

**IEC60870-5-101 Master Protocol Details  
for  
KALKI Protocol Gateway/GatewayLite**

**Product User Guide**

Version – 1.0

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## 1. Introduction

The purpose of this document is to describe the functionalities of IEC101 Master protocol implemented in the Kalki Protocol Gateway / Kalki Substation GatewayLite. This will contain details of interoperability, configuration details & mapping of the data from some of the other master protocols available in Kalki Protocol Gateway.

## 2. Interoperability

This companion standard presents sets of parameters and alternatives from which subsets have to be selected to implement particular telecontrol systems. Certain parameter values, such as the number of octets in the COMMON ADDRESS of ASDUs represent mutually exclusive alternatives. This means that only one value of the defined parameters is admitted per system. Other parameters, such as the listed set of different process information in command and in monitor direction allow the specification of the complete set or subsets, as appropriate for given applications. This clause summarizes the parameters of the previous clauses to facilitate a suitable selection for a specific application. If a system is composed of equipment stemming from different manufacturers it is necessary that all partners agree on the selected parameters.

The selected parameters are marked in the white boxes as follows:

- Function or ASDU is not used
- Function or ASDU is used as standardized (default)
- Function or ASDU is used in reverse mode
- Function or ASDU is used in standard and reverse mode

### 2.1 System or device

- System definition
- Controlling station definition (Master)
- Controlled station definition (Slave)

### 2.2 Network configuration

- Point-to-point
- Multiple point-to-point
- Multipoint-party line
- Multipoint-star

### 2.3 Physical layer

Transmission speed (control direction)

Unbalanced interchange circuit V.24/V.28	Unbalanced interchange circuit V.24/V.28	Balanced interchange circuit X.24/X.27	
Standard	Recommended if >1 200 bit/s		
<input type="checkbox"/> 100 bit/s	<input checked="" type="checkbox"/> 2400 bit/s	<input checked="" type="checkbox"/> 2400 bit/s	<input type="checkbox"/> 56000 bit/s
<input type="checkbox"/> 200 bit/s	<input checked="" type="checkbox"/> 4800 bit/s	<input checked="" type="checkbox"/> 4800 bit/s	<input type="checkbox"/> 64000 bit/s
<input type="checkbox"/> 300 bit/s	<input checked="" type="checkbox"/> 9600 bit/s	<input checked="" type="checkbox"/> 9600 bit/s	
<input checked="" type="checkbox"/> 600 bit/s		<input checked="" type="checkbox"/> 19200 bit/s	
<input checked="" type="checkbox"/> 1200 bit/s		<input type="checkbox"/> 38400 bit/s	

Transmission speed (monitor direction)

Unbalanced interchange circuit V.24/V.28	Unbalanced interchange circuit V.24/V.28	Balanced interchange circuit X.24/X.27	
Standard	Recommended if >1 200 bit/s		
<input type="checkbox"/> 100 bit/s	<input checked="" type="checkbox"/> 2400 bit/s	<input checked="" type="checkbox"/> 2400 bit/s	<input type="checkbox"/> 56000 bit/s
<input type="checkbox"/> 200 bit/s	<input checked="" type="checkbox"/> 4800 bit/s	<input checked="" type="checkbox"/> 4800 bit/s	<input type="checkbox"/> 64000 bit/s
<input type="checkbox"/> 300 bit/s	<input checked="" type="checkbox"/> 9600 bit/s	<input checked="" type="checkbox"/> 9600 bit/s	
<input checked="" type="checkbox"/> 600 bit/s		<input checked="" type="checkbox"/> 19200 bit/s	
<input checked="" type="checkbox"/> 1200 bit/s		<input type="checkbox"/> 38400 bit/s	

### 2.4 Link layer

Frame format FT 1.2, single character 1 and the fixed time out interval are used exclusively in this companion standard.

Link transmission procedure

- Balanced transmission
- Unbalanced transmission

Address field of link

- Not present (balanced transmission only)
- One octet
- Two octets
- Structured
- Unstructured

Frame length

Maximum length L (number of octets)

## 2.5 Application layer

### 2.5.1 Transmission mode for application data

Mode 1 (Least significant octet first), as defined in clause 4.10 of IEC 870-5-4, is used exclusively in this companion standard.

### 2.5.2 Common address of ASDU

- One octet                       Two octets

### 2.5.3 Information object address

- One octet                       structured  
 Two octets                     unstructured  
 Three octets

### 2.5.4 Cause of transmission

- One octet                       Two octets (with originator address)

### 2.5.6 Selection of standard ASDUs

#### 2.5.6.1 Process information in monitor direction

- |  |           |
|--|-----------|
| <input checked="" type="checkbox"/> <1> := Single-point information                                  | M_SP_NA_1 |
| <input checked="" type="checkbox"/> <2> := Single-point information with time tag                    | M_SP_TA_1 |
| <input checked="" type="checkbox"/> <3> := Double-point information                                  | M_DP_NA_1 |
| <input checked="" type="checkbox"/> <4> := Double-point information with time tag                    | M_DP_TA_1 |
| <input checked="" type="checkbox"/> <5> := Step position information                                 | M_ST_NA_1 |
| <input checked="" type="checkbox"/> <6> := Step position information with time tag                   | M_ST_TA_1 |
| <input checked="" type="checkbox"/> <7> := Bitstring of 32 bit                                       | M_BO_NA_1 |
| <input checked="" type="checkbox"/> <8> := Bitstring of 32 bit with time tag                         | M_BO_TA_1 |
| <input checked="" type="checkbox"/> <9> := Measured value, normalized value                          | M_ME_NA_1 |
| <input checked="" type="checkbox"/> <10> := Measured value, normalized value with time tag           | M_ME_TA_1 |
| <input checked="" type="checkbox"/> <11> := Measured value, scaled value                             | M_ME_NB_1 |
| <input checked="" type="checkbox"/> <12> := Measured value, scaled value with time tag               | M_ME_TB_1 |
| <input checked="" type="checkbox"/> <13> := Measured value, short floating point value               | M_ME_NC_1 |
| <input checked="" type="checkbox"/> <14> := Measured value, short floating point value with time tag | M_ME_TC_1 |
| <input checked="" type="checkbox"/> <15> := Integrated totals  | M_IT_NA_1 |

<input checked="" type="checkbox"/> <16> := Integrated totals with time tag	M_IT_TA_1
<input checked="" type="checkbox"/> <17> := Event of protection equipment with time tag	M_EP_TA_1
<input checked="" type="checkbox"/> <18> := Packed start events of protection equipment with time tag	M_EP_TB_1
<input checked="" type="checkbox"/> <19> := Packed output circuit information of protection equipment with time tag	M_EP_TC_1
<input checked="" type="checkbox"/> <20> := Packed single-point information with status change detection	M_PS_NA_1
<input checked="" type="checkbox"/> <21> := Measured value, normalized value without quality descriptor	M_ME_ND_1
<input checked="" type="checkbox"/> <30> := Single-point information with time tag CP56Time2a	M_SP_TB_1
<input checked="" type="checkbox"/> <31> := Double-point information with time tag CP56Time2A	M_DP_TB_1
<input checked="" type="checkbox"/> <32> := Step position information with time tag CP56Time2A	M_ST_TB_1
<input checked="" type="checkbox"/> <33> := Bitstring of 32 bit with time tag CP56Time2A	M_BO_TB_1
<input checked="" type="checkbox"/> <34> := Measured value, normalized value with time tag CP56Time2A	M_ME_TD_1
<input checked="" type="checkbox"/> <35> := Measured value, scaled value with time tag CP56Time2A	M_ME_TE_1
<input checked="" type="checkbox"/> <36> := Measured value, short floating point value with time tag CP56Time2A	M_ME_TF_1
<input checked="" type="checkbox"/> <37> := Integrated totals with time tag CP56Time2A	M_IT_TB_1
<input type="checkbox"/> <38> := Event of protection equipment with time tag CP56Time2A	M_EP_TD_1
<input type="checkbox"/> <39> := Packed start events of protection equipment with time tag CP56time2A	M_EP_TE_1
<input type="checkbox"/> <40> := Packed output circuit information of protection equipment with time tag CP56Time2a	M_EP_TF_1

**2.5.6.2 Process information in control direction**

<input checked="" type="checkbox"/> <45> := Single command	C_SC_NA_1
<input checked="" type="checkbox"/> <46> := Double command	C_DC_NA_1
<input checked="" type="checkbox"/> <47> := Regulating step command	C_RC_NA_1
<input checked="" type="checkbox"/> <48> := Set point command, normalized value	C_SE_NA_1
<input checked="" type="checkbox"/> <49> := Set point command, scaled value	C_SE_NB_1
<input checked="" type="checkbox"/> <50> := Set point command, short floating point value	C_SE_NC_1
<input checked="" type="checkbox"/> <51> := Bitstring of 32 bit	C_BO_NA_1

**2.5.6.3 System information in monitor direction**

<input checked="" type="checkbox"/> <70> := End of initialization	M_EI_NA_1
---	-----------

**2.5.6.4 System information in control direction**

<input checked="" type="checkbox"/> <100> := Interrogation command	C_IC_NA_1
<input checked="" type="checkbox"/> <101> := Counter interrogation command	C_CI_NA_1
<input checked="" type="checkbox"/> <102> := Read command	C_RD_NA_1
<input checked="" type="checkbox"/> <103> := Clock synchronization command	C_CS_NA_1
<input checked="" type="checkbox"/> <104> := Test command	C_TS_NB_1

- |  |           |
|--|-----------|
| <input checked="" type="checkbox"/> <105> := Reset process command     | C_RP_NC_1 |
| <input checked="" type="checkbox"/> <106> := Delay acquisition command | C_CD_NA_1 |

