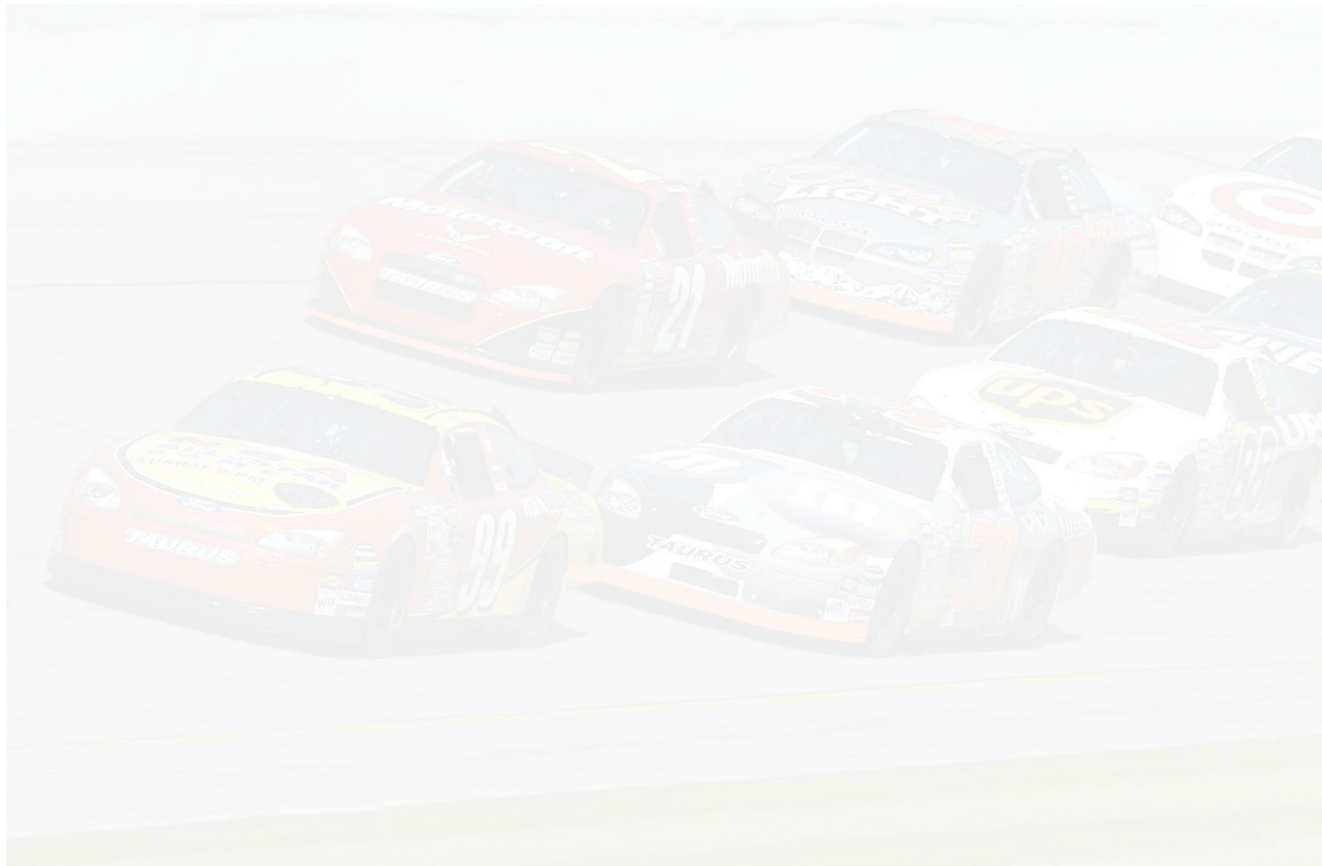




## Tani Item Syntax

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# Tani GmbH

## Networks in industry

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*The name Tani stands for communication in industrial production.*

*The focus is on communication systems:*

- OPC Server for widespread PLCs
- Equipment and software for connecting PLCs, SCADA systems and databases.
- Fieldbus diagnostic systems.

# Tani Item Syntax

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# Table of contents

|                  |                                 |          |
|------------------|---------------------------------|----------|
| <b>Chapter 1</b> | <b>Item Syntax</b>              | <b>5</b> |
| 1                | S7 Item Syntax.....             | 5        |
| 2                | S5 Item Syntax.....             | 9        |
| 3                | Modbus Item Syntax.....         | 12       |
| 4                | PLC-5 / SLC Item Syntax.....    | 15       |
| 5                | MELSEC-Q Item Syntax.....       | 17       |
| 6                | KNX Item Syntax.....            | 19       |
| 7                | IEC60870-5-104 Item Syntax..... | 26       |
| 8                | Send/Receive Item Syntax.....   | 34       |
| 9                | Browsing Tree.....              | 34       |
| 10               | System Tree.....                | 35       |
| 11               | Configuration Tree.....         | 41       |
| 12               | Redundancy.....                 | 42       |
| 13               | Bit mask.....                   | 43       |
| 14               | Arrays.....                     | 43       |
| 15               | Suffixes.....                   | 43       |
| 16               | Item Syntax neutral.....        | 46       |

# 1 Item Syntax

This chapter describes the Item syntax for the corresponding connection (Access Path) that can be used to create new items (tags) .

## General information

- [Browsing Tree](#)
- [System Tree](#)
- [Redundancy](#)

## Item Syntax for different PLCs

- [S7 Item Syntax](#)
- [S5 Item Syntax](#)
- [Modbus Item-Syntax](#)
- [PLC-5 / SLC Item Syntax](#)
- [MELSEC-Q Item Syntax](#)
- [IEC 60870-5 Item Syntax](#)
- [KNX Item Syntax](#)
- [Send/Receive Item Syntax](#)
- [Configuration Item Syntax](#)

## Information for PLCs with online symbols

- [S7-1200/S7-1500, Rockwell CompactLogix/ControlLogix, BACnet](#)

## The following chapters are generally:

- [Bit mask](#)
- [Arrays](#)
- [Suffixes](#)

## 1.1 S7 Item Syntax

The S7 item syntax is set up as shown below:

**<Area><Data type><Start address>[.Array size][Suffix]**

If the data type is BOOL, the bit number is required:

**<Area><Data type><Start address><.Bit number>[.Array size]**

If the data type is STRING, the string length is required:

**<Area><Data type><Start address><.String length>[.Array size][Suffix]**

Legend: <> mandatory [ ] optional

### <Area>

|            | Syntax                    | Orientation <sup>1</sup> | Access Rights | Notes                                                                                                                   |
|------------|---------------------------|--------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------|
| Data block | DBx.<br>V synonym for DB1 | BYTE                     | Read / write  | With data blocks, the specification of a block number x is required (x = 1 to 65535). A dot must appear after the block |

|                       |                       |      |              |                                                                                         |
|-----------------------|-----------------------|------|--------------|-----------------------------------------------------------------------------------------|
| <b>Instance block</b> | <b>Dlx.</b>           | BYTE | Read / write | number.                                                                                 |
| <b>Flag</b>           | <b>M or F</b>         | BYTE | Read / write |                                                                                         |
| <b>Timer</b>          | <b>T</b>              | WORD | Read         | directly followed by the timer number.<br>The data type is REAL, with suffix S5T STRING |
| <b>Counter</b>        | <b>Z or C</b>         | WORD | Read / write | directly followed by the counter number.                                                |
| <b>Input</b>          | <b>E or I</b>         | BYTE | Read         |                                                                                         |
| <b>Output</b>         | <b>A or O or Q</b>    | BYTE | Read / write |                                                                                         |
| <b>I/O Input</b>      | <b>PE or PI</b>       | BYTE | Read         |                                                                                         |
| <b>I/O Output</b>     | <b>PA or PO or PQ</b> | BYTE | Read / write |                                                                                         |

<sup>1</sup>BYTE-oriented means that a byte is addressed for each physical address.

WORD-oriented means that a word (16 bits) is addressed for each physical address.

### <Data type>

| Type                     | Syntax                  | DB / DI                 | M                              | I/O                                                                        | PI / PO                                                                     | C/T            | with Array                                                                                         | useful Suffixes                           |
|--------------------------|-------------------------|-------------------------|--------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------|-------------------------------------------|
| BIT<br>VT_BOOL           | <b>X</b>                | DB5.X4.3                | MX1.3                          | ---                                                                        | ---                                                                         | ---            | ---                                                                                                | ---                                       |
| BIT<br>VT_BOOL           |                         | DB5.4.3                 | M1.3                           | E4.3<br>I4.3<br>A4.3<br>O4.3                                               | PE4.5<br>PI4.5<br>PA1.3<br>PO1.3                                            | ---            | ---                                                                                                | ---                                       |
| BYTE<br>VT_UI1           | <b>B</b><br><b>Byte</b> | DB5.B2<br>DB5.Byte2     | MB4<br>MByte4<br>FB4<br>FByte4 | EB4<br>EByte4<br>IB4<br>IByte4<br>AB5<br>AByte5<br>OB5<br>OByte5           | PEB4<br>PEByte4<br>PIB4<br>PIByte4<br>PAB5<br>PAByte5<br>POB5<br>POByte5    | ---            | DB5.B2.4<br>DB5.Byte2<br>.4<br>MB4.3<br>MByte4.3<br>FB4.4<br>FByte4.4<br>POB5.3<br>etc.            | KF<br>BCD                                 |
| WORD<br>VT_UI2<br>VT_I4* | <b>W</b><br><b>Word</b> | DB5.W3<br>DB5.Word<br>3 | MW4<br>MWord4<br>FW4<br>FWord4 | EW4<br>EWord4<br>IW4<br>IWord4<br>AW5<br>AWord5<br>OW5<br>OWord5<br>QWord5 | PEW4<br>PEWord4<br>PIW4<br>PIWord4<br>PAWord5<br>PAWord5<br>POW5<br>POWord5 | C5<br>Z5<br>T5 | DB5.W3.2<br>DB5.Word<br>3.2<br>MW4.2<br>EWord4.2<br>PAWord5.<br>3<br>C5.3<br>Z5.10<br>T5.2<br>etc. | KF<br>BCD<br>KT<br>S5T<br>TR<br>D<br>SWAP |
| INT<br>VT_I2             | <b>I</b><br><b>Int</b>  | DB5.I3<br>DB5.Int3      | MI4<br>MInt4<br>FI4<br>FInt4   | EI4<br>EInt4<br>II4<br>IInt4<br>AI5<br>AInt5<br>OI5                        | PEI4<br>PEInt4<br>PII4<br>PIInt4<br>PAI5<br>PAInt5<br>POI5                  | ---            | DB5.I3.2<br>DB5.Int3.2<br>MI4.4<br>FInt4.3<br>AInt5.3<br>OI5.2<br>OInt5.5                          | SWAP                                      |

|                                    |                                      |                                             |                                    |                                                                                  |                                                                                              |      |                                                                                                        |                                     |
|------------------------------------|--------------------------------------|---------------------------------------------|------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------|-------------------------------------|
|                                    |                                      |                                             |                                    | OInt5                                                                            | POInt5                                                                                       |      | POInt5.4<br>etc.                                                                                       |                                     |
| REAL<br>VT_R4                      | <b>R</b><br><b>Real</b>              | DB5.R2<br>DB5.REAL<br>2                     | MR4<br>MREAL4                      | ER4<br>EReAL4<br>IR4<br>IREAL4<br>AR4<br>AREAL4<br>OR4<br>OREAL4                 | PER4<br>PEReAL4<br>PIR4<br>PIREAL4<br>PAR4<br>PAREAL4<br>POR4<br>POREAL4                     | ---- | DB5.R2.2<br>DB5.REAL<br>2.4<br>MR4.5<br>ER4.4<br>AREAL4.5<br>PER4.2<br>PAR4.7<br>POR4.3<br>etc.        | KG<br>SWAP                          |
| STRING<br>VT_BSTR                  | <b>S</b><br><b>String</b>            | DB5.S1.80<br>DB5.String<br>1.80             | MS2.80<br>MString2.8<br>0          | ---                                                                              | ---                                                                                          | ---  | DB5.S1.80<br>.5<br>DB5.String<br>1.80.5<br>MS2.80.3<br>MString2.8<br>0.3                               | KA <sup>1</sup>                     |
| S7-<br>STRING<br>VT_BSTR           | <b>G</b><br><b>SS</b>                | DB5.G2.80<br>DB5.SS2.<br>80                 | MG2.80<br>MSS2.80                  | ---                                                                              | ---                                                                                          | ---  | DB5.G2.80<br>.5<br>DB5.SS2.<br>80.5<br>MG2.80.5<br>MSS2.80.<br>5                                       | ---                                 |
| S5-<br>STRING<br>VT_BSTR           | <b>SF</b>                            | DB5.SF2.8<br>0                              | FSF2.80                            | ---                                                                              | ---                                                                                          | ---  | DB5.SF2.8<br>0.5<br>MSF2.80.5                                                                          | ---                                 |
| DOUBLE<br>WORD<br>VT_UI4<br>VT_R8* | <b>DW</b><br><b>Dword</b>            | DB5.DW3<br>DB5.Dwor<br>d3                   | MDW4<br>MDWord4<br>FDW4<br>FDWord4 | EDW4<br>EDWord4<br>IDW4<br>IDWord4<br>ADW5<br>ADWord5<br>ODW5<br>ODWord5<br>QDW5 | PEDW4<br>PEDWord<br>4<br>PIDW4<br>PIDWord4<br>PADW5<br>PADWord<br>5<br>PODW5<br>PODWord<br>5 | ---  | DB5.DW3<br>MDW4.2<br>FDW4.2<br>EDW4.4<br>ADWord5.<br>8<br>PEDW4.8<br>PADW5.4<br>PODW5.4<br>etc.        | KF<br>BCD<br>KG<br>T<br>TOD<br>SWAP |
| DOUBLE<br>INT<br>VT_I4             | <b>D</b><br><b>DI</b><br><b>DInt</b> | DB5.D3 <sup>2</sup><br>DB5.DI3<br>DB5.DInt3 | MDI4<br>MDInt4<br>FDI4<br>FDInt4   | EDI4<br>EDInt4<br>IDI4<br>IDInt4<br>ADI5<br>ADInt5<br>ODI5<br>ODInt5<br>QDI5     | PEDI4<br>PEDInt4<br>PIDI4<br>PIDInt4<br>PADI5<br>PADInt5<br>PODI5<br>PODInt5                 | ---  | DB5.D3.2<br>DB5.DI3.2<br>DB5.DInt3.<br>4<br>MDI4.5<br>EDI4.5<br>ADI5.2<br>PEDI4.5<br>PADInt5.2<br>etc. | BCD<br>T<br>TOD<br>SWAP             |
| QUAD<br>WORD                       | <b>QW</b><br><b>Qword</b>            | DB5.QW3<br>DB5.Qwor                         | MQW4<br>MQWord4                    | EQW4<br>EQWord4                                                                  | PEQW4<br>PEQWord                                                                             | ---  | DB5.QW3<br>MQW4.2                                                                                      | KF<br>BCD                           |

