

MAINTENANCE & SERVICE INSTRUCTION SHEET

Water Less® / Perfect Plus™ / Ironclad® Batteries



HAWKER

Water Less®

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perfect plus®

IRONCLAD®



1 BATTERY DISCONNECT

Disconnect the electrical connection between the battery and the vehicle by separating the plugs.



2 REMOVE BATTERY COVER

Leave watering plugs closed.



3 LEVEL INDICATOR

Open standard watering plugs and check the electrolyte level. Visually check float indicator of the aquamatic plug. Do not fill water before the charge; only refill if level is below electrodes.



Tricolour LED	Blue LED
Green blinking - hardware OK	Rapid blinking - wireless identification
Blue rapid blinking - wireless identification	Slow blinking - voltage balance warning
Red blinking - temperature warning > 55° C	OFF - Flashing - electrolyte level is OK
	Light is constantly on - electrolyte level is low - Add water!

HAWKER **Water Less**

Level indicator	Action
Grey housing: (2 - 3) PzMB	
Green LED is lit continuously	Electrolyte level is OK
Green LED is off	Add water
Blue housing: (2 - 10) PzM and (4 - 11) PzMB	
Green LED flashing	Electrolyte level is OK
Green / Orange LED flashing	Warning status
Red LED flashing	Add water

HAWKER **perfect plus** **IRONCLAD**

Level indicator	Action
Grey housing: (2 - 3) PzMB	
Green LED is lit continuously	Electrolyte level is OK
Red LED flashing	Add water



4 CONNECT CHARGER PLUG

Connect (EC) electrolyte circulation system (if connector w/o integrated air supply).



5 SWITCH ON CHARGER

Check if the charger has been switched on. Charge the battery.



6 ADD WATER

Water topping up should be carried out 20 minutes before the end of charge or immediately after charging.

WATER LESS®	PERFECT PLUS™ / IRONCLAD®
Add water if necessary. See item 3 and table for water level indication.	Add water until the "max." mark is reached. Alternatively, connect the Aquamatic tube and see if all plugs show "max." indication.



*LED - level indicator option
*Aquamatic option

*Wi-iQ® - monitoring device option
*EC - electrolyte circulation option

IMPORTANT
Steps continue on page 2

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7 SWITCH OFF CHARGER

Switch off charger, then disconnect it. If EC is connected, disconnect that too. Check final values if necessary.



8 EQUALIZING CHARGE

Carry out weekly equalizing charge.



9 INSPECT FOR DAMAGE

Visually inspect all the battery components for mechanical damage (particularly charging plug and cables).



10 MEASURE CELL VOLTAGES

Monitoring cell voltages is essential for maintaining battery health and lifespan.



11 MEASURE ELECTROLYTE GRAVITIES AND TEMPERATURE

If over 45°C, leave to cool down.



12 MEASURE INSULATION VALUE

Must be at least 50 Ω per V of nominal voltage.



13 CLEAN BATTERY

Clean the battery and extract liquid from inside the container.



14 EXCHANGE AEROMATIC FILTER

Check air pump function.



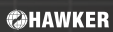
15 REQUEST SERVICE

If significant changes or cell differences are found, request further maintenance from the Service department.



*LED - level indicator option
*Aquomatic option

*Wi-iQ® - monitoring device option
*EC - electrolyte circulation option



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FLOODED BATTERY TECHNOLOGY

#	STEP	DAILY			WEEKLY			MONTHLY			ANNUALLY		
		Water Less®	Perfect Plus™	Ironclad®	Water Less®	Perfect Plus™	Ironclad®	Water Less®	Perfect Plus™	Ironclad®	Water Less®	Perfect Plus™	Ironclad®
1	Battery disconnect	X	X	X									
2	Remove battery cover	X	X	X									
3	Level indicator	X	X	X									
4	Connect charger plug	X	X	X									
5	Switch on charger	X	X	X									
6	Add water (if necessary)	X	X	X	X	X	X	X					
7	Switch off charger	X	X	X									
8	Equalizing charge				X	X	X						
9	Visually inspect for damage				X	X	X						
10	Measure cell voltages							X	X	X			
11	Measure electrolyte gravity							X	X	X			
11	Measure electrolyte temp.	X	X	X									
12	Measure insulation valve										X	X	X
13	Clean battery										X	X	X
14	Exchange aeromatic filter										X	X	X
15	Call service department*	X	X	X									

*if required.

TOPPING UP INTERVALS - WATER LESS® AND WATER LESS® 20

Interval	with the charger / charging factor
2 weeks in three-shift operation ^[1]	50 Hz, Cf ^[4] 1.2
4 weeks in one-shift operation ^[2]	50 Hz, Cf ^[4] 1.2
5 weeks in three-shift operation ^[1]	HF ^[5] , Cf ^[4] 1.10
8 weeks in one-shift operation ^[2] in three-shift operation ^[1]	HF ^[5] , Cf ^[4] 1.10 HF ^[5] +EC ^[3] Cf ^[4] 1.07
12 weeks in three-shift operation ^[1]	50 Hz, HF ^[5] , Wi-iQ, Cf ^[4] 1.04
13 weeks in one-shift operation ^[2]	HF ^[5] +EC ^[3] Cf ^[4] 1.07
20 weeks in one-shift operation ^[2]	50 Hz, HF ^[5] , Wi-iQ, Cf ^[4] 1.04

- 1 Cycle number can be reduced in three shift operation at high temperatures
- 2 With 80% DoD, 5 days/week at the battery temperatures of 30°C
- 3 Electrolyte circulation
- 4 Charging factor
- 5 High Frequency



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