Base Load Power Hub (BLPH)

AC UPS - FACTORY ACCEPTANCE TEST PROCEDURE

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Revision / Change Log

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HOLDS LIST

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Base Load Power Hub (BLPH)

AC UPS PAS - TAG: UP-200F3
FACTORY ACCEPTANCE TEST PROCEDURE

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AEG POWER SOLUTIONS

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

Configuration No.: 1000007888_010 1000007888_020	**Order-No.:** 4400007525
Serial No.: 100XYZX/001-002 Protect 8.33/40-400-216-400-RP-IP43 100XYZX/001 Bypass Trans. Cabinet 40kVA 400/400V	**Project name:** Hollandse Kust Noord (HKN) wind farm

Participants:	Company:	Date/Signature:
1.		
2.		
3.		
4.		

Remark:

Both UPS with the serial numbers respectively ending with 001 and 002 are electrically tested at the FAT.

Note:

For the start-up step-by-step procedure and for the shut-down step-by-step procedure please refer to the SAT procedure document.

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

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Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

1. Overview:

SCOPE This procedure describes the methods for inspecting and checking the UPS system to ensure that it meets the operational requirements and specification.
REFERENCE DOCUMENT Engineering Documents IEC 62040-3 Routine test report 14188_FAT_1
TESTING EQUIPMENT & ACCESSORIES Digital Multimeter, Oscilloscope and Clamp-meter. Calibration certificates are available for review during FAT session
DIELECTRIC AND INSULATION TEST according EN / IEC 62040-3:2021 Clause 5.2.3.4 See Test Report from AEG PS (Internal Test Report) Not tested during FAT
LOAD DURATION TEST (Optional) See Separate Test Report from AEG PS Not tested during FAT

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

2. Visual Inspection

Reference to EN IEC 62040-3:2021 Clause 6.2.2.2

1.) General construction	**Check**
• Complete arrangement	
• Degree of Protection	
• Dimensions	
• Coating	
2.) Labels	
• Nameplate / Rating Plate	
• Tag Plate	
• Warning labels	
• Components Labelling of Instruments and Lamps	
3.) Installation of technical components	
• Arrangement and accessibility	
• Exchange of PCB	
• Terminals	
• Wiring	
4.) Protection against touching	
• Installation and connection of protective conductors	
• Covers, Shrouding	
5.) Check the arrangement of measuring apparatus	

***) See separate Punch List**

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

3 .Static Test (Load Characteristic):

Reference to EN / IEC 62040-3:2021 Clause 6.4.2.3

Incorporates Tests for:

Inverter I/P Voltage Tolerance,
0%, 50% and 100% Inverter Load Tests,
Inverter O/P Voltage and Frequency Regulation,
Quality of the Inverter Output Voltage (THDv Measurement).

This test is carried out using a test rectifier (in order to demonstrate the I/P tolerance of the Inverter.)
Please note that "Inverter Load" relates to the Protect 8 rating (40kVA) with a power factor of 0.8 lag.

Test field Rectifier is connected to the terminals X2 of the UPS

Acceptance Criteria:

Inverter I/P Voltage Tolerance:	max 259 Vdc, min 184 Vdc
Inverter O/P Voltage Tolerance:	230.9 V +/-1% (max 233.2 Vac, min 228.6 Vac)
Inverter Frequency Regulation:	50 Hz +/-0.2% (max 50.1 Hz, min 49.9 Hz)
Inverter O/P Voltage Distortion (THDv):	<3% (linear load)

U_{DC} [V]		I_{DC} [A]	I_{L1} [A]	I_{L2} [A]	I_{L3} [A]	U_{L1-N} [V]	U_{L2-N} [V]	U_{L3-N} [V]	THDv [%]	f [Hz]
		X2	X3	X3	X3	X3	X3	X3	X3	X3
U_{nom}	Leerlauf no load		0	0	0					
-15%	0,5*I_n*cos φ 0,8									
184 V	1,0*I_n*cos φ 0,8									
U_{nom}	Leerlauf no load		0	0	0					
216 V	0,5*I_n*cos φ 0,8									
	1,0*I_n*cos φ 0,8									
U_{nom}	Leerlauf no load		0	0	0					
+20%	0,5*I_n*cos φ 0,8									
259 V	1,0*I_n*cos φ 0,8									

