

FreyrSCADA Embedded Solution

IEC 60870-5-104 Server Stack Interoperability

Stack Version: 21.04.001

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1. Interoperability

This companion standard presents sets of parameters and alternatives from which subsets must be selected to implement particular telecontrol systems. Certain parameter values, such as the choice of "structured" or "unstructured" fields of the INFORMATION OBJECT 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 interoperability list is defined as in IEC 60870-5-101 and extended with parameters used in this standard. The text descriptions of parameters which are not applicable to this companion standard are strike-through (corresponding check box is marked black).

NOTE:- In addition, the full specification of a system may require individual selection of certain parameters for certain parts of the system, such as the individual selection of scaling factors for individually addressable measured values.

The selected parameters should be 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 s

The possible selection (blank, X, R, or B) is specified for each specific Clause or parameter.

A black check box indicates that the option cannot be selected in this companion standard.

1.1 System or device

(System-specific parameter, indicate the definition of a system or a device by marking One of the following with an "X")

- System definition
- Controlling station definition (master)
- Controlled station definition (slave)

1.2 Network configuration

(Network-specific parameter, all configurations that are used are to be marked with an "X")

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

1.3 Physical layer

(Network-specific parameter, all interfaces and data rates that are used are to be marked with an "X")

Transmission speed (control direction)

Unbalanced interchange
Circuit V.24/V.28
Standard

Unbalanced interchange
Circuit V.24/V.28
Recommended if >1 200 bit/s

Balanced interchange
Circuit X.24/X.27

| | | | | | | | |
|--------------------------|-------------|--------------------------|-------------|--------------------------|--------------|--------------------------|--------------|
| <input type="checkbox"/> | 100 bit/s | <input type="checkbox"/> | 2 400 bit/s | <input type="checkbox"/> | 2 400 bit/s | <input type="checkbox"/> | 56 000 bit/s |
| <input type="checkbox"/> | 200 bit/s | <input type="checkbox"/> | 4 800 bit/s | <input type="checkbox"/> | 4 800 bit/s | <input type="checkbox"/> | 64 000 bit/s |
| <input type="checkbox"/> | 300 bit/s | <input type="checkbox"/> | 9 600 bit/s | <input type="checkbox"/> | 9 600 bit/s | | |
| <input type="checkbox"/> | 600 bit/s | | | <input type="checkbox"/> | 19 200 bit/s | | |
| <input type="checkbox"/> | 1 200 bit/s | | | <input type="checkbox"/> | 38 400 bit/s | | |

Transmission speed (monitor direction)

Unbalanced interchange
Circuit V.24/V.28
Standard

Unbalanced interchange
Circuit V.24/V.28
Recommended if >1 200 bit/s

Balanced interchange
Circuit X.24/X.27

| | | | | | | | |
|--------------------------|-------------|--------------------------|-------------|--------------------------|--------------|--------------------------|--------------|
| <input type="checkbox"/> | 100 bit/s | <input type="checkbox"/> | 2 400 bit/s | <input type="checkbox"/> | 2 400 bit/s | <input type="checkbox"/> | 56 000 bit/s |
| <input type="checkbox"/> | 200 bit/s | <input type="checkbox"/> | 4 800 bit/s | <input type="checkbox"/> | 4 800 bit/s | <input type="checkbox"/> | 64 000 bit/s |
| <input type="checkbox"/> | 300 bit/s | <input type="checkbox"/> | 9 600 bit/s | <input type="checkbox"/> | 9 600 bit/s | | |
| <input type="checkbox"/> | 600 bit/s | | | <input type="checkbox"/> | 19 200 bit/s | | |
| <input type="checkbox"/> | 1 200 bit/s | | | <input type="checkbox"/> | 38 400 bit/s | | |

1.4 Link layer

(Network-specific parameter, all options that are used are to be marked with an "X". Specify the maximum frame length. If a non-standard assignment of class 2 messages is implemented for unbalanced transmission, indicate the type ID and COT of all messages assigned to class 2.)

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

| | |
|--|---|
| <p>Link transmission procedure</p> <p><input type="checkbox"/> Balanced transmission</p> <p><input type="checkbox"/> Unbalanced transmission</p> <p>Frame length</p> <p><input type="checkbox"/> Maximum length L (number of octets)</p> | <p>Address field of the link</p> <p><input type="checkbox"/> not present (balanced transmission only)</p> <p><input type="checkbox"/> one octet</p> <p><input type="checkbox"/> two octets</p> <p><input type="checkbox"/> Structured</p> <p><input type="checkbox"/> Unstructured</p> |
|--|---|

When using an unbalanced link layer, the following ASDU types are returned in class 2 Messages (low priority) with the indicated causes of transmission:

The standard assignment of ASDUs to class 2 messages is used as follows:

| Type identification | Cause of Transmission |
|---------------------|-----------------------|
| 9,11,13,21 | <1> |

A special assignment of ASDUs to class 2 messages is used as follows:

| Type identification | Cause of Transmission |
|---------------------|-----------------------|
| | |
| | |
| | |
| | |

NOTE (In response to a class 2 poll, a controlled station may respond with class 1 data when there is no class 2 data available).

1.5 Application layer

Transmission mode for application data

Mode 1 (least significant octet first), as defined in 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

Common address of ASDU

(System-specific parameter, all configurations that are used are to be marked with an "X")

One octet two octets

Information object address

(System-specific parameter, all configurations that are used are to be marked with an "X")

One octet Structured
 Two octets Unstructured
 Three octets

Cause of transmission

(System-specific parameter, all configurations that are used are to be marked with an "X")

One octet two octets (with originator address)
Originator address is set to zero if not used

Length of APDU

(System-specific parameter, specify the maximum length of the APDU per system)

The maximum length of APDU for both directions is 253. It is a fixed system parameter.

Maximum length of APDU per system in control direction

Maximum length of APDU per system in monitor direction

Selection of standard ASDUs

Process information in monitor direction

(Station-specific parameter, mark each type ID with an "X" if it is only used in the standard Direction, "R" if only used in the reverse direction, and "B" if used in both directions)

| | | |
|-------------------------------------|---|-----------|
| <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 checked="" 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 information 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 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 checked="" type="checkbox"/> | <38>:= Event of protection equipment with time tag CP56Time2a | M_EP_TD_1 |
| <input checked="" type="checkbox"/> | <39>:= Packed start events of protection equipment with time tag CP56Time2a | M_EP_TE_1 |
| <input checked="" type="checkbox"/> | <40>:= Packed output circuit information of protection equipment with time tag CP56Time2a | M_EP_TF_1 |

In this companion standard only the use of the set <30> – <40> for ASDUs with time tag is permitted.

Process information in control direction

(Station-specific parameter, mark each type ID with an “X” if it is only used in the standard direction, “R” if only used in the reverse direction, and “B” if used in both directions)

| | | |
|-------------------------------------|---|-----------|
| <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 |
| <input checked="" type="checkbox"/> | <58>:= Single command with time tag CP56Time2a | C_SC_TA_1 |
| <input checked="" type="checkbox"/> | <59>:= Double command with time tag CP56Time2a | C_DC_TA_1 |
| <input checked="" type="checkbox"/> | <60>:= Regulating step command with time tag CP56Time2a | C_RC_TA_1 |
| <input checked="" type="checkbox"/> | <61>:= Set point command, normalized value with time tag CP56Time2a | C_SE_TA_1 |
| <input checked="" type="checkbox"/> | <62>:= Set point command, scaled value with time tag CP56Time2a | C_SE_TB_1 |
| <input checked="" type="checkbox"/> | <63>:= Set point command, short floating point value with time tag CP56Time2a | C_SE_TC_1 |
| <input checked="" type="checkbox"/> | <64>:= Bitstring of 32 bit command with time tag CP56Time2a | C_BO_TA_1 |

Either the ASDUs of the set <45> – <51> or of the set <58> – <64> are used.

System information in monitor direction

(Station-specific parameter, mark with an “X” if it is only used in the standard direction, “R” if only used in the reverse direction, and “B” if used in both directions)

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

System information in control direction

(Station-specific parameter, mark with an “X” if it is only used in the standard direction, “R” if only used in the reverse direction, and “B” if used in both directions)

| | | |
|-------------------------------------|--|----------------------|
| <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 type="checkbox"/> | <104>:= Test command | C_TS_NA_1 |
| <input checked="" type="checkbox"/> | <105>:= Reset process command | C_RP_NA_1 |
| <input type="checkbox"/> | <106>:= Delay acquisition command | C_CD_NA_1 |
| <input checked="" type="checkbox"/> | <107>:= Test command with time tag CP56Time2a | C_TS_TA_1 |

Parameter in control direction

(Station-specific parameter, mark each type ID with an “X” if it is only used in the standard direction, “R” if only used in the reverse direction, and “B” if used in both directions)

