Laboratories GSD SRL

CE **MARKING**

ELECTROMAGNETIC COMPATIBILITY
ELECTRICAL SAFETY
LASER SPECTROSCOPY
ENVIRONMENTAL PHYSICS

G.S.D. S.r.l.
Certified in accordance with
UNI EN ISO 9001:2015
by
TÜV Rheinland Italia S.r.l.
Certificate N. 39 00 1850509

Test Report n. 21104

Manufacturer: **FLOORWASH S.r.l.**
Via Camillo Golgi, 15
25036 Palazzolo Sull'Oglio (BS)
Italy

Eut: **FLB 3658**

Pisa, 2021 February, 19

G.S.D. s.r.l.
Via Marmiceto, 8
56121 OSPEDALETTO - PISA
Tel. 050.984254 - Fax 050.984262
P. IVA 01343950505

SENIOR EMC TEST MANAGER
Dr. Gian Luca Genovesi

QUALITY MANAGER
Dr. David Pelliccia

INDEX

1 Manufacturer and EUT identification

Manufacturer: **FLOORWASH S.r.l.**
Via Camillo Golgi, 15
25036 Palazzolo Sull'Oglio (BS)
Italy

Eut: **FLB 3658**
Certified cell: **Panasonic mod. NCR18650PF**

Sample receiving date: 2021 January, 12

Nominal data: Nominal voltage 36 V
Nominal capacity 5.8 Ah
Charge voltage 42 V
Charge current 1.16 A

2 PHOTO

Fig. 2.1
FLB 3658
EUT (Equipment Under test)