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

4 .Dynamic Test:

Reference to EN / IEC 62040-3: 2011 Clause 6.4.2.11.4

Incorporates Tests for:

Load Application (100%): Inverter
Load Removal (100%): Inverter.
40 kVA cos phi 0.8, U = 216 Vdc

Please note that “Inverter Load” relates to the Protect 8 rating (40 kVA) with a power factor of 0.8 lag.

Acceptance Criteria:

Inverter O/P Voltage Tolerance:	230.9V +/-1% (max 233.2 Vac, min 228.6 Vac)
Response time: ≤ 2ms	According EN/IEC 62040-3 5.3.1 Figure1

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

Load switched on
Connecting load from test field switch board
Test 0 to 100 % cos φ = 0.8 ind.
Recording of AC load voltage and AC load current at X3 **with screen shot**

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

Load switched off
Disconnecting load from test field switch board
Test 100 to 0 % cos φ = 0.8 ind.
Recording of AC load voltage and AC load current at X3 **with screen shot**

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

5. Short Circuit Test:

Reference to EN / IEC 62040-3: 2021 Clause 6.4.2.9.2

Incorporates Tests for:

O/P Short Circuit via Fuse, without Bypass Mains available,
O/P Short Circuit via Fuse, with Bypass Mains available,
O/P Short Circuit @ terminals, with Inverter only.

Please note that “Inverter Load” relates to the Protect 8 rating (40 kVA) with a power factor of 0.8 lag.

Acceptance Criteria:

Fuse Characteristic Curves
Short circuit without bypass → Inverter trips fuse without switching OFF.
Short circuit with bypass → Inverter switch over to mains without gap and trip the fuse. Terminal short circuit without Bypass mains → Inverter switches off after a certain time (Dynamic Current Limit Duration).
The Dynamic Current Limit Duration is approx. 500 ms Recording of AC load voltage and AC load current
Short circuit current to be measured and recorded

For all the test that cause alarm assertion, check the activation of the related hard-wired alarm

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

Short circuit without Bypass mains with fuse
Fuse is tripped by Inverter
Test on 100 % Load = 40 kVA cos φ = 0.8 ind.
Protection: 16 A fuse gG
Measured tripping time of the Fuse: **XYZ ms**
Recording of AC load voltage and AC load current at X3 **with screen shot**

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

Short circuit with Bypass mains with fuse
Transfer to SBS. Fuse is tripped by SBS. Retransfer to Inverter
Test on 100 % Load = 40 kVA cos φ = 0.8 ind.
Protection: 16 A fuse gG
Measured tripping time of the Fuse/MCB: **XYZ ms**
Recording of AC load voltage and AC load current at X3 **with screen shot**

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

Terminal short circuit without Bypass mains
Inverter is supplying appox. 2 x Inom (3 phase) for measured time and then switched off
Test on 100 % Load = 40 kVA cos φ = 0.8 ind.
Measured switch off time Inverter: **XYZ ms**
Recording of AC load voltage and AC load current at X3 **with screen shot**

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

6. Overload Test:

Reference to EN / IEC 62040-3: 2021 Clause 6.4.2.9.1

Incorporates Tests for:

150% Load Capability Test

Please note that “Inverter Load” relates to the Protect 8 rating (40 kVA) with a power factor of 0.8 lag.

Acceptance Criteria:

The Inverter swithes off after a certain time (Minimum Overlad Duration)

Inverter O/P Voltage Tolerance:	230.9V +/-1% (max 233.2 Vac, min 228.6 Vac)
Inverter Frequency Regulation:	50 Hz +/-0.2% (max 50.1 Hz, min 49.9 Hz)
Inverter O/P Voltage Distortion:	<3% (linear load)
Minimum Overload Duration:	approx. 60 seconds

Load connected from test field switch board
Load: 150% / cos φ = 0.8 ind. = 60 kVA
Measured Switch off time: **XYZ sec.**
Recording of AC load voltage and AC load current at X3 **with screen shot**

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

7. Functional tests UPS / Load Transfer Tests:

Reference to EN / IEC 62040-3:2021 Clause 6.2.2.7 / 6.2.2.8 / 6.2.2.9

Incorporates Tests for:

Rectifier Mains Failure – continued Inverter operation via Battery
Rectifier Mains Return – auto start of the rectifier
Inverter Failure – transfer of load from Inverter to Bypass Mains
Inverter Restoration – transfer of load from Bypass Mains to Inverter
Manual Bypass Switch – transfer of load directly to Bypass Mains

The tests are performed at Inverter full load.

Please note that “Inverter Load” relates to the Protect 8 rating with a power factor of 0.8 lag.

Acceptance Criteria:

Rectifier Mains Failure:	No disruption to the Inverter operation.
Rectifier Mains Return:	Auto start of the rectifier and charging of the Battery
Transfer Inverter to Static Bypass:	No-break transfers

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

A) Rectifier Mains Failure

Switch OFF rectifier Mains via Rectifier input isolator Q1

Recording of Rectifier AC current at X1 and AC load voltage and AC load current at X3

Result:

B) Rectifier Mains Return

Switch ON rectifier mains via Rectifier input isolator Q1

Recording of Rectifier AC current at X1 and AC load voltage and AC load current at X3

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

C) Transfer inverter-SBS mains

Switch OFF Inverter via Display

Recording of AC load voltage and AC load current at X3 and Bypass current at X4

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

D) Transfer SBS mains-inverter

Switch ON Inverter via Display

Recording of AC load voltage and AC load current at X3 and Bypass current at X4

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

E) Parallel Operation (load transfer test)

Parallel operation UPS n.1 and UPS n.2 - Switching OFF UPS n.2 via Display A18 on the door of the UPS

UPS n.1 takes over 100% Load
AC load voltage and AC load current and SBS current by screen shot.

and in addition repeat the test as following indicated:

Parallel operation UPS n.1 and UPS n.2 - Switching OFF UPS n.2 via de-energization of its upstream power supply

UPS n.1 takes over 100% Load
AC load voltage and AC load current and SBS current by screen shot.

Switching OFF UPS n.1 via Display A18 on the door of the UPS

Transfer to Bypass operation
AC load voltage and AC load current and SBS current by screen shot.

and in addition repeat the test as following indicated:

Switching OFF UPS n.1 via de-energization of its upstream power supply

Transfer to Bypass operation
AC load voltage and AC load current and SBS current by screen shot.

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

Bypass operation - Switching ON UPS n.2 via Display A18 on the door of of the UPS

UPS n.2 takes over 100% load
AC load voltage and AC load current and SBS current by screen shot.

and in addition repeat the test as following indicated:

Bypass operation - Switching ON UPS n.2 via re-energization of its upstream power supply

UPS n.2 takes over 100% load
AC load voltage and AC load current and SBS current by screen shot.

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

Switching ON UPS n.1 via Display A18 on the door of of the UPS
Load sharing 50%

Parallel operation with load sharing 50% of UPS n.1 and UPS n.2
AC load voltage and AC load current and SBS current by screen shot.

and in addition repeat the test as following indicated:

Switching ON UPS n.1 via re-energization of its upstream power supply
Load sharing 50%

Parallel operation with load sharing 50% of UPS n.1 and UPS n.2
AC load voltage and AC load current and SBS current by screen shot.

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

F) Parallel Operation (functional sequence test)

Starting condition: UPS redundant system working in normal operation with By-Pass input and both Rectifier inputs n.1 and n.2 all energized. UPS n.1 and UPS n.2 synchronized with the By-Pass

1. De-energize upstream power supply to Rectifier input n.2
2. De-energize upstream power supply to By-Pass
3. Confirm the normal operation of UPS n.1 at the correct load
4. Re-energize upstream power supply to Rectifier input n.2
5. Confirm the correct synchronization and normal operation of both UPS n.1 and n.2 with load sharing activated
6. Re-energize upstream power supply to By-Pass
7. Confirm reinstatement and normal operation of all UPS unit functions.
8. At each test step, validate correct functioning of hardwired I/O signals

G) Parallel Operation (functional sequence test)

Starting condition: UPS redundant system working in normal operation with By-Pass input and both Rectifier inputs n.1 and n.2 all energized. UPS n.1 and UPS n.2 synchronized with the By-Pass

1. De-energize upstream power supply to Rectifier input n.1
2. De-energize upstream power supply to By-Pass
3. Confirm the normal operation of UPS n.2 at the correct load
4. Re-energize upstream power supply to Rectifier input n.1
5. Confirm the correct synchronization and normal operation of both UPS n.1 and n.2 with load sharing activated
6. Re-energize upstream power supply to By-Pass
7. Confirm reinstatement and normal operation of all UPS unit functions.
8. At each test step, validate correct functioning of hardwired I/O signals

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

8. DC Ripple Current Measurement

with Test field battery

Reference to EN / IEC 62040-3:2021 Clause 6.4.3.3

Acceptance Criteria:

Current ripple of less than 5 A rms for every 100 Ah / Measured with test field battery with screen shot

The capacity of the test field battery is 300Ah.

The measured value is **XYZ A** rms / 1 V = 1 A

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

9. MODBUS Adapter (Demonstration)

Incorporates Tests for:
A29.1 MODBUS Adapter

Test to be performed for chosen failure messages, status messages and measuring values.

Designation	Source	Terminals	Checked
MODBUS Adapter	A29.1	A29.1	

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
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10. Alarm Test:

Reference to EN IEC 62040-3:2021 Clause 6.2.2.3

Incorporates Tests for:

Remote Alarm signalling on Boards A12/A13
System Operational Check

Acceptance Criteria:

Technical datasheet (TD)

Designation	Terminals	Relay/Opto	Result
Inverter operation 1)	UPS A12-X3: 1, 2, 3	**A12K21**	
SBS operation 1)	UPS A12-X3: 4, 5, 6	**A12K22**	
Rec Fault / Rec mains fault 1)	UPS A12-X3: 7, 8, 9	**A12K23**	
Battery undervoltage 1)	UPS A12-X3: 10, 11, 12	**A12K24**	
Common fault 2)	UPS A12-X4: 1, 2, 3	**A12K25**	
SBS blocked 1)	UPS A13-X3: 1, 2, 3	**A13K26**	
Fan fault 1)	UPS A13-X3: 4, 5, 6	**A13K27**	
BAT room fan on 1)	UPS A13-X3: 7, 8, 9	**A13K28**	
INV remote off 3)	UPS A12-X5: 1, 2	**A12Opto1**	
BAT room fan fault 3)	UPS A13-X4: 1, 2	**A13Opto2**	
Not parameterised 3)	UPS A13-X4: 3, 4	**A13Opto3**	
Fan fault 1)	Bypass X12: 7, 8, 9	**N/A**	
Common fault 1)	Bypass X12: 10, 11, 12	**N/A**	

1) Remote signal / close on the terminals with the lower number
2) Remote signal / close on the terminals with the higher number

OPTO Input test

Check battery boost charge inhibit (external signal) in case of high battery temperature

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_1_00_updated
Type:	**UPS System Protect 8.33/40kVA-S10**	**Tag No.: BC-200F3A, BC-200F3B, BY-200F3**

11. Measuring Devices:

AEG internal Measuring device No.:	Measuring device name	Seriel number:	Calibrated until:

12. Remarks:

Base Load Power Hub (BLPH)

AC UPS F&G - TAG: UP-200F4
FACTORY ACCEPTANCE TEST PROCEDURE

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Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

Configuration No.: 1000007888_080 1000007888_090	**Order-No.:** 4400007525
Serial No.: 100XYZX/001-002 Protect 8.33/20-400-216-400-RP-IP43 100XYZX/001 Bypass Trans. Cabinet 20kVA 400/400V	**Project name:** Hollandse Kust Noord (HKN) wind farm

Participants:	Company:	Date/Signature:
1.		
2.		
3.		
4.		

Remark:

Both UPS with the serial numbers respectively ending with 001 and 002 are electrically tested at the FAT.

Note:

For the start-up step-by-step procedure and for the shut-down step-by-step procedure please refer to the SAT procedure document.

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

Content:

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Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

1. Overview:

SCOPE This procedure describes the methods for inspecting and checking the UPS system to ensure that it meets the operational requirements and specification.
REFERENCE DOCUMENT Engineering Documents IEC 62040-3 Routine test report 14188_FAT_2
TESTING EQUIPMENT & ACCESSORIES Digital Multimeter, Oscilloscope and Clamp-meter. Calibration certificates are available for review during FAT session
DIELECTRIC AND INSULATION TEST according EN / IEC 62040-3:2021 Clause 5.2.3.4 See Test Report from AEG PS (Internal Test Report) Not tested during FAT
LOAD DURATION TEST (Optional) See Separate Test Report from AEG PS Not tested during FAT

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

2. Visual Inspection
Reference to EN IEC 62040-3:2021 Clause 6.2.2.2

1.) General construction	**Check**
• Complete arrangement	
• Degree of Protection	
• Dimensions	
• Coating	
2.) Labels	
• Nameplate / Rating Plate	
• Tag Plate	
• Warning labels	
• Components Labelling of Instruments and Lamps	
3.) Installation of technical components	
• Arrangement and accessibility	
• Exchange of PCB	
• Terminals	
• Wiring	
4.) Protection against touching	
• Installation and connection of protective conductors	
• Covers, Shrouding	
5.) Check the arrangement of measuring apparatus	

***) See separate Punch List**

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

3 .Static Test (Load Characteristic):

Reference to EN / IEC 62040-3:2021 Clause 6.4.2.3

Incorporates Tests for:

Inverter I/P Voltage Tolerance,
0%, 50% and 100% Inverter Load Tests,
Inverter O/P Voltage and Frequency Regulation,
Quality of the Inverter Output Voltage (THDv Measurement).

This test is carried out using a test rectifier (in order to demonstrate the I/P tolerance of the Inverter.)
Please note that "Inverter Load" relates to the Protect 8 rating (20kVA) with a power factor of 0.8 lag.

Test field Rectifier is connected to the terminals X2 of the UPS

Acceptance Criteria:

Inverter I/P Voltage Tolerance:	max 259 Vdc, min 184 Vdc
Inverter O/P Voltage Tolerance:	230.9 V +/-1% (max 233.2 Vac, min 228.6 Vac)
Inverter Frequency Regulation:	50 Hz +/-0.2% (max 50.1 Hz, min 49.9 Hz)
Inverter O/P Voltage Distortion (THDv):	<3% (linear load)

U_{DC} [V]		I_{DC} [A]	I_{L1} [A]	I_{L2} [A]	I_{L3} [A]	U_{L1-N} [V]	U_{L2-N} [V]	U_{L3-N} [V]	THDv [%]	f [Hz]
		X2	X3	X3	X3	X3	X3	X3	X3	X3
U_{nom}	Leerlauf no load		0	0	0					
-15%	0,5*I_n*cos φ 0,8									
184 V	1,0*I_n*cos φ 0,8									
U_{nom}	Leerlauf no load		0	0	0					
216 V	0,5*I_n*cos φ 0,8									
	1,0*I_n*cos φ 0,8									
U_{nom}	Leerlauf no load		0	0	0					
+20%	0,5*I_n*cos φ 0,8									
259 V	1,0*I_n*cos φ 0,8									