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

File transfer

(Station-specific parameter, mark each type ID with an “X” if it is only used in the standard Direction, “R” if only used in the reverse direction, and “B” if used in both directions)

| | |
|--|-----------|
| <input checked="" type="checkbox"/> <120>:= File ready | F_FR_NA_1 |
| <input checked="" type="checkbox"/> <121>:= Section ready | F_SR_NA_1 |
| <input checked="" type="checkbox"/> <122>:= Call directory, select file, call file, call section | F_SC_NA_1 |
| <input checked="" type="checkbox"/> <123>:= Last section, last segment | F_LS_NA_1 |
| <input checked="" type="checkbox"/> <124>:= Ack file, ack section | F_AF_NA_1 |
| <input checked="" type="checkbox"/> <125>:= Segment | F_SG_NA_1 |
| <input checked="" type="checkbox"/> <126>:= Directory {blank or X, only available in monitor (standard) direction} | F_DR_TA_1 |
| <input checked="" type="checkbox"/> <127>:= Query Log – Request archive file | F_SC_NB_1 |

Type identification and cause of transmission assignments
(Station-specific parameters)

Shaded boxes: option not required.

Black boxes: option not permitted in this companion standard

Blank = function or ASDU is not used.

Mark type identification/cause of transmission combinations:

“X” if used only in the standard direction;

“R” if used only 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 <n> | 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 |
| <1> | M_SP_NA_1 | | X | X | | X | | | | | | X | X | | X | | | | | |
| <2> | M_SP_TA_1 | | | | | | | | | | | | | | | | | | | |
| <3> | M_DP_NA_1 | | X | X | | X | | | | | | X | X | | X | | | | | |
| <4> | M_DP_TA_1 | | | | | | | | | | | | | | | | | | | |
| <5> | M_ST_NA_1 | | X | X | | X | | | | | | X | X | | X | | | | | |
| <6> | M_ST_TA_1 | | | | | | | | | | | | | | | | | | | |
| <7> | M_BO_NA_1 | | X | X | | X | | | | | | | | | X | | | | | |
| <8> | M_BO_TA_1 | | | | | | | | | | | | | | | | | | | |
| <9> | M_ME_NA_1 | X | X | X | | X | | | | | | | | | X | | | | | |
| <10> | M_ME_TA_1 | | | | | | | | | | | | | | | | | | | |
| <11> | M_ME_NB_1 | X | X | X | | X | | | | | | | | | X | | | | | |
| <12> | M_ME_TB_1 | | | | | | | | | | | | | | | | | | | |
| <13> | M_ME_NC_1 | X | X | X | | X | | | | | | | | | X | | | | | |
| <14> | M_ME_TC_1 | | | | | | | | | | | | | | | | | | | |
| <15> | M_IT_NA_1 | | | X | | | | | | | | | | | | X | | | | |
| <16> | M_IT_TA_1 | | | | | | | | | | | | | | | | | | | |
| <17> | M_EP_TA_1 | | | | | | | | | | | | | | | | | | | |
| <18> | M_EP_TB_1 | | | | | | | | | | | | | | | | | | | |
| <19> | M_EP_TC_1 | | | | | | | | | | | | | | | | | | | |
| <20> | M_PS_NA_1 | | X | X | | X | | | | | | | | | X | | | | | |
| <21> | M_ME_ND_1 | X | X | X | | X | | | | | | | | | X | | | | | |
| <30> | M_SP_TB_1 | | | X | | X | | | | | | X | X | | | | | | | |
| <31> | M_DP_TB_1 | | | X | | X | | | | | | X | X | | | | | | | |
| <32> | M_ST_TB_1 | | | X | | X | | | | | | X | X | | | | | | | |
| <33> | M_BO_TB_1 | | | X | | X | | | | | | | | | | | | | | |
| <34> | M_ME_TD_1 | | | X | | X | | | | | | | | | | | | | | |