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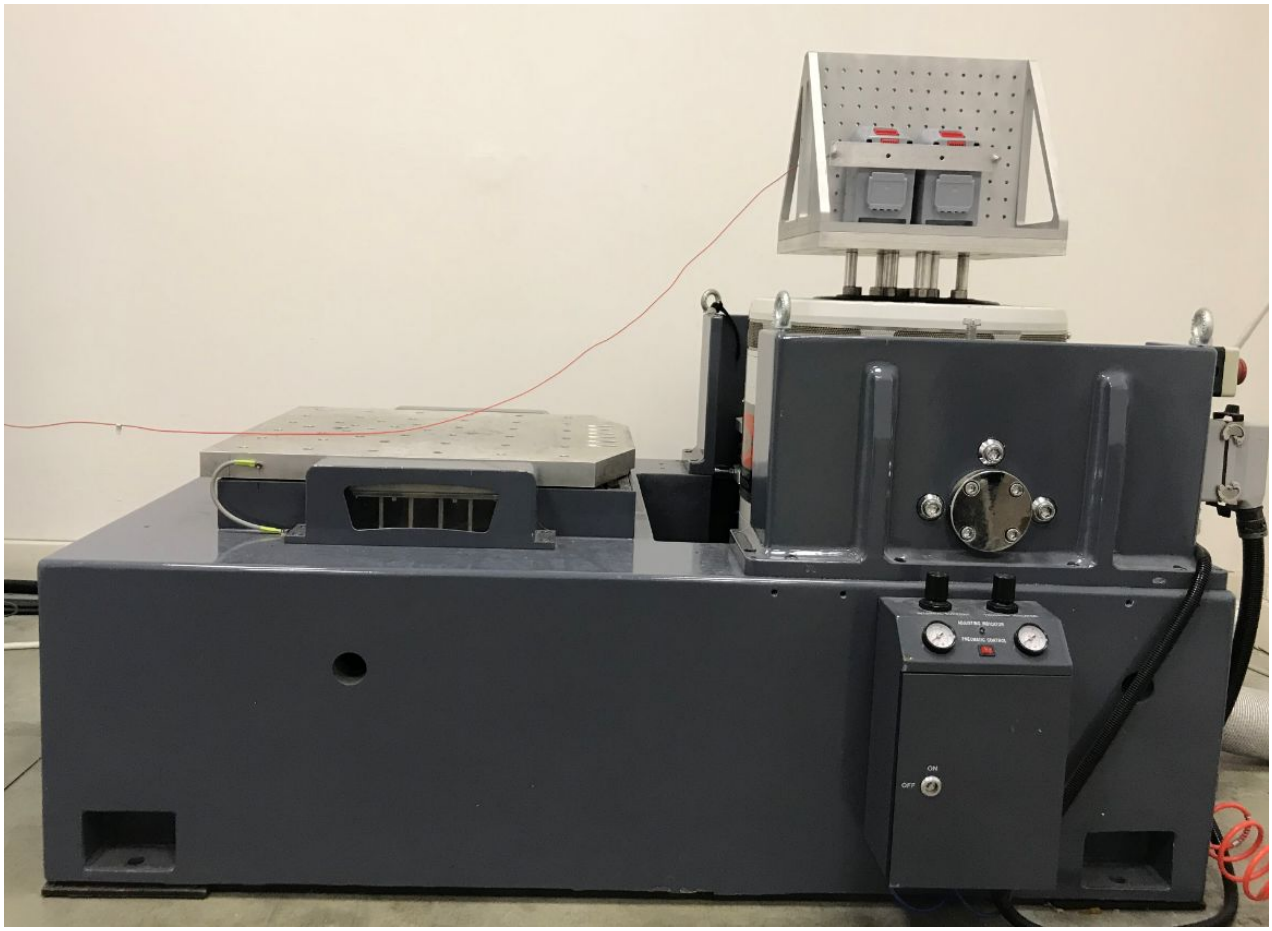
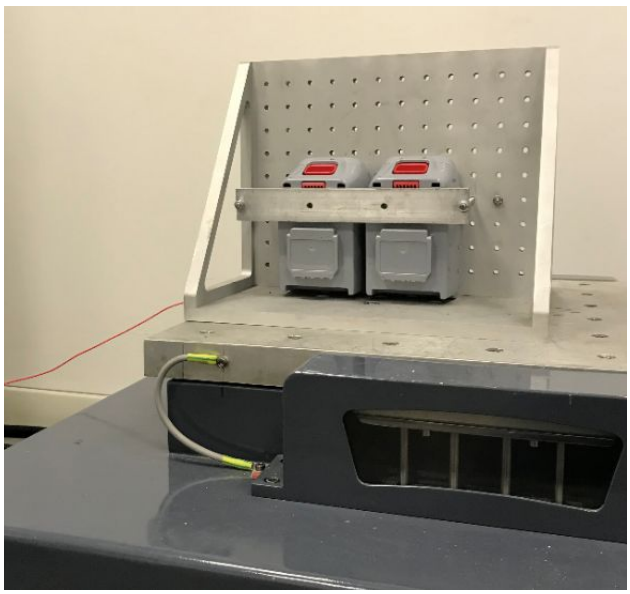
Fig. 2.2 *FLB 3658* *Product Label*

Fig. 2.3
Batteries in T.1 Test setup
(Altitude Simulation test)

Fig. 2.4
Batteries in T.2 Test setup
(Thermal test)





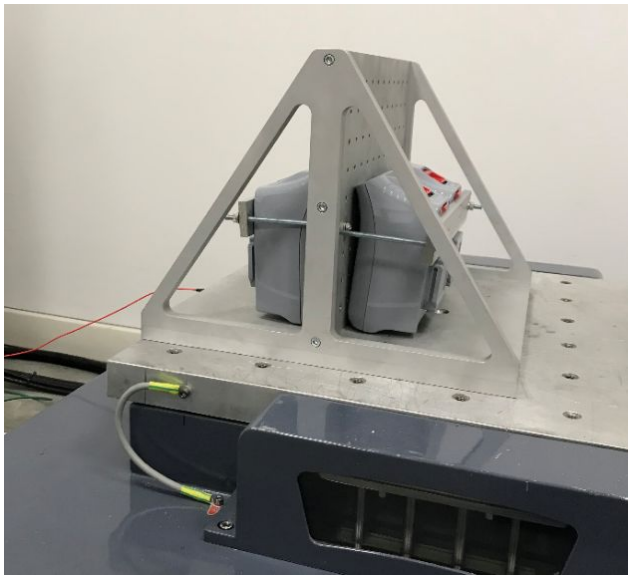


Fig. 2.5
Batteries in T.3/T.4 Test setup
(Vibration/Shock test)

