OptiMATE™4

Automatic charger for 12V lead/acid batteries

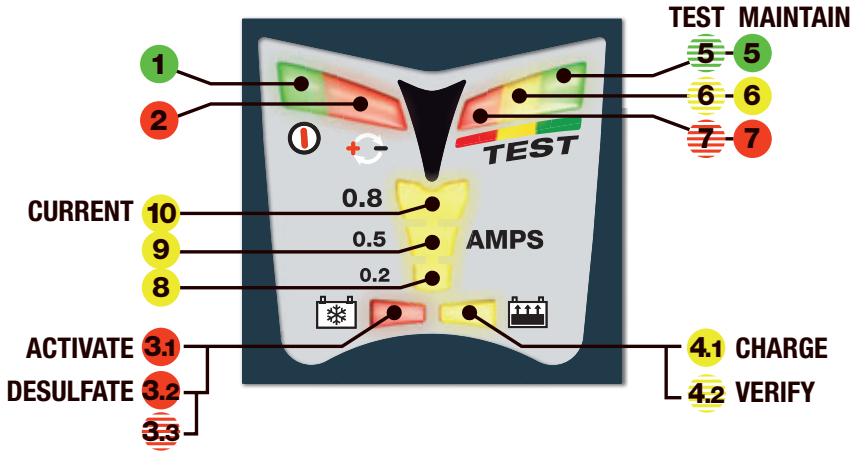
INSTRUCTIONS FOR USE

IMPORTANT: Read completely before charging

tecMATE™

QUICK GUIDE – LED INFORMATION PANEL

Full details on any LED or step can be found in the manual under the same #



1. LED #1 - Power on. This LED confirms AC power supply to the charger.
All charge and test LEDs light briefly to confirm microprocessor health.

2. LED #2 indicates inverse polarity - wrong output connections. Swap around to activate output.

3. Circuit activation and recovery of deep-discharged, neglected batteries

3.1 ACTIVATION - If the battery voltage is above 2V, LED #3 lights briefly to confirm circuit activation.
For most batteries LED #3 goes out immediately and charge LED #4 comes on.

3.2 RECOVERY - For neglected or very flat batteries, LED #3 remains on and indicates steadily.

3.3 TURBO RECOVERY - For a badly neglected battery TURBO RECOVERY engages and LED #3 flashes.
If step 3 has not concluded after 2 hours, step 4 engages automatically.

4. Charge and charge verification

4.1 CHARGE: A steady LED #4 indicates the bulk charge stage.

4.2 VERIFICATION: LED #4 flashes while the circuit verifies battery charge level.
If the battery requires further charging the programme reverts to CHARGE. Multiple reversions may occur. These reversions will cause LED #4 to alternate between steady and flashing, irregularly.
When LED #4 has flashed continuously for 30 minutes (or if steps 3 + 4 have not concluded within 48 hours) step 5 engages and a voltage retention test starts.

5. 6. 7. Voltage retention tests alternating half-hourly with battery maintenance

5 For a good battery LED #5 flashes throughout the 30 minute test. NO CHARGE CURRENT.

6/7 Flashing #6 / #7 may replace #5 if the battery voltage falls during the test, or vice versa.
Read § 6 and 7 in the main manual if either or both LEDs #6 and #7 indicate in this period.
Maintenance - float charge at a safe voltage limit to counter self-discharge.
During the 30 minute maintenance charge periods, whichever LED(s) #5 / 6 / 7 was/were flashing at the end of the TEST now indicate steadily. The battery can draw current as required to support small loads and counter selfdischarge.
Maintenance and voltage retention test periods continue alternating half-hourly until the battery is disconnected. The test result is updated during each subsequent test.

8. 9. 10. CHARGE CURRENT LEDs

8 LED #8 (0,2A) could indicate if LED #3 (DESULFATE) is on or if LED #4 (CHARGE) is flashing.

9 LED #9 (0,5A) is normally on during the early part of the charge verification with LED #4 flashing.

10 LED #10 (0,8A) should indicate together with a steady LED #4 (CHARGE) during bulk charge.
If any LEDs #8/9/10 are on and any LEDs #5/6/7 are also on, read "note" in manual after §10.
On battery disconnection, all CHARGE and TEST LEDs light just briefly to confirm microprocessor reset.

OptiMATE™4

AUTOMATIC CHARGER FOR 12V LEAD/ACID BATTERIES.

Recommended for charging batteries of from 2 to 30Ah capacity, and for maintenance charging of batteries from 2 to 50Ah capacity. Do not use for NiCd, NiMH, Li-Ion or non-rechargeable batteries.
Input: 220-240V~ 0,095A. Output: 0,8A 12W (max).

IMPORTANT: READ THE FOLLOWING FULL INSTRUCTIONS FOR USE BEFORE USING THE CHARGER.

SAFETY WARNING AND NOTES: Batteries emit EXPLOSIVE GASES - prevent flame or sparks near batteries. Disconnect AC power supply before making or breaking DC/battery connections. Battery acid is highly corrosive. Wear protective clothing and eyewear and avoid contact. In case of accidental contact, wash immediately with soap and water. Check that the battery posts are not loose; if so, have the battery professionally assessed. If the battery posts are corroded, clean with a copper wire brush; if greasy or dirty clean with a rag damped in detergent. Use the charger only if the input and output leads and connectors are in good, undamaged condition. If the input cable is damaged, it is essential to have it replaced without delay by the manufacturer, his authorised service agent or a qualified workshop, to avoid danger. Protect your charger from acid and acid fumes and from damp and humid conditions both during use and in storage. Damage resulting from corrosion, oxidation or internal electrical short-circuiting is not covered by warranty. Distance the charger from the battery during charging to avoid contamination by or exposure to acid or acidic vapours. If using it in the horizontal orientation, place the charger on a hard, flat surface, but NOT on plastic, textile or leather. Otherwise use the fixing holes provided in the enclosure base to attach the charger to any convenient, sound vertical surface.

EXPOSURE TO LIQUIDS: When placed on a horizontal flat surface this charger is designed to withstand exposure to liquids accidentally spilled or splashed onto the casing from above, or to light rainfall. Do not allow liquid to accumulate below or around the base of the charger. Prolonged exposure to falling rain is inadvisable and longer service life will be obtained by minimizing such exposure. Failure of the charger due to oxidation resulting from the eventual penetration of liquid into the electronic components is not covered by warranty. Never expose connectors or plugs to rain or snow.

BATTERY CONNECTIONS: 2 sets of interchangeable connection sets are supplied to connect the battery to the charger. One has crocodile clamps for charging the battery off-vehicle, the other has metal eyelets intended for permanent connection to the battery posts, and a resealable rubber protective cap on the 2-pole connector at its other extremity. When fixed permanently to the battery, this connection set allows easy and sure connection of the charger to maintain the battery in-circuit. For vehicle batteries, the resealable rubber cap should be closed whenever the charger is disconnected and/or the vehicle is in use so as to protect the 2-pole connector from dirt and damp. Consult a professional service agent for assistance in attaching the metal eyelets to the battery posts. Distance the polarised two-pole connector (for connection to the charger) as far as possible from the battery and secure it so that it cannot foul any moving parts or be pinched or damaged by sharp edges. The in-line fuse in the eyelets connection set protects the battery against such accidental shorting across positive and negative conductors. Replace any burnt fuse only with a similar new fuse of identical type and 7,5A rating.

IMPORTANT NOTES:

1. When charging a car battery, or if using the battery clamps, first disconnect and remove the battery from the vehicle and place it in a well ventilated area.
2. If the battery is deeply discharged (and possibly sulphated), it is essential to disconnect the battery from the vehicle before connecting the charger for a recovery attempt. The charger's special recovery mode cannot engage if it senses that the battery is still connected to a vehicle wiring circuit which effectively offers a lower electrical resistance than the battery on its own. However, if the deep-discharged battery is not removed for recovery, neither battery nor vehicle electronics will be damaged.
3. If nonetheless you intend to connect the charger to an automotive battery using the battery clips connection set without first disconnecting and removing the battery, connect first to the battery terminal not connected to the chassis, then the other battery clip to the chassis well away from the battery and fuel line. Do this before connecting to the AC input. Always disconnect in reverse sequence.

USING THE OPTIMATE™4

The clauses below are numbered the same as the quick guide on the inside front cover.

1. and 2. Connections and input power

Connect the charger to the battery: RED clamp to POSITIVE (POS, P, +) terminal and BLACK clamp to NEGATIVE (NEG, N,–) terminal. Now you are ready to start:

1. Connect the charger to a mains supply socket providing AC supply of 220 to 240V. The "POWER ON" LED #1 should illuminate. If not, check your AC supply and the connection to it.
2. If the INVERSE POLARITY LED #2 indicates, the battery connections are incorrect. The charger is electronically protected so no damage will result, and the output will be disabled automatically. Disconnect the AC input, swap the battery connections around, then restore the AC input power.

Automatic microprocessor controlled operations.

All charge and test LEDs light briefly after § 1 above to confirm microprocessor health.

3. Circuit activation and recovery of deep-discharged, neglected batteries

For safety reasons, the OptiMate™ output will only switch on if a battery retaining at least 2V is correctly connected to it and it is connected to a live 220-240V input. If these conditions are not met, only the POWER ON LED #1 will light on the LED panel.

3.1 Immediately the output circuit is activated, the orange DESULFATE LED #3 comes on very briefly while the OptiMate™ checks whether the battery can be charged effectively by the normal multi-stage programme. If it can, the yellow CHARGE LED #4 will almost immediately replace the DESULFATE LED, and the CURRENT LED #10 (0,8A) should come on.

3.2 If the battery is extremely flat (deep-discharged or sulphated), the DESULFATE LED will continue to indicate for up to 2 hours while a special high voltage is applied to force a very small fixed current into the battery in a recovery attempt. This recovery mode has two stages. In the first stage the voltage is limited to about 16V for 5 seconds while the circuit assesses whether this level is likely to be adequate to recover the battery. If this assessment is positive the recovery mode programme continues with voltage limited at 16V for up to 2 hours maximum, or until the moment when the automatic circuit judges that the battery can accept the normal charging programme. During 3.2 the charge current LED #8 (0,2A) may indicate after some time when the battery starts to accept some current.

3.3 In the case of very badly neglected batteries that have not received any charge for many months, the second more powerful TURBO stage of the recovery mode will engage about 5 seconds after the circuit has been initialised. The voltage limit is reset at 22V, but the current is limited to a very low and safe value. To indicate the activation of the TURBO RECOVERY mode the DESULFATE LED #3 flashes. As and when the battery can accept the very low set current, the charge voltage automatically reduces. At this moment or in any case after the maximum time limit of 2 hours has elapsed, the CHARGE mode (§ 4) will engage.

NOTE: A battery left deep-discharged for an extended period may develop permanent damage in one or more cells. Such batteries may heat up excessively during charging. Stop charging any battery immediately if it is uncomfortably hot to touch.

4. Charge and charge verification

4.1 The BULK CHARGE stage (steady LED #4) delivers a constant current of about 0,8 Amps (LED #10) into the battery. This will cause the charging voltage to increase gradually. When it reaches 14,3V, the OptiMate™ will start the absorption and CHARGE VERIFICATION stage.

4.2 CHARGE VERIFICATION (flashing LED #4): The charging voltage is now limited at 13,6V during 30 minutes whilst the battery's charge level is verified. If the battery requires further charging the programme will revert to the main CHARGING stage (§ 4.1) and yellow LED #4 will indicate steadily again. When the rising voltage again signals that the battery is approaching full charge the circuit reverts to VERIFICATION and LED #4 resumes flashing. These reversions may occur as many times as is necessary to reduce the battery's current demand below 200mA at 13,6V (which is consistent with a battery that has accepted as much charge as its basic condition allows). As soon as the circuit has verified that the charge is adequate (signaled by LED #4 having flashed continuously and consistently for a full 30 minutes), the voltage retention test (see § 5) automatically follows.

NOTE 1. For safety reasons there is an overall time limit of 48 hours for programme stages 3.2 through 4.2.

NOTE 2. Some sealed "MF" or "AGM" batteries that have been neglected may cause the programme to advance to the CHARGE VERIFICATION stage (4.2) without proceeding through the bulk CHARGE stage (§ 4.1). The built-in diagnostics will detect and correct this anomaly. The circuit will oscillate between bulk charge and verification as described in § 4.2.

5., 6. and 7.
Voltage retention tests alternating half-hourly with battery maintenance

The first VOLTAGE RETENTION TEST period of 30 minutes follows § 4.2, thereafter a 30 minute MAINTENANCE period. These 30 minute TEST and MAINTENANCE periods then alternate for as long as the battery remains connected. Delivery of current to the battery is interrupted for 30 minutes during voltage retention test periods to allow the battery to rest (thereby minimizing loss of water from the electrolyte) and to allow the circuit to monitor the battery's voltage decline to determine its ability to retain charge and deliver power.

5. For batteries with a good state of health the green LED #5 should flash at the start of the test period and continue to flash for the full 30 minutes until the next 30 minute maintenance period commences, when the LED indication reverts to steady. If the battery remains in circuit with the electrical system it supports, and accessories or lights impose an electrical load on the battery, the green LED may give way to one or other inferior LED indication during test or maintenance periods. See table below.
6. At some stage during the test period the yellow TEST LED #6 may start to indicate alone or together with the green #5 or red LED #7 according to the severity of the voltage decline. See table below. Normally voltage drop is associated with some current flow see the NOTE following § 10 below. For a good battery remaining in circuit with the electrical system it supports, if the decline in voltage resulted from a current drain out of the battery which was only of a temporary nature, the LED indication can revert to a better level, ideally green.
7. If the red LED #7 alone, or the yellow #6 and red LED #7 together start to flash during a 30 minutes test (or steadily during a maintenance period), a significant problem exists. Read the NOTE and FURTHER NOTE below the table.

Interpretation of possible LED indications during or after the 30 minutes retention test

	RED #7	**RED #7 + YELLOW #6**	**YELLOW #6**	**YELLOW #6 + GREEN #5**	**GREEN #5**
BATTERY TYPE	**Voltage below 12V**	**Voltage 12,0 – 12,2V**	**Voltage 12,2 – 12,4V**	**Voltage 12,4 – 12,6V**	**Voltage 12,6V +**
WITH FILLER CAPS	READ NOTE BELOW	NEEDS REPLACING SOON	MARGINAL	GOOD	VERY GOOD
AGM SEALED MF	READ NOTE BELOW	REPLACE NOW	REPLACE	MAY NEED REPLACING SOON	GOOD
GEL SEALED MF	READ NOTE BELOW	REPLACE NOW	REPLACE	MAY NEED REPLACING SOON	GOOD

NOTE: For any test result other than green #5, remove the battery from the electrical system it supports and reconnect the optimate. If a better test result is now obtained, this suggests that the power losses are partly due to a problem in the electrical system it supports, not in the battery itself. You are advised to read the following note #6 and 7 and to consult an electrical specialist.

FURTHER NOTE ON LED INDICATIONS #6 and 7: If the above re-test results in a remark in the above table other than GOOD or VERY GOOD, you are advised to take the battery to a professional service workshop equipped with a BatteryMate™ motorcycle battery tester-charger (www.batterymate.com) or a TestMate™ digital battery tester (www.testmate.com), for a more thorough investigation. The red /yellow+red LEDs #6 and 7, (or yellow LED #6 alone for a sealed motorcycle battery) mean that after being charged the battery's voltage is not being sustained or that despite recovery attempts the battery was irrecoverable. This may be due to a defect in the battery itself, such as a short-circuited cell or total sulphation, or, in the case of a battery still connected to a vehicle's wiring system, the red LED #7 may be signalling a loss of current through deteriorated wiring or a degraded switch or contact, or in-circuit current-consuming accessories. A sudden load such as the headlights being switched on while the charger is connected can also cause the battery voltage to dip significantly. Always remove the battery from the electrical system it supports, reconnect the OptiMate™ and allow it to proceed through its programme once more.

FINAL NOTE ON THE VOLTAGE RETENTION TEST: This test is a strongly indicative but not necessarily a conclusive test of battery condition, which for starter batteries can be more precisely established by using a TestMate™mini which tests 12V batteries on the vehicle during cranking, as well as the charging system operation. Alternatively, contact a workshop equipped with a BatteryMate™150-9 or TestMate™ digital battery tester.

Automatic battery maintenance

The 30 minute float charge maintenance periods follow and alternate with the 30 minute test periods during which there is no charge current. This "50% duty cycle" prevents loss of electrolyte in sealed batteries and minimizes gradual loss of water from the electrolyte in batteries with filler caps, and thereby contributes significantly to optimizing the service life of irregularly or seasonally used batteries. The circuit offers current to the battery within a safe 13,6V voltage limit ("float charge"), allowing it to draw whatever small current is necessary to sustain it at (or close to) