Event with Time				
33	0	Frozen Analogue Event - All Variations				
33	1	32-Bit Frozen Analogue Event without Time				
33	2	16-Bit Frozen Analogue Event without Time				
33	3	32-Bit Frozen Analogue Event with Time				
33	4	16-Bit Frozen Analogue Event with Time				
40	0	Analogue Output Status - All Variations	1	06	129	27
40	1	32-Bit Analogue Output Status	1	all except 0B	129	27 when all points were requested otherwise same as in request
40	2	16-Bit Analogue Output Status				
41	0	Analogue Output Block - All Variations				
41	1	32-Bit Analogue Output Block	3, 4, 5, 6	all except 0B and 06	129	echo of request + status
41	2	16-Bit Analogue Output Block				
50	0	Time and Date - All Variations	1	06	129	27
50	1	Time and Date	1 2	all except 0B and 06 with function 2	129	27 when all points were requested otherwise same as in request
50	2	Time and Date with Interval				
51	0	Time and Date CTO - All Variations				
51	1	Time and Date CTO				
51	2	Unsynchronized Time and Date CTO				
52	0	Time Delay - All Variations				
52	1	Time Delay Coarse			129	07
52	2	Time Delay Fine			129	07
60	0	All classes	1	06	129	27
60	1	Class 0 Data	1	06	129	27
60	2	Class 1 Data	1	06	129	27
60	3	Class 2 Data	1	06	129	27
60	4	Class 3 Data	1	06	129	27
70	1	File Identifier				
80	1	Internal Indications	2	all except 0B and 06	129	-

Object			Request (slave must parse)		Response (master must parse)	
Obj	**Var**	**Description**	**Func. codes (dec)**	**Qual. codes (hex)**	**Func. codes (dec)**	**Qual. codes (hex)**
81	1	Storage Object				
82	1	Device Profile				
83	1	Private Registration Object				
83	2	Private Registration Object Descriptor				
90	1	Application Identifier	17, 18	06	129	-
100	1	Short Floating Point				
100	2	Long Floating Point				
100	3	Extended Floating Point				
101	1	Small Packed Binary-Coded Decimal				
101	2	Medium Packed Binary-Coded Decimal				
101	3	Large Packed Binary-Coded Decimal				
150	0	String - All Variations	1	06	129	27
150	1	String	1, 2	all except 0B and 06 in case of function 2	129	27 when all points were requested otherwise same as in request
151	1	Transparent SPA – All Variations	1	06	129	27
151	1	Transparent SPA	1, 2	all except 0B and 06 in case of function 2	129	27 when all points were requested otherwise same as in request
		No Object	13, 14			
		No Object	23			

5. Appendix B: List of used abbreviations

APCI	Application protocol control information
APDU	Application protocol data unit
CRC	Cyclic redundancy check
CTS	Clear to send
DCD	Data carrier detect
DCE	Data circuit terminating equipment
DIR	Direction of physical transmission
DNP	Distributed network protocol
EPA	Enhanced performance architecture
FCB	Frame control bit
FCV	Frame count valid
FIN	Final fragment bit
FIR	First fragment bit
IEC	International Electrotechnical Commission
ISO	International Organization for Stardardization
LPDU	Link protocol data unit
OSI	Open system interconnection
PDU	Protocol data unit
POD	Protocol object dictionary
PRM	Primary message
PSN	Public switched network
RTS	Request to send
RTU	Remote terminal unit
SDU	Service data unit

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