



Technical Information

CEI IEC 896-2 1995-11

6 & 12 Volt AGM Range (ESL)



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Batteries under consideration

6 & 12 Volt MonoBloc AGM

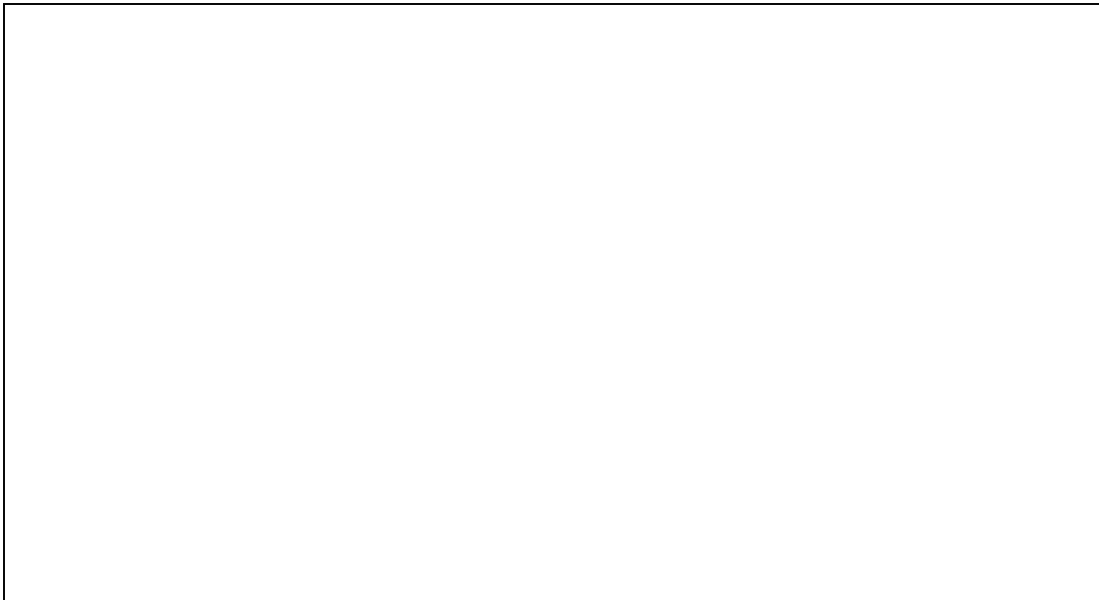
Requirements:

Valve regulated stationary lead-acid cells or monobloc batteries shall be designed to withstand the mechanical stresses met during normal transportation and handling.

WING specifications: **6 & 12 Volt bloc AGM**

WING 6 & 12Vmonobloc range utilizes an ABS injection moulded case and cover of substantial mechanical strength. The case side wall is 5mm at the top tapering to 4.5mm at the base. The photo below shows the case top section with the ridge to hermitically seal the cell this ridge fits in a slot in the cover, which is filled with a specialized epoxy before the cover is assembled.

Epoxy adhesion strength to ABS is at least equivalent to the strength of the case.





Batteries under consideration

6 & 12 Volt MonoBloc AGM

Requirements:

The control valves shall not allow air to enter the cell but shall allow gas to escape from the cell above an internal pressure which does not lead to deformation or other damage to the cell.

WING specifications: **6 & 12 Volt bloc AGM**

WING 6 & 12V range utilize an EPDM rubber valve which is resistant to corrosion from Sulphuric acid. A release agent (high grade silica oil) is applied to the valve to prevent sticking.

Valve design is such that it is impossible for the valve to seal the cell thus eliminating the possibility of cell expansion due to over pressure.