|                             |                                      |                                |                                  |                                                                              |                                                                                              |     |                                                                                                             |      |
|-----------------------------|--------------------------------------|--------------------------------|----------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------|------|
| VT_UI8                      |                                      | d3                             | FQW4<br>FQWord4                  | IQW4<br>IQWord4<br>AQW5<br>AQWord5<br>OQW5<br>OQWord5<br>QQW5                | 4<br>PIQW4<br>PIQWord4<br>PAQW5<br>PAQWord<br>5<br>POQW5<br>POQWord<br>5                     |     | FQW4.2<br>EQW4.4<br>AQWord5.<br>8<br>PEQW4.8<br>PAQW5.4<br>POQW5.4<br>etc.                                  | SWAP |
| QUAD INT<br>VT_I8           | <b>Q</b><br><b>QI</b><br><b>QInt</b> | DB5.Q3<br>DB5.QI3<br>DB5.QInt3 | MQI4<br>MQInt4<br>FQI4<br>FQInt4 | EQI4<br>EQInt4<br>IQI4<br>IQInt4<br>AQI5<br>AQInt5<br>OQI5<br>OQInt5<br>QQI5 | PEQI4<br>PEQInt4<br>PIQI4<br>PIQInt4<br>PAQI5<br>PAQInt5<br>POQI5<br>POQInt5                 | --- | DB5.Q3.2<br>DB5.QI3.2<br>DB5.QInt3.<br>4<br>MQI4.5<br>EQI4.5<br>AQI5.2<br>PEQI4.5<br>PAQInt5.2<br>etc.      | SWAP |
| DOUBLE<br>VT_R8             | <b>QR</b><br><b>QReal</b>            | DB5.QR2<br>DB5.QREAL2          | MQR4<br>MQREAL4                  | EQR4<br>EQREAL4<br>IQR4<br>IQREAL4<br>AQR4<br>AQREAL4<br>OQR4<br>OQREAL4     | PEQR4<br>PEQREAL<br>4<br>PIQR4<br>PIQREAL4<br>PAQR4<br>PAQREAL<br>4<br>POQR4<br>POQREAL<br>4 | --- | DB5.QR2.<br>2<br>DB5.QREAL2.4<br>MQR4.5<br>EQR4.4<br>AQREAL4.<br>5<br>PEQR4.2<br>PAQR4.7<br>POQR4.3<br>etc. | SWAP |
| Date and<br>Time<br>VT_DATE | <b>DT</b>                            | DB5.DT3                        | MDT4                             | EDT4<br>IDT4<br>ADT5<br>ODT5<br>QDI5                                         | PEDT4<br>PIDT4<br>PADT5<br>PODT5                                                             | --- | DB5.DT3.2<br>MDT4.2<br>EDT4.2<br>PEDT4.2<br>etc.                                                            | ISO  |

<sup>1</sup> KA Suffix is not possible with string arrays

<sup>2</sup> Caution! Danger of mix up with S5 syntax for bit (DB5D1.1)

#### Notes on counters and timers

Counters and timers are always addressed by words. For this reason, the specification of a data type is not required!

The start address directly follows the "T" or "C/Z" area. Timers can only be read! Counters can be read and written.

Timer values are indicated in seconds (e.g., T = 0.7 => T = 0.7 s = 700 ms).

Counters are represented in decimals (0 to 999).

#### <Start address>

The start address specifies the addresses starting at which can be read or written.

Example: DB5.DW6: Double word 6 of the data block 5 is the start address.

Example: MB17: Flag byte 17 is the start address.

If the start address is a certain bit, the bit number must also be specified.



**<.Bit number>**

The bit number must always be specified when the data type is BOOL.

Example: I4.3: bit 3 of input byte 4 – an input bit is addressed here.

Example: MX12.1: Bit 1 of flag byte 12 – a flag bit is addressed here.

**[.Array size]**

An array (i.e., field, row, data area) is a series of equal elements. An array combines several units of one data type into a field. If, for example, several words are read out from a data block, this is called an array of words. To create an array, the length of the array is added to the standard syntax separated by a dot.

Example: DB10.REAL2.5.

For more information on arrays, see also [Arrays](#).

**[Suffix]**

A value can be represented in another format with the aid of a suffix.

For more information on suffixes, see also [Suffixes](#).

## 1.2 S5 Item Syntax

The S5 item syntax is set up as shown below:

**<Area><Data type><Start address>[.Array size][Suffix]**

If the data type is BOOL, the bit number is required:

**<Area><Data type><Start address><.Bitnr.>[.Array size]**

If the data type is STRING, the string length is required:

**<Area><Data type><Start address><.String length>[.Array size][Suffix]**

Legend: <> mandatory [ ] optional

**<Area>**

|                     | Syntax                 | Orientation <sup>1</sup> | Access rights | Notes                                                                                                                       |
|---------------------|------------------------|--------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------|
| Data block          | <b>DBx</b>             | WORD                     | Read / write  | With blocks, the specification of a block number x is required (x = 1 to 65535). After the block number no dot is required. |
| Extended data block | <b>DXx</b>             | WORD                     | Read / write  |                                                                                                                             |
| Flag                | <b>M oder F</b>        | BYTE                     | Read / write  |                                                                                                                             |
| Timer               | <b>T</b>               | WORD                     | Read          |                                                                                                                             |
| Counter             | <b>Z oder C</b>        | WORD                     | Read          |                                                                                                                             |
| Input               | <b>E oder I</b>        | BYTE                     | Read          |                                                                                                                             |
| Output              | <b>A oder O oder Q</b> | BYTE                     | Read / write  |                                                                                                                             |
| Periphery           | <b>P</b>               | BYTE                     | Read / write  |                                                                                                                             |
| Extended Periphery  | <b>OB</b>              | BYTE                     | Read / write  |                                                                                                                             |
| System area         |                        | WORD                     | Read          |                                                                                                                             |
| Absolute memory     | <b>AS</b>              | WORD                     | Read          |                                                                                                                             |

|       |  |  |  |  |
|-------|--|--|--|--|
| cells |  |  |  |  |
|-------|--|--|--|--|

<sup>1</sup>BYTE-oriented means that a byte is addressed for each physical address.

WORD-oriented means that a word (16 bits) is addressed for each physical address.

#### <Data type> for Data blocks and extended Data blocks

| Type<br>VT_Type       | Syntax    | Sample   | with Array  | useful<br>Suffixes            |
|-----------------------|-----------|----------|-------------|-------------------------------|
| BIT<br>VT_BOOL        | <b>D</b>  | DB5D4.12 | ---         | ---                           |
| BYTE<br>VT_UI1        | <b>DB</b> | DB5DB3   | DB5DB3.5    | KF, BCD                       |
| LEFT BYTE<br>VT_UI1   | <b>DL</b> | DB5DL4   | DB5DL4.2    | ---                           |
| RIGHT BYTE<br>VT_UI1  | <b>DR</b> | DB5DR2   | DB5DR2.5    | ---                           |
| WORD<br>VT_UI2        | <b>DW</b> | DB5DW4   | DB5DW4.5    | KF, BCD, KT,<br>S5T, TR, SWAP |
| DOUBLE WORD<br>VT_UI4 | <b>DD</b> | DB5DD3   | DB5DD3.2    | KF, BCD, KG, T,<br>TOD, SWAP  |
| QUAD WORD<br>VT_UI8   | <b>DQ</b> | DB5DQ3   | DB5DQ3.2    | KF, BCD, SWAP                 |
| STRING<br>VT_BSTR     | <b>S</b>  | DB5S2.3  | DB5S2.80.3  | KA <sup>1</sup>               |
| S7-STRING<br>VT_BSTR  | <b>SS</b> | DB5SS2.3 | DB5SS2.80.3 | ---                           |
| S5-STRING<br>VT_BSTR  | <b>SF</b> | DB5SF2.3 | DB5SF2.80.3 | ---                           |

#### <Data type> for all other areas

|                | Syntax   | M or F       | I/O                          | P / OB     | C / T / RS /<br>AS            | with Array                                                            | useful<br>Suffixes                   |
|----------------|----------|--------------|------------------------------|------------|-------------------------------|-----------------------------------------------------------------------|--------------------------------------|
| BIT<br>VT_BOOL |          | M4.3<br>F4.3 | E4.3<br>I4.3<br>A4.3<br>Q4.3 | ---        | ---                           | ---                                                                   | ---                                  |
| BYTE<br>VT_UI1 | <b>B</b> | MB4<br>FB4   | EB4<br>IB4<br>AB5<br>QB5     | PB4<br>OB4 | ---                           | MB4.3<br>FB4.4<br>EB4.4<br>IB4.5<br>AB5.2<br>QB5.5<br>PB4.2<br>OB4.3  | KF<br>BCD                            |
| WORD<br>VT_UI2 | <b>W</b> | MW4<br>FW4   | EW4<br>IW4<br>AW5<br>QW5     | PW2<br>OW2 | C5<br>T5<br>RS4<br>BS4<br>AS5 | MW4.2<br>FW4.4<br>EW4.5<br>IW4.2<br>AW5.5<br>QW5.2<br>PW2.10<br>OW2.3 | KF<br>BCD<br>KT<br>S5T<br>TR<br>SWAP |

|                          |           |                    |                          |            |     |                                                                      |                                     |
|--------------------------|-----------|--------------------|--------------------------|------------|-----|----------------------------------------------------------------------|-------------------------------------|
|                          |           |                    |                          |            |     | C5.5<br>T5.3<br>RS4.2<br>BS4.7<br>AS5.2                              |                                     |
| DOUBLE<br>WORD<br>VT_UI4 | <b>D</b>  | MD4<br>FD4         | ED4<br>ID4<br>AD5<br>QD5 | PD5<br>OD5 | --- | MD4.4<br>FD4.2<br>ED4.6<br>ID4.2<br>AD5.6<br>QD5.2<br>PD5.4<br>OD5.9 | KF<br>BCD<br>KG<br>T<br>TOD<br>SWAP |
| QUAD<br>WORD<br>VT_UI8   | <b>Q</b>  | MQ4<br>FQ4         | EQ4<br>IQ4<br>AQ5<br>QQ5 | PQ5<br>OQ5 | --- | MQ4.4<br>FQ4.2<br>EQ4.6<br>IQ4.2<br>AQ5.6<br>QQ5.2<br>PQ5.4<br>OQ5.9 | KF<br>BCD<br>SWAP                   |
| STRING<br>VT_BSTR        | <b>S</b>  | MS4.80<br>FS4.80   | ---                      | ---        | --- | MSS4.80.3<br>FSS4.80.3                                               | KA <sup>1</sup>                     |
| S7-STRING<br>VT_BSTR     | <b>SS</b> | MSS4.80<br>FSS4.80 | ---                      | ---        | --- | MSS4.80.3<br>FSS4.80.3                                               | ---                                 |
| S5-STRING<br>VT_BSTR     | <b>SF</b> | MSF4.80<br>FSF4.80 | ---                      | ---        | --- | MSF4.80.3<br>FSF4.80.3                                               | ---                                 |

<sup>1</sup> KA Suffix is not possible with string arrays

#### Notes on counters and timers

Counters and timers are always addressed by words. For this reason, the specification of a data type is not required!

The start address directly follows the "T" or "C/Z" area. Timers can only be read! Counters can be read and written.

Timer values are indicated in seconds (e.g., T = 0.7 => T = 0.7 s = 700 ms).

Counters are represented in decimals (0 to 999).

#### <Start address>

The start address specifies the addresses starting at which can be read or written.

Example: DB5.DW6: Double word 6 of the data block 5 is the start address.

Example: MB17: Flag byte 17 is the start address.

If the start address is a certain bit, the bit number must also be specified.

#### <.Bit number>

The bit number must always be specified when the data type is BOOL.

Example: I4.3: bit 3 of input byte 4 – an input bit is addressed here.

Example: FX12.1: Bit 1 of flag byte 12 – a flag bit is addressed here.

#### Note:

Writing to bits of a S5 PLC is not permitted. Please read the byte/word, set the bit and write the byte/word back.

#### [.Array size]

An array (i.e., field, row, data area) is a series of equal elements. An array combines several units of one data type into a field. If, for example, several words are read out from a data block, this is called an array of words. To create an array, the length of the array is added to the standard syntax separated by a dot. Example: DB10DW2.5.

For more information on arrays, see also [Arrays](#).

### [Suffix]

A value can be represented in another format with the aid of a suffix.

For more information on suffixes, see also [Suffixes](#).

## 1.3 Modbus Item Syntax

The Modbus item syntax is set up as shown below:

**<Area><Data type><Start address>[.Array size][Suffix]**

If the data type is BOOL, the bit number is required:

**<Area><Data type><Start address><.Bit number>[.Array size]**

The following item syntax allows to address a different UnitID as set up at the connection parameters:

**[UnitID.]<Area><Data type><Start address><.Bit number>[.Array size][Suffix]**

Legend: <> mandatory [ ] optional

### [UnitID.]

The UnitID item syntax is specified for an item with the literals "ID" followed by a number and a dot.

The range is 0 - 255.

If the UnitID is not present in the Itemsyntax, the parameterized UnitID is transferred to the PLC.

Samples:

Id1.40001

Id2.R2

Id3.S5.30

### <Area>

|                                       | Syntax                        | Syntax with number | Orientation <sup>1</sup> | Access Rights |
|---------------------------------------|-------------------------------|--------------------|--------------------------|---------------|
| Discrete Inputs                       | I<br>E<br>DI<br>DE            | 1xxxxx             | BIT                      | Read          |
| Discrete Outputs                      | A<br>O<br>Q<br>DA<br>DO<br>DQ | 0xxxxx             | BIT                      | Read / write  |
| Input Register                        | ER<br>IR                      | 3xxxxx             | WORD                     | Read          |
| Register<br>(Holding Register)        | R<br>HR                       | 4xxxxx             | WORD                     | Read / write  |
| Discrete Inputs<br>Oktal <sup>2</sup> | J                             | -                  | BIT                      | Read          |

|                                       |          |   |     |              |
|---------------------------------------|----------|---|-----|--------------|
| Discrete Outputs<br>Okta <sup>2</sup> | <b>P</b> | - | BIT | Read / write |
|---------------------------------------|----------|---|-----|--------------|

<sup>1</sup> BIT-oriented means that one bit is addressed for each physical address.

WORD-oriented means that one word (16 bits) is addressed for each physical address.

<sup>2</sup> Entry of the start address is octal and the numbers 8 and 9 are invalid characters. Internally, the address is handled decimally and must be considered for logger and status entries.

Areas can either be addressed via the above stated **alphabetic sequence** or via a **number**. This means that a discrete input can be addressed by the abbreviation "E" the same as with the number "1", discrete outputs by letter "O" or number 0, Input registers by "IR" or "3", Registers by "R" or "4".

#### <Data type>

| Data type<br>VT-Type              | Syntax                      | Syntax R                                                        | Syntax<br>I / O                                                                   | Syntax<br>ER                              | with Array                                            | useful<br>Suffixes       |
|-----------------------------------|-----------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------|--------------------------|
| BIT<br>VT_BOOL                    | <b>X</b> <sup>1</sup>       | RX5.2 <sup>1</sup><br>HRX5.2 <sup>1</sup><br>4X5.2 <sup>1</sup> | E5<br>I5<br>DE5<br>DI5<br>100005<br>A5<br>O5<br>Q5<br>DA5<br>DO5<br>DQ5<br>000005 | ERX5.2 <sup>1</sup><br>3X5.2 <sup>1</sup> | I1.10<br>O2.5                                         |                          |
| LEFT CHAR<br>RIGHT CHAR<br>VT_I1  | <b>LC</b><br><b>RC</b>      | RLC5<br>RRC5                                                    | ---<br>---                                                                        | ERLC5<br>ERRC5                            | RLC5.2<br>RRC5.2                                      |                          |
| LEFT BYTE<br>RIGHT BYTE<br>VT_UI1 | <b>LB</b><br><b>RB</b>      | RLB5<br>RRB5                                                    | ---<br>---                                                                        | ERLB5<br>ERRB5                            | RLB5.2<br>RRB5.2                                      |                          |
| INT<br>VT_I2                      | <b>ohne</b><br><br><b>I</b> | R5<br>HR5<br>45<br>RI5<br>HRI5<br>4I5                           | ---                                                                               | ER5<br>IR5<br>35<br>ERI5<br>IRI5<br>3I5   | R5.2<br>HR5.2<br>45.2<br>ERI5.2<br>IRI5.2<br>3I5.2    | SWAP <sup>2</sup>        |
| WORD<br>VT_UI2                    | <b>W</b>                    | RW5<br>HRW5<br>4W5                                              | ----                                                                              | ERW5<br>IRW5<br>3W5                       | RW5.2<br>HRW5.2<br>4W5.2<br>ERW5.2<br>IRW5.2<br>3W5.2 | SWAP <sup>2</sup>        |
| DOUBLE INT<br>VT_I4               | <b>D</b><br><br><b>DI</b>   | RD5<br>HRD5<br>4D5<br>RDI5<br>HRDI5<br>4DI5                     | ---                                                                               | ERD5                                      | RD5.2<br>HRD5.2<br>4D5.2                              | TOD<br>SWAP <sup>2</sup> |
| DOUBLE                            | <b>DW</b>                   | RDW5                                                            | ---                                                                               | ERDW5                                     | RDW5.2                                                | TOD                      |

|                                |                       |                                             |      |                        |                                                             |                                      |
|--------------------------------|-----------------------|---------------------------------------------|------|------------------------|-------------------------------------------------------------|--------------------------------------|
| WORD<br>VT_UI4                 |                       | HRDW5<br>4DW5                               |      | IRDW5<br>3DW5          | HRDW5.2<br>4DW5.2<br>ERDW5.2<br>IRDW5.2<br>3DW5.2           | SWAP <sup>2</sup>                    |
| QUAD INT<br>VT_I8              | <b>Q</b><br><b>QI</b> | RQ5<br>HRQ5<br>4Q5<br>RQI5<br>HRQI5<br>4QI5 | ---  | ERQ5<br>IRQ5<br>3Q5    | ERQ5.2<br>IRQ5.2<br>3Q5.2                                   | SWAP <sup>2</sup>                    |
| QUAD WORD<br>VT_UI8            | <b>QW</b>             | RQW5<br>HRQW5<br>4QW5                       | ---  | ERQW5<br>IRQW5<br>3QW5 | RQW5.2<br>HRQW5.2<br>4QW5.2<br>ERQW5.2<br>IRQW5.2<br>3QW5.2 | SWAP <sup>2</sup>                    |
| REAL<br>VT_R4                  | <b>R</b>              | RR5                                         | ---- | ERR5                   | RR5.2<br>ERR5.2                                             | SWAP <sup>2</sup>                    |
| DOUBLE<br>VT_R8                | <b>QR</b>             | RQR5                                        | ---  | ERQR5                  | RQR5.2<br>ERQR5.2                                           | SWAP <sup>2</sup>                    |
| STRING<br>VT_BSTR <sup>2</sup> | <b>S</b>              | RS5.80                                      | ---- | ERS5.80                | RS5.80.3                                                    | SWAP <sup>2</sup><br>KA <sup>3</sup> |

<sup>1</sup> Diskrete Inputs and Outputs are one single bit in the PLC. When reading from Register or Input Registers, the whole register is read and the bit is extracted.

**Note:**

Writing of individual bits in the register and input register area is possible if the writing of bits in the word is activated in the configuration of the connection.

The entire register is then read, the bit is set or deleted and the register is written back again.

<sup>2</sup> The suffix SWAP is possible for a string to give the bytes the correct order. For the other data types all bytes are changed in the order.

<sup>3</sup> KA Suffix is not possible with string arrays

### <Start address>

The start address specifies the address starting at which read or write accesses begins.

Example:

ER5 -> Input Register 5

O12 -> Output 12

### <.Bit number>

The bit number must always be specified when the data type is BOOL!

Example: HRX5.2: Bit 2 of holding register 5

### [.Array size]

Arrays are created to combine several units of one data type together in one field.

Example: HRD5.3

For more information on arrays, see also [Arrays](#).

### [Suffix]

A value can be represented in another format with the aid of a suffix.

For more information on suffixes, see also [Suffixes](#).

## 1.4 PLC-5 / SLC Item Syntax

The item syntax for PLC-5 and SLC is set up as shown below:

**<Area>[File number]<Start address>[Array size][Tani-Suffix]**  
**<Area>[File number]<Start address>[Array size][RSLinX-Suffix]**

Legend: <> mandatory      [ ] optional

### <Area>

| File Type    | Syntax    | Orientation <sup>1</sup> | Access rights | Default File number | Address |
|--------------|-----------|--------------------------|---------------|---------------------|---------|
| Output       | <b>O</b>  | BIT                      | Read / write  | 0                   | octal   |
| Input        | <b>I</b>  | BIT                      | Read          | 1                   | octal   |
| Integer      | <b>N</b>  | WORD                     | Read / write  | 7                   | decimal |
| Binary       | <b>B</b>  | WORD                     | Read / write  | 3                   | decimal |
| Float        | <b>F</b>  | DOUBLE WORD              | Read / write  | 8                   | decimal |
| String       | <b>ST</b> | SLC-String               | Read / write  | 9                   | decimal |
| SFC-Status   | <b>SC</b> | WORD                     | Read / write  | 3                   | decimal |
| Status       | <b>S</b>  | WORD                     | Read / write  | 2                   | decimal |
| Timer        | <b>T</b>  | WORD                     | Read / write  | 4                   | decimal |
| Counter      | <b>C</b>  | WORD                     | Read / write  | 5                   | decimal |
| Control      | <b>R</b>  | WORD                     | Read / write  | 6                   | decimal |
| ASCII        | <b>A</b>  | WORD                     | Read / write  | 9                   | decimal |
| Long Integer | <b>L</b>  | DOUBLE WORD              | Read / write  | 9                   | decimal |

<sup>1</sup> BIT-oriented means that one bit is addressed for each physical address.

WORD-oriented means that one word (16 bits) is addressed for each physical address.

DOUBLE WORD-oriented means that one double word (32 bits) is addressed for each physical address.

### [File number]

Specification of the file number is optional. If it is not specified, the default file number is used. See column marked **Default File Number** in the table.

### <Start address>

The start address specifies the address starting at which read or write accesses begin. The start address can consist of 2 pieces of information. Word (floating) number and when a single bit is accessed, then the bit number. The word number can be omitted with a bit. The word number or the floating number is introduced by a colon (:). The bit number is then introduced with a slash (/) <:word> or <:float> or </bit>.

The address is octal for some areas. It is decimal for others. See column labeled Address.

Either the word number, the float number or the bit number is specified as the start address.  
 <:word> or <:float> or </bit>

The following syntax is used to address a certain bit within a word.

<:word/bit>

**NOTE:**

When bits are write-accessed, the whole word is written!

| Syntax   | Description                                                    |
|----------|----------------------------------------------------------------|
| O:0      | Word 0 in Output file 0                                        |
| O:0/12   | Bit 10 (12 octal = 10 decimal) in output file 0                |
| O/12     | Bit 10 (12 octal = 10 decimal) in output file 0                |
| I:37     | Word 31 (37 octal = 31 decimal) in input file 1                |
| I4:37/2  | Bit 2 in Word 31 (37 octal = 31 decimal) in input file 4       |
| I:1/0    | Bit 0 in Word 1 in input file 1                                |
| B3/26    | Bit 26 in binary file 3                                        |
| B12:5/15 | Bit 15 in word 5 of binary file 12                             |
| F8:0     | Float 0                                                        |
| N23:4    | word 4 of integer file 23                                      |
| N23:4/2  | Bit 2 in word 4 of integer file 23 = Bit 66 in integer file 23 |
| N23/66   | Bit 66 in integer file 23                                      |

**[Array size]**

Arrays are created to combine several units of one data type in a field together. Arrays are only possible for word areas and float areas. The array size is initiated with a #.

Examples: N23:4#10

**[Tani-Suffix]**

A value can be represented in another format with the aid of a suffix. If no suffix is specified, the formats from the column Orientation apply.

For more information on suffixes, see also [Suffixes](#).

**[RsLinX-Suffix]**

The alternative syntax allows you to use one or more suffixes. Every suffix is initiated. The order is arbitrary.

**NOTE:**

The combination of RSLINX-Suffixes and Tani-Suffixes is not possible.

| Suffix   | Description                                                                   | File Types          |
|----------|-------------------------------------------------------------------------------|---------------------|
| ,N       | Values are represented with sign. (Default is: no sign)                       | I, O, N, B, S, A    |
| ,M       | Values are represented in Motorola-Format. (Default is: Intel-Format)         | I, O, N, B, S, A, F |
| ,L<xxx>  | The len specifier for RSLinX Format. xxx is the count of array length         | all                 |
| ,SC<xxx> | Values are interpreted as a zero-terminated string. The maximum length is XXX | N, A                |



## 1.5 MELSEC-Q Item Syntax

Two syntax versions are available for setting up items.

1. Simple version:

**<Area><Start address>[.Array size][Suffix]**

2. Expanded version:

**<Area><.Type><Start address>[.Array size][Suffix]**

Legend: <> mandatory      [ ] optional

### REMEMBER :

- With the expanded version, a period is required between the <area> and the <type>. If the period is omitted, the syntax uses the simple version. The <type> then corresponds to the default type (for bit area BIT, for word area WORD – see table <Bereich> (Area)).
- If the representation of the start address is HEX, all numbers for this area are also HEX
- The HEX / decimal numbers can be changed with the following prefixes.  
Conversion of HEX -> DEC: Input of 0d (number zero + the letter d) before the decimal address  
Conversion of DEC -> HEX Input of 0x (number 0 + the letter x) before the hexadecimal address
- When words, double words or strings are registered in a bit area, the start address is a bit address and only possible on word boundaries (dec. 0/16/32... or hex: 0/10/20...) (e.g., Y.D10.3).
- Bit arrays in bit areas are not possible.
- Bit arrays in WORD areas with HEX representation, are not possible.

### <Area>

|                               | Syntax     | Orientation <sup>1</sup> | Representation of the Start address |
|-------------------------------|------------|--------------------------|-------------------------------------|
| Special Relay                 | <b>SM</b>  | BIT                      | decimal                             |
| Special Register              | <b>SD</b>  | WORD                     | decimal                             |
| Input Relay                   | <b>X</b>   | BIT                      | HEX                                 |
| Output Relay                  | <b>Y</b>   | BIT                      | HEX                                 |
| Internal Relay                | <b>M</b>   | BIT                      | decimal                             |
| Latch Relay                   | <b>L</b>   | BIT                      | decimal                             |
| Annunciator                   | <b>F</b>   | BIT                      | decimal                             |
| Edge Relay                    | <b>V</b>   | BIT                      | decimal                             |
| Link Relay                    | <b>B</b>   | BIT                      | HEX                                 |
| Data Register                 | <b>D</b>   | WORD                     | decimal                             |
| Link Register                 | <b>W</b>   | WORD                     | HEX                                 |
| Timer Contact                 | <b>TS</b>  | BIT                      | decimal                             |
| Timer Coil                    | <b>TC</b>  | BIT                      | decimal                             |
| Timer Current Value           | <b>TN</b>  | WORD                     | decimal                             |
| Retentive Timer Contact       | <b>STS</b> | BIT                      | decimal                             |
| Retentive Timer Coil          | <b>STC</b> | BIT                      | decimal                             |
| Retentive Timer Current Value | <b>STN</b> | WORD                     | decimal                             |
| Counter Contact               | <b>CS</b>  | BIT                      | decimal                             |
| Counter Coil                  | <b>CC</b>  | BIT                      | decimal                             |
| Counter Current Value         | <b>CN</b>  | WORD                     | decimal                             |

|                                                        |           |      |         |
|--------------------------------------------------------|-----------|------|---------|
| Special Link Relay                                     | <b>SB</b> | BIT  | HEX     |
| Special Link Register                                  | <b>SW</b> | WORD | HEX     |
| Step Relay                                             | <b>S</b>  | BIT  | decimal |
| Direct Input                                           | <b>DX</b> | BIT  | HEX     |
| Direct Output                                          | <b>DY</b> | BIT  | HEX     |
| Index Register                                         | <b>Z</b>  | WORD | decimal |
| File Register<br>(Normal Access by block<br>Switching) | <b>R</b>  | WORD | decimal |
| File Register<br>(Serial No. Access)                   | <b>ZR</b> | WORD | HEX     |

<sup>1</sup> BIT-oriented means that one bit is addressed for each physical address. WORD-oriented means that one word (16 bits) is addressed for each physical address.

#### <.Type> <,Type>

| Typ<br>VT_Type              | Syntax                                | Simple<br>Syntax | ex:Bit area                   | Ex: Word<br>area         | with Array in<br>Bit area  | with Array<br>in Word<br>area | useful<br>Suffixes |
|-----------------------------|---------------------------------------|------------------|-------------------------------|--------------------------|----------------------------|-------------------------------|--------------------|
| BIT<br>VT_BOOL              | <b>X</b>                              | DY1              | ----                          | D.X1.2                   | ----                       | ----                          | ----               |
| BIT <sup>1</sup><br>VT_BOOL | ----                                  | DY1              | ----                          | D.1.2                    | ----                       | ----                          | ----               |
| BYTE<br>VT_UI2              | <b>B</b><br><b>BYTE</b>               | ----             | Y.B10<br>Y.BYTE10             | R.B1<br>R.BYTE1          | Y.B10.5<br>Y.BYTE10.5      | R.B1.3<br>R.BYTE1.<br>3       | ----               |
| INT<br>VT_I2                | <b>I</b><br><b>INT</b>                | Y.I10<br>Y.INT10 | Y.I10<br>Y.INT10              | R.I2<br>R.INT2           | Y.I10.3<br>Y.INT10.3       | R.I2.3<br>R.INT2.3            | ----               |
| WORD<br>VT_UI2              | <b>W</b><br><b>WORD</b>               | R20              | Y.W10<br>Y.WORD10             | R.W2<br>R.WORD2          | Y.W10.3<br>Y.WORD10.<br>3  | R.W2.3<br>R.WORD2.<br>3       | ----               |
| DOUBLE<br>WORD<br>VT_UI4    | <b>D</b><br><b>DW</b><br><b>DWORD</b> | ----             | Y.D10<br>Y.DWORD1<br>0        | R.D2<br>R.DWORD<br>2     | Y.D10.3<br>Y.DWORD1<br>0.3 | R.D2.3<br>R.DWORD<br>2.3      | ----               |
| DOUBLE<br>INT<br>VT_I4      | <b>DI</b><br><b>DINT</b>              | ----             | Y.DI10<br>Y.DINT10            | R.DI2<br>R.DINT2         | Y.DI10.3<br>Y.DINT10.3     | R.DI2.3<br>R.DINT2.3          | ----               |
| REAL<br>VT_R4               | <b>R</b><br><b>REAL</b>               | ----             | Y.R10<br>Y.REAL10             | R.R2<br>R.REAL2          | Y.R10.3<br>Y.REAL10.3      | R.R2.3<br>R.REAL2.<br>3       | ----               |
| STRING<br>VT_BSTR           | <b>S</b><br><b>STRING</b>             | ----             | Y.S10.20<br>Y.STRING10<br>.20 | R.S2<br>R.STRING<br>2.20 | ----                       | ----                          | ----               |

<sup>1</sup> Careful: With HEX addresses, it's better to select the version with the X

#### [.Array size]

Arrays are created to combine several units of one data type into one field.