**2.5.6.5. Parameter in control direction**

- |   |           |
|---|-----------|
| <input type="checkbox"/> <110> := Parameter of measured value, normalized value           | P_ME_NA_1 |
| <input type="checkbox"/> <111> := Parameter of measured value, scaled value               | P_ME_NB_1 |
| <input type="checkbox"/> <112> := Parameter of measured value, short floating point value | P_ME_NC_1 |
| <input type="checkbox"/> <113> := Parameter activation                                    | P_AC_NA_1 |

**2.5.6.6 File Transfer**

- |  |           |
|--|-----------|
| <input type="checkbox"/> <120> := File ready   | F_FR_NA_1 |
| <input type="checkbox"/> <121> := Section ready  | F_SR_NA_1 |
| <input type="checkbox"/> <122> := Call directory, select file, call file, call section | F_SC_NA_1 |
| <input type="checkbox"/> <123> := Last section, last segment                           | F_LS_NA_1 |
| <input type="checkbox"/> <124> := Ack file, ack section                                | F_AF_NA_1 |
| <input type="checkbox"/> <125> := Segment  | F_SG_NA_1 |
| <input type="checkbox"/> <126> := Directory  | F_DR_TA_1 |

**2.5.7. Type identifier and cause of transmission assignments**

Shaded boxes are not required.

Black boxes are not permitted in this companion standard

Blank: functions or ASDU not used.

Mark Type Identification/Cause of transmission combinations:

'X' if only used in the standard direction

'R' if only used in the reverse direction

'B' if used in both directions

Type identification		Cause of transmission																		
		periodic, cyclic	background scan	spontaneous	initialized	request or requested	activation	activation confirmation	deactivation	deactivation confirmation	activation termination	return info caused by a remote cmd	return info caused by a local cmd	file transfer	interrogated by group <number>	request by group <id> counter request	unknown type identification	unknown cause of transmission	unknown common address of ASDU	unknown information object address
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<1>	M_SP_NA_1					X									X					
<2>	M_SP_TA_1			X								X	X							
<3>	M_DP_NA_1					X									X					
<4>	M_DP_TA_1			X								X	X							
<5>	M_ST_NA_1					X									X					
<6>	M_ST_TA_1			X								X	X							
<7>	M_BO_NA_1					X									X					
<8>	M_BO_TA_1			X																
<9>	M_ME_NA_1	X				X									X					
<10>	M_ME_TA_1			X																
<11>	M_ME_NB_1	X				X									X					
<12>	M_ME_TB_1			X																
<13>	M_ME_NC_1	X				X									X					
<14>	M_ME_TC_1			X																
<15>	M_IT_NA_1															X				
<16>	M_IT_TA_1			X																
<17>	M_EP_TA_1																			

Type identification		Cause of transmission																			
		periodic, cyclic	background scan	spontaneous	initialized	request or requested	activation	activation confirmation	deactivation	deactivation confirmation	activation termination	return info caused by a remote cmd	return info caused by a local cmd	file transfer	interrogated by group <number>	request by group <n> counter request	unknown type identification	unknown cause of transmission	unknown common address of ASDU	unknown information object address	
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47	
<18>	M_EP_TB_1																				
<19>	M_EP_TC_1																				
<20>	M_PS_NA_1																				
<21>	M_ME_ND_1																				
<30>	M_SP_TB_1			X								X	X								
<31>	M_DP_TB_1			X								X	X								
<32>	M_ST_TB_1			X								X	X								
<33>	M_BO_TB_1			X																	
<34>	M_ME_TD_1			X																	
<35>	M_ME_TE_1			X																	
<36>	M_ME_TF_1			X																	
<37>	M_IT_TB_1			X												X					
<38>	M_EP_TD_1																				
<39>	M_EP_TE_1																				
<40>	M_EP_TF_1																				
<45>	C_SC_NA_1						X	X	X	X	X										
<46>	C_DC_NA_1						X	X	X	X	X										
<47>	C_RC_NA_1						X	X	X	X	X										
<48>	C_SE_NA_1						X	X	X	X	X										
<49>	C_SE_NB_1						X	X	X	X	X										
<50>	C_SE_NC_1						X	X	X	X	X										
<51>	C_BO_NA_1						X	X			X										
<58>	C_SC_TA_1																				
<59>	C_DC_TA_1																				
<60>	C_RC_TA_1																				
<61>	C_SE_TA_1																				
<62>	C_SE_TB_1																				
<63>	C_SE_TC_1																				

Type identification		Cause of transmission																		
		periodic, cyclic	background scan	spontaneous	initialized	request or requested	activation	activation confirmation	deactivation	deactivation confirmation	activation termination	return info caused by a remote cmd	return info caused by a local cmd	file transfer	interrogated by group <number>	request by group <n> counter request	unknown type identification	unknown cause of transmission	unknown common address of ASDU	unknown information object address
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<64>	C_BO_TA_1																			
<70>	M_EI_NA_1*)				X															
<100>	C_IC_NA_1						X	X	X	X	X									
<101>	C_CI_NA_1						X	X			X									
<102>	C_RD_NA_1					X														
<103>	C_CS_NA_1			X			X	X												
<104>	C_TS_NA_1						X	X												
<105>	C_RP_NA_1						X	X												
<106>	C_CD_NA_1						X	X												
<107>	C_TS_TA_1						X	X												
<110>	P_ME_NA_1																			
<111>	P_ME_NB_1																			
<112>	P_ME_NC_1																			
<113>	P_AC_NA_1																			
<120>	F_FR_NA_1																			
<121>	F_SR_NA_1																			
<122>	F_SC_NA_1																			
<123>	F_LS_NA_1																			
<124>	F_AF_NA_1																			
<125>	F_SG_NA_1																			
<126>	F_DR_TA_1*)																			
<b>* Blank or X only</b>																				