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

4 .Dynamic Test:

Reference to EN / IEC 62040-3: 2011 Clause 6.4.2.11.4

Incorporates Tests for:

Load Application (100%): Inverter
Load Removal (100%): Inverter.
20 kVA cos phi 0.8, U = 216 Vdc

Please note that “Inverter Load” relates to the Protect 8 rating (20kVA) with a power factor of 0.8 lag.

Acceptance Criteria:

Inverter O/P Voltage Tolerance:	230.9V +/-1% (max 233.2 Vac, min 228.6 Vac)
Response time: ≤ 2ms	According EN/IEC 62040-3 5.3.1 Figure1

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Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

Load switched on
Connecting load from test field switch board
Test 0 to 100 % cos φ = 0.8 ind.
Recording of AC load voltage and AC load current at X3 **with screen shot**

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

Load switched off
Disconnecting load from test field switch board
Test 100 to 0 % cos φ = 0.8 ind.
Recording of AC load voltage and AC load current at X3 **with screen shot**

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

5. Short Circuit Test:

Reference to EN / IEC 62040-3: 2021 Clause 6.4.2.9.2

Incorporates Tests for:

O/P Short Circuit via Fuse, without Bypass Mains available,
O/P Short Circuit via Fuse, with Bypass Mains available,
O/P Short Circuit @ terminals, with Inverter only.

Please note that “Inverter Load” relates to the Protect 8 rating (20 kVA) with a power factor of 0.8 lag.

Acceptance Criteria:

Fuse Characteristic Curves
Short circuit without bypass → Inverter trips fuse without switching OFF.
Short circuit with bypass → Inverter switch over to mains without gap and trip the fuse. Terminal short circuit without Bypass mains → Inverter switches off after a certain time (Dynamic Current Limit Duration).
The Dynamic Current Limit Duration is approx. 500 ms Recording of AC load voltage and AC load current
Short circuit current to be measured and recorded

For all the test that cause alarm assertion, check the activation of the related hard-wired alarm

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Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

Short circuit without Bypass mains with fuse
Fuse is tripped by Inverter
Test on 100 % Load = 20 kVA cos φ = 0.8 ind.
Protection: 10 A fuse gG
Measured tripping time of the Fuse: **XYZ ms**
Recording of AC load voltage and AC load current at X3 **with screen shot**

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

Short circuit with Bypass mains with fuse
Transfer to SBS. Fuse is tripped by SBS. Retransfer to Inverter
Test on 100 % Load = 20 kVA cos φ = 0.8 ind.
Protection: 10 A fuse gG
Measured tripping time of the Fuse/MCB: **XYZ ms**
Recording of AC load voltage and AC load current at X3 **with screen shot**

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

Terminal short circuit without Bypass mains
Inverter is supplying appox. 2 x Inom (3 phase) for measured time and then switched off
Test on 100 % Load = 20 kVA cos φ = 0.8 ind.
Measured switch off time Inverter: **XYZ ms**
Recording of AC load voltage and AC load current at X3 **with screen shot**

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

6. Overload Test:

Reference to EN / IEC 62040-3: 2021 Clause 6.4.2.9.1

Incorporates Tests for:

150% Load Capability Test

Please note that “Inverter Load” relates to the Protect 8 rating (20 kVA) with a power factor of 0.8 lag.