| 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 <n> | 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 | |
| <35> | M_ME_TE_1 | | | X | | X | | | | | | | | | | | | | | | |
| <36> | M_ME_TF_1 | | | X | | 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 | | | | | | | X | X | X | X |
| <46> | C_DC_NA_1 | | | | | | X | X | X | X | X | | | | | | | X | X | X | X |
| <47> | C_RC_NA_1 | | | | | | X | X | X | X | X | | | | | | | X | X | X | X |
| <48> | C_SE_NA_1 | | | | | | X | X | X | X | X | | | | | | | X | X | X | X |
| <49> | C_SE_NB_1 | | | | | | X | X | X | X | X | | | | | | | X | X | X | X |
| <50> | C_SE_NC_1 | | | | | | X | X | X | X | X | | | | | | | X | X | X | X |
| <51> | C_BO_NA_1 | | | | | | X | X | | | X | | | | | | | X | X | X | X |
| <58> | C_SC_TA_1 | | | | | | X | X | X | X | X | | | | | | | X | X | X | X |
| <59> | C_DC_TA_1 | | | | | | X | X | X | X | X | | | | | | | X | X | X | X |
| <60> | C_RC_TA_1 | | | | | | X | X | X | X | X | | | | | | | X | X | X | X |
| <61> | C_SE_TA_1 | | | | | | X | X | X | X | X | | | | | | | X | X | X | X |
| <62> | C_SE_TB_1 | | | | | | X | X | X | X | X | | | | | | | X | X | X | X |
| <63> | C_SE_TC_1 | | | | | | X | X | X | X | X | | | | | | | X | X | X | X |
| <64> | C_BO_TA_1 | | | | | | X | X | | | X | | | | | | | X | X | X | X |
| <70> | M_EI_NA_1* | | | | X | | | | | | | | | | | | | | | | |
| <100> | C_IC_NA_1 | | | | | | X | X | X | X | X | | | | | | | X | X | X | X |
| <101> | C_CI_NA_1 | | | | | | X | X | | | X | | | | | | | X | X | X | X |
| <102> | C_RD_NA_1 | | | | | X | | | | | | | | | | | | X | X | X | X |
| <103> | C_CS_NA_1 | | | X | | | X | X | | | | | | | | | | X | X | X | X |
| <104> | G_TS_NA_4 | | | | | | | | | | | | | | | | | | | | |
| <105> | C_RP_NA_1 | | | | | | X | X | | | | | | | | | | X | X | X | X |
| <106> | G_CD_NA_4 | | | | | | | | | | | | | | | | | | | | |
| <107> | C_TS_TA_1 | | | | | | X | X | | | | | | | | | | X | X | X | X |
| <110> | P_ME_NA_1 | | | | | | X | X | | | | | | | | X | | X | X | X | X |
| <111> | P_ME_NB_1 | | | | | | X | X | | | | | | | | X | | X | X | X | X |
| <112> | P_ME_NC_1 | | | | | | X | X | | | | | | | | X | | X | X | X | X |
| <113> | P_AC_NA_1 | | | | | | X | X | X | X | | | | | | | | X | X | X | X |
| <120> | F_FR_NA_1 | | | | | | | | | | | | | | X | | | X | X | X | |
| <121> | F_SR_NA_1 | | | | | | | | | | | | | | X | | | X | X | X | |

| 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 |
| <122> | F_SC_NA_1 | | | | | X | | | | | | | | X | | | X | X | X | |
| <123> | F_LS_NA_1 | | | | | | | | | | | | | X | | | X | X | X | |
| <124> | F_AF_NA_1 | | | | | | | | | | | | | X | | | X | X | X | |
| <125> | F_SG_NA_1 | | | | | | | | | | | | | X | | | X | X | X | |
| <126> | F_DR_TA_1* | | | X | | X | | | | | | | | | | | | | | |
| <127> | F_SC_NB_1* | | | | | X | | | | | | | | X | | | X | X | X | |

* Blank or X only

1.6 Basic application functions

Station initialization

(Station-specific parameter, mark with an "X" if function is used)

Remote initialization

Cyclic data transmission

(Station-specific parameter, mark with an "X" if function is used only in the standard direction, "R" if used only in the reverse direction, and "B" if used in both directions)

Cyclic data Transmission

Read Procedure

(Station-specific parameter, mark with an "X" if function is used only in the standard direction, "R" if used only in the reverse direction, and "B" if used in both directions)

Read procedure

Spontaneous transmission

(Station-specific parameter, mark with an "X" if function is used only in the standard direction, "R" if used only in the reverse direction, and "B" if used in both directions)

Spontaneous transmission

Double transmission of information objects with cause of transmission spontaneous

(Station-specific parameter, mark each information type with an "X" where both a type ID without time and corresponding type ID with time are issued in response to a single spontaneous change of a monitored object)

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, see 7.2.1.1)

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

Station interrogation

(Station-specific parameter, mark with an "X" if function is used only in the standard direction, "R" if used only in the reverse direction, and "B" if used in both directions)

- | | | |
|---|--|--|
| <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 | |

Information object addresses assigned to each group must be shown in a separate table

Clock synchronization

(Station-specific parameter, mark with an "X" if function is used only in the standard direction, "R" if used only in the reverse direction, and "B" if used in both directions)