## 2.6. Basic application functions

### 2.6.1. Station initialization

- Remote initialization

### 2.6.2. Cyclic data transmission

- Cyclic Data transmission

### 2.6.3. Read procedure

- Read Procedure

### 2.6.4. Spontaneous transmission

- Spontaneous transmission

### 2.6.5. Double transmission of information objects with cause of transmission spontaneous

The following type identifications may be transmitted in succession caused by a single status change of an information object. The particular information object addresses for which double transmission is enabled are defined in a project-specific list.

- Single-point information M SP NA 1, M SP TA 1, M SP TB 1 and M PS NA 1
- Double-point information M DP NA 1, M DP TA 1 and M DP TB 1
- Step position information M\_ST\_NA\_1, M\_ST\_TA\_1 and M\_ST\_TB\_1
- Bitstring of 32 bit M\_BO\_NA\_1, M\_BO\_TA\_1 and M\_BO\_TB\_1 (if defined for a specific project)
- Measured value, normalized value M ME NA 1, M ME TA 1, M ME ND 1 and M ME TD 1
- Measured value, scaled value M ME NB 1, M ME TB 1 and M ME TE 1
- Measured value, short floating point number M\_ME\_NC\_1, M\_ME\_TC\_1 and M\_ME\_TF\_1

### 2.6.6. Station interrogation

- |   |  |  |
|---|--|--|
| <input checked="" type="checkbox"/> global  |  |  |
| <input checked="" type="checkbox"/> group 1 | <input checked="" type="checkbox"/> group 7  | <input checked="" type="checkbox"/> group 13 |
| <input checked="" type="checkbox"/> group 2 | <input checked="" type="checkbox"/> group 8  | <input checked="" type="checkbox"/> group 14 |
| <input checked="" type="checkbox"/> group 3 | <input checked="" type="checkbox"/> group 9  | <input checked="" type="checkbox"/> group 15 |
| <input checked="" type="checkbox"/> group 4 | <input checked="" type="checkbox"/> group 10 | <input checked="" type="checkbox"/> group 16 |
| <input checked="" type="checkbox"/> group 5 | <input checked="" type="checkbox"/> group 11 |  |
| <input checked="" type="checkbox"/> group 6 | <input checked="" type="checkbox"/> group 12 | Addresses per group have to be defined       |

### 2.6.7. Clock synchronization

- Clock synchronization

### 2.6.8. Command transmission

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Direct command transmission   | <input checked="" type="checkbox"/> Select and execute command           |
| <input checked="" type="checkbox"/> Direct set point command transmission                                   | <input checked="" type="checkbox"/> Select and execute set point command |
| <input checked="" type="checkbox"/> No additional definition  | <input checked="" type="checkbox"/> C_SE_ACTTERM used                    |
| <input type="checkbox"/> Short pulse duration (duration determined by a system parameter in the outstation) |  |
| <input type="checkbox"/> Long pulse duration (duration determined by a system parameter in the outstation)  |  |
| <input checked="" type="checkbox"/> Persistent output   |  |

### 2.6.9. Transmission of integrated totals

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> Counter request              | <input checked="" type="checkbox"/> General request counter |
| <input checked="" type="checkbox"/> Counter freeze without reset | <input checked="" type="checkbox"/> Request counter group 1 |
| <input checked="" type="checkbox"/> Counter freeze with reset    | <input checked="" type="checkbox"/> Request counter group 2 |
| <input checked="" type="checkbox"/> Counter reset                | <input checked="" type="checkbox"/> Request counter group 3 |
|  | <input checked="" type="checkbox"/> Request counter group 4 |

Addresses per group have to be defined

### 2.6.10. Parameter loading

- Threshold value
- Smoothing factor
- Low limit for transmission of measured value
- High limit for transmission of measured value

### 2.6.11. Parameter activation

- Act/deact of persistent cyclic or periodic transmission of the addressed object

### 2.6.12. File transfer

File transfer in monitor direction

- File transfer in monitor direction
- File transfer in control direction

### 3. Configuration Details

Configuration of KSGl is done through the configuration utility named “EasyConnect”. The IEC101 master configuration is divided into 3 parts – channel configuration, node configuration & configuration of profile.

#### 3.1. Channel Configurations

Channel configuration involves configuration of the following parameters.

