

## 8 Interoperability

### 8.1 Physical layer

#### 8.1.1 Electrical interface

- EIA RS-485
- Number of loads 32 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.

#### 8.1.2 Optical interface

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

#### 8.1.3 Transmission speed

- 9 600 bit/s
- 19 200 bit/s

### 8.2 Link layer

There are no choices for the link layer.

### 8.3 Application layer

#### 8.3.1 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.

#### 8.3.2 COMMON ADDRESS OF ASDU

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

### 8.3.3 Selection of standard information numbers in monitor direction

#### 8.3.3.1 System functions in monitor direction

##### INF Semantics

- |                                     |     |                              |
|-------------------------------------|-----|------------------------------|
| <input checked="" type="checkbox"/> | <0> | End of general interrogation |
| <input checked="" type="checkbox"/> | <0> | Time synchronization         |
| <input type="checkbox"/>            | <2> | Reset FCB                    |
| <input checked="" type="checkbox"/> | <3> | Reset CU                     |
| <input checked="" type="checkbox"/> | <4> | Start/restart                |
| <input checked="" type="checkbox"/> | <5> | Power on                     |

#### 8.3.3.2 Status indications in monitor direction

##### INF Semantics

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

### 8.3.3.3 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

### 8.3.3.4 Earth fault indications in monitor direction

#### INF Semantics

- <48> Earth fault L<sub>1</sub>
- <49> Earth fault L<sub>2</sub>
- <50> Earth fault L<sub>3</sub>
- <51> Earth fault forward, i.e. line
- <52> Earth fault reverse, i.e. busbar

### 8.3.3.5 Fault indications in monitor direction

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

### 8.3.3.6 Auto-reclosure indications in monitor direction

#### INF Semantics

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

### 8.3.3.7 Measurands in monitor direction

#### INF Semantics

- <144> Measurand I
- <145> Measurands I, V
- <146> Measurands I, V, P, Q
- <147> Measurands  $I_N$ ,  $V_{EN}$
- <148> Measurands  $I_{L1,2,3}$ ,  $V_{L1,2,3}$ , P, Q, f

### 8.3.3.8 Generic functions in monitor direction

#### INF Semantics

- <240> Read headings of all defined groups
- <241> Read values or attributes of all entries of one group
- <243> Read directory of a single entry
- <244> Read value or attribute of a single entry
- <245> End of general interrogation of generic data
- <249> Write entry with confirmation
- <250> Write entry with execution
- <251> Write entry aborted

### 8.3.4 Selection of standard information numbers in control direction

#### 8.3.4.1 System functions in control direction

#### INF Semantics

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

#### 8.3.4.2 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

#### 8.3.4.3 Generic functions in control direction

##### INF Semantics

- <240> Read headings of all defined groups
- <241> Read values or attributes of all entries of one group
- <243> Read directory of a single entry
- <244> Read value or attribute of a single entry
- <245> General interrogation of generic data
- <248> Write entry
- <249> Write entry with confirmation
- <250> Write entry with execution
- <251> Write entry abort

#### 8.3.5 Basic application functions

- Test mode
- Blocking of monitor direction
- Disturbance data
- Generic services
- Private data

### 8.3.6 Miscellaneous

Measurands are transmitted with ASDU 3 as well as with ASDU 9. As defined in 7.2.6.8, the maximum MVAL can either be 1,2 or 2,4 times the rated value. No different rating shall be used in ASDU 3 and ASDU 9, i.e. for each measurand there is only one choice.

Measurand	Max. MVAL = rated value times	
	1,2	or 2,4
Current L <sub>1</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Current L <sub>2</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Current L <sub>3</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Voltage L <sub>1-E</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Voltage L <sub>2-E</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Voltage L <sub>3-E</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Active power P	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Reactive power Q	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Frequency f	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Voltage L <sub>1</sub> - L <sub>2</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>