

IEC 60870-5-104 Protocol Interoperability List

Network configuration

- | | |
|--|--|
| <input type="checkbox"/> Point-to-point | <input type="checkbox"/> Multipoint-party line |
| <input type="checkbox"/> Multiple point-to-point | <input type="checkbox"/> Multipoint-star |

Physical layer

Transmission speed (control direction)

Unbalanced interchange
circuit V.24/V.28
Standard

- 100 bit/s
- 200 bit/s
- 300 bit/s
- 600 bit/s
- 1200 bit/s

Unbalanced interchange
circuit V.24/V.28
Recommended if >1200 bit/s

- 2400 bit/s
- 4800 bit/s
- 9600 bit/s
- 19200 bit/s
- 38400 bit/s
- 56000 bit/s

Balanced interchange
circuit X.24/X.27

- 2400 bit/s
- 4800 bit/s
- 9600 bit/s
- 19200 bit/s
- 38400 bit/s
- 56000 bit/s
- 64000 bit/s

Transmission speed (monitor direction)

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Balanced interchange
circuit X.24/X.27

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- 56000 bit/s
- 64000 bit/s

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Link layer

Link transmission procedure

- | | |
|---|---|
| <input type="checkbox"/> Balanced transmission | <input type="checkbox"/> Not present (balanced transmission only) |
| <input type="checkbox"/> Unbalanced transmission | <input type="checkbox"/> One octet |
| | <input type="checkbox"/> Two octets |
| | <input type="checkbox"/> Structured |
| | <input type="checkbox"/> Unstructured |

Frame length

Maximum length L
(number of octets)

Address field of the link

Application layer

Transmission mode for application data

Common address of ASDU
(system-specific parameter)

- | | |
|---|--|
| <input type="checkbox"/> One octet | <input checked="" type="checkbox"/> Two octets |
|---|--|

Information object address
(system-specific parameter)

- | |
|--|
| <input type="checkbox"/> One octet |
| <input type="checkbox"/> Two octets |
| <input checked="" type="checkbox"/> Three octets |
| <input type="checkbox"/> structured |
| <input checked="" type="checkbox"/> unstructured |

Cause of transmission
(system-specific parameter)

- | | |
|---|--|
| <input type="checkbox"/> One octet | <input checked="" type="checkbox"/> Two octets (with originator address) |
|---|--|

Selection of standard ASDUs**Process information in monitor direction**

<input checked="" type="checkbox"/> <1> := Single-point information	M_SP_NA_1
<input 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 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 type="checkbox"/> <6> := Step position information with time tag	M_ST_TA_1
<input type="checkbox"/> <7> := Bitstring of 32 bit	M_BO_NA_1
<input 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 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 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 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 type="checkbox"/> <16> := Integrated totals with time tag	M_IT_TA_1
<input type="checkbox"/> <17> := Event of protection equipment with time tag	M_EP_TA_1
<input type="checkbox"/> <18> := Packed start events of protection equipment with time tag	M_EP_TB_1
<input type="checkbox"/> <19> := Packed output circuit inf of protection equipment with time tag	M_EP_TC_1
<input type="checkbox"/> <20> := Packed single-point information with status change detection	M_PS_NA_1
<input type="checkbox"/> <21> := Measured value, normalized value without quality descriptor	M_ME_ND_1

IEC 60870-5-104 Protocol Interoperability List

Selection of standard ASDUs

Process information in monitor direction

<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 type="checkbox"/> <33> := Bitstring of 32 bit with time tag CP56Time2a	M_BO_TB_1
<input checked="" type="checkbox"/> <34> := Measured value, normalised 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 tripping events of protection equipment with time tag CP56Time2a	M_EP_TF_1

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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 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 type="checkbox"/> <51> := Bitstring of 32 bit	C_BO_NA_1

Parameter in control direction

(station-specific parameter)

<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

Clock synchronization

(station-specific parameter)

<input checked="" type="checkbox"/> Clock synchronization

General interrogation

(system or station-specific parameter)

<input checked="" type="checkbox"/> Global
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IEC 60870-5-101 Protocol Interoperability List

Network configuration		
<input checked="" type="checkbox"/> Point-to-point	<input type="checkbox"/> Multipoint-party line	
<input checked="" type="checkbox"/> Multiple point-to-point	<input type="checkbox"/> Multipoint-star	
PHYSICAL LAYER		
Transmission speed (control direction)		
Unbalanced interchange circuit V.24/V.28 Standard	Unbalanced interchange circuit V.24/V.28 Recommended if >1200 bit/s	Balanced interchange circuit X.24/X.27
<input checked="" type="checkbox"/> 100 bit/s	<input checked="" type="checkbox"/> 2400 bit/s	<input type="checkbox"/> 2400 bit/s
<input checked="" type="checkbox"/> 200 bit/s	<input checked="" type="checkbox"/> 4800 bit/s	<input type="checkbox"/> 4800 bit/s
<input checked="" type="checkbox"/> 300 bit/s	<input checked="" type="checkbox"/> 9600 bit/s	<input type="checkbox"/> 9600 bit/s
<input checked="" type="checkbox"/> 600 bit/s	<input checked="" type="checkbox"/> 19200 bit/s	<input type="checkbox"/> 19200 bit/s
<input checked="" type="checkbox"/> 1200 bit/s	<input checked="" type="checkbox"/> 38400 bit/s	<input type="checkbox"/> 38400 bit/s
	<input checked="" type="checkbox"/> 56000 bit/s	<input type="checkbox"/> 56000 bit/s
		<input type="checkbox"/> 64000 bit/s
Transmission speed (monitor direction)		
Unbalanced interchange circuit V.24/V.28 Standard	Unbalanced interchange circuit V.24/V.28 Recommended if >1200 bit/s	Balanced interchange circuit X.24/X.27
<input checked="" type="checkbox"/> 100 bit/s	<input checked="" type="checkbox"/> 2400 bit/s	<input type="checkbox"/> 2400 bit/s
<input checked="" type="checkbox"/> 200 bit/s	<input checked="" type="checkbox"/> 4800 bit/s	<input type="checkbox"/> 4800 bit/s
<input checked="" type="checkbox"/> 300 bit/s	<input checked="" type="checkbox"/> 9600 bit/s	<input type="checkbox"/> 9600 bit/s
<input checked="" type="checkbox"/> 600 bit/s	<input checked="" type="checkbox"/> 19200 bit/s	<input type="checkbox"/> 19200 bit/s
<input checked="" type="checkbox"/> 1200 bit/s	<input checked="" type="checkbox"/> 38400 bit/s	<input type="checkbox"/> 38400 bit/s
	<input checked="" type="checkbox"/> 56000 bit/s	<input type="checkbox"/> 56000 bit/s
		<input type="checkbox"/> 64000 bit/s

IEC 60870-5-101 Protocol Interoperability List

LINK LAYER

Link transmission procedure

- Balanced transmission
- Unbalanced transmission

Not present (balanced transmission

)

One octet

Two octets

Structured

Unstructured

Frame length

255

Maximum length L
(number of octets)

Address field of the link

APPLICATION LAYER

Transmission mode for application data

Common address of ASDU
(system-specific parameter)

One octet

Two octets

Information object address
(system-specific parameter)

One octet

Two octets

Three octets

structured

unstructured

Cause of transmission
(system-specific parameter)

One octet

Two octets (with originator address)

Selection of standard ASDUs**Process information in monitor direction**

<input checked="" type="checkbox"/> <1> := Single-point information	M_SP_NA_1
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<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
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<input checked="" type="checkbox"/> <10> := Measured value, normalized value with time tag	M_ME_TA_1
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<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
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<input type="checkbox"/> <17> := Event of protection equipment with time tag	M_EP_TA_1
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<input type="checkbox"/> <19> := Packed output circuit inf of protection equipment with time tag	M_EP_TC_1
<input type="checkbox"/> <20> := Packed single-point information with status change detection	M_PS_NA_1
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IEC 60870-5-101 Protocol Interoperability List

Selection of standard ASDUs

Process information in monitor direction

<input checked="" type="checkbox"/> <30> := Single point information with time tag CP56Time2a	M_SP_TB_1
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<input checked="" type="checkbox"/> <32> := Step position information with time tag CP56Time2a	M_ST_TB_1
<input type="checkbox"/> <33> := Bitstring of 32 bit with time tag CP56Time2a	M_BO_TB_1
<input checked="" type="checkbox"/> <34> := Measured value, normalised 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
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IEC 60870-5-101 Protocol Interoperability List

Process information in control direction

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<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 type="checkbox"/> <51> := Bitstring of 32 bit	C_BO_NA_1

Parameter in control direction

(station-specific parameter)

<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

Clock synchronization

(station-specific parameter)

<input checked="" type="checkbox"/> Clock synchronization

General interrogation

(system or station-specific parameter)

<input checked="" type="checkbox"/> Global
--

IEC 60870-5-103 Protocol Interoperability List

Physical layer

(network-specific parameter)

Electrical interface

- EIA RS -485
- Number of loads for one protection equipment

NOTE – EIA RS-485 standard defines unit loads so that 32 of them can be operated on one line. For detailed information refer to clause 3 of EIA RS-485 standard.