##### 3.1.1. ChannelNumber

*Description:* Indicates the Unique Identification Number For Channel

*Default:* Depends up on the order of creation

*Range:* 1-4,8,16 (Depends upon converter model)

##### 3.1.2. Channel State

*Description:* Indicates Whether the Channel is active or not.

*Default:* 1

*Range:* 0 or 1.

##### 3.1.3. Channel Mode

*Description:* Indicates the type of Link

*Default:* Unbalanced

*Range:* Unbalanced, Balanced.

##### 3.1.4. First Char Wait

*Description:* Indicates the time delay between receiving a character and transmitting the next character

*Default:* 1 millisecond

*Range:* 0-100 milliseconds

### **3.1.5. Channel Type**

*Description:* Indicates the type of Channel

*Default:* RS232

*Range:* RS232/RS485

### **3.1.6. Baud**

*Description:* Indicates the baud Rate

*Default:* 9600

*Range:* 600-19200

### **3.1.7. Data Bits**

*Description:* Indicates the number of Data Bits

*Default:* 8

*Range:* 7,8

### **3.1.8. Stop Bits**

*Description:* Indicates the number of Stop Bits

*Default:* 1

*Range:* 1,2

### **3.1.9. Parity**

*Description:* Indicates the parity Type

*Default:* Even

*Range:* Even, Odd, None

### **3.1.10. Port**

*Description:* Indicates the name of the Port

*Default:* Com1.

*Range:* Com1-16.

### **3.1.11. Flow Control**

*Description:* Indicates the type of flow control.

*Default:* None

*Range:* None, Hardware, Software

### **3.1.12. CTS Delay**

*Description:* Indicates the delay between rising of CTS signal by the modem and starting of a new transmission

*Default:* 30

*Range:* 0-100milliseconds

### **3.1.13. Post Transmission Delay**

*Description:* Indicates the delay between releasing of RTS and end of a transmission.

*Default:* 0 milliseconds

*Range:* 0-100 milliseconds

### **3.1.14. Time Out**

*Description:* Indicates the application layer incremental timeout in milliseconds

*Default:* 30000 milliseconds

*Range:* 0-100000 milliseconds

### **3.1.15. Frame Timeout**

*Description:* Indicates the maximum time to allow receiving an entire frame.

*Default:* 15000 milliseconds

*Range:* 0-50000 milliseconds

### **3.1.16. Confirm Timeout**

*Description:* Maximum time to wait for a link layer confirmation.

*Default:* 2000 milliseconds

*Range:* 0-50000 milliseconds

### **3.1.17. Retries**

*Description:* Indicates the maximum number of retries.

*Default:* 3

*Range:* 0-10

### **3.1.18. Link Confirm Mode**

*Description:* Specifies when to ask for link layer confirmations.

*Default:* Always.

*Range:* Never, Always

### **3.1.19. Single Char Acknowledgement**

*Description:* Enable/Disable Single Character Acknowledgement

*Default:* Disable.

*Range:* Enable/Disable.

### 3.1.20. Single Char Response

*Description:* Enable/Disable Single Character Response.

*Default:* Disable.

*Range:* Enable/Disable.

### 3.1.21. Test Frame Period

*Description:* Indicates the time between test frames when a balanced link Mode is selected.

*Default:* 0 seconds

*Range:* 0-1800 seconds

### 3.1.22. Link Address Size

*Description:* Indicates the size of link address. Link address is specified under node configuration depending on this attribute.

*Default:* 1

*Range:* 1,2

## **3.2. Node Configurations**

### 3.2.1. Node Number

*Description:* Indicates the Unique Identification Number For Node

*Default:* Depends up on the order of creation.

*Range:* 1-64,128,256(Depends upon converter model).

### 3.2.2. Node State

*Description:* Indicates whether Node is active or not.

*Default:* 1

*Range:* 0 or 1.

### 3.2.3. Link Address

*Description:* Indicates the link address specified in IEC60870-5-101. The size of the link address comes under channel configuration parameters.

*Default:* 1

*Range:* 0-255 or 0-65535

### 3.2.4. COT Size

*Description:* Indicates the Number of Octets for Cause of Transmission Octets.

*Default:* 2 bytes

*Range:* 1 byte or 2 bytes.

### 3.2.5. IOA Size

*Description:* This indicates the size of information object address.

*Default:* 2

*Range:* 1,2,3

### 3.2.6. ASDU Size

*Description:* This indicates the size of ASDU in octets as specified in IEC60870-5-101.

*Default:* 2

*Range:* 1,2

### 3.2.7. ASDU Address

*Description:* This indicates the value of ASDU address specified in IEC60870-5-101.

*Default:* 1

*Range:* 0-255 or 0-65535 (Depends on the number of Octets).

### 3.2.8. Class1 Poll Delay

*Description:* Indicates the time before class 1 poll when no request pending. '0' indicates the class-1 poll will be given only when ACD bit is set from the slave.

*Default:* 0 ms.

*Range:* 0-60000 ms.

### 3.2.9. Class2 Poll Delay

*Description:* Indicates the time before class 2 poll when no request pending.

*Default:* 500 ms.

*Range:* 0-60000 ms.

