

Table of Contents

REF: Electrical System	3
Batteries	3
<i>Sub-Documents</i>	3
<i>HD AGM</i>	5
<i>Aftermarket AGM</i>	6
<i>Aftermarket LFP</i>	7

[Go To Technical Menu](#)

REF: Electrical System

Batteries

Sub-Documents

- * . . . [Battery vent tube clamps](#)
- * . . . [Moving & Mounting the battery cables](#)
- * . . . [Charging the battery](#)

The battery is used to store power to operate the lights, electronics, starter circuit & ignition system of the motorcycle when the engine is not running. Once the engine is started, the task of supplying power for these purposes is taken over by the charging system, while also recharging the battery. In this way, the battery is ready for the next situation where power is required without the engine running.

Battery terminals are a maintenance issue for all types of batteries due to power loss, both outgoing and recharging, when terminals are not properly clean & tight. The connections should be checked regularly. See the Sportsterpedia section on Battery Cables - [HERE](#).

The three most common battery designs are:

1. FLA - Flooded Lead-Acid (aka wet-cell)
2. AGM - Absorbent Glass Mat
3. Llon - Lithium Ion
4. LFP - LiFePo_4 (Lithium Iron Phosphate) an updated version of Llon

The FLA is the oldest of the three technologies and is still a popular choice in automotive applications. It is typically the least expensive of the three. The internal charge plates are 'flooded' with liquid battery acid (thru filler caps), thus it's name. These batteries have vents with a tube routed towards the ground for electrolyte expansion, but that also allows evaporation requiring periodic checks & refills.

The AGM technology is similar in design, but instead of liquid acid sloshing around inside the battery (and sometimes spilling out), it uses a mat between the plates to absorb the acid. This stabilizes the liquid and keeps it in better contact with the plates, thus creating a more even charge surface. This also means the battery is sealed at the factory and does not require addition of electrolyte later. (Some AGM batteries now appear to be available as factory filled or user filled.)

The Llon design similarly uses plates, but these plates are highly refined compounds with a similarly refined lithium ion electrolyte material which is not a liquid. This refinement accounts for their

capabilities being different from the lead-acid batteries and also accounts for their higher costs (which will likely be reduced with increased usage). Llon batteries are virtually maintenance-free.

The LFP design is a refinement of the Llon. It has a more constant discharge voltage and a better safety record. However, the LFP design may require cell balancing & may exhibit a 'memory effect' when partially discharging and recharging. Special charging processes (specific chargers for LFP batteries) may be required to resolve these issues.¹⁾

AGM-type Batteries

Voltage Reading	12.7	12.6	12.3	12.0	11.8
Percent Charged	100%	75%	50%	25%	0%

Older-style Sealed Lead Acid Batteries

Voltage Reading	13.0	12.8	12.5	12.2	12.0
Percent Charged	100%	75%	50%	25%	0%

²⁾³⁾

Be sure your multimeter BLACK Probe is properly grounded to the Battery Negative Post or to the frame.

The above charts reflect the charts in the HD manuals as footnoted. Some other reference sources may indicate that SLA voltages are typically lower than AGM voltages. Check the manufacturer's specifications for your specific battery if you have any questions.

The wet-cell FLA is slowly being phased out with a greater embrace of the AGM or Llon versions. So, in a generalized way, here are the differences between the newer Llon batteries and the less-new AGM batteries:

Llon vs AGM:

- Llon typically weighs 1/3-1/2 that of AGM
- Llon takes & delivers a charge more efficiently (less loss) but requires better regulation of charging cycle
- Llons can be discharged deeper (up to 80%) than AGM (up to 50%)
- Llon can be charge-cycled 5-10 times more often
- Llon initial cost is about 1.5x-3x that of AGM
- Llon batteries may require specific chargers (AGM can use FLA chargers)

These variations must be weighed in light of the environment and usage for a particular application. It's nonsensical to talk battery life without a valid reference to the environment of the usage - meaning the quality of the charging system plus the way the battery is used. In some sense, this is like the debates of 'best oil' or 'best tire' or even 'best bike'.

Factors that need to be taken into account when choosing a battery are: starter motor CCA requirements; charging system capability; average ambient temperature when you ride; temps when bike is stored; number of starts (as in how often do you ride, how often do you stop/restart when you ride, etc.); added accessories that require power when engine is not running; other environmental and usage factors.

HD AGM

Recent HD Sportster model batteries are Absorbed Glass Mat (AGM) versions. Those used on the 883cc models are rated at 12v, 12Ah & 200CCA. ⁴⁾ A typical size is 6-7/8" Length, 3-7/16" Width & 6-1/8" Height.

(According to [this post](#), HD changed brands from Deka to Yuasa in 2019)

Here's the sales pitch made for HD batteries when they were sourcing them as Deka brand:

H-D AGM⁵⁾ Original Equipment Batteries⁶⁾

Genuine H-D Batteries offer the latest technology for higher cold cranking amps, long life and improved rechargeability. Featuring the latest AGM technology and great Harley-Davidson graphics, these batteries are durable, long-lasting and trouble-free. Made in the U.S.A.

- 1) Completely sealed, valve regulated maintenance free design eliminates acid spills and corrosion damage.
- 2) Re-engineered vent system is specially designed to minimize leakage.
- 3) Exclusive molded terminal design increases strength and durability.
- 4) Unique positive post bushing resists vibration damage and retards acid leaks and corrosion.
- 5) Heat sealed cover prevents electrolyte leakage and improves reliability.
- 6) Larger diameter through-partition welds direct more power to the starting motor.
- 7) Heavy top lead improves plate-to-lug adhesion for vibration resistance and long life.
- 8) Plates are lock-bonded together, reducing vibration damage for longer life.
- 9) Exclusive calcium/calcium alloy grids provide highest cranking amps and lowest self-discharge. Full frame, power path design directs more power to the terminals for quick, sure starts.
- 10) High density oxide provides maximum power-perpound or dependable "high cycling" service.
- 11) Tear-resistant AGM* separators protect plates, ensuring long life.
- 12) Exclusive demineralized electrolyte improves service life. Metered addition of electrolyte means no excess acid.
- 13) Positive terminal protector (not shown) protects against short circuits and sparks.
- 14) Stainless steel terminal bolts (not shown) won't rust or corrode.
- 15) Distinguished Harley-Davidson Bar & Shield is molded into case, for quick, confident recognition.

Motorcycle batteries built and rigorously tested to Harley-Davidson's exacting requirements. H-D® AGM battery ratings are determined by the strict regulations and testing of the Battery Council International.

Aftermarket AGM

As one example of an aftermarket AGM battery that might be used on a 1200cc Sportster, the Extreme Magna Power EXT16 is rated at 12v, 19Ah & 325CCA (weighs 17-lbs). It is a full size battery - 6.875" Length, 4.0" Width, 6.125" Height - Tight fit

Additional research found this claim at

<http://www.impactbattery.com/batteries/powersports/brands/magna-power>

ETX Magna Power Sealed AGM Batteries

The familiar looking ETX numbered Extreme Magna Power battery is manufactured by East Penn Manufacturing in Lyons, PA. You read that correct, these are American Made motorcycle batteries.

It is not too often you hear made in USA anymore, especially when it comes to power sport batteries! The powerful Magna Power battery line is actually marketed under EPM Products out of Baltimore, MD as a subsidiary of East Penn Manufacturing.

It is also worth noting that these Magna Power motorcycle batteries are private labeled for many automotive box stores including O'Reilly's (Super Start Extreme), Auto Zone (Duralast Gold) as well as Pep Boys (Magna Power) and Advanced Auto (AutoCraft).

There are several other well known and online brands that use the East Penn Extreme Magna Power battery. They include Braille, Big Crank, ThrottleX, Duracell, Deka Intimidator (which is the house brand sold directly by East Penn Manufacturing vs. the Magna Power and private label division marketed by EPM Products), Harley Davidson and Power Source (Lightning Start) to name a few.

Not all of them will use the ETX battery numbering system and will rely on an internal stock code system or unique SKU identifier, but rest assured they all come from the same factory and will provide the power you need to rule the road.

The EXT designated batteries are made by East Penn Manufacturing. A summary list, from the above claim, suggests these batteries are all USA Made:

- Super Start Extreme (O'Reilly's)
- Duralast Gold (Auto Zone)
- Magna Power (Pep Boys)
- Autocraft (Advance Auto)
- Braille
- Big Crank
- ThrottleX

Duracell
Deka Intimidator
Harley Davidson (65991-82B OEM battery?)
Lightning Start (Power Source)

The YTX designated batteries are made by Yuasa (Yuasa Battery Inc). They likely also make other branded models, if they are designated as a YTX model. Yuasa Batteries Inc. is located in Laureldale, PA.

As with any product, you might rightly expect that some versions of the products from these manufacturers vary in quality due to materials and processes being different. Even though multiple brands of batteries may be made by the same manufacturer, that does not 'necessarily' mean they are all manufactured to the same specifications.

Aftermarket LFP

As one example of an aftermarket LFP battery that might be used on a 1200cc Sportster, the Shorai LFX18A1-BS12 is a Lithium Iron Phosphate battery, rated at 12v, 18Ah & 270CCA. It's compact size weighs only 3.15-lbs and measures 5.83" Length, 2.63" Width, and 4.13" Height.

Shorai Batteries require a charging system output of 13.1 Volts or higher at idle, and must not exceed 15.2 volts at maximum output.

From the [Shorai website](#):

What about Water & Corrosion - Avoid high pressure power washing around the battery case, or constant exposure to water. If the battery may be occasionally submerged, we highly suggest application of sealant to fill the horizontal seam between top and bottom of the battery case, and that the 5-pin port be fully packed with dielectric grease. (dielectric grease is a good idea in any case to insure no pin corrosion). Also, heavy grease should be liberally applied to terminals for wet environments.

What about Cold Weather Starting - Down to about 20 degrees Fahrenheit (-7C) most users find that they can start normally on first crank. If your headlight comes on at key-ON, it is good for the batteries to flow some current before cranking in cold weather. The suggested headlight-on time before cranking depends on the temperature. If starting at 40F/5C, 30 seconds will help wake the battery and increase cranking performance. If at 0F/-17C, leave the lights on for 4~5 minutes before cranking. The result will be a better first crank, and longer battery life. If the engine fails to start on first crank, that first crank has warmed the battery, and the second attempt will be much stronger. Other accessories that can be turned on before cranking can also be used for this purpose, such as heated gear, radio, etc... Insuring that the battery is fully charged after storage also improves first-start performance in cold weather.

[Go To Technical Menu](#)

1)

<https://phys.org/news/2013-04-memory-effect-lithium-ion-batteries.html>

2)

2016 Sportster Owner's Manual

³⁾

1998 Sportster Service Manual

⁴⁾

per 2010 & 2015 HD Police model brochure

⁵⁾

Absorbed Glass Mat

⁶⁾

WARNING: Battery posts, terminals and related accessories contain lead compounds, chemicals known to the State of California to cause cancer and birth defects.

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