- Clock synchronization
- Day of week used
- RES1, GEN (time tag substituted/ not substituted) used
- SU-bit (summertime) used

Command transmission

(Object-specific parameter, mark with an "X" if function is used only in the standard direction, "R" if used only in the reverse direction, and "B" if used in both directions)

- Direct command transmission
- Direct set point command transmission
- Select and execute command
- Select and execute set point command
- C_SE ACTTERM used
- No additional definition
- Short-pulse duration (duration determined by a system parameter in the controlled station)
- Long-pulse duration (duration determined by a system parameter in the controlled station)
- Persistent output
- Supervision of maximum delay of command direction of commands and set point commands

Configurable Maximum allowable delay of commands and set point commands

Transmission of integrated totals

(Station- or object-specific parameter, mark with an "X" if function is used only in the standard direction, "R" if used only in the reverse direction, and "B" if used in both directions)

- Mode A: local freeze with spontaneous transmission
- Mode B: local freeze with counter interrogation
- Mode C: freeze and transmit by counter interrogation commands
- Mode D: freeze by counter-interrogation command, frozen values reported spontaneously

- Counter read
- Counter freeze without reset
- Counter freeze with reset
- Counter reset
- General request counter
- Request counter group 1
- Request counter group 2
- Request counter group 3
- Request counter group 4

Parameter loading

(Object-specific parameter, mark with an "X" if function is used only in the standard direction, "R" if used only in the reverse direction, and "B" if used in both directions)

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

Parameter activation

(Object-specific parameter, mark with an "X" if function is used only in the standard direction, "R" if used only in the reverse direction, and "B" if used in both directions)

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

Test procedure

(Station-specific parameter, mark with an "X" if function is used only in the standard direction, "R" if used only in the reverse direction, and "B" if used in both directions)

- Test procedure

File transfer

(Station-specific parameter, mark with an "X" if function is used)

File transfer in monitor direction

- Transparent file
- Transmission of disturbance data of protection equipment
- Transmission of sequences of events
- Transmission of sequences of recorded analogue values

File transfer in control direction

- Transparent file

Background scan

(Station-specific parameter, mark with an "X" if function is used only in the standard direction, "R" if used only in the reverse direction, and "B" if used in both directions)

- Background scan

Acquisition of transmission delay

(Station-specific parameter, mark with an "X" if function is used only in the standard direction, "R" if used only in the reverse direction, and "B" if used in both directions)

- Acquisition of transmission delay

Definition of time outs

| Parameter | Default value | Remarks | Selected value |
|----------------|---------------|---|----------------|
| t ₀ | 30 s | Time-out of connection establishment | Configurable |
| t ₁ | 15 s | Time-out of send or test APDUs | Configurable |
| t ₂ | 10 s | Time-out for acknowledges in case of no data messages t ₂ < t ₁ | Configurable |
| t ₃ | 20 s | Time-out for sending test frames in case of a long idle state | Configurable |

Maximum range for time-outs t₀ to t₁: 1 s to 255 s, accuracy 1 s.

Recommended range for timeout t₃: 1 s to 48h, resolution 1s.

Long timeouts for t₃ may be needed in special cases where satellite links or dialup connections are used (for instance to establish connection and collect values only once per day or week).

Maximum number of outstanding I format APDUs k and latest acknowledge APDUs (w)

| Parameter | Default value | Remarks | Selected value |
|-----------|---------------|--|----------------|
| k | 12 APDUs | Maximum difference receive sequence number to send state | Configurable |
| w | 8 APDUs | Maximum difference receive sequence number to send state | Configurable |

Maximum range of values k: 1 to 32767 (2¹⁵-1) APDUs, accuracy 1 APDU

Maximum range of values w: 1 to 32767 APDUs, accuracy 1 APDU (Recommendation: w should not exceed two-thirds of k).

Port number

| Parameter | Default value | Remarks |
|------------|---------------|----------------------------|
| Portnumber | 2404 | In all cases(Configurable) |

Redundant connections

Number N of redundancy group connections used

RFC 2200 suite

RFC 2200 is an official Internet Standard which describes the state of standardization of Protocols used in the Internet as determined by the Internet Architecture Board (IAB). It offers a broad spectrum of actual standards used in the Internet. The suitable selection of documents from RFC 2200 defined in this standard for given projects has to be chosen by the user of this standard.

- Ethernet 802.3
- Serial X.21 interface
- Other selection from RFC 2200

List of valid documents from RFC 2200

1.
2.
3.
4.
5.
6.
7. etc.