8 Interoperability

8.1 Physical layer

8.1.1 Electrical interface

[X] EIA RS-485

[X] 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

[X] 9 600 bit/s

[X] 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

[X] One COMMON ADDRESS OF ASDU (identical with station address)

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

8.3.3.2 Status indications in monitor direction

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

8.3.3.3 Supervision indications in monitor direction

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

8.3.3.4 Earth fault indications in monitor direction

	INF	Semantics
X	<48>	Earth fault L_1
X	<49>	Earth fault L_2
X	<50>	Earth fault L_3
X	<51>	Earth fault forward, i.e. line
X	<52>	Earth fault reverse, i.e. busbar

8.3.3.5 Fault indications in monitor direction

	INF	Semantics
X	<64>	Start /pick-up L_1
X	<65>	Start /pick-up L_2
X	<66>	Start /pick-up L_3
X	<67>	Start /pick-up N
X	<68>	General trip
X	<69>	Trip L_1
X	<70>	Trip L_2
X	<71>	Trip L_3
X	<72>	Trip I>> (back-up operation)
X	<73>	Fault location X in ohms
X	<74>	Fault forward/line
X	<75>	Fault reverse/busbar
X	<76>	Teleprotection signal transmitted
X	<77>	Teleprotection signal received
X	<78>	Zone 1
X	<79>	Zone 2
X	<80>	Zone 3
X	<81>	Zone 4
X	<82>	Zone 5
X	<83>	Zone 6
X	<84>	General start/pick-up
X	<85>	Breaker failure
X	<86>	Trip measuring system L_1
X	<87>	Trip measuring system L_2
X	<88>	Trip measuring system L_3
X	<89>	Trip measuring system E
X	<90>	Trip I>
X	<91>	Trip I>>
X	<92>	Trip IN>
X	<93>	Trip IN>>

8.3.3.6 Auto-reclosure indications in monitor direction

	INF	Semantics
X	<128>	CB ‘on’ by AR
X	<129>	CB ‘on’ by long-time AR
X	<130>	AR blocked

8.3.3.7 Measurands in monitor direction

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

8.3.3.8 Generic functions in monitor direction

	INF	Semantics
X	<240>	Read headings of all defined groups
X	<241>	Read values or attributes of all entries of one group
X	<243>	Read directory of a single entry
X	<244>	Read value or attribute of a single entry
X	<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
X	<0>	Initiation of general interrogation
X	<0>	Time synchronization

8.3.4.2 General commands in control direction

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

8.3.4.3 Generic functions in control direction

	INF	Semantics
X	<240>	Read headings of all defined groups
X	<241>	Read values or attributes of all entries of one group
X	<243>	Read directory of a single entry
X	<244>	Read value or attribute of a single entry
X	<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
- [X] 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_1	X		X
Current L_2	X		X
Current L_3	X		X
Voltage L_{1-E}	X		X
Voltage L_{2-E}	X		X
Voltage L_{3-E}	X		X
Active power P	X		X
Reactive power Q	X		X
Frequency f	X		X
Voltage L_1 - L_2	X		X