### 3.2.10. Propagation Delay

*Description:* Indicates the network propagation delay.

*Default:* 0 ms.

*Range:* 0-10000 ms.

### 3.2.11. Clock Synchronization

*Description:* To enable/disable clock synchronization.

*Default:* Enable

*Range:* Enable / Disable

### 3.2.12. Clock Synch Type

*Description:* When to send clock synchronization.

*Default:* End Of Init

*Range:* End Of Init, Interval

### 3.2.13. Clock Synch Interval

*Description:* Enabled only when Clock Synch Type is Interval. Denotes interval in which clock is synchronized.

*Default:* 10

*Range:* 1-120 minutes

### 3.2.14. General Interrogation

*Description:* To enable/disable General Interrogation.

*Default:* Enable

*Range:* Enable / Disable

### 3.2.15. General Interrogation Mode

*Description:* When to request for General Interrogation.

*Default:* End Of Init

*Range:* End Of Init, Interval

### 3.2.16. General Interrogation Interval

*Description:* Interval in which a General Interrogation command is send.

*Default:* 5

*Range:* 1-120 minutes

### 3.2.17. Group Interrogation

*Description:* To enable/disable Group Interrogation.

*Default:* Enable

*Range:* Enable/Disable

### 3.2.18. Group Interrogation Mode

*Description:* When to request for Group Interrogation.

*Default:* End Of Init

*Range:* End Of Init, Interval

### 3.2.19. Group Interrogation Interval-1

*Description:* Enabled only when Group Interrogation Mode is Interval. Denotes interval for scan group -1.

*Default:* 5

*Range:* 1-120 minutes

### 3.2.20. Scan Groups for Interval-1

*Description:* Groups defined under Interval-1

*Default:*

*Range:* Group 1 to 16

### 3.2.21. Group Interrogation Interval-2

*Description:* Enabled only when Group Interrogation Mode is Interval. Denotes interval for scan group-2.

*Default:* 10

*Range:* 1-120 minutes

### 3.2.22. Scan Groups for Interval-2

*Description:* Groups defined under Interval-2

*Default:*

*Range:* Group 1 to 16

### 3.2.23. Group Interrogation Interval-3

*Description:* Enabled only when Group Interrogation Mode is Interval. Defines interval for scan group-3.

*Default:* 15

*Range:* 1-120 minutes

### 3.2.24. Scan Groups for Interval-3

*Description:* Groups defined under Interval-3

*Default:*

*Range:* Group 1 to 16

### 3.2.25. Counter Interrogation

*Description:* To enable/disable Counter Interrogation.

*Default:* Enable

*Range:* Enable/Disable

### 3.2.26. Counter Interrogation Mode

*Description:* When to request for Counter Interrogation.

*Default:* End Of Init

*Range:* End Of Init, Interval

### 3.2.27. Counter Interrogation Interval

*Description:* Enabled only when counter Interrogation Mode is Interval. Denotes interval in which a Counter Interrogation Command is Send.

*Default:* 10

*Range:* 1-120 minutes

### 3.2.28. Counter Group Interrogation

*Description:* To enable/disable Counter Group Interrogation.

*Default:* Enable

*Range:* Enable / Disable

### 3.2.29. Counter Group Interrogation Mode

*Description:* When to request for Counter Group Interrogation.

*Default:* End Of Init

*Range:* End Of Init, Interval

### 3.2.30. Counter Group Interrogation Interval

*Description:* Interval in which a Counter Group Interrogation Command is Send.

*Default:* 15

*Range:* 1-120 minutes

### 3.2.31. Scan Groups for Counter Interrogation

*Description:* Groups defined for Counter Group Interrogation

*Default:*

*Range:* Group 1 to 4

### 3.2.32. CSE Activation Termination

*Description:* Expect activation termination on CSE commands

*Default:* Enable

*Range:* Enable / Disable

### 3.2.33. CMD Activation Termination

*Description:* Expect activation termination on all other commands Expect activation termination on all other commands

*Default:* Enable

*Range:* Enable / Disable

## **3.3. Profile Attributes**

### 3.3.1. ASDU Types

You can configure the different ASDU types of IEC101 here. The following are major ASDU types available for configuration.

#### **3.3.1.1. Single Indications**

When you configure this point you will get the following ASDU types of IEC101.

M\_SP\_NA\_1 (ASDU type 1) → the data will be updated in this format when you give general interrogation.

M\_SP\_TA\_1 (ASDU type 2) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 24 bits.

M\_SP\_TB\_1 (ASDU type 30) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 56 bits.

#### **3.3.1.2. Double Indications**

When you configure this point you will get the following ASDU types of IEC101.

M\_DP\_NA\_1 (ASDU type 3) → the data will be updated in this format when you give general interrogation.

M\_DP\_TA\_1 (ASDU type 4) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 24 bits.

M\_DP\_TB\_1 (ASDU type 31) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 56 bits.

#### **3.3.1.3. Step position information**

When you configure this point you will get the following ASDU types of IEC101.