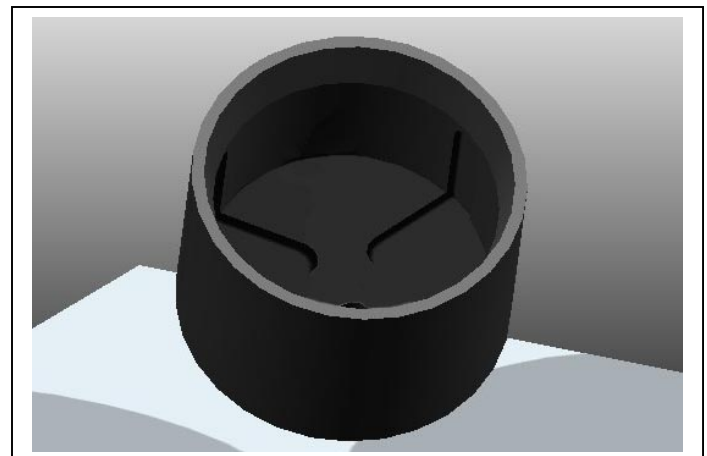
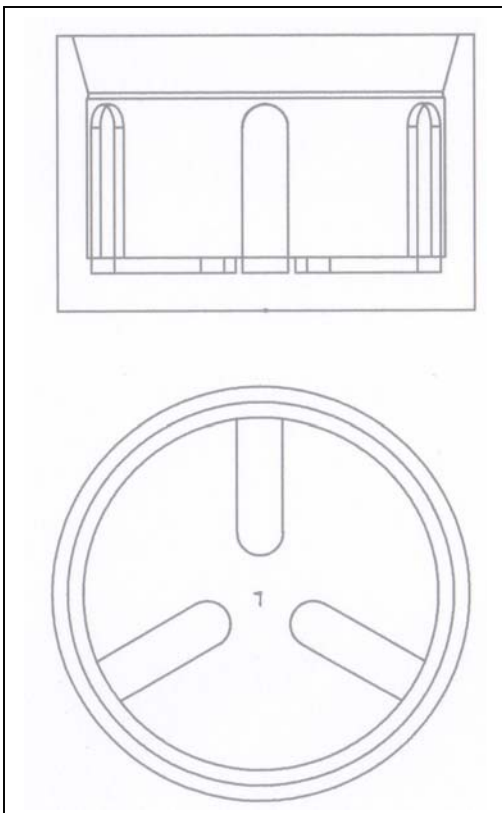


Fig 1 Left is a valve drawing showing the sectional profile and the cutouts to prevent sealing.

Fig 2 Above shows the actual valve in profile

The valve assembly also incorporates a flame arrestor to prevent a spark from igniting the gas in the battery during venting. The whole assembly is glued in to the cell and has a tamperproof top cover to prevent unwanted access.

WING Specification

Release pressure 1.5 – 2 PSI (10.5 to 14 KPa)

Reseal pressure 1 PSI (7 KPa)

See appendix 1 for sample valve IQC testing

IEC 896-2 1995 Section 2.3

Flammability of Containers and Lids



Batteries under consideration

6 & 12 Volt MonoBloc AGM

Requirements:

In battery installations where it is essential that the plastic components used are flame retardant, the battery manufacturer shall indicate the category of flame retardency in accordance with test method FV, flame-vertical specimen, of IEC 707.

WING specifications: **6 & 12 Volt Bloc AGM**

When requested the containers, lids and valve assemblies are constructed from Flame retardant ABS conforming to the flammability classification of UL94 – V0 or IEC707-FV0.



Batteries under consideration

6 & 12 Volt MonoBloc AGM

Requirements:

Under recommended operating conditions the quantity of hydrogen released from valve regulated stationary lead-acid cells or monobloc batteries shall be sufficiently low to make these cells or monobloc batteries suitable for use in office or equipment environments, for example.

The amount of gas emitted during charging is mostly dependent on two factors:

1. The age of the battery
 2. The charge voltage
-
1. When the battery is new the gassed volume is significantly higher than a battery, which has been subjected to float voltage for a reasonable period or one that has been cycled a number of times.
After 10 cycles the gas generated will have fallen to 40% of that of a new battery, after 150 cycles it is expected to fall to less than 10% of a new battery.
 2. The amount of gas produced increases exponentially as the voltage is increased above the maximum recommended value.
If we compare the volume of gas released at 2.3 volts per cell with that produced at 2.48 volts per cell the latter produces approximately 50 times as much gas.

It is therefore important to follow the manufacturers recommended values for maximum float voltage and temperature compensation.