Examples:

D20.300

For more information on arrays, see also [Arrays](#).

#### [Suffix]

Suffixes can be used to represent a value in another format.

Example: D20.300KF

For more information on suffixes, see also [Suffixes](#).

## 1.6 KNX Item Syntax

The KNX item syntax is set up as shown below:

**<Address>[\$<Data type>]**

Legend: <...> mandatory      [<...>] optional

### <Address>

KNX group address to access.

Possible syntax:

- <main>/<middle>/<subgroup> - 3-level address, main = 0 .. 31, middle = 0 .. 7, subgroup = 0 .. 255
- <main>/<subgroup> - 2-level address, main = 0 .. 31, subgroup = 0 .. 2047
- <group> - 1-level address, group = 0 .. 65535

Example: 1/0/1

### <Data type>

The data type to use. If not given, the data is handled as byte array. Exactly one of the numeric code, encoding description or the name shall be used.

| Numeric | Encoding | Name                   | Datatype |
|---------|----------|------------------------|----------|
| 1.001   | B1       | DPT_Switch             | Bool     |
| 1.002   | B1       | DPT_Bool               | Bool     |
| 1.003   | B1       | DPT_Enable             | Bool     |
| 1.004   | B1       | DPT_Ramp               | Bool     |
| 1.005   | B1       | DPT_Alarm              | Bool     |
| 1.006   | B1       | DPT_BinaryValue        | Bool     |
| 1.007   | B1       | DPT_Step               | Bool     |
| 1.008   | B1       | DPT_UpDown             | Bool     |
| 1.009   | B1       | DPT_OpenClose          | Bool     |
| 1.010   | B1       | DPT_Start              | Bool     |
| 1.011   | B1       | DPT_State              | Bool     |
| 1.012   | B1       | DPT_Invert             | Bool     |
| 1.013   | B1       | DPT_DimSendStyle       | Bool     |
| 1.014   | B1       | DPT_InputSource        | Bool     |
| 1.015   | B1       | DPT_Reset              | Bool     |
| 1.016   | B1       | DPT_Ack                | Bool     |
| 1.017   | B1       | DPT_Trigger            | Bool     |
| 1.018   | B1       | DPT_Occupancy          | Bool     |
| 1.019   | B1       | DPT_Window_Door        | Bool     |
| 1.021   | B1       | DPT_LogicalFunction    | Bool     |
| 1.022   | B1       | DPT_Scene_AB           | Bool     |
| 1.023   | B1       | DPT_ShutterBlinds_Mode | Bool     |
| 1.100   | B1       | DPT_Heat/Cool          | Bool     |
| 2.001   | B2       | DPT_Switch_Control     | Bool[2]  |

|       |      |                         |           |
|-------|------|-------------------------|-----------|
| 2.002 | B2   | DPT_Bool_Control        | Bool[2]   |
| 2.003 | B2   | DPT_Enable_Control      | Bool[2]   |
| 2.004 | B2   | DPT_Ramp_Control        | Bool[2]   |
| 2.005 | B2   | DPT_Alarm_Control       | Bool[2]   |
| 2.006 | B2   | DPT_BinaryValue_Control | Bool[2]   |
| 2.007 | B2   | DPT_Step_Control        | Bool[2]   |
| 2.008 | B2   | DPT_Direction1_Control  | Bool[2]   |
| 2.009 | B2   | DPT_Direction2_Control  | Bool[2]   |
| 2.010 | B2   | DPT_Start_Control       | Bool[2]   |
| 2.011 | B2   | DPT_State_Control       | Bool[2]   |
| 2.012 | B2   | DPT_Invert_Control      | Bool[2]   |
| 3.007 | B4   | DPT_Control_Dimming     | Bool[4]   |
| 3.008 | B4   | DPT_Control_Blinds      | Bool[4]   |
| 4.001 | A8   | DPT_Char_ASCII          | UInt 8    |
| 4.002 | A8   | DPT_Char_8859_1         | UInt 8    |
| 5.001 | U8   | DPT_Scaling             | UInt 8    |
| 5.003 | U8   | DPT_Angle               | UInt 8    |
| 5.004 | U8   | DPT_Percent_U8          | UInt 8    |
| 5.005 | U8   | DPT_DecimalFactor       | UInt 8    |
| 5.006 | U8   | DPT_Tariff              | UInt 8    |
| 5.010 | U8   | DPT_Value_1_Ucount      | UInt 8    |
| 6.001 | V8   | DPT_Percent_V8          | Int 8     |
| 6.010 | V8   | DPT_Value_1_Count       | Int 8     |
| 6.020 | B5N3 | DPT_Status_Mode3        | Structure |
| 7.001 | U16  | DPT_Value_2_Ucount      | UInt 16   |
| 7.002 | U16  | DPT_TimerPeriodMsec     | UInt 16   |
| 7.003 | U16  | DPT_TimerPeriod10Msec   | UInt 16   |
| 7.004 | U16  | DPT_TimerPeriod100Msec  | UInt 16   |
| 7.005 | U16  | DPT_TimerPeriodSec      | UInt 16   |
| 7.006 | U16  | DPT_TimerPeriodMin      | UInt 16   |
| 7.007 | U16  | DPT_TimerPeriodHrs      | UInt 16   |
| 7.010 | U16  | DPT_PropDataType        | UInt 16   |
| 7.011 | U16  | DPT_Length_mm           | UInt 16   |
| 7.012 | U16  | DPT_UEICurrentmA        | UInt 16   |
| 7.013 | U16  | DPT_Brightness          | UInt 16   |
| 8.001 | V16  | DPT_Value_2_Count       | Int 16    |
| 8.002 | V16  | DPT_DeltaTimeMsec       | Int 16    |
| 8.003 | V16  | DPT_DeltaTime10Msec     | Int 16    |
| 8.004 | V16  | DPT_DeltaTime100Msec    | Int 16    |
| 8.001 | V16  | DPT_DeltaTimeSec        | Int 16    |
| 8.006 | V16  | DPT_DeltaTimeMin        | Int 16    |
| 8.007 | V16  | DPT_DeltaTimeHrs        | Int 16    |
| 8.010 | V16  | DPT_Percent_V16         | Int 16    |
| 8.011 | V16  | DPT_Rotation_Angle      | Int 16    |

|        |              |                                |           |
|--------|--------------|--------------------------------|-----------|
| 9.001  | F16          | DPT_Value_Temp                 | Float     |
| 9.002  | F16          | DPT_Value_Tempd                | Float     |
| 9.003  | F16          | DPT_Value_Tempa                | Float     |
| 9.004  | F16          | DPT_Value_Lux                  | Float     |
| 9.005  | F16          | DPT_Value_Wsp                  | Float     |
| 9.006  | F16          | DPT_Value_Pres                 | Float     |
| 9.007  | F16          | DPT_Value_Hunidity             | Float     |
| 9.008  | F16          | DPT_Value_AirQuality           | Float     |
| 9.010  | F16          | DPT_Value_Time1                | Float     |
| 9.011  | F16          | DPT_Value_Time2                | Float     |
| 9.020  | F16          | DPT_Value_Volt                 | Float     |
| 9.021  | F16          | DPT_Value_Curr                 | Float     |
| 9.022  | F16          | DPT_PowerDensity               | Float     |
| 9.023  | F16          | DPT_KelvinPerPercent           | Float     |
| 9.024  | F16          | DPT_Power                      | Float     |
| 9.025  | F16          | DPT_Value_Volume_Flow          | Float     |
| 9.026  | F16          | DPT_Rain_Amount                | Float     |
| 9.027  | F16          | DPT_Value_Temp_F               | Float     |
| 9.028  | F16          | DPT_Value_Wsp_kmh              | Float     |
| 10.001 | N3U5r2U6r2U6 | DPT_TimeOfDay                  | Structure |
| 11.001 | r3U5r4U4r1U7 | DPT_Date                       | Structure |
| 12.001 | U32          | DPT_Value_4_Ucount             | Uint 32   |
| 13.001 | V32          | DPT_Value_4_Count              | Int 32    |
| 13.002 | V32          | DPT_FlowRate_m3/h              | Int 32    |
| 13.010 | V32          | DPT_ActiveEnergy               | Int 32    |
| 13.011 | V32          | DPT_ApparantEnergy             | Int 32    |
| 13.012 | V32          | DPT_ReactiveEnergy             | Int 32    |
| 13.013 | V32          | DPT_ActiveEnergy_kWh           | Int 32    |
| 13.014 | V32          | DPT_ApparentEnergy_kVAh        | Int 32    |
| 13.015 | V32          | DPT_ReactiveEnergy_kVARh       | Int 32    |
| 13.100 | V32          | DPT_LongDeltaTimeSec           | Int 32    |
| 14.000 | F32          | DPT_Value_Acceleration         | Float     |
| 14.001 | F32          | DPT_Value_Acceleration_Angular | Float     |
| 14.002 | F32          | DPT_Value_Activation_Energy    | Float     |
| 14.003 | F32          | DPT_Value_Activity             | Float     |
| 14.004 | F32          | DPT_Value_Mol                  | Float     |
| 14.005 | F32          | DPT_Value_Amplitude            | Float     |
| 14.006 | F32          | DPT_Value_AngleRad             | Float     |
| 14.007 | F32          | DPT_Value_AngleDeg             | Float     |
| 14.008 | F32          | DPT_Value_AngularMomentum      | Float     |
| 14.009 | F32          | DPT_Value_Angular_Velocity     | Float     |

|        |     |                                        |       |
|--------|-----|----------------------------------------|-------|
| 14.010 | F32 | DPT_Value_Area                         | Float |
| 14.011 | F32 | DPT_Value_Capacitance                  | Float |
| 14.012 | F32 | DPT_Value_Charge_DensitySurface        | Float |
| 14.013 | F32 | DPT_Value_Charge_DensityVolume         | Float |
| 14.014 | F32 | DPT_Value_Compressibility              | Float |
| 14.015 | F32 | DPT_Value_Conductance                  | Float |
| 14.016 | F32 | DPT_Value_Electrocal_Conductivity      | Float |
| 14.017 | F32 | DPT_Value_Density                      | Float |
| 14.018 | F32 | DPT_Value_Electric_Charge              | Float |
| 14.019 | F32 | DPT_Value_Electric_Current             | Float |
| 14.020 | F32 | DPT_Value_Electric_CurrentDensity      | Float |
| 14.021 | F32 | DPT_Value_Electric_DipoleMoment        | Float |
| 14.022 | F32 | DPT_Value_Electric_Displacement        | Float |
| 14.023 | F32 | DPT_Value_Electric_FieldStrength       | Float |
| 14.024 | F32 | DPT_Value_Electric_Flux                | Float |
| 14.025 | F32 | DPT_Value_Electric_FluxDensity         | Float |
| 14.026 | F32 | DPT_Value_Electric_Polarization        | Float |
| 14.027 | F32 | DPT_Value_Electric_Potential           | Float |
| 14.028 | F32 | DPT_Value_Electric_PotentialDifference | Float |
| 14.029 | F32 | DPT_Value_ElectromagneticMoment        | Float |
| 14.030 | F32 | DPT_Value_Electromotive_Force          | Float |
| 14.031 | F32 | DPT_Value_Energy                       | Float |
| 14.032 | F32 | DPT_Value_Force                        | Float |
| 14.033 | F32 | DPT_Value_Frequency                    | Float |
| 14.034 | F32 | DPT_Value_AngularFrequency             | Float |
| 14.035 | F32 | DPT_Value_Heat_Capacity                | Float |
| 14.036 | F32 | DPT_Value_Heat_FlowRate                | Float |
| 14.037 | F32 | DPT_Value_Heat_Quantity                | Float |
| 14.038 | F32 | DPT_Value_Impedance                    | Float |

|        |     |                                  |       |
|--------|-----|----------------------------------|-------|
| 14.039 | F32 | DPT_Value_Length                 | Float |
| 14.040 | F32 | DPT_Value_Light_Quantity         | Float |
| 14.041 | F32 | DPT_Value_Luminance              | Float |
| 14.042 | F32 | DPT_Value_Luminous_Flux          | Float |
| 14.043 | F32 | DPT_Value_Luminous_Intensity     | Float |
| 14.044 | F32 | DPT_Value_Magnetic_FieldStrength | Float |
| 14.045 | F32 | DPT_Value_Magnetic_Flux          | Float |
| 14.046 | F32 | DPT_Value_Magnetic_FluxDensity   | Float |
| 14.047 | F32 | DPT_Value_Magnetic_Moment        | Float |
| 14.048 | F32 | DPT_Value_Magnetic_Polarization  | Float |
| 14.049 | F32 | DPT_Value_Manetization           | Float |
| 14.050 | F32 | DPT_Value_MagnetomotiveForce     | Float |
| 14.051 | F32 | DPT_Value_Mass                   | Float |
| 14.052 | F32 | DPT_Value_MassFlux               | Float |
| 14.053 | F32 | DPT_Value_Momentum               | Float |
| 14.054 | F32 | DPT_Value_Phase_AngleRad         | Float |
| 14.055 | F32 | DPT_Value_Phase_AngleDeg         | Float |
| 14.056 | F32 | DPT_Value_Power                  | Float |
| 14.057 | F32 | DPT_Value_Power_Factor           | Float |
| 14.058 | F32 | DPT_Value_Pressure               | Float |
| 14.059 | F32 | DPT_Value_Reactance              | Float |
| 14.060 | F32 | DPT_Value_Resistance             | Float |
| 14.061 | F32 | DPT_Value_Resistivity            | Float |
| 14.062 | F32 | DPT_Value_Selfinductance         | Float |
| 14.063 | F32 | DPT_Value_SolidAngle             | Float |
| 14.064 | F32 | DPT_Value_Sound_Intensity        | Float |
| 14.065 | F32 | DPT_Value_Speed                  | Float |
| 14.066 | F32 | DPT_Value_Stress                 | Float |
| 14.067 | F32 | DPT_Value_Surface_Tension        | Float |
| 14.068 | F32 | DPT_Value_Common_Temperature     | Float |
| 14.069 | F32 | DPT_Value_Absolute_Temperature   | Float |
| 14.070 | F32 | DPT_Value_Temperature            | Float |

|        |                           |                                |           |
|--------|---------------------------|--------------------------------|-----------|
|        |                           | Difference                     |           |
| 14.071 | F32                       | DPT_Value_Thermal_Capacity     | Float     |
| 14.072 | F32                       | DPT_Value_Thermal_Conductivity | Float     |
| 14.073 | F32                       | DPT_Value_ThermoelectricPower  | Float     |
| 14.074 | F32                       | DPT_Value_Time                 | Float     |
| 14.075 | F32                       | DPT_Value_Torque               | Float     |
| 14.076 | F32                       | DPT_Value_Volume               | Float     |
| 14.077 | F32                       | DPT_Value_Volume_Flux          | Float     |
| 14.078 | F32                       | DPT_Value_Weight               | Float     |
| 14.079 | F32                       | DPT_Value_Work                 | Float     |
| 15.000 | U4U4U4U4U4B4N4            | DPT_Access_Data                | Structure |
| 16.000 | A112                      | DPT_String_ASCII               | String    |
| 16.001 | A112                      | DPT_String_8859_1              | String    |
| 17.001 | r2U6                      | DPT_SceneNumber                | Structure |
| 18.001 | B1r1U6                    | DPT_SceneControl               | Structure |
| 19.001 | U8r4U4r3U5U3U5r2U6r2U6B16 | DPT_DateTime                   | Structure |
| 20.001 | N8                        | DPT_SCLOMode                   | Uint 8    |
| 20.002 | N8                        | DPT_BuildingMode               | Uint 8    |
| 20.003 | N8                        | DPT_OccMode                    | Uint 8    |
| 20.004 | N8                        | DPT_Priority                   | Uint 8    |
| 20.005 | N8                        | DPT_LightApplicationMode       | Uint 8    |
| 20.006 | N8                        | DPT_ApplicationArea            | Uint 8    |
| 20.007 | N8                        | DPT_AlarmClassType             | Uint 8    |
| 20.008 | N8                        | DPT_PSUMode                    | Uint 8    |
| 20.011 | N8                        | DPT_ErrorClass_System          | Uint 8    |
| 20.012 | N8                        | DPT_ErrorClass_HVAC            | Uint 8    |
| 20.013 | N8                        | DPT_Time_Delay                 | Uint 8    |
| 20.014 | N8                        | DPT_Beaufort_Wind_Force_Scale  | Uint 8    |
| 20.017 | N8                        | DPT_SensorSelect               | Uint 8    |
| 20.020 | N8                        | DPT_ActuatorConnectType        | Uint 8    |
| 20.100 | N8                        | DPT_FuelType                   | Uint 8    |
| 20.101 | N8                        | DPT_BurnerType                 | Uint 8    |
| 20.102 | N8                        | DPT_HVACMode                   | Uint 8    |
| 20.103 | N8                        | DPT_DHWMode                    | Uint 8    |
| 20.104 | N8                        | DPT_LoadPriority               | Uint 8    |
| 20.105 | N8                        | DPT_HVACContrMode              | Uint 8    |
| 20.106 | N8                        | DPT_HVACEmergMode              | Uint 8    |
| 20.107 | N8                        | DPT_ChangeoverMode             | Uint 8    |
| 20.108 | N8                        | DPT_ValveMode                  | Uint 8    |
| 20.109 | N8                        | DPT_DamperMode                 | Uint 8    |
| 20.110 | N8                        | DPT_HeaderMode                 | Uint 8    |



|         |     |                                     |          |
|---------|-----|-------------------------------------|----------|
| 20.111  | N8  | DPT_FanMode                         | Uint 8   |
| 20.112  | N8  | DPT_MasterSlaveMode                 | Uint 8   |
| 20.113  | N8  | DPT_StatusRoomSetp                  | Uint 8   |
| 20.120  | N8  | DPT_ADAType                         | Uint 8   |
| 20.121  | N8  | DPT_BackupMode                      | Uint 8   |
| 20.122  | N8  | DPT_StartSynchronizatio<br>n        | Uint 8   |
| 20.600  | N8  | DPT_Behaviour_Lock_Un<br>lock       | Uint 8   |
| 20.601  | N8  | DPT_Behaviour_Bus_Po<br>wer Up Down | Uint 8   |
| 20.602  | N8  | DPT_DALI_Fade_Time                  | Uint 8   |
| 20.603  | N8  | DPT_BlinkingMode                    | Uint 8   |
| 20.604  | N8  | DPT_LightControlMode                | Uint 8   |
| 20.605  | N8  | DPT_SwitchPBModel                   | Uint 8   |
| 20.606  | N8  | DPT_PBAAction                       | Uint 8   |
| 20.607  | N8  | DPT_DimmPBModel                     | Uint 8   |
| 20.608  | N8  | DPT_SwitchOnMode                    | Uint 8   |
| 20.609  | N8  | DPT_LoadTypeSet                     | Uint 8   |
| 20.610  | N8  | DPT_LoadTypeDetected                | Uint 8   |
| 20.801  | N8  | DPT_SABExcept-<br>Behaviour         | Uint 8   |
| 20.802  | N8  | DPT_SABBbehaviour_Loc<br>k_Unlock   | Uint 8   |
| 20.803  | N8  | DPT_SSSBMode                        | Uint 8   |
| 20.804  | N8  | DPT_BlindsControlMode               | Uint 8   |
| 20.1000 | N8  | DPT_CommMode                        | Uint 8   |
| 20.1001 | N8  | DPT_AddInfoTypes                    | Uint 8   |
| 20.1002 | N8  | DPT_RF_ModeSelect                   | Uint 8   |
| 20.1003 | N8  | DPT_RF_FilterSelect                 | Uint 8   |
| 21.001  | B8  | DPT_StatusGen                       | Bool[8]  |
| 21.002  | B8  | DPT_Device_Control                  | Bool[8]  |
| 21.100  | B8  | DPT_ForceSign                       | Bool[8]  |
| 21.101  | B8  | DPT_ForceSignCool                   | Bool[8]  |
| 21.102  | B8  | DPT_StatusRHC                       | Bool[8]  |
| 21.103  | B8  | DPT_StatusSDHWC                     | Bool[8]  |
| 21.104  | B8  | DPT_FullTypeSet                     | Bool[8]  |
| 21.105  | B8  | DPT_StatusRCC                       | Bool[8]  |
| 21.106  | B8  | DPT_StatusAHU                       | Bool[8]  |
| 21.601  | B8  | DPT_LightActuatorErrorIn<br>fo      | Bool[8]  |
| 21.1000 | B8  | DPT_RF_ModelInfo                    | Bool[8]  |
| 21.1001 | B8  | DPT_RF_FilterInfo                   | Bool[8]  |
| 21.1010 | B8  | DPT_Channel_Activation<br>_16       | Bool[8]  |
| 22.100  | B16 | DPT_StatusDHWC                      | Bool[16] |
| 22.101  | B16 | DPT_StatusRHCC                      | Bool[16] |
| 22.1000 | B16 | DPT_Media                           | Bool[16] |

|         |            |                              |          |
|---------|------------|------------------------------|----------|
| 22.1010 | B16        | DPT_Media                    | Bool[16] |
| 23.001  | N2         | DPT_OnOff_Action             | Bool[2]  |
| 23.002  | N2         | DPT_Alarm_Reaction           | Bool[2]  |
| 23.003  | N2         | DPT_UpDown_Action            | Bool[2]  |
| 23.102  | N2         | DPT_HVAC_PB_Action           | Bool[2]  |
| 24.001  | A[n]       | DPT_VarString_8859_1         | String   |
| 27.001  | B32        | DPT_CombinedInfoOnOff        | Bool[32] |
| 28.001  | A[n]\$UTF8 | DPT_UTF-8                    | String   |
| 29.010  | V64        | DPT_ActiveEnergy_V64         | Int 64   |
| 29.011  | V64        | DPT_ApparentEnergy_V64       | Int 64   |
| 29.012  | V64        | DPT_ReactiveEnergy_V64       | Int 64   |
| --      | U64        | --                           | UInt 64  |
| 30.1010 | B24        | DPT_Channel_Activation_24    | Bool[24] |
| 31.101  | N3         | DPT_PB_Action_HVAC_Extended  | Bool[3]  |
| 231.001 | A8A8A8A8   | DPT_Locale_ASCII             | String   |
| 234.001 | A8A8       | DPT_LanguageCodeAlpha2_ASCII | String   |
| 234.002 | A8A8       | DPT_RegionCodeAlpha2_ASCII   | String   |

Examples:

1/0/1\$DPT\_Switch - Monitor the light switch group 1/0/1, or switch all lights belonging to that group

1/0/1\$B1 - the same, using the encoding syntax

1/0/1\$1.001 - the same, using the numeric syntax

## 1.7 IEC60870-5-104 Item Syntax

The IEC60870-5-104 item syntax is set up as shown below:

**[<CA>.<Data type>[.<IOA>][.<Option>][.<more Options ...>]**

Legend: <...> mandatory      [<...>] optional

### <CA>

Specifies the CA (Common Address) to use. Required if the connection is set to "Allow all CAs". Not used if a CA is specified in the connection settings.

### <IOA>

Specifies the IOA (Information Object Address) to use. Required for ordinary Read and Write operations. Not used for special commands.

### <Data type> (read = monitor direction)

|                          | Syntax <sup>1</sup>                         | Type <sup>2</sup> | Access Rights | Options <sup>3</sup>                                                                                                       |
|--------------------------|---------------------------------------------|-------------------|---------------|----------------------------------------------------------------------------------------------------------------------------|
| Single Point Information | M_SP<br>M_SP_NA_1<br>M_SP_TA_1<br>M_SP_TB_1 | Bool              | Read          | Value/SPI - 0 OFF, 1 ON<br>BL - 0 Not Blocked, 1 Blocked<br>SB - 0 Not Substituted, 1 Substituted<br>NT - 0 Topical, 1 Not |

|                                       |                                                             |          |      |                                                                                                                                                                                                                                                                                                                |
|---------------------------------------|-------------------------------------------------------------|----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       |                                                             |          |      | Topical<br>IV - 0 Valid, 1 Invalid<br>Timestamp - transmitted<br>timestamp, unused for<br>M_SP_NA_1                                                                                                                                                                                                            |
| <b>Double Point<br/>Information</b>   | M_DP<br>M_DP_NA_1<br>M_DP_TA_1<br>M_DP_TB_1                 | Bool[2]  | Read | Value/DPI - 00<br>intermediate state, 01<br>OFF, 10 ON, 11 invalid<br>state<br>BL - 0 Not Blocked, 1<br>Blocked<br>SB - 0 Not Substituted, 1<br>Substituted<br>NT - 0 Topical, 1 Not<br>Topical<br>IV - 0 Valid, 1 Invalid<br>Timestamp - transmitted<br>timestamp, unused for<br>M_DP_NA_1                    |
| <b>Step Position<br/>Information</b>  | M_ST<br>M_ST_NA_1<br>M_ST_TA_1<br>M_ST_TB_1                 | Int 8    | Read | Value - Position Value<br>T - 0 Not Topical, 1<br>Topical<br>OV - 0 No Overflow, 1<br>Overflow<br>BL - 0 Not Blocked, 1<br>Blocked<br>SB - 0 Not Substituted, 1<br>Substituted<br>NT - 0 Topical, 1 Not<br>Topical<br>IV - 0 Valid, 1 Invalid<br>Timestamp - transmitted<br>timestamp, unused for<br>M_ST_NA_1 |
| <b>Binary State<br/>Information</b>   | M_BO<br>M_BO_NA_1<br>M_BO_TA_1<br>M_BO_TB_1                 | Bool[32] | Read | Value/BSI - Binary State<br>OV - 0 No Overflow, 1<br>Overflow<br>BL - 0 Not Blocked, 1<br>Blocked<br>SB - 0 Not Substituted, 1<br>Substituted<br>NT - 0 Topical, 1 Not<br>Topical<br>IV - 0 Valid, 1 Invalid<br>Timestamp - transmitted<br>timestamp, unused for<br>M_BO_NA_1                                  |
| <b>Measured Value,<br/>Normalized</b> | M_ME_NV<br>M_ME_ND_1<br>M_ME_NA_1<br>M_ME_TA_1<br>M_ME_TD_1 | Float    | Read | Value/NVA - Normalized<br>Value<br>OV - 0 No Overflow, 1<br>Overflow, unused for<br>M_ME_ND_1                                                                                                                                                                                                                  |

|                                    |                                                |        |      |                                                                                                                                                                                                                                                                                                  |
|------------------------------------|------------------------------------------------|--------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    |                                                |        |      | BL - 0 Not Blocked, 1 Blocked, unused for M_ME_ND_1<br>SB - 0 Not Substituted, 1 Substituted, unused for M_ME_ND_1<br>NT - 0 Topical, 1 Not Topical, unused for M_ME_ND_1<br>IV - 0 Valid, 1 Invalid, unused for M_ME_ND_1<br>Timestamp - transmitted timestamp, unused for M_ME_ND_1, M_ME_NA_1 |
| <b>Measured Value, Scaled</b>      | M_ME_SV<br>M_ME_NB_1<br>M_ME_TB_1<br>M_ME_TE_1 | Int 16 | Read | Value/SVA - Scaled Value<br>OV - 0 No Overflow, 1 Overflow<br>BL - 0 Not Blocked, 1 Blocked<br>SB - 0 Not Substituted, 1 Substituted<br>NT - 0 Topical, 1 Not Topical<br>IV - 0 Valid, 1 Invalid<br>Timestamp - transmitted timestamp, unused for M_ME_NB_1                                      |
| <b>Measured Value, Short Float</b> | M_ME_FV<br>M_ME_NC_1<br>M_ME_TC_1<br>M_ME_TF_1 | Float  | Read | Value/FVA - Floating-point Value<br>OV - 0 No Overflow, 1 Overflow<br>BL - 0 Not Blocked, 1 Blocked<br>SB - 0 Not Substituted, 1 Substituted<br>NT - 0 Topical, 1 Not Topical<br>IV - 0 Valid, 1 Invalid<br>Timestamp - transmitted timestamp, unused for M_ME_NC_1                              |
| <b>Binary Counter</b>              | M_IT<br>M_IT_NA_1<br>M_IT_TA_1<br>M_IT_TB_1    | Int 32 | Read | Value/BCR - Binary Counter Reading<br>SQ - Sequence Counter<br>CY - 0 No Carry, 1 Carry<br>SA - 0 Not Adjusted, 1 Counter Adjusted<br>IV - 0 Valid, 1 Invalid<br>Timestamp - transmitted                                                                                                         |

|                                                           |                                   |         |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------|-----------------------------------|---------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           |                                   |         |      | timestamp, unused for M_IT_NA_1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Single Event of Protection Equipment</b>               | M_EP_EV<br>M_EP_TA_1<br>M_EP_TD_1 | Bool[2] | Read | Value/ES - Event State<br>EI - 0 Elapsed Time Valid, 1 Elapsed Time Invalid<br>BL - 0 Not Blocked, 1 Blocked<br>SB - 0 Not Substituted, 1 Substituted<br>NT - 0 Topical, 1 Not Topical<br>IV - 0 Valid, 1 Invalid<br>ElapsedTime - Elapsed Time<br>Timestamp - transmitted timestamp                                                                                                                                                                                                                                       |
| <b>Start Events of Protection Equipment</b>               | M_EP_SE<br>M_EP_TB_1<br>M_EP_TE_1 | Bool    | Read | Value/GS - General Start of Operation<br>SL1 - Start of Operation Phase L1<br>SL2 - Start of Operation Phase L2<br>SL3 - Start of Operation Phase L3<br>SIE - Start of Operation Earth Current<br>SRD - Start of Operation in Reverse Direction<br>EI - 0 Elapsed Time Valid, 1 Elapsed Time Invalid<br>BL - 0 Not Blocked, 1 Blocked<br>SB - 0 Not Substituted, 1 Substituted<br>NT - 0 Topical, 1 Not Topical<br>IV - 0 Valid, 1 Invalid<br>RelayDurationTime - Relay Duration Time<br>Timestamp - transmitted timestamp |
| <b>Output Circuit Information of Protection Equipment</b> | M_EP_OC<br>M_EP_TC_1<br>M_EP_TF_1 | Bool    | Read | Value/GC - General Command to Output Circuit<br>CL1 - Command to Output Circuit Phase L1<br>CL2 - Command to Output Circuit Phase L2<br>CL3 - Command to Output Circuit Phase L3                                                                                                                                                                                                                                                                                                                                           |

|                                    |                                 |          |      |                                                                                                                                                                                                                                                                           |
|------------------------------------|---------------------------------|----------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    |                                 |          |      | EI - 0 Elapsed Time Valid, 1 Elapsed Time Invalid<br>BL - 0 Not Blocked, 1 Blocked<br>SB - 0 Not Substituted, 1 Substituted<br>NT - 0 Topical, 1 Not Topical<br>IV - 0 Valid, 1 Invalid<br>RelayOperatingTime - Relay Operating Time<br>Timestamp - transmitted timestamp |
| <b>Status and Change Detection</b> | <b>M_PS</b><br><b>M_PS_NA_1</b> | Bool[16] | Read | Value/State - Current State<br>CD - Change Detection<br>OV - 0 No Overflow, 1 Overflow<br>BL - 0 Not Blocked, 1 Blocked<br>SB - 0 Not Substituted, 1 Substituted<br>NT - 0 Topical, 1 Not Topical<br>IV - 0 Valid, 1 Invalid                                              |

<sup>1</sup>First line captures all opcodes for the type, other lines capture only the specific opcode.

<sup>2</sup>The data type of the Value element. Most types support additional information which may have different types.

<sup>3</sup>For read, only one option may be given. If missing, all data is returned as a structure.

#### <Data type> (write = command direction, simple values)

|                             | Syntax <sup>1</sup>                                 | Type <sup>2</sup> | Access Rights | Options <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------|-----------------------------------------------------|-------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Single Point Command</b> | <b>C_SC</b><br><b>C_SC_NA_1</b><br><b>C_SC_TA_1</b> | Bool              | Write         | write mode (required if any options are given):<br>D/Direct - one-step write<br>SE/SelectExecute - two-step write<br>Timestamp mode (only if not specified via type, default NTS):<br>TS/Timestamp - send timestamp (use C_xx_Tx_1 opcode)<br>NTS/NoTimestamp - don't send timestamp (use C_xx_Nx_1 opcode)<br>Write Qualifier (default 0 - unspecified):<br>SP/ShortPulse - send the Short Pulse qualifier<br>LP/LongPulse - send the |

|                             |                                                     |         |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------|-----------------------------------------------------|---------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             |                                                     |         |       | Long Pulse qualifier<br>P/Persistent - send the Persistent qualifier<br>QU0 .. QU31 - specify numerically                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Double Point Command</b> | <b>C_DC</b><br><b>C_DC_NA_1</b><br><b>C_DC_TA_1</b> | Bool[2] | Write | write mode (required if any options are given):<br>D/Direct - one-step write<br>SE/SelectExecute - two-step write<br>Timestamp mode (only if not specified via type, default NTS):<br>TS/Timestamp - send timestamp (use C_xx_Tx_1 opcode)<br>NTS/NoTimestamp - don't send timestamp (use C_xx_Nx_1 opcode)<br>Write Qualifier (default 0 - unspecified):<br>SP/ShortPulse - send the Short Pulse qualifier<br>LP/LongPulse - send the Long Pulse qualifier<br>P/Persistent - send the Persistent qualifier<br>QU0 .. QU31 - specify numerically |
| <b>Regulating Command</b>   | <b>C_RC</b><br><b>C_RC_NA_1</b><br><b>C_RC_TA_1</b> | Bool[2] | Write | write mode (required if any options are given):<br>D/Direct - one-step write<br>SE/SelectExecute - two-step write<br>Timestamp mode (only if not specified via type, default NTS):<br>TS/Timestamp - send timestamp (use C_xx_Tx_1 opcode)<br>NTS/NoTimestamp - don't send timestamp (use C_xx_Nx_1 opcode)<br>Write Qualifier (default 0 - unspecified):<br>SP/ShortPulse - send the Short Pulse qualifier<br>LP/LongPulse - send the Long Pulse qualifier<br>P/Persistent - send the Persistent qualifier<br>QU0 .. QU31 - specify numerically |

|                                                |                                                        |          |       |                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------|--------------------------------------------------------|----------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Binary State Command</b>                    | <b>C_BO</b><br><b>C_BO_NA_1</b><br><b>C_BO_TA_1</b>    | Bool[32] | Write | write mode (required if any options are given):<br>D/Direct - one-step write<br>Timestamp mode (only if not specified via type, default NTS):<br>TS/Timestamp - send timestamp (use C_xx_Tx_1 opcode)<br>NTS/NoTimestamp - don't send timestamp (use C_xx_Nx_1 opcode)                                                                                                                          |
| <b>Set-Point Command, Normalized Value</b>     | <b>C_SE_NV</b><br><b>C_SE_NA_1</b><br><b>C_SE_TA_1</b> | Float    | Write | write mode (required if any options are given):<br>D/Direct - one-step write<br>SE/SelectExecute - two-step write<br>Timestamp mode (only if not specified via type, default NTS):<br>TS/Timestamp - send timestamp (use C_xx_Tx_1 opcode)<br>NTS/NoTimestamp - don't send timestamp (use C_xx_Nx_1 opcode)<br>Write Qualifier (default 0 - unspecified):<br>QL0 .. QL127 - specify numerically |
| <b>Set-Point Command, Scaled Value</b>         | <b>C_SE_SV</b><br><b>C_SE_NB_1</b><br><b>C_SE_TB_1</b> | Int 16   | Write | write mode (required if any options are given):<br>D/Direct - one-step write<br>SE/SelectExecute - two-step write<br>Timestamp mode (only if not specified via type, default NTS):<br>TS/Timestamp - send timestamp (use C_xx_Tx_1 opcode)<br>NTS/NoTimestamp - don't send timestamp (use C_xx_Nx_1 opcode)<br>Write Qualifier (default 0 - unspecified):<br>QL0 .. QL127 - specify numerically |
| <b>Set-Point Command, Floating-Point Value</b> | <b>C_SE_FV</b><br><b>C_SE_NC_1</b><br><b>C_SE_TC_1</b> | Float    | Write | write mode (required if any options are given):<br>D/Direct - one-step write<br>SE/SelectExecute - two-                                                                                                                                                                                                                                                                                         |



|  |  |  |  |                                                                                                                                                                                                                                                                                          |
|--|--|--|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |  |  | step write<br>Timestamp mode (only if not specified via type, default NTS):<br>TS/Timestamp - send timestamp (use C_xx_Tx_1 opcode)<br>NTS/NoTimestamp - don't send timestamp (use C_xx_Nx_1 opcode)<br>Write Qualifier (default 0 - unspecified):<br>QL0 .. QL127 - specify numerically |
|--|--|--|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

<sup>1</sup>First line selects the opcode based on the presence/absence of the Timestamp option, other lines use the specific opcode.

<sup>2</sup>The data type to write.

<sup>3</sup>For write, multiple options may be given, depending on the opcode, minimum is D or SE. If none are present, write a structure that gives the options.

#### <Data type> (command direction, special commands)

|                                      | Syntax <sup>1</sup>            | Type <sup>2</sup> | Access Rights | Options <sup>3</sup>                                                                                                                                                                                                                                                                               |
|--------------------------------------|--------------------------------|-------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Interrogation Command</b>         | C_IC<br>C_IC_NA_1              | Bool              | Write         | interrogation mode:<br>G/Global - global interrogation<br>INRO1 .. INRO16 - group interrogation<br>QOI0 .. QOI255 - specify numerically                                                                                                                                                            |
| <b>Counter Interrogation Command</b> | C_CI<br>C_CI_NA_1              | Bool              | Write         | interrogation mode:<br>G/Global - global interrogation<br>REQCO1 .. REQCO4 - group interrogation<br>RQT0 .. RQT63 - specify numerically<br>counter freeze mode (default 0 - read only):<br>F/Freeze - freeze counters<br>R/Reset - reset counters<br>FR/FreezeAndReset - freeze and reset counters |
| <b>Clock Synchronization Command</b> | C_CS<br>C_CS_NA_1              | Bool              | Write         |                                                                                                                                                                                                                                                                                                    |
| <b>Test Command</b>                  | C_TS<br>C_TS_NA_1<br>C_TS_TA_1 | Bool              | Write         | write mode (required if any options are given):<br>D/Direct - one-step write<br>Timestamp mode (only if not specified via type, default NTS):                                                                                                                                                      |

|  |  |  |  |                                                                                                                       |
|--|--|--|--|-----------------------------------------------------------------------------------------------------------------------|
|  |  |  |  | TS/Timestamp - send timestamp (use C_xx_Tx_1 opcode)<br>NTS/NoTimestamp - don't send timestamp (use C_xx_Nx_1 opcode) |
|--|--|--|--|-----------------------------------------------------------------------------------------------------------------------|

<sup>1</sup>First line selects the opcode based on the presence/absence of the Timestamp option, other lines use the specific opcode.

<sup>2</sup>The data type to write. For commands, any written value will execute the command.

<sup>3</sup>For write, multiple options may be given, depending on the opcode, minimum is D or SE. If none are present, write a structure that gives the options.

<sup>4</sup>For C\_CS, write a Bool value to Item "C\_CS".

### Examples

M\_SP.1000.SPI - Monitor the Single-Point value at IOA 1000; returns a Bool value. Monitors opcodes

M\_SP\_NA\_1, M\_SP\_TA\_1, M\_SP\_TB\_1

M\_SP\_NA\_1.1000.SPI - Monitor the Single-Point value at IOA 1000; returns a Bool value. Monitors opcode M\_SP\_NA\_1 only

M\_SP.1000.IV - Monitor the Invalid bit of Single-Point value 1000

M\_SP.1000.Timestamp - Monitor the Timestamp of Single-Point value 1000

M\_SP.1000 - Monitor the Single-Point value 1000; returns a structure SIQ\_TS that contains the value, timestamp and all quality bits

C\_SC.1000.D - Write a Bool value to execute a Single Point Command to IOA 1000 (uses C\_SC\_NA\_1)

C\_SC.1000.D.TS - Write a Bool value to execute a Single Point Command to IOA 1000, include a timestamp (uses C\_SC\_TA\_1)

C\_SC.1000.SE - Write a Bool value to execute a Single Point Command to IOA 1000 (uses C\_SC\_NA\_1 and the Select-and-Execute semantic)

C\_SC.1000.D.SP - Write a Bool value to execute a Single Point Command to IOA 1000 (uses C\_SC\_NA\_1 and the Short-Pulse qualifier)

C\_SC.1000 - Write a structure SCO to execute a Single Point Command to IOA 1000. Value, opcode and write options are specified by the structure contents.

C\_IC.G - Write a Bool value to execute a Global Interrogation Command

## 1.8 Send/Receive Item Syntax

Send/Receive frames will be handled as byte arrays.

The name is raw.

The frames will be sent and received as one piece. In connections without a protocol like PLC Header, RFC1006 or OSI/H1 it can not be guaranteed that the frames will not be concentrated or splitted in pieces.

Ideally RAW data will be handled by PLC Engine Collect. It contains lot of RAW data access functions as search, change and more.

## 1.9 Browsing Tree

The address space can be browsed online.

The address space on OPC Classic and OPCPipe starts in the root.

Example: <PLC>.flag0. Or "System.Topics.<PLC>.Status

On OPC UA the root starts with "**Objects**". Under this topic there are multiple elements depending on the OPC configuration. The most important element is the element "**Topics**". All elements described on this manual are under this item.

Example: **Objects.Topics.<PLC>.flag0**. Or "**Objects.Topics.System.Topics.<PLC>.Status**"

If browsing of items is not used registering an item needs a prefix. Which prefix your OPC UA server requires can be found in the documentation of your OPC UA server. No standard for a prefix exist, some servers are using names, others UUID or numbers, but it can be a binary field also. There exist no limitation in length. It is not guaranteed that the prefix will be the same after reconnect to the UA server.

The OPC UA server needs if browsing will not be used "**#ns=1;s=**" in front of an item. Leave the "**Objects.Topics**" away.

Example the OPC UA server: Read the flag word zero from a Siemens S7 300, the OPC connection is named "OPC", the controller connection is named "s7": "**OPC.#ns=1;s=s7.mw0**"

## 1.10 System Tree

The **System tree** contains the **special items** the server supports. They allow accessing internal variables, their status and a lot more.

The system tree can be added or disabled using the configuration with a separate **System** connection.

The system tree "**System**" lies in

- **OPC-DA and OpcPipe**: directly in the root.
- **OPC-UA** under "**Objects.Topic.System**"

With writing to the special item "**AddTopic**" it is possible adding more connections to PLC without using the configuration software. Additionally, the server can be configured via a "Config" connection.