Fig. 2.6
Battery in T.5 Test setup
(External short circuits)

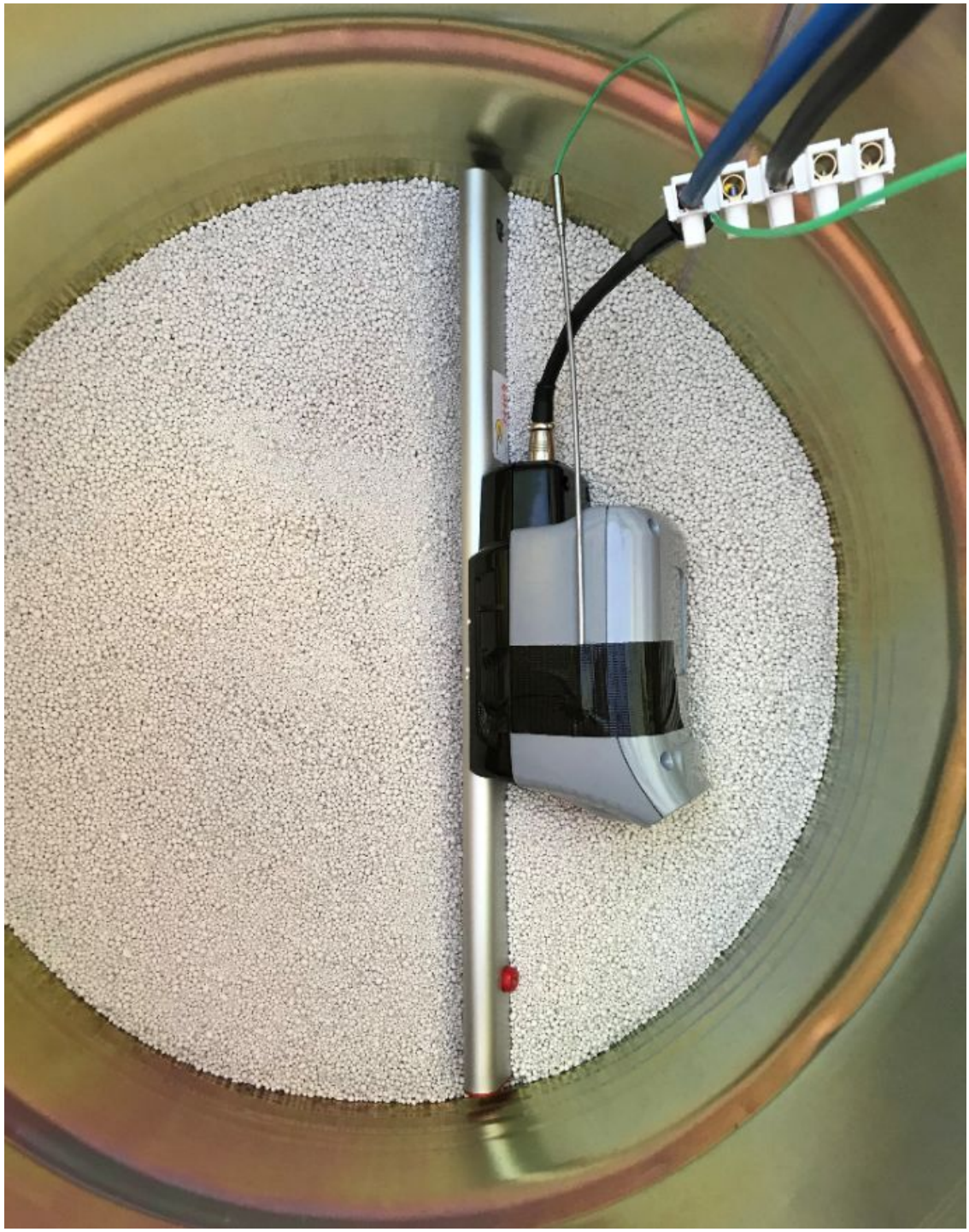


Fig. 2.7
Battery in T.7 Test setup
(Overcharge)

3 TEST GENERALITY

The following documents are applicable and governed the preparation of the tests performed:

Ref.	Standard / Document Title
1.	***ST/SG/AC.10/11/Rev.7 Recommendations on the Transport of Dangerous Goods. Manual of tests and Criteria – Seventh revised edition*** ***UN Manual of Tests and Criteria – SECTION 38 - CLASSIFICATION PROCEDURES, TEST METHODS AND CRITERIA RELATING TO SUBSTANCES AND ARTICLES OF TRANSPORT - CLASS 9*** ***§38.3 Lithium metal and lithium ion batteries***

The following table gives the summary of all test.

TEST	
T.1	*Altitude simulation*
T.2	*Thermal test*
T.3	*Vibration*
T.4	*Shock*
T.5	*External short circuit*
T.7	*Overcharge*

Evaluation criteria:

Requirements 1:

- no mass;
- no leakage;
- no venting;
- no disassembly;
- no rupture;
- no fire
- open circuit voltage of each test cell or battery after testing have to be not less than 90% of its voltage immediately prior to procedure[1].

Requirements 2:

- External cells or batteries temperature have to be less than 170°C and
- no disassembly;
- no rupture;

[1]This requirement is not applicable to test cells and batteries at fully discharged state

- no fire

within 6 hours of test finish

Environmental Conditions

Temperature = (294 ± 4) K
Relative humidity = (50 ± 5) %

Samples under test:

n. 8 samples FLB 3658:
n. 4 samples at first charge cycle
n. 4 samples after 25 charge cycles

Disposition of test and measure

Test and/or measure disposition is compliance with the relative reference standard.

Test site:

Tests were performed in G.S.D. S.r.l. - PISA Italy

4 Summary of Test Results

Test		***Result***
T.1	*Altitude simulation*	*Pass*
T.2	*Thermal test*	*Pass*
T.3	*Vibration*	*Pass*
T.4	*Shock*	*Pass*
T.5	*External short circuit*	*Pass*
T.7	*Overcharge*	*Pass*

Extensions:

The results refer only to the sampled EUT and under the specified conditions.

5 TEST T.1: ALTITUDE SIMULATION

According to §38.3.4.1 of Ref.1, purpose of this test, is to simulates air transport under low -pressure conditions.

Procedure:

Apparatus shall be stored at 11,6kPa (or less) for at least 6 hours in ambient temperature (20±5°C)

Test Equipment:

EQUIPMENT DESIGNATION	*MANUFACTURER*	*MODEL, TYPE*	*NEXT CALIBRATION*
VACUUM CHAMBER	Officine Galileo	V4aq	JAN 2022
DATA ACQUISITION UNIT	HP	34970A	JAN 2022

Evaluation criteria: Requirements 38.3.4.1.3 Ref. 1

Results

After the test the equipment continued to be full functionally, no malfunction as on requirements were founded. Equipment complied with the test specifications.

6 TEST T.2: THERMAL TEST

According to §38.3.4.2 of Ref.1, purpose of this test, is to assesses cell and battery seal integrity and internal connections Test performs rapid and extreme temperature changes.

Procedure:

Cells and Batteries are to be stored for at least 6 hours at a test temperature equal to 75±2°C followed by storage for at least 6 hours at a test temperature equal to -40±2°C.
Maximum time interval between test temperature extreme is 30 minutes.
This procedure is to be repeated 10 times after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20±5°C)[2].

Test Equipment:

EQUIPMENT DESIGNATION	*MANUFACTURER*	*MODEL, TYPE*	*NEXT CALIBRATION*
THERMAL CHAMBER	ACS	CH1200C	JAN 2022
DATA ACQUISITION UNIT	HP	34970A	JAN 2022

Evaluation criteria: Requirements 38.3.4.2.3 Ref. 1

Results

After the test the equipment continued to be full functionally, no malfunction as on requirements were founded. Equipment complied with the test specifications.

[2]For large cells and batteries the duration of exposure to the temperature extremes shoul be at leasu 12 hours.

7 TEST T.3: VIBRATIONS

According to §38.3.4.3 of Ref.1, purpose of this test, is to simulates vibration during transport.

Cells and Batteries are subjected to sinusoidal vibration with specified sweep and duration as in table below, for each of three mutually perpendicular mounting position of the cell.
One of the directions of vibration must be perpendicular to terminal face.

FREQUENCY RANGE [Hz]	SWEEP	*DURATION [MINUTES]*	*REPETITION*	*TOTAL TIME [HOUR]*
7 – 200	logarithmic[3]	15	12	3
7 – 200	traversed			

Test Equipment:

EQUIPMENT DESIGNATION	*MANUFACTURER*	*MODEL, TYPE*	*NEXT CALIBRATION*
VIBRATING TABLE	DONGLING	ES-10-240	JAN 2022
AMPLIFIER	DONGLING	SDA-10	JAN 2022
REFERENCE ACCELEROMETER	DYTRAN	3055	JAN 2022
DIGITAL CONTROLLER	LMS INSTRUMENTS	SC310V	JAN 2022

Evaluation criteria: Requirements 38.3.4.3.3 Ref. 1

Results

After the test the equipment continued to be full functionally, no malfunction as on requirements were founded. Equipment complied with the test specifications.
Graphics in following figures show some registrations of the test.

[3]From 7Hz a peak acceleration of 1 g_n is maintained until 18Hz is reached. The amplitude is maintained at 0.8mm (1,6mm total excursion) and the frequency increased until a peak acceleration of 8 g_n occurs (approx. 50Hz). A peak acceleration of 8 g_n is then maintained until the frequency is increased to 200Hz

8 TEST T.4: SHOCK

According to §38.3.4.4 of Ref.1, purpose of this test, is to simulates possible impact during transport.

Cells and Batteries are subjected to a half-sine shock of peak acceleration, pulse duration as specified in table below for each of three mutually perpendicular mounting position of the cell[4].

PEAK ACCELERATION [g_n]	POLARITY	*DURATION [MILLISECONDS]*	*REPETITION*	*AXE*	*TOTAL SHOCK*
150	positive	6	3	X Y Z	18
150	negative				

Test Equipment:

EQUIPMENT DESIGNATION	*MANUFACTURER*	*MODEL, TYPE*	*NEXT CALIBRATION*
VIBRATING TABLE	DONGLING	ES-10-240	JAN 2022
AMPLIFIER	DONGLING	SDA-10	JAN 2022
REFERENCE ACCELEROMETER	DYTRAN	3055	JAN 2022
DIGITAL CONTROLLER	LMS INSTRUMENTS	SC310V	JAN 2022

Evaluation criteria: Requirements 38.3.4.4.3 Ref. 1

Results

After the test the equipment continued to be full functionally, no malfunction as on requirements were founded. Equipment complied with the test specifications.

[4]However large cells and large batteries shall be subjected t a half-sine shock of peak acceleration of 50g_n and pulse duration of 11 milliseconds.

9 Test T.5: External Short circuit

According to §38.3.4.5 of Ref.1, purpose of this test, is to simulates possible external short circuit.

Cells and Batteries have to be temperature stabilized so that its external case temperature reaches 57±4°C.
Short circuit have to be realized with a total external resistance of less than 0,1Ω at 57±4°C.
This short circuit condition is continued for at least 1 hour after the cell or battery external case temperature returned to 57±4°C.
Cells and batteries must be observed for a further 6 hour for the test to be concluded

Test Equipment:

Equipment Designation	*Manufacturer*	*Model, Type*	*Next Calibration*
Data Acquisition / Switch Unit	HP	34970A	Jan 2022

Evaluation criteria: Requirements 38.3.4.5.3 Ref. 1

Results
After the test external temperature did not exceed 170 °C and there was no disassembly, no rupture and no fire within six hours of this test. Equipment complied with the test specifications.

10 TEST T.7: OVERCHARGE

According to §38.3.4.7 of Ref.1, purpose of this test, is evaluates the ability of a rechargeable battery to withstand an overcharge condition.

The voltage of the test was 50.4 V and 2.32 A. Tests were conducted at ambient temperature. The duration of the test was 24 hours.

Test Equipment:

EQUIPMENT DESIGNATION	*MANUFACTURER*	*MODEL, TYPE*	*NEXT CALIBRATION*
POWER SUPPLY	AGILENT	6574A	JAN 2022

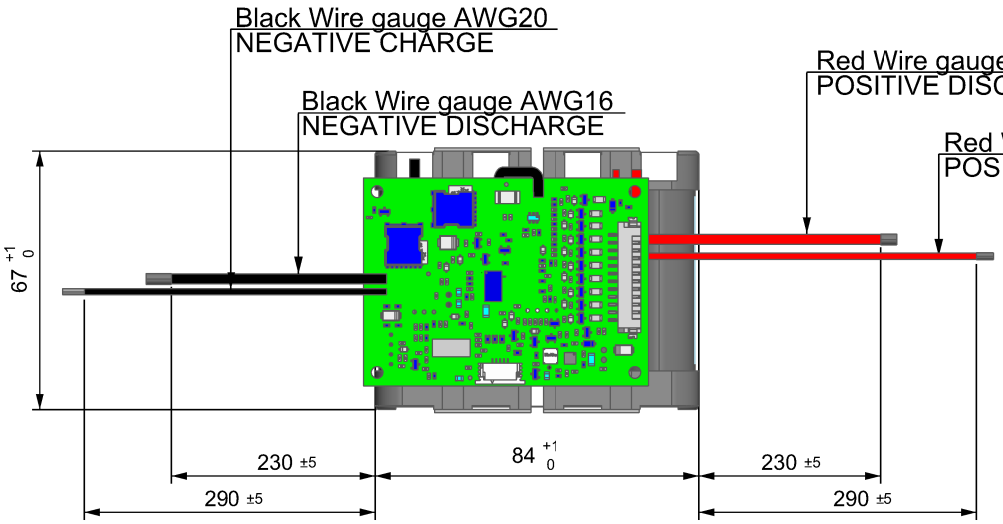
Evaluation criteria: Requirements 38.3.4.7.3 Ref. 1

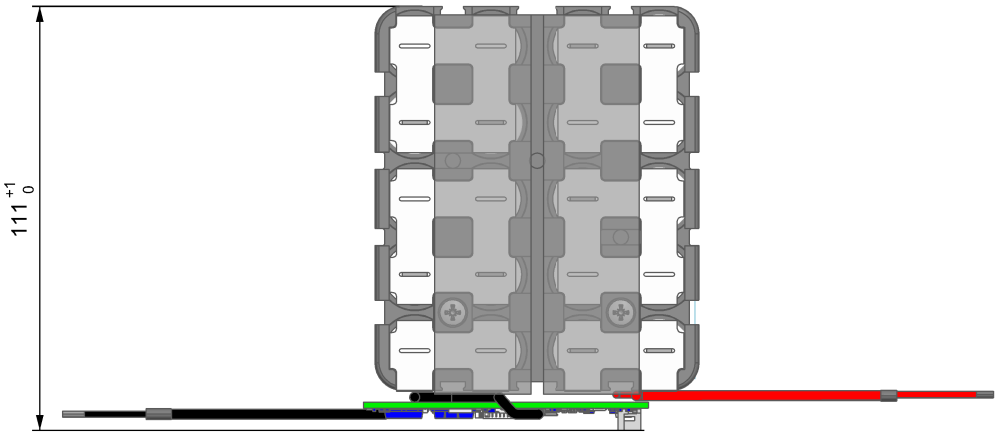
Results

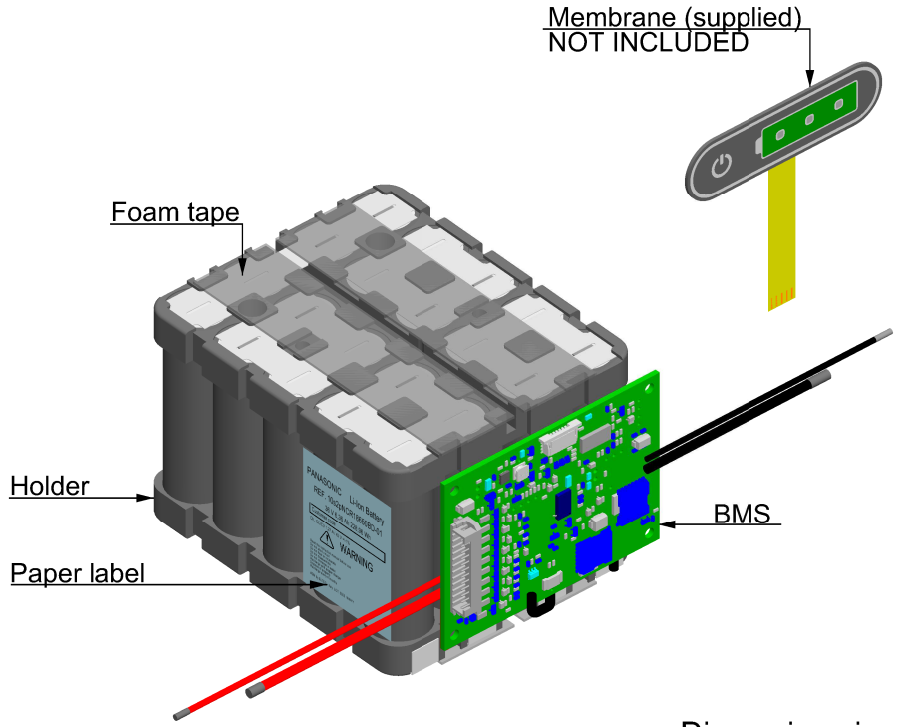
After the test no disassembly and no fire were observed.
Equipment complied with the test specifications.

11 Report Revision History

Revision details		
Date	***Page No.(s)***	***Details***
2021 February, 19	20	Rev. *00-draft00* First draft issue







Dimensions in mm

Eltec
Carasco - Italy

REF.10s2pNCR18650BD-01

"PANASONIC" Li-Ion Battery

Nominal voltage: 36 V

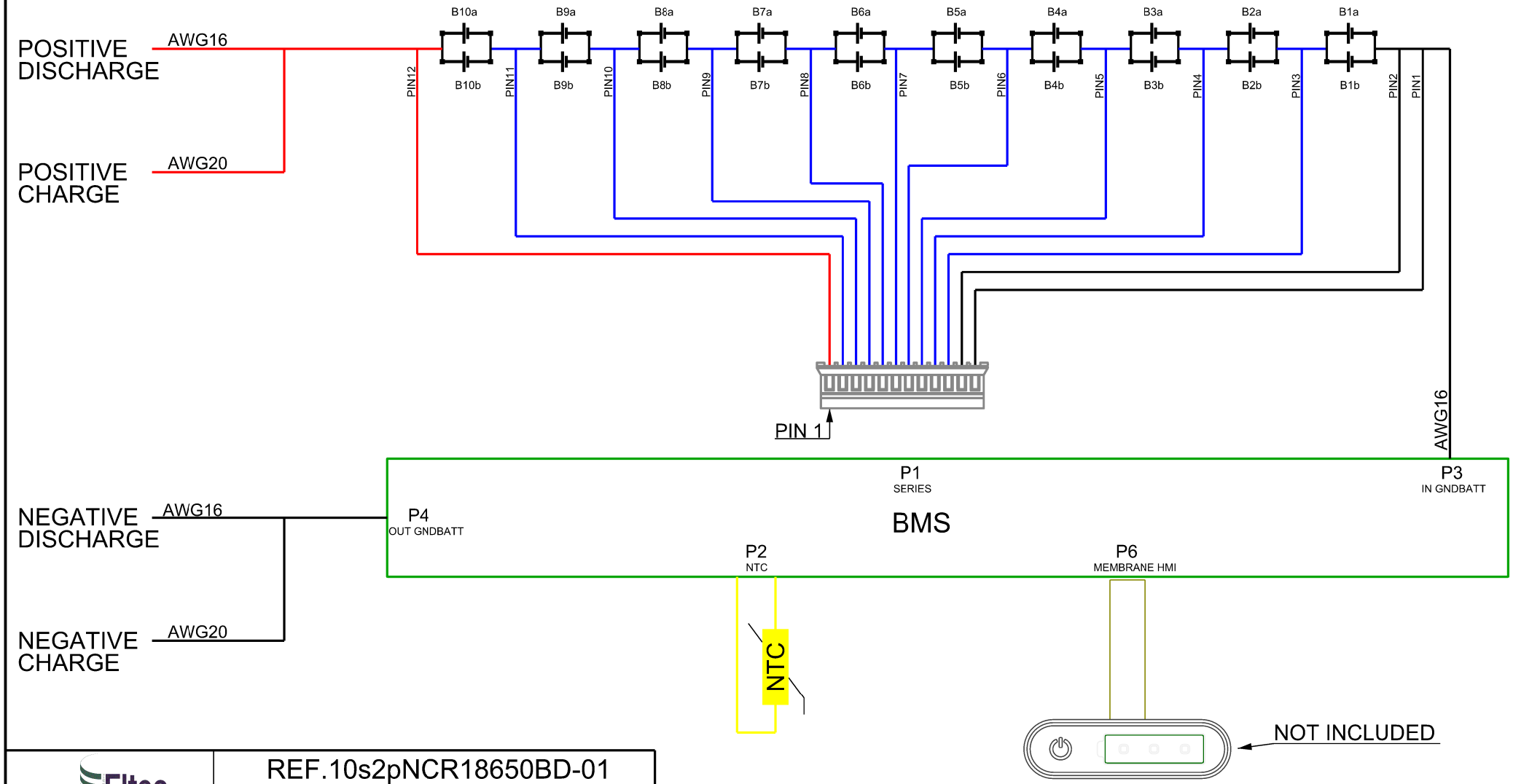
Nominal capacity: 6,36 Ah 228,96 Wh

Standard charge: CC/CV 1,27 A / 42 V +/-1%

Discharge current: 16 A

Project Mng.: Abbà A.	Drawing: Di Marcello S.	Date: 03/08/2021	Rev.:0	Customer sign

Battery Outline



Eltec Carasco - Italy	REF.10s2pNCR18650BD-01 "PANASONIC" Li-Ion Battery			
Project Mng.: Abbà A.	Drawing: Di Marcello S.	Date: 03/08/2021	Rev.:0	Sht. 2a

REV.	DATE	DESCRIPTION
00	03/08/2021	-
01		
02		
03		

Label:

Eltec Carasco - Italy	REF.10s2pNCR18650BD-01 "PANASONIC" Li-Ion Battery			
Project Mng.: Abbà A.	Drawing: Di Marcello S.	Date: 03/08/2021	Rev.:0	Sht. 2b

In the following document we produce all the necessary information required in your email of the 18th of October 2021.

1. Battery Manufacturer:

Eltec Srl

Web: www.elteconline.com
Tel.: +39 0185 351825
Mail: info@elteconline.com / davide.morea@elteconline.com

2. Certification Laboratory:

G.S.D. Srl
Address: Via Marmiceto, 8 - 56121 – Ospedaletto - Pisa - Italy
Tel.: +39 050 3161359
Mail: info@gsd.it
Web: www.gsd.it

3. Description of the cell/battery:
Type of cell: lithium ion
Mass of Battery: 1,4 kg
Watt/hour rating: 228,96

Gabriele Finazzi
CEO Floorwash Srl