Batteries under consideration

6 & 12 Volt MonoBloc AGM

Requirements:

Under recommended operation conditions, the temperature of valve regulated stationary lead-acid cells or monobloc batteries shall be sufficiently low to prevent thermal runaway. The temperature limits shall be stated by the manufacturer.

WING specifications: **6&12 Volt Monobloc AGM**

Thermal runaway occurs when the heat generated within the cell is greater than the heat that can be dissipated through the case and cover to the surroundings. A typical cause is "drying" of the electrolyte. Thermal runaway is not a common phenomenon in VRLA batteries as the recombination efficiency is above 95% and the container is hermitically sealed to prevent acid escaping from the cells.



Batteries under consideration

6 & 12 Volt MonoBloc AGM

Requirements:

2.6.1 Polarity

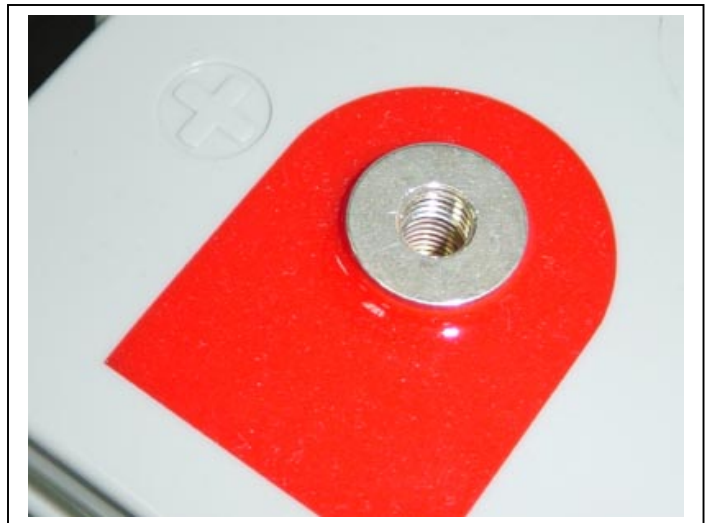
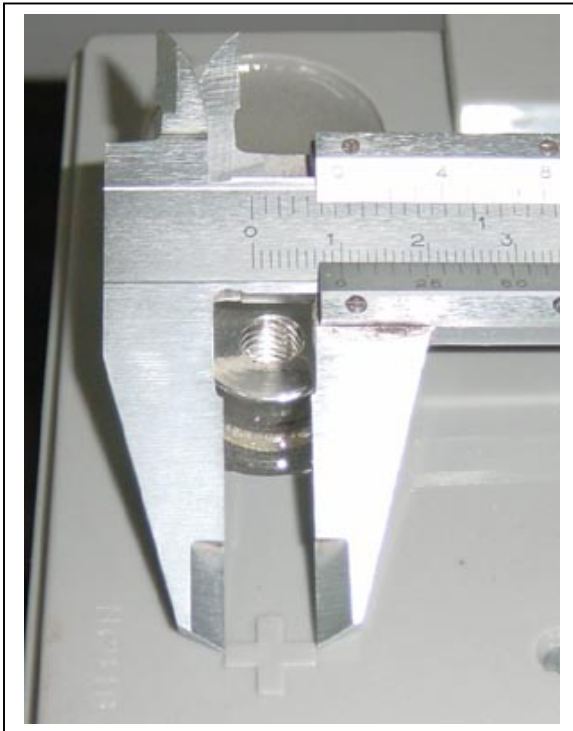
Valve regulated stationary cells or monobloc batteries shall carry the polarity marking of at least the positive terminal.

Symbols used for the marking of the polarity shall be in accordance with IEC417.

The marking of the positive terminal shall be according to the symbol 417-IEC-5006: negative polarity, and shall be indented or in relief on the lid adjacent to the negative terminal.

The value of dimension "a" of the symbols shall be not less than 5mm, which corresponds to a minimum total length of each arm of the symbol of 6mm.

6.2.1 All WING 6 & 12 Volt Bloc batteries exhibit positive and negative symbols which meet all international standards. In addition to this the positive terminal is coloured red and the negative black.