Examples:

- SPS connection status: If a connection named "s7" is configured the connection status lies under **System.Topics.s7.Status** (over OPC UA **server.System.Topics.s7.Status**)  
The PLC operation mode lies under **System.Topics.s7.PlcDetails.PlcMode**
- Add a new connection with writing to **System.AddTopic**.  
"s7.tcp://192.168.2.200:102?name=\"my name  
\",typ=client,ownTSAP=0101,destinationTSAP=0302,slave=9,start1=1,WriteAllowed=1"

### Elements in the root

- OPCPipe and OPC DA the start floor lies in the root floor.
- Under OPC-UA the start floor lies under "**Objects.Topics**"

| Topic name    | Description                                                                                                                                                                                                   |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>System</b> | System data as the list of topics, version information                                                                                                                                                        |
| <b>Memory</b> | Temporary variables and structures which relies on the system memory.                                                                                                                                         |
| <b>Config</b> | Server Internal variables with which you can configure the OPC server or the PlcEngine. The individual variables have comments that describe the functionality. They are not described in detail in the help. |
| <b>OPC UA</b> | connection for OPC UA special functions                                                                                                                                                                       |

|                             |                                                                                                                           |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>System Items</b>         |                                                                                                                           |
| <b>&lt;user defined&gt;</b> | User defined topics created with the configuration software or with the browser or over writing to <b>System.AddTopic</b> |

### System

| Topic name            | Description                                                                                                                                                                                                                                                                                                                                          |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Topics</b>         | The predefined item " <b>System.Topics</b> " is containing the list of configured connections to controllers. The elements allows accessing information about stati of the OPC server itself and the connections to the controllers. Additional details from the controllers can be read as the name of the controller, its operation mode and more. |
| <b>AddTopic</b>       | Adds connections to controllers.<br>With writing of a string in the defined syntax connections will be added. The syntax is described in <a href="#">AddTopic</a> .                                                                                                                                                                                  |
| <b>Licenses</b>       | information about the current licenses                                                                                                                                                                                                                                                                                                               |
| <b>Versions</b>       | Versions of the software and its parts from the OPC server or the PlcEngine.                                                                                                                                                                                                                                                                         |
| <b>Internal</b>       | Please do not use this. It is made for special applications.                                                                                                                                                                                                                                                                                         |
| <b>Platform</b>       | allows tags for different Platform things, eg: inputs and outputs on Phytec Regor                                                                                                                                                                                                                                                                    |
| <b>Status</b>         | Extended Server status                                                                                                                                                                                                                                                                                                                               |
| <b>CurrentTime</b>    | the current time and time information is available for further processing.                                                                                                                                                                                                                                                                           |
| ...<br>and other tags |                                                                                                                                                                                                                                                                                                                                                      |

### Values for System.Topics.<topicName>

| Topic name         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Status</b>      | Brings the status of the connection.<br>0-> ok<br>3 -> no connection<br>5 -> access denied<br>6 -> wait for data<br>7 -> wait for send ready<br>23 -> The communication partner denies the port. No program did open it<br>26 -> ARP can not resolve the address. Mostly the partner is switched off or disconnected<br>29 -> Suspended. No OPC client or logic table used one item.<br>30 -> Osi reset by peer. Mostly a TSAP is wrong<br>31 -> The port is already in use, mostly by another program<br>32 -> The domain name can not be resolved. The domain server is unreachable, or the name was not found.<br>33 -> The network is unreachable. Mostly the computers network interfaces are configured badly. |
| <b>ReadCount</b>   | Number of handled synchronous read jobs. This variable can be written.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>WriteCount</b>  | Number of handled write jobs. This variable can be written.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>ActiveCount</b> | Number of active items.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>ServerCycle</b> | Number of cycles with changed PLC data. This variable can be written.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Redundancy</b>  | This will exist in connections configured for redundancy only. <a href="#">Details here</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>AddVariable</b> | This element only exists in the Memory topic.<br>Adds a variable in the memory variables. This element is write only.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        | <p>The syntax is<br/> <code>&lt;variable name&gt;=&lt;variable type&gt;&lt;[&gt;&lt;array size&gt;&lt;]&gt;&lt;;comment&gt;</code><br/> Supported variable types are: u8, u16, u32, u64. i8, i16, i32, i64, f32, f64, bit, string.<br/> Example: MyVariable=u16[10]; Array of UINT 16 with 10 elements<br/> If a variable name contains dots all named before the last dot are nodes.<br/> Hint: The symbols created with <b>AddVariable</b> will be deleted if the OPC or PLC Engine Collect software is stopped.</p>                                                                                             |
| <b>DeleteVariable</b>  | <p>Deletes a variable which was created with <b>AddVariable</b>. The name of the variable need to be given. This element is write only.<br/> Each variable and node need to be deleted separately.<br/> Hint: If a variable will be deleted which was not created with <b>AddVariable</b> the access will be denied.</p>                                                                                                                                                                                                                                                                                           |
| <b>AddSymbol</b>       | <p>The element only exists in controller topics which does not support symbols in the controller itself. Mostly this are Siemens S7 300/400 controllers, Modbus devices or Mitsubishi controllers.<br/> Adds a symbol. The item syntax of the desired controller type of the topic will be used.<br/> SymbolName=&lt;ItemSyntax&gt;&lt;;comment&gt;<br/> Example for a S7 300: MyFlag=mw0; Flag word zero<br/> The symbol name can contain dots. So multiple floors can be created.<br/> Hint: The symbols created with <b>AddSymbol</b> will be deleted if the OPC or PLC Engine Collect software is stopped.</p> |
| <b>DeleteSymbol</b>    | Deletes a with <b>AddSymbol</b> created symbol.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>AddStructure</b>    | Not available today                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>DeleteStructure</b> | Not available today                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>DeleteTopic</b>     | If a connection has been added dynamically, this item is visible. If this is written to, this dynamically created connection is deleted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

### Values for System.Topics.<topicName>.PlcDetail

If the information can not be readied from the controller the quality becomes bad (sensor failed).

| Topic name         | Description                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------|
| <b>PlcMode</b>     | 0 -> PLC in Stop, 1 -> PLC in RUN/STOP, 2 -> PLC in RUN.                                                      |
| <b>KeySwitch</b>   | 0 -> Key switch in position Stop, 1 -> Run/Prog, 2 -> Run, 3 -> Mres                                          |
| <b>PlcName</b>     | The name given to the controller. Not all controllers does contain a name.                                    |
| <b>PlcType</b>     | The PLC type the manufacturer did give to it. Not all controllers does contain this.                          |
| <b>OrderNumber</b> | The order number of the controller. Not all controllers does contain this.                                    |
| <b>Force</b>       | Information if forces will exist in the controllers program code. Some p,c deliver the number of forces here. |
| <b>Battery</b>     | Status of the battery. 0 -> Ok, 1 -> empty, 2 -> no battery, 3 -> not supported                               |

Not all controller types and controller firmware versions are supporting all items under **PlcDetails**. So the **OrderNumber** will be available in Siemens S7 only. The details can be found in the controllers system manuals.

### Values for System.AddTopic

**Warning: System.AddTopic is deprecated. Please use the configuration topic which has much more functionality.**

Topics can be created over this item.

**Important:** With **AddTopic** created connections are existing non permanent. On power off they will be lost. They must be created again after power on.

A topic created with **System.Topics.<created topic>** can be deleted with **System.Topics.<created topic>DeleteTopic**.

| Topic name      | Description                                                                                                                           |                                                                                                                                                                                |                                                                                   |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Name            | <Topic Name>. The name of the created connection. Please note the rules for topic names which will existing from various OPC clients. |                                                                                                                                                                                |                                                                                   |
| PlcType         | Valid are:                                                                                                                            |                                                                                                                                                                                |                                                                                   |
|                 | Value                                                                                                                                 | Description                                                                                                                                                                    |                                                                                   |
|                 | s7                                                                                                                                    | Siemens S7-200, 300, 400 and compatible as Speed7. Can be used for accessing the controller over MPI adapter from Hilscher, Process Informatik, IBH Softec, Softing, Helmholz. |                                                                                   |
|                 | tia                                                                                                                                   | Siemens S7 1200 and 1500. This will support the optimized data blocks.                                                                                                         |                                                                                   |
|                 | s5                                                                                                                                    | Siemens S5 with network CP All racks are supported 135, 155, 188. All CPU types.                                                                                               |                                                                                   |
|                 | compactlogics                                                                                                                         | Rockwell Control Logix and Compact Logix.                                                                                                                                      |                                                                                   |
|                 | slc                                                                                                                                   | Rockwell SLC family.                                                                                                                                                           |                                                                                   |
|                 | modbus                                                                                                                                | Modbus TCP and compatible systems as Wago, Beckhoff, Modicon, Omron and more..                                                                                                 |                                                                                   |
|                 | melsecQ                                                                                                                               | Mitsubishi Melsec family.                                                                                                                                                      |                                                                                   |
| raw             | Raw data.                                                                                                                             |                                                                                                                                                                                |                                                                                   |
| NetworkProtocol | Valid are:                                                                                                                            |                                                                                                                                                                                |                                                                                   |
|                 | Value                                                                                                                                 | Alternative                                                                                                                                                                    | Description                                                                       |
|                 | ip                                                                                                                                    | tcp                                                                                                                                                                            | TCP/IP TCP over IpV4 (192.168.1.1) or IpV6 <235b:34aa::0001:0030) or domain names |
|                 | udp                                                                                                                                   |                                                                                                                                                                                | TCP/IP UDP over IpV4 (192.168.1.1) or IpV6 <235b:34aa::0001:0030) or domain names |
|                 | h1                                                                                                                                    | osi                                                                                                                                                                            | OSI/H1 over MAC Addresses (080006010001) or (08:00:06:01:00:01)                   |
| NetworkAddress  | IpV4 (192.168.1.1) or<br>IpV6 (235b:34aa::0001:0030) or<br>domain names (s7.mydomain.com)                                             |                                                                                                                                                                                |                                                                                   |
| Port            | 1 .. 65534. This is needed for IP connections only.                                                                                   |                                                                                                                                                                                |                                                                                   |
| ConnectType     | Valid are: <ul style="list-style-type: none"><li>• Server</li><li>• Client</li></ul>                                                  |                                                                                                                                                                                |                                                                                   |
| OwnTSAP         | in hexadecimal. This is valid on OSI/H1 or Port 102 (RFC1006) connections only. (0101)                                                |                                                                                                                                                                                |                                                                                   |
| DestinationTSAP | in hexadecimal. This is valid on OSI/H1 or Port 102 (RFC1006) connections only. (0302)                                                |                                                                                                                                                                                |                                                                                   |
| Slave           | In Modbus connections this is the slave or node address. In Rockwell                                                                  |                                                                                                                                                                                |                                                                                   |

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           | connections this is the CPU number. All other connections do not use this value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Start1</b>             | If Modbus connection this defines the assumed first register. False means the first register is zero otherwise the register count starts with one.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>RockwellRouting</b>    | <p>This is for reaching specific parts of the controller or access controllers in underlying connections. This element requires text.</p> <p>Three options exist:</p> <ul style="list-style-type: none"> <li>• No routing (empty path). This is for reaching CPU Damit with logical integrated network modules in the PLC. Example are Micro800 or L16.</li> <li>• Simple routing. This is for reaching a specific CPU in multi CPU controllers..<br/><b>CPU(0)</b> will access CPU 0. In controllers with logical separate network adapters this is required. The L35E-models will need this.</li> <li>• Extended routing. This is for accessing controllers over underlying networks as DH+<br/><b>Port(1;2)</b> goes over port 1 to the destination 2.<br/><b>PortEx(4;192.168.2.212)</b> accesses controllers in an underlying ip network. In this example the network adapter has the port number 4, the next controller is reached over 192.168.2.212.<br/><b>DHPlus(1;0;0;15)</b> reaches a controller over a DHplus on channel A(1), Source Link 0 the plc destination Link 0 Node 15.<br/>An example for a longer routing path:<b>Port(1;0)-Port(2;1)-PortEx(4;192.168.2.212)</b></li> </ul> <p>The port and slot numbers are taken from the graphical configuration or RsWho.</p> <p>Connection routing paths can be very long if this runs over multiple underlying busses.</p> <p>Some controllers as the Micro800 models can not have a routing path if they need to be accessed. In case of route over a Micro800 model to other controllers the path is required.</p> |
| <b>RockwellCharset</b>    | This can be: <b>UTF8</b> (default) or <b>ANSI</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>RockwellHeader</b>     | Allowed is <b>ENCAP</b> (default) or <b>CSP</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>RockwellProtocol</b>   | Allowed is <b>CIP</b> (default) or <b>PCCC</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>RockwellShowHidden</b> | Possible are <b>None</b> (default), <b>Hidden</b> , <b>Underscore</b> , <b>All</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Create</b>             | Writing a value not zero creates the connection. This variable is write only.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>CreateStatus</b>       | <p>0 -&gt; Topic is created. This variable is read only.</p> <p>1 -&gt; Invalid connection parameters. Mostly this will happen on too long TSAP values.</p> <p>5 -&gt; Invalid adapter. The given adapter is not available. Mostly on variable adapters (USB to Ethernet) which was disconnected.</p> <p>17 -&gt; No free memory available.</p> <p>101 -&gt; not supported. This will happen on plc protocols which are not available.</p> <p>1319 -&gt; not supported. Mostly this happens on unsupported network protocols as IpV6 which is not configured.</p> <p>1324 -&gt; License limit. The maximum of connections are created already.</p> <p>1325 -&gt; not licensed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>AddTopic</b>           | can be used instead of the variables <b>Name</b> , <b>PlcType</b> , <b>NetworkProtocol</b> , <b>NetworkAddress</b> , <b>Port</b> , <b>ConnectType</b> , <b>OwnTSAP</b> , <b>DestinationTSAP</b> for                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

|  |                                                                                                                                                                                                                                                                                  |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | creation of connections. This variable is write only. The syntax on an example of an s7 connection with the name "s7"<br>"s7.tcp://192.168.2.200:102?name=\"my name<br>\\\",typ=client,ownTSAP=0101,destinationTSAP=0302"<br>The element <b>Create</b> is not used in this case. |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Values for System.Versions

A version number of zero says that the component is not loaded.

| Topic name        | Description                                                                                                |
|-------------------|------------------------------------------------------------------------------------------------------------|
| <b>PlcEngine</b>  | Version number of the core of the PlcEngine or OPC server.                                                 |
| <b>Wmk</b>        | Version number of the Wmk library. This library contains general functions.                                |
| <b>IpLib</b>      | Version number of the TCPIP library. This library contains all IP socket functions.                        |
| <b>H1</b>         | Version number of the Osi/H1 driver.                                                                       |
| <b>OpcDA</b>      | Version number of the OPC DA library. This library contains Classic OPC and is available for Windows only. |
| <b>OpcUA</b>      | Version number of the OPC UA library. This library contains OPC UA.                                        |
| <b>OpcPipe</b>    | Version number of the OpcPipe library. This library contains the item management.                          |
| <b>PlcLib</b>     | Version number of the PLC protocol library. This library contains all PLC protocols and its management.    |
| <b>ItemSyntax</b> | Version number of the item syntax library. The library converts symbols in elements.                       |
| <b>ConfigSubs</b> | Version number of the configuration general functions. The library handles the configuration of the core.  |
| <b>..</b>         | Depending of the software or the release more software component version numbers are shown.                |

### Values for System.Platform

Platform offers variables which are different from platform to platform. Mostly this are I/O variables.

Variables for the Regor devices from the manufacturer Phytec:

| Topicname          | Beschreibung                                                                      |
|--------------------|-----------------------------------------------------------------------------------|
| <b>Digital1Dir</b> | Sets the function of pin 1. "true" defines it as output, "false" as input.        |
| <b>Digital1In</b>  | If pin 1 is an input "true" signals a closed connection between pin 1 and ground. |
| <b>Digital1Out</b> | If pin 1 is an output "true" signals a closed switch between pin 1 and ground.    |
|                    | <b>Digital2Dir, Digital2In, Digital2Out</b> are for pin 2. Same to pin 3 and 4.   |
| <b>ErrorLED</b>    | "true" signals the LED on. Writing "false" switches it off, "true" on again.      |
| <b>RunStopLED</b>  | "true" signals the LED on. Writing "false" switches it off, "true" on again.      |

### Values for System.Licenses

The licenses and their details are here.

| Topic name          | Description                                                                     |
|---------------------|---------------------------------------------------------------------------------|
| <b>BaseLicense</b>  | Order number of the product. The comment of the item contains the product name. |
| <b>BaseLicenseE</b> | End date for time limited and test licenses in the format yyyy-mm-dd hh:mm      |



|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>xpires</b>           | for example: 2017-12-31 23:59                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>BaseLicenseState</b> | Bit coded value:<br>Bit 0: A permanent license is present and it is OK.<br>Bit 1: The dongle is recognized and valid.<br>Bit 2: The dongle was recognized in the past, but now it can not be found.<br>Bit 3: Licensing via software confirm code.<br>Bit 4: A software confirm code is detected and OK.<br>Bit 5: A time limited confirm code has been detected. The expiration time is shown in item BaseLicenseExpires.<br>Bit 6: A time limited confirm code has been detected and expired.<br>Bit 7: The hardware (network card) to which the license was attached is no longer present.<br>Bit 8: No license is recognized, it is a test version. The expiration time is shown in item BaseLicenseExpires.<br>Bit 9: The test phase has expired, a restart is required.<br>Bit 10: Free license product is set, no licensing required |
| <b>AddonLicenseX</b>    | Order number of an addon. X is a consecutive number and starts with 1. If multiple addons exist more AddonLicenseX elements will exist. The comment of the item contains the addon product name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

### Values for System.Status

Provides data points for extended status of the entire server.

| Item name                  | Description                                                                                                                                                                                                                                                                                           |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>StructChangeCounter</b> | These items are incremented when the internal structure or enum lists are modified.                                                                                                                                                                                                                   |
| <b>EnumChangeCounter</b>   | This is not connection-specific, but a single counter for the entire server.<br>If automatic import is switched off, the counters increment when a structure/enum is imported manually.<br>If automatic import is switched on, the counters increment when a new structure/enum is read from the PLC. |

## 1.11 Configuration Tree

With the Configuration Topic all configurations can be done as the graphical configuration does. The topic can be created with the graphical configuration. If the software is installed on a new system the installer asks for the creation of this topic.

All details for the configuration is available in the Connection subtree.

It is separated to

|            |                                                      |
|------------|------------------------------------------------------|
| Base       | Name of the connection, rights, time details         |
| OPC        | All for OPC server and clients                       |
| Transport  | IP Addresses, TSAPs, OSI                             |
| Operations | Handling for read and write connections, assistances |

und viele Weitere die sich selbst erklären

The configuration topic knows some dynamic handling.

Example 1: Read the details of a connection.

Write the connection name to Configuration.Connection.Base.ConnectionName and the group name in

Configuration.Connection.Base.ConnectionGroup.

After this write true to Configuration.Connection.Operations.Read. The job starts the content of the variable Configuration.Connection.Base.Status will change to 6 (running). If the variable changes zu zero the list of connections is read. In Configuration.Connection.Base.ListResults the results will be delivered. In Configuration.Connection.Base.ListResultMaxLen the number of connections will return. In case of an error the variable Configuration.Connection.Base.ListStatus is containing the error code, Configuration.Connection.Base.ListErrorText is containing an error text for this. If this is handled over OPC UA so Configuration.Connection.Base.ListResult is an array with the desired length.

Example 2: Read the list of network adapters.

Write the variable Configuration.Operations.Adapter.Start to true. The variable Configuration.Operations.Assistants.Adapter.Status will return 6 (running). If the job finishes without an error the variable will become zero. In Configuration.Operations.Assistants.Adapter.Result the recognized network adapters of the station will return..In case of an error a human readable text will be in Configuration.Operations.Assistants.Adapter.ErrorText, in Configuration.Operations.Assistants.Adapter.Status the corresponding error code is delivered.

Example 3: Read the list of available Rockwell PLC.

Please search the network adapters as in example 2. Copy the needed adapter to Configuration.Operations.Assistants.RockwellHost.Configuration.Adapter. Write true to Configuration.Operations.Assistants.RockwellHost.Start. The job will start, The variable Configuration.Operations.Assistants.RockwellHostStatus will change to 6 (running). If the job will finish (in Configuration.Operations.Assistants.RockwellHost.Status zero comes) the found Rockwell controllers will be in Configuration.Operations.Assistants.RockwellHost.Result die Liste der gefundenen Steuerungen. Searching PLC will need time, some PLC will respond very late. So the variable Configuration.Operations.Assistants.RockwellHost.Start need set to true multiple times. If this is handled over OPC UA so Configuration.Operations.Assistants.RockwellHost.Result is an array with the desired length.

Please import the structures from the Configuration topic if your OPC client can handle structures.

## 1.12 Redundancy

Connections with redundancy only provide these values.

| Element name               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CurrentMaster</b>       | <p>Reading brings the current master. 1 is the first connection.<br/>Writing switches to the given connection.</p> <p><b>Hint:</b><br/><b>Writing an invalid value does nothing.</b></p> <p>In <b>dynamic master</b> this switches to the given connection. If the new connection will work stable it will remain. Otherwise an other connection is choose.</p> <p>In <b>static master</b> it will be switched back after one minute if the master works stable. If the slave connection breaks it will be switched to the master immediately it it will work stable. Otherwise an outer connection is choose.</p> |
| <b>Connection&lt;n&gt;</b> | <p>This variable will exist in the number of redundancy connections. .<br/>Each Connection&lt;n&gt; Variable will contain<br/><b>Status</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|  |                                                                                                                                                                                    |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>ServerCycle</b><br><b>ReadCount</b><br><b>WriteCount.</b><br>These variables are working in the same manner of in connections without redundancy. <a href="#">Details here.</a> |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 1.13 Bit mask

With a bit mask several bits of a data type can be read or written, by combining them to one decimal value. Bit maskign of arrays is possible as well.

### Syntax

8 bits of data word 0 of data block 5 shall be read beginning with bit 2. Therefore the following syntax is used:

- db5.w0#2.8 or
- db5.w0#2,8 or
- db5.w0#2#8

### Examples

DB10.W03.4  
 DB10.DWord2#20.10  
 DB10.DWord6#20.10KF  
 DB10.DInt10#20#10

#### Note:

Does not work with Left Byte or Right Byte (DL, DR) and Suffix BA

#### Note:

Do not mask bits of REAL or KG

## 1.14 Arrays

The word array means a series of equal elements (field, row, data area). An array combines several units of one data type in a field. To create an array, the length of the array is added to the standard syntax, separated by a period.

Arrays are impossible in:

- with all suffixes that are string to the client:
  - ISO

## 1.15 Suffixes

Using a suffix, a value can be displayed in a different format.

| Suffixes | Syntax | Used for | Area | Data type | Variant Data Type | Comment |
|----------|--------|----------|------|-----------|-------------------|---------|
|----------|--------|----------|------|-----------|-------------------|---------|

|                                |            |                                |                                                                                                                                                  |                                  |                                  |                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------|------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date and Time in String Format | <b>ISO</b> | DT                             | 1990-1-1-00:00:00.000 bis<br>2098-12-31-24:59:59.999*                                                                                            | STRING                           | VT_BSTR                          | The suffix DT is used to show the data saved in the PLC as a combined data type DATE_AND_TIME and is transferred as a string. The data type DATE_AND_TIME has 8 bytes (64 bits) in the PLC. The year, the month, the day, the hour, the minutes, the seconds and the milliseconds are included. Remember to use the correct separators (hyphen, colon and period)! |
| BCD                            | <b>BCD</b> | Byte<br>Word<br>DWord<br>QWord | Byte: 0 to 99<br>Word: 0 to 999<br>DWord: 0 to 9999999<br>QWord: 0 to 9999999999999999                                                           | VT_I1<br>VT_I2<br>VT_I4<br>VT_I8 | VT_I1<br>VT_I2<br>VT_I4<br>VT_I8 | With the BCD suffix, the data stored in the PLC is represented as an unsigned, binary-encoded value. For example, the decimal value "65535" will be represented as "9999".                                                                                                                                                                                         |
| ASCII to Hex                   | <b>KA</b>  | String                         | HEX: 0 to 9, A to F                                                                                                                              | STRING                           | VT_BSTR                          | With the KA suffix, the data stored in the PLC is represented as HEX characters.                                                                                                                                                                                                                                                                                   |
| Signed                         | <b>KF</b>  | Byte<br>Word<br>DWord<br>QWord | Byte: -128 to 127<br>Word: -32768 to 32767<br>DWord: -2147483648 to 2147483647<br>QWord: -9.223.372.036.854.775.808 to 9.223.372.036.854.775.807 | CHAR<br>SHORT<br>LONG<br>LLONG   | VT_I1<br>VT_I2<br>VT_I4<br>VT_I8 | With the KF suffix, the data stored in the PLC is represented as a signed fixed point number.                                                                                                                                                                                                                                                                      |
| S5-KG                          | <b>KG</b>  | DWord                          | 0.1469368E-38 to 0.1701412E39<br>Attention: The KG area in the PLC is larger than in the PC!                                                     | REAL                             | VT_R4                            | With the KG suffix, the data stored in the PLC is treated as a 4-byte floating point number.                                                                                                                                                                                                                                                                       |
| S5-KT-Format                   | <b>KT</b>  | Word                           | 000.0 to 999.3                                                                                                                                   | STRING                           | VT_BSTR                          | With the KT suffix, the data stored in the PLC is represented as a 2-byte time constant. The time base is included in addition to the time value. The value range is from 000.0 to 999.3                                                                                                                                                                           |
| S5 Time                        | <b>S5T</b> | Word                           | 0ms to 2h46m30                                                                                                                                   | STRING                           | VT_BSTR                          | With the S5T suffix, the data stored in the PLC is represented as S5TIME (SIMATIC time). The S5TIME data type occupies one 16-bit word and is the                                                                                                                                                                                                                  |

|             |            |             |                                                   |        |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------|------------|-------------|---------------------------------------------------|--------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             |            |             |                                                   |        |         | product of the time value and the time interval (time base). The time duration is given in hours, minutes, seconds and milliseconds. The BCD number format is used for internal representation. The value range is from 0 ms to 2h46m30s. The smallest value is 10ms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Date        | <b>D</b>   | Word        | 1990-01-01<br>bis<br>2168-12-31                   | STRING | VT_BSTR | <p>The suffix D is used to show the data saved on the PLC as data type DATE. The DATE data type occupies one word. The content corresponds to the number of days since 01.01.1990. The representation contains the year, the day and the month, separated by a hyphen. September 1, 2006 is shown as 2006-01-09. The value range is from 0 (0 days since 01.01.1990: 1990-01-01) to 65378 (65378 days since 01.01.1990: 2168-12-31).</p> <p>Rules for use of suffix D:</p> <ul style="list-style-type: none"> <li>• The years 1990 up to and including 2089 can be specified with 2 or 4 positions. The years starting with 2090 must be entered with 4 positions.<br/>90 to 99 ==&gt; 1990 to 1999<br/>00 to 89 ==&gt; 2000 to 2089</li> <li>• The months and days can be specified with either 1 or 2 positions.</li> <li>• Anything but numbers can be used as a separator (e.g., 89/09/17). Any number of separators can be used.</li> </ul> |
| Time        | <b>T</b>   | DWord       | -<br>24d20h31m23s648ms<br>to<br>24d20h31m23s647ms | STRING | VT_BSTR | <p>With the T suffix, the data stored in the PLC is represented as the TIME data type. The TIME data type occupies one double word (32 bits). The representation contains the days (d), hours (h), minutes (m), seconds (s) and milliseconds (ms). Milliseconds can be omitted.</p> <p>The value range is from -2147483648 (-24d20h31m23s648ms) to 2147483647 (24d20h31m23s647ms)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Time of Day | <b>TOD</b> | DWord, DInt | 0:0:0.0 to<br>23:59:59.999                        | STRING | VT_BSTR | <p>The TOD suffix is used to show the data saved on the PLC as data type TIME_OF_DAY. The data type TIME_OF_DAY occupies one double word (32 bits). The representation contains the information for hours:minutes:seconds and .milliseconds. Milliseconds can be omitted.</p> <p>The value range goes from 0:0:0.0 to 23:59:59.999.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|            |                 |                                                                      |                                 |                    |                    |                                                                                                                                         |
|------------|-----------------|----------------------------------------------------------------------|---------------------------------|--------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| TimeReal   | <b>TR</b>       | Word                                                                 | 0.01 to 9990.0                  | REAL               | VT_R4              | With the TR suffix, the data stored in the PLC is represented as the TIME REAL data type.<br>The value range is from 0.01 to 9990.0 (s) |
| Swap bytes | <b>SWAP</b>     | String<br>Word, Int<br>DWord, DInt<br>QWord, QInt<br>Real,<br>Double | Exchange high byte and low byte | original data type | original data type | High byte and low byte of the tags stored in the PLC are exchanged. Important for strings in Modbus PLCs.                               |
| Comment    | <b>_comment</b> | all items                                                            | gives the comment of the item   | STRING             | VT_BSTR            | Only for OPC DA returns the comment of the item. It is write protected.                                                                 |

\* ms can be omitted.

## 1.16 Item Syntax neutral

Modern PLCs don't need an item syntax. All symbols are available on the controller. They will be read online. This applies to all Rockwell ControlLogix and CompactLogix PLCs, all Siemens S7 1500 and 1200 models, and BACnet devices.

Some subsystems as MQTT do not know variables with defined data types. For these the neutral item syntax is offered also.

For MQTT the usage of this item syntax need to be configured in the connection parameters.

A tag is fully defined with the tag name, the data type is defined by the PLC. Normally, nothing needs to be added.

However, there are some exceptions:

- Addressing a single element of an array:  
the zero-based index is specified in square brackets after the item name.

**<Tagname>[<index>]**

If you need offline symbols, you can add them. This may be required:

- to have symbols without a controller online,
- to rename symbols
- for simulation connections.

The "item syntax" is the real symbol name in the controller.

Because no data type is available without online access to the PLC an optional name extension exists for specifying the type.

The rule is:

**<Symbolname>{{<Datatype>,<Endian>}}**

or for arrays:

**<Symbolname>{{<Datatype>,<Arraylength>,<Endian>}}**

The following data types are allowed (the spaces are important):

**Bool**

Int 8  
Int 16  
Int 32  
Int 64  
Uint 8  
Uint 16  
Uint 32  
Uint 64  
Float  
Double  
Timestamp  
String

These is possible for endian:

**LittleEndian**, some times known as INTEL format

**BigEndian**, known as Motorola format

If non endian is given the format of the locally working cpu is used.

The symbol name (without the {{ }} name extension) must be present in the controller (except for simulation connections).