M\_ST\_NA\_1 (ASDU type 5) → the data will be updated in this format when you give general interrogation.

M\_ST\_TA\_1 (ASDU type 6) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 24 bits.

M\_ST\_TB\_1 (ASDU type 32) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 56 bits.

**3.3.1.4. Measured Value (N)**

When you configure this point you will get the following ASDU types of IEC101.

M\_ME\_NA\_1 ( ASDU type 9 ) → the data will be updated in this format when you give general interrogation.

M\_ME\_TA\_1 ( ASDU type 10 ) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 24 bits.

M\_ME\_TD\_1 ( ASDU type 34 ) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 56 bits.

**3.3.1.4. Measured Value (S)**

When you configure this point you will get the following ASDU types of IEC101.

M\_ME\_NB\_1 ( ASDU type 11 ) → the data will be updated in this format when you give general interrogation.

M\_ME\_TB\_1 ( ASDU type 12 ) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 24 bits.

M\_ME\_TE\_1 ( ASDU type 35 ) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 56 bits.

**3.3.1.5. Measured Value (F)**

When you configure this point you will get the following ASDU types of IEC101.

M\_ME\_NC\_1 ( ASDU type 13 ) → the data will be updated in this format when you give general interrogation.

M\_ME\_TC\_1 ( ASDU type 14 ) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 24 bits.

M\_ME\_TF\_1 ( ASDU type 36 ) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 56 bits.

**3.3.1.6. Integrated Totals**

When you configure this point you will get the following ASDU types of IEC101.

M\_IT\_NA\_1 ( ASDU type 15 ) → the data will be updated in this format when you give general interrogation.

M\_IT\_TA\_1 ( ASDU type 16 ) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 24 bits.

M\_IT\_TB\_1 ( ASDU type 37 ) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 56 bits.

### 3.3.1.7. Bitstring of 32 bit

When you configure this point you will get the following ASDU types of IEC101.

M\_BO\_NA\_1 ( ASDU type 7 ) → the data will be updated in this format when you give general interrogation.

M\_BO\_TA\_1 ( ASDU type 8 ) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 24 bits.

M\_BO\_TB\_1 ( ASDU type 33 ) → the data will be updated in this format when the data is reported spontaneously & Event time stamp attribute is configured as 56 bits.

### 3.3.1.8. Single Commands

The IEC101 master supports C\_SC\_NA\_1 (ASDU type 45) command. It will support SBO & direct operate command variations.

### 3.3.1.9. Double Commands

The IEC101 master supports C\_DC\_NA\_1 (ASDU type 46) command. It will support SBO & direct operate command variations.

### 3.3.1.10. Regulating step Commands

The IEC101 master supports C\_RC\_NA\_1 (ASDU type 47) command. It will support SBO & direct operate command variations.

### 3.3.1.11. Setpoint Command (N)

The IEC101 master supports C\_SE\_NA\_1 (ASDU type 48) command. It will support SBO & direct operate command variations.

### 3.3.1.12. Setpoint Command (S)

The IEC101 master supports C\_SE\_NB\_1 (ASDU type 49) command. It will support SBO & direct operate command variations.

### 3.3.1.13. Setpoint Command (F)

The IEC101 master supports C\_SE\_NC\_1 (ASDU type 50) command. It will support SBO & direct operate command variations.

### 3.3.1.14. Setpoint Command (B)

The IEC101 master supports C\_BO\_NA\_1 (ASDU type 51) command. It will support SBO & direct operate command variations.

## 3.3.2. Information Object Address

This specifies the Information object address of the data point for IEC101 master.

## 3.3.3. No of Points

This specifies the total number of points. The ASDU address of these points will be considered sequentially.

#### 4. Mapping Details to other protocols: -

This section gives detailed idea of the data types in other slave protocols, to which specific IEC101 master types can be mapped.