Optical interface

- Glass fiber
- Plastic fiber
- F-SMA type connector
- BFOC/2,5 type connector

Transmission speed

- 9600 bit/s
- 19200 bit/s

Application layer

Common Address of ASDU

- One COMMON ADDRESS OF ASDU (identical with station address)
- More than one COMMON ADDRESS OF ASDU

IEC 60870-5-103 Protocol Interoperability List

Selection of standard information numbers in monitor direction

System functions in monitor direction

INF Semantics

- <0> End of general interrogation
- <1> Time synchronization
- <2> Reset FCB
- <3> Reset CU
- <4> Start/restart
- <5> Power on

Status indications in monitor direction

INF Semantics

- <16> Auto-recloser active
- <17> Teleprotection active
- <18> Protection active
- <19> LED reset
- <20> Monitor direction blocked
- <21> Test mode
- <22> Local parameter setting
- <23> Characteristic 1
- <24> Characteristic 2
- <25> Characteristic 3
- <26> Characteristic 4
- <27> Auxiliary input 1
- <28> Auxiliary input 2
- <29> Auxiliary input 3
- <30> Auxiliary input 4

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Supervision indications in monitor direction

INF Semantics

- <32> Measurand supervision I
- <33> Measurand supervision V
- <35> Phase sequence supervision
- <36> Trip circuit supervision
- <37> I>> back-up operation
- <38> VT fuse failure
- <39> Teleprotection disturbed
- <46> Group warning
- <47> Group alarm

Earth fault indications in monitor direction

INF Semantics

- <48> Earth fault L1
- <49> Earth fault L2
- <50> Earth fault L3
- <51> Earth fault forward, i.e. line
- <52> Earth fault reverse, i.e. busbar

Auto -reclosure indications in monitor direction

INF Semantics

- <128> CB 'on' by AR
- <129> CB 'on' by long-time AR
- <130> AR blocked

Fault indications in monitor direction

INF Semantics

- <64> Start /pick-up L1
- <65> Start /pick-up L2
- <66> Start /pick-up L3
- <67> Start /pick-up N
- <68> General trip
- <69> Trip L1
- <70> Trip L2
- <71> Trip L3
- <72> Trip I>> (back-up operation)
- <73> Fault location X in ohms
- <74> Fault forward/line
- <75> Fault reverse/busbar
- <76> Teleprotection signal transmitted
- <77> Teleprotection signal received
- <78> Zone 1
- <79> Zone 2
- <80> Zone 3
- <81> Zone 4
- <82> Zone 5
- <83> Zone 6
- <84> General start/pick-up
- <85> Breaker failure
- <86> Trip measuring system L1
- <87> Trip measuring system L2
- <88> Trip measuring system L3
- <89> Trip measuring system E
- <90> Trip I>
- <91> Trip I>>
- <92> Trip IN>
- <93> Trip IN>>

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Measurands in monitor direction

INF Semantics

- <144> Measurand I
- <145> Measurands I, V
- <146> Measurands I, V, P, Q
- <147> Measurands IN, VEN
- <148> Measurands IL1,2,3, VL1,2,3, P, Q, f

Selection of standard information numbers in control direction

System functions in control direction

INF Semantics

- <0> Initiation of general interrogation
- <0> Time synchronization

General commands in control direction

INF Semantics

- <16> Auto-recloser on/off
- <17> Teleprotection on/off
- <18> Protection on/off
- <19> LED reset
- <23> Activate characteristic 1
- <24> Activate characteristic 2
- <25> Activate characteristic 3
- <26> Activate characteristic 4

Basic application functions

- Test mode
- Blocking of monitor direction
- Disturbance data

DNP 3.0 Protocol Interoperability List / Device Profile

Vendor Name : PT. Integra Teknik Asia	
Device Name : InTekUC	
Highest DNP Level Supported : For Requests Level 3 For Responses Level 3	Device Function: <input checked="" type="checkbox"/> Master <input checked="" type="checkbox"/> Slave
Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table): 	
Maximum Data Link Frame Size (octets) Transmitted <input style="width: 50px;" type="text" value="292"/> Received <input style="width: 50px;" type="text" value="292"/>	Maximum Application Fragment Size (octets) Transmitted <input style="width: 50px;" type="text" value="255"/> Received <input style="width: 50px;" type="text" value="2048"/>
Maximum Data Link Re-tries <input checked="" type="checkbox"/> None <input type="checkbox"/> Fixed at <input style="width: 50px;" type="text"/> <input type="checkbox"/> Configurable, range <input style="width: 50px;" type="text"/> to <input style="width: 50px;" type="text"/>	Maximum Application Layer Re-tries <input type="checkbox"/> None <input checked="" type="checkbox"/> Configurable, range <input style="width: 50px;" type="text" value="1"/> to <input style="width: 50px;" type="text" value="10"/>

DNP 3.0 Protocol Interoperability List / Device Profile

Requires Data Link Layer Confirmation:

- Never
- Always
- Sometimes
- Configurable

Requires Application Layer Confirmation:

- Never
- Always
- When reporting Event Data
- When sending multi-fragment responses
- Sometimes
- Configurable

Timeouts while waiting for:

- | | | | | | |
|-------------------------|-------------------------------|-----------------------------------|--------------------------------|--|--|
| Data Link Confirm | <input type="checkbox"/> None | <input type="checkbox"/> Fixed at | <input type="text" value="X"/> | <input type="checkbox"/> Variable | <input checked="" type="checkbox"/> Configurable |
| Complete Appl. Fragment | <input type="checkbox"/> None | <input type="checkbox"/> Fixed at | <input type="text"/> | <input type="checkbox"/> Variable | <input type="checkbox"/> Configurable |
| Application Confirm | <input type="checkbox"/> None | <input type="checkbox"/> Fixed at | <input type="text"/> | <input checked="" type="checkbox"/> Variable | <input type="checkbox"/> Configurable |
| Complete Appl. Response | <input type="checkbox"/> None | <input type="checkbox"/> Fixed at | <input type="text" value="X"/> | <input type="text" value="7"/> Variable | <input type="checkbox"/> Configurable |
| Others _____ | | | | | |

DNP 3.0 Protocol Interoperability List / Device Profile

Sends/Executes Control Operations:

WRITE Binary Outputs	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input checked="" type="checkbox"/> Configurable
SELECT/OPERATE	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input checked="" type="checkbox"/> Configurable
DIRECT OPERATE	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input checked="" type="checkbox"/> Configurable
DIRECT OPERATE - NO ACK	<input checked="" type="checkbox"/> Never	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable
Count > 1	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input checked="" type="checkbox"/> Configurable
Pulse On	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input checked="" type="checkbox"/> Configurable
Pulse Off	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input checked="" type="checkbox"/> Configurable
Latch On	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input checked="" type="checkbox"/> Configurable
Latch Off	<input type="checkbox"/> Never	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input checked="" type="checkbox"/> Configurable
Queue	<input checked="" type="checkbox"/> Never	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable
Clear Queue	<input checked="" type="checkbox"/> Never	<input type="checkbox"/> Always	<input type="checkbox"/> Sometimes	<input type="checkbox"/> Configurable

Fill Out The Following Item For Master Devices Only:

Expects Binary Input Change Events:

- Either time-tagged or non-time-tagged for a single event
- Both time-tagged and non-time-tagged for a single event
- Configurable (attach explanation)

DNP 3.0 Protocol Interoperability List / Device Profile

IMPLEMENTATION OBJECT						
This table describes the objects, function codes and qualifiers available in this Master						
OBJECT			REQUEST (slave must parse)		RESPONSE (master must parse)	
Obj	Var	Description	Func Codes (dec)	Qual Codes (hex)	Func Codes	Qual Codes (hex)
1	2	Binary Input with Status			129, 130	00, 01
10	0	Binary Output - All Variations	1	06		
12	0	Control Block - All Variations				
20	0	Binary Counter - All Variations	1, 7, 8, 9, 10	06		
21	0	Frozen Counter - All Variations	1	06		
22	0	Counter Change Event - All Variations	1	06,07,08		
23	0	Frozen Counter Event - All Variations				
30	0	Analog Input - All Variations	1	06		
31	0	Frozen Analog Input - All Variations				
32	0	Analog Change Event - All Variations	1	06,07,08		
33	0	Frozen Analog Event - All Variations				
40	0	Analog Output Status - All Variations	1	06		
41	1	32-Bit Analog Output Block				
41	2	16-Bit Analog Output Block	3, 4, 5, 6	17, 28	129	echo of request
50	0	Time and Date - All Variations				

Modbus Protocol Interoperability List**Modbus TCP/IP**

Attribute	Default Value	Details
Channel Type	TCP/IP	
IP Address	0.0.0.0	IP Address of slave device
Port Number	502	Configurable
Retries	3	Configurable

Modbus RTU Serial

Attribute	Default Value	Supported Values
Channel Type	RS232	RS232 / RS485 2 Wire / RS485 4 Wire
Communication Mode	Half Duplex	Half Duplex
Baudrate	9600	300 bps to 115200 bps
Databits	8	8
Parity	None	None, Even, Odd
Stopbits	1	1,2
Flow Control	None	None, Hardware, Software
Retries	3	Configurable

Modbus Function Types

Function Name	Function Code
Read Coil	1
Read Input Status	2
Read Holding Register	3
Read Input Register	4
Write Single Coil	5
Write Single Register	6
Write Multiple Coils	15
Write Multiple Registers	16