Requirements:

2.6.2 Information: The following information shall be permanently marked on the cell or monobloc battery:

- a) Nominal Voltage**
- b) Name of manufacturer or supplier and manufacturer's or suppliers type reference.**
- c) Rated or nominal capacity expressed in Ah with an indication of the rating expressed either as a current or as a time together with the relevant final voltage of 1.8 V per cell, if not otherwise stated by the manufacturer.**
- d) Voltage for float operation of 20 C with a tolerance of +/- 1%**
- e) Date of manufacture.**

Label as below

2.6.2 a The nominal voltage is stated as 12V or 6V

2.6.2 b Manufacturer "WING", type reference "ESL".

2.6.2 c Capacity is shown as 120Ah at C20 rate

2.6.2 d Charging parameters are as detailed.

2.6.2 e Date of manufacture is hot stamped on to the battery cover as follows:

Each battery is date coded to the following specification:

A B C 1 2

A – Nominal letter, which can be specified by the customer, if not specified H is used.

B – Represents the year as follows:

2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
B	C	D	E	F	G	H	I	J	K	L	N

C – Represents the month as follows:

Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
A	B	C	D	E	F	G	H	I	J	K	L

12 – Represents the date.



SEALED **MF** RECHARGEABLE BATTERY

TYPE	VOLTAGE REGULATION	INITIAL CURRENT
STAND-BY USE	13.5 ~ 13.8V	NO Limit
CYCLIC USE	14.4 ~ 15.0V	8.25A MAX

CHARGING INSTRUCTION (AT25°C)

ESL 33-12 12V 33Ah

CAUTION NON-SPILLABLE
• AVOID SHORT CIRCUIT
• DO NOT CHARGE IN A SEALED CONTAINER
• KEEP AWAY FROM SPARKS AND FLAMES

WING-BATTERY



187mmX110mm



SEALED **MF** RECHARGEABLE BATTERY

TYPE	VOLTAGE REGULATION	INITIAL CURRENT
STAND-BY USE	13.5 ~ 13.8V	NO Limit
CYCLIC USE	14.4 ~ 15.0V	30A MAX

CHARGING INSTRUCTION (AT25°C)

ESL 120-12 12V 120Ah

CAUTION NON-SPILLABLE
• AVOID SHORT CIRCUIT
• DO NOT CHARGE IN A SEALED CONTAINER
• KEEP AWAY FROM SPARKS AND FLAMES

WING-BATTERY



230mmX117.5mm

IEC 896-2 1995 Section 2.7

Packaging



Batteries under consideration

6&12 Volt MonoBloc AGM

Requirements:

Safety recommendations required by national or international regulations shall be included on the cell or monobloc battery, or in the package.

International symbols are all included on the label see 2.6 for example..



Batteries under consideration

6 & 12 Volt MonoBloc AGM

Requirements:

For test procedure refer to clause 5.1 of the standard.

Three 12 V units are to be tested. The standard requires that 95% of rated capacity be achieved on the first cycle, 100% by the fifth cycle.

Test – 18 batteries

Test batteries are split in to three sets of 6.

Test results are shown as initial capacity for tests:

3.2 Suitability for float operation	Series 3
3.3 Endurance in Cycles	Series 2
3.4 Charge retention	Series 1

Test results – See following.

All units easily exceeded the quoted capacity for this model.

Range Qualification

The 6 & 12 Volt range of batteries all utilize the same plate and separator configuration, positive to negative ratios are consistent and acid to active material ratios are constant, all are filled with the same grade and strength sulfuric acid and charged under the same charging program. We are therefore confident to apply this test result to the full range.



Batteries under consideration

6 & 12 Volt MonoBloc AGM

Requirements:

As per 3.2.2 of the standard. Batteries operating in continuous floating operation, when tested to sub-clause 5.2.1, shall meet the following requirements:

- a) After a period of six months the actual capacity C_a , on discharge according to clause 5.1 shall be recorded and shall be greater than or equal to the quoted capacity at the given discharge rate.***
- b) A cell or monobloc battery shall be declared faulty if, after six months, the voltage readings are outside the values recommended by the manufacturer.***
- c) In type qualification tests, cells or monobloc batteries shall not be proven defective the period of six months. For longer term tests, defective cells or monobloc batteries may be replaced by the manufacturer and the test continued for another six months; no single cell or monobloc battery shall be proven defective during this second six-month period.***

Temperature to be maintained between 15 and 25 C with the average as close to 20 C as possible.

Test units – 12V 160 Ah series 1 (six batteries as tested in 3.1)

Test: A Float voltage of 2.27 VPC was applied for a six month period. The string was maintained at approximately 20 °C. Average temperature for the period was 19.47 °C.

Average voltage – 13.658 VPC

Total Deviation – 0.68%

Initial capacity of the cells was 171.11 Ah (C10), Final capacity of the cells on test was 171.98 Ah C10 – see following.

Conclusion: The cells pass all the standards requirements for float voltage operation. As all cells use the plates separator internal construction etc. all models within the range will exhibit the same characteristics.



Endurance in Cycles

Batteries under consideration

6&12 Volt Monobloc AGM

Requirements:

After capacity testing the cells are to be connected to a device whereby they undergo a continuous series of cycles, each cycle comprising:

- a) *A discharge for 3 hr at a current of $I = 2 \times I_{10}$ maintained constant within +/- 1%.*
- b) *Charge for 21 hr immediately following the discharge, at a voltage recommended by the manufacturer but not exceeding 2.40 VPC, the current limited to $2 \times I_{10}$ unless otherwise recommended.*

The cells shall undergo one cycle per day at an ambient temperature between 15 and 25 degrees C with the average as close to 20 degrees C as possible.

After a series of 50 cycles the cells shall undergo a capacity test in accordance with clause 5.1 of the standard and the capacity recorded.

The cells shall then undergo another series of 50 cycles followed by another capacity test. This process shall be repeated until the capacity has fallen below 0.8 x initial capacity.

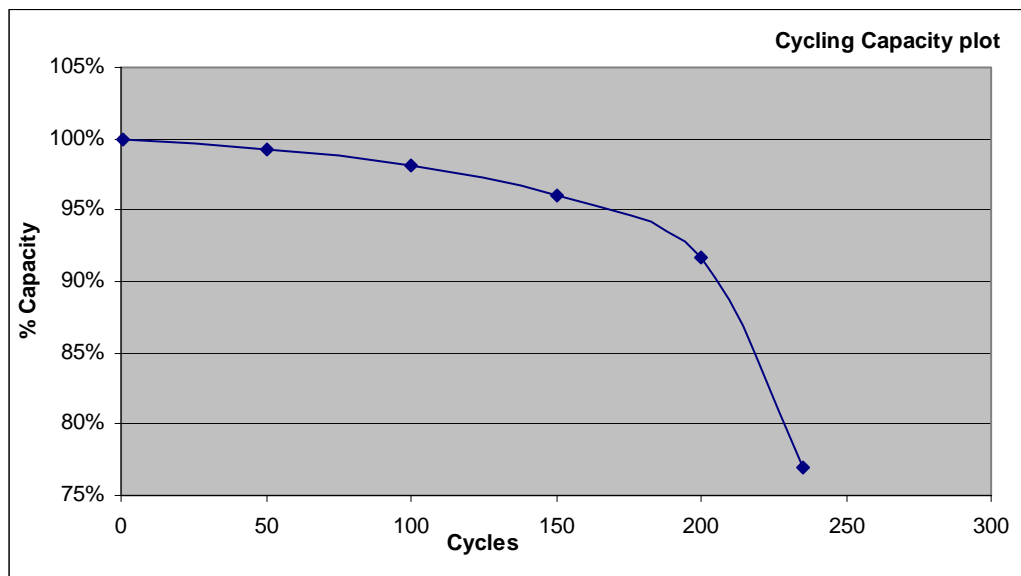
Test Batteries: Series 2 6 x 12V 160Ah

Test results: See Appendix B

Summary of the results

No Of Cycles	Ah Capacity	% age Capacity
1	169.62	100.0%
50	168.45	99.3%
100	166.39	98.1%
150	162.83	96.0%
200	155.54	91.7%
235	130.61	77.0%

From the test results shown and plotted above the life of the battery to 80% actual capacity is 220 cycles.





Charge Retention

Batteries under consideration

6 & 12 Volt Bloc AGM

Requirements:

After capacity testing the cells are to be allowed to stand open circuit for a 90 day period, during which time the average ambient temperature shall be 20 degrees C +/- 2.

After 90 days of storage open circuit, the cells or monobloc batteries shall undergo a capacity test in accordance with clauses 5.1.3 to 5.1.10. The measured capacity shall be corrected as necessary due to any temperature variation from the requirement.

$$\text{The retained charge} = \frac{\text{Retained capacity}}{\text{Initial capacity}} \times 100 (\%)$$

Test method: As above

Test result

The average ambient temperature over the period of the test was maintained at 20 °C.

See Appendix 5 for discharge test results as per the following Graphs.

$$\text{Retained charge} = \frac{163.38 \times 100}{167.99} = 97.26\%$$

Range Qualification

The 6 & 12 Volt range of batteries all utilize the same plate and separator configuration, positive to negative ratios are consistent and acid to active material ratios are constant, all are filled with the same grade and strength sulfuric acid and charged under the same charging program. We are therefore confident to apply this test result to the full range.



Batteries under consideration

6 & 12 Volt MonoBloc AGM

Requirements:

Values shall be determined by the test method described in clause 5.5.

Test batteries 12V 160 6 cells (Series 1)

Test method

- 1) Discharge the cell individually at I10 x 5 recording the current and voltage at 20 seconds, immediately stopping the test.
- 2) Allow the cell to stand open circuit for 5 minutes.
- 3) Discharge the cell individually at I10 x 20 recording the current and voltage at 5 seconds, immediately stopping the test.

Calculate the Short circuit current as = $\frac{V1I2 - V2I1}{V1 - V2}$

Calculate the Internal resistance as = $\frac{V1 - V2}{I2 - I1}$

Result

Results for a range of batteries are shown below.



Batteries under consideration

6 & 12 Volt MonoBloc AGM

Requirements:

Values shall be determined by the test method described in Annex D of the standard.

Test batteries ESL12V 120 Ah 6 cells

Test method:

The following test was carried out in a controlled temperature environment with an ambient temperature of approx. 20 C.

- 1 The 12 V string was subjected to a capacity test in accordance with clause 5.1 of the standard.
- 2 Day 1 to 30 (720 h +/- 10h) – batteries to be float charged and the individual float voltages recorded.
- 3 Day 30 to 44 (336h +/- 4h) – Start the gas collection and record the volume and float temperatures at the end of the test on day 44. (gas 1)
Reset the gas volume measuring device to Zero.
- 4 Day 44 Discharge the battery string at the C3 current to the a cut off voltage of 1.6 VPC. Recharge the battery with C3 current at the recommended upper float voltage.
- 5 Day 44 to 46 (48h +/-2h) Record the gas volume emitted from the start of the discharge at day 44 until day 46 (gas 2). Reset the gas volume measuring device to zero.
- 6 Day 46 to 60 (336h +/- 4h) On day 60 record the gas volume emitted (gas 3). Record the individual float voltages and stop the test.

Results.

- 1 Capacity test. See appendix 6
- 2 Individual float voltages as follows:
13.653 13.612 13.604 13.606 13.627 13.621
- 3 Gas 1 was recorded as 15998 cubic centimeters in 338 hours.
- 4 Float voltage reset to 2.30 VPC.
- 5 Gas 2 was recorded as 3511 cubic centimeters in 47 hours.
- 6 Gas 3 was recorded as 21062 cubic centimeters in 335 hours.
13.822 13.839 13.768 13.823 13.764 13.745

$$V_{\text{gas1}} = 15998/6 \times 6 = 444.4$$

$$V_{\text{gas2}} = 3511/6 \times 6 = 97.53$$

$$V_{\text{gas3}} = 21062/6 \times 6 = 585$$

$$V_{\text{gas}} = \frac{444.4+97.53+585}{107} = 10.53$$

Conclusion: V gas for the sample batteries is lower than that recommended by the standard.