<b>IEC101 masterTypes</b>	<a href="#">14-M1</a>	<a href="#">14-M2</a>	<a href="#">14-M3</a>	<a href="#">14-M4</a> <a href="#">14-M5</a> <a href="#">14-M6</a>	<a href="#">14-M7</a>	<a href="#">14-M8</a>	<a href="#">14-C1</a>	<a href="#">14-C2</a>	<a href="#">14-C3</a>	<a href="#">14-C4</a> <a href="#">14-C5</a> <a href="#">14-C6</a>	<a href="#">14-C7</a>
IEC101/ 104 slave types	<a href="#">14-M1</a>	<a href="#">14-M2</a>	<a href="#">14-M3</a>	<a href="#">14-M4</a> <a href="#">14-M5</a> <a href="#">14-M6</a>	<a href="#">14-M7</a>	<a href="#">14-M8</a>	<a href="#">14-C1</a>	<a href="#">14-C2</a>	<a href="#">14-C3</a>	<a href="#">14-C4</a> <a href="#">14-C5</a> <a href="#">14-C6</a>	<a href="#">14-C7</a>
IEC103 slave types	<a href="#">103-T1</a> <a href="#">103-T2</a>	<a href="#">103-T1</a> <a href="#">103-T2</a>	<a href="#">103-T3</a> <a href="#">103-T4</a> <a href="#">103-T9</a>	<a href="#">103-T3</a> <a href="#">103-T4</a> <a href="#">103-T9</a>	<a href="#">103-T3</a> <a href="#">103-T4</a> <a href="#">103-T9</a>	<a href="#">103-T3</a> <a href="#">103-T4</a> <a href="#">103-T9</a>	<a href="#">103-T20</a>	<a href="#">103-T20</a>	<a href="#">103-T20</a>	--	--
Modbus slave types	<a href="#">MB-T1</a> <a href="#">MB-T2</a>	<a href="#">MB-T3</a> <a href="#">MB-T4</a>	<a href="#">MB-T5</a> <a href="#">MB-T6</a>	<a href="#">MB-T5</a> <a href="#">MB-T6</a>	<a href="#">MB-T5</a> <a href="#">MB-T6</a>	<a href="#">MB-T5</a> <a href="#">MB-T6</a>	<a href="#">MB-T7</a> <a href="#">MB-T8</a>	<a href="#">MB-T9</a> <a href="#">MB-T10</a>	<a href="#">MB-T7</a> <a href="#">MB-T8</a> <a href="#">MB-T9</a> <a href="#">MB-T10</a>	<a href="#">MB-T11</a> <a href="#">MB-T12</a>	<a href="#">MB-T11</a> <a href="#">MB-T12</a>
DNP3.0 slave types	<a href="#">DN-T1</a> <a href="#">DN-T3</a>	<a href="#">DN-T1</a> <a href="#">DN-T3</a>	<a href="#">DN-T2</a> <a href="#">DN-T4</a>	<a href="#">DN-T2</a> <a href="#">DN-T4</a>	<a href="#">DN-T2</a> <a href="#">DN-T4</a>	<a href="#">DN-T2</a> <a href="#">DN-T4</a>	<a href="#">DN-T5</a>	<a href="#">DN-T5</a>	<a href="#">DN-T5</a>	<a href="#">DN-T6</a>	<a href="#">DN-T6</a>

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<b>IEC101/104 Type Details</b>	
<b>IEC101/104 types</b>	<b>Type Details</b>
14_M1	Single Indication
14_M2	Double Indication
14_M3	Step position information
14_M4	Measured value, normalized value
14_M5	Measured value, Scaled value
14_M6	Measured value, short floating point value
14_M7	Integrated totals
14_M8	Bitstring of 32 bit
14_C1	Single command
14_C2	Double command
14_C3	Regulating step command
14_C4	Set point command, normalised value
14_C5	Set point command, Scaled value
14_C6	Set point command, short floating point value
14_C7	Set point command, Bitstring of 32 bit

<b>Modbus Type Details</b>		
<b>Modbus types</b>	<b>Type Details</b>	<b>Supported Formats</b>
MB-T1	Single Indication, Read Coil status	NA
MB-T2	Single Indication, Read Discrete inputs	NA
MB-T3	Double Indication, Read Coil status	NA
MB-T4	Double Indication, Read Discrete inputs	NA
MB-T5	Analog I/P, Read Input Registers	NA
MB-T6	Analog I/P, Read Holding Registers	Signed Single Register Unsigned Single Register Signed 32 bit Register ( lsw – msw ) Signed 32 bit Register ( msw – lsw ) Unsigned 32 bit Register ( lsw – msw ) Unsigned 32 bit Register ( msw – lsw ) Float ( lsw – msw ) Float ( msw – lsw ) Double
MB-T7	Single Command, Force single coil	NA
MB-T8	Single Command, Force multiple coils	NA
MB-T9	Double Command, Force single coil	NA
MB-T10	Double Command, Force multiple coils	NA
MB-T11	Analog O/P, Force single register	Signed Single Register Unsigned Single Register
MB-T12	Analog O/P, Force multiple registers	Signed Single Register Unsigned Single Register Signed 32 bit Register ( lsw – msw ) Signed 32 bit Register ( msw – lsw ) Unsigned 32 bit Register ( lsw – msw ) Unsigned 32 bit Register ( msw – lsw ) Float ( lsw – msw ) Float ( msw – lsw )

<b>IEC103 Type Details</b>	
<b>IEC103 types</b>	<b>Type Details</b>
103-T1	Time Tagged Message (103 TYPE = 1)
103-T2	Time Tagged Message With Relative Time(103 TYPE = 2)
103-T3	Measurands I (103 TYPE = 3)
103-T4	Time Tagged Measurands with Relative Time. (103 TYPE = 4)
103-T5	Identification (103 TYPE = 5)
103-T9	Measurands II (103 TYPE = 9)
103-T20	Write general commands (103 TYPE = 20)
103-T21	Directory

<b>DNP3.0 Type Details</b>	
<b>DNP3.0 types</b>	<b>Type Details</b>
DN-T1	Binary Input
DN-T2	Analog Input
DN-T3	Binary Output Status
DN-T4	Analog Output Status
DN-T5	Binary Output Command
DN-T6	Analog Output Command