Acceptance Criteria:

The Inverter swithes off after a certain time (Minimum Overlad Duration)

Inverter O/P Voltage Tolerance:	230.9V +/-1% (max 233.2 Vac, min 228.6 Vac)
Inverter Frequency Regulation:	50 Hz +/-0.2% (max 50.1 Hz, min 49.9 Hz)
Inverter O/P Voltage Distortion:	<3% (linear load)
Minimum Overload Duration:	approx. 60 seconds

Load connected from test field switch board
Load: 150% / cos φ = 0.8 ind. = 30 kVA
Measured Switch off time: **XYZ sec.**
Recording of AC load voltage and AC load current at X3 **with screen shot**

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

7. Functional tests UPS / Load Transfer Tests:

Reference to EN / IEC 62040-3:2021 Clause 6.2.2.7 / 6.2.2.8 / 6.2.2.9

Incorporates Tests for:

Rectifier Mains Failure – continued Inverter operation via Battery
Rectifier Mains Return – auto start of the rectifier
Inverter Failure – transfer of load from Inverter to Bypass Mains
Inverter Restoration – transfer of load from Bypass Mains to Inverter
Manual Bypass Switch – transfer of load directly to Bypass Mains

The tests are performed at Inverter full load.

Please note that “Inverter Load” relates to the Protect 8 rating (20 kVA) with a power factor of 0.8 lag.

Acceptance Criteria:

Rectifier Mains Failure:	No disruption to the Inverter operation.
Rectifier Mains Return:	Auto start of the rectifier and charging of the Battery
Transfer Inverter to Static Bypass:	No-break transfers

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

A) Rectifier Mains Failure

Switch OFF rectifier Mains via Rectifier input isolator Q1

Recording of Rectifier AC current at X1 and AC load voltage and AC load current at X3

Result:

B) Rectifier Mains Return

Switch ON rectifier mains via Rectifier input isolator Q1

Recording of Rectifier AC current at X1 and AC load voltage and AC load current at X3

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

C) Transfer inverter-SBS mains

Switch OFF Inverter via Display

Recording of AC load voltage and AC load current at X3 and Bypass current at X4

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

D) Transfer SBS mains-inverter

Switch ON Inverter via Display

Recording of AC load voltage and AC load current at X3 and Bypass current at X4

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

E) Parallel Operation (load transfer test)

Parallel operation UPS n.1 and UPS n.2 - Switching OFF UPS n.2 via Display A18 on the door of the UPS

UPS n.1 takes over 100% Load
AC load voltage and AC load current and SBS current by screen shot.

and in addition repeat the test as following indicated:

Parallel operation UPS n.1 and UPS n.2 - Switching OFF UPS n.2 via de-energization of its upstream power supply

UPS n.1 takes over 100% Load
AC load voltage and AC load current and SBS current by screen shot.

Switching OFF UPS n.1 via Display A18 on the door of the UPS

Transfer to Bypass operation
AC load voltage and AC load current and SBS current by screen shot.

and in addition repeat the test as following indicated:

Switching OFF UPS n.1 via de-energization of its upstream power supply

Transfer to Bypass operation
AC load voltage and AC load current and SBS current by screen shot.

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

Bypass operation - Switching ON UPS n.2 via Display A18 on the door of of the UPS

UPS n.2 takes over 100% load
AC load voltage and AC load current and SBS current by screen shot.

and in addition repeat the test as following indicated:

Bypass operation - Switching ON UPS n.2 via re-energization of its upstream power supply

UPS n.2 takes over 100% load
AC load voltage and AC load current and SBS current by screen shot.

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

Switching ON UPS n.1 via Display A18 on the door of of the UPS
Load sharing 50%

Parallel operation with load sharing 50% of UPS n.1 and UPS n.2
AC load voltage and AC load current and SBS current by screen shot.

and in addition repeat the test as following indicated:

Switching ON UPS n.1 via re-energization of its upstream power supply
Load sharing 50%

Parallel operation with load sharing 50% of UPS n.1 and UPS n.2
AC load voltage and AC load current and SBS current by screen shot.

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

F) Parallel Operation (functional sequence test)

Starting condition: UPS redundant system working in normal operation with By-Pass input and both Rectifier inputs n.1 and n.2 all energized. UPS n.1 and UPS n.2 synchronized with the By-Pass

1. De-energize upstream power supply to Rectifier input n.2
2. De-energize upstream power supply to By-Pass
3. Confirm the normal operation of UPS n.1 at the correct load
4. Re-energize upstream power supply to Rectifier input n.2
5. Confirm the correct synchronization and normal operation of both UPS n.1 and n.2 with load sharing activated
6. Re-energize upstream power supply to By-Pass
7. Confirm reinstatement and normal operation of all UPS unit functions.
8. At each test step, validate correct functioning of hardwired I/O signals

G) Parallel Operation (functional sequence test)

Starting condition: UPS redundant system working in normal operation with By-Pass input and both Rectifier inputs n.1 and n.2 all energized. UPS n.1 and UPS n.2 synchronized with the By-Pass

1. De-energize upstream power supply to Rectifier input n.1
2. De-energize upstream power supply to By-Pass
3. Confirm the normal operation of UPS n.2 at the correct load
4. Re-energize upstream power supply to Rectifier input n.1
5. Confirm the correct synchronization and normal operation of both UPS n.1 and n.2 with load sharing activated
6. Re-energize upstream power supply to By-Pass
7. Confirm reinstatement and normal operation of all UPS unit functions.
8. At each test step, validate correct functioning of hardwired I/O signals

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

8. DC Ripple Current Measurement

with Test field battery

Reference to EN / IEC 62040-3:2021 Clause 6.4.3.3

Acceptance Criteria:

Current ripple of less than 5 A rms for every 100 Ah / Measured with test field battery with screen shot

The capacity of the test field battery is 300Ah.

The measured value is **XYZ A** rms / 1 V = 1 A

Result:

9. MODBUS Adapter (Demonstration)

Incorporates Tests for:
A29.1 MODBUS Adapter

Test to be performed for chosen failure messages, status messages and measuring values.

Designation	Source	Terminals	Checked
MODBUS Adapter	A29.1	A29.1	

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Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

10. Alarm Test:

Reference to EN IEC 62040-3:2021 Clause 6.2.2.3

Incorporates Tests for:

Remote Alarm signalling on Boards A12/A13
System Operational Check

Acceptance Criteria:

Technical datasheet (TD)

Designation	Terminals	Relay/Opto	Result
Inverter operation 1)	UPS A12-X3: 1, 2, 3	**A12K21**	
SBS operation 1)	UPS A12-X3: 4, 5, 6	**A12K22**	
Rec Fault / Rec mains fault 1)	UPS A12-X3: 7, 8, 9	**A12K23**	
Battery undervoltage 1)	UPS A12-X3: 10, 11, 12	**A12K24**	
Common fault 2)	UPS A12-X4: 1, 2, 3	**A12K25**	
SBS blocked 1)	UPS A13-X3: 1, 2, 3	**A13K26**	
Fan fault 1)	UPS A13-X3: 4, 5, 6	**A13K27**	
BAT room fan on 1)	UPS A13-X3: 7, 8, 9	**A13K28**	
INV remote off 3)	UPS A12-X5: 1, 2	**A12Opto1**	
BAT room fan fault 3)	UPS A13-X4: 1, 2	**A13Opto2**	
Not parameterised 3)	UPS A13-X4: 3, 4	**A13Opto3**	
Fan fault 1)	Bypass X12: 7, 8, 9	**N/A**	
Common fault 1)	Bypass X12: 10, 11, 12	**N/A**	

1) Remote signal / close on the terminals with the lower number
2) Remote signal / close on the terminals with the higher number

OPTO Input test

Check battery boost charge inhibit (external signal) in case of high battery temperature

Result:

Factory Acceptance Test Report		Document-No.: 14188_FAT_2_00_updated
Type:	**UPS System Protect 8.33/20kVA-S10**	**Tag No.: BC-200F4A, BC-200F4B, BY-200F4**

11. Measuring Devices:

AEG internal Measuring device No.:	Measuring device name	Seriel number:	Calibrated until:

12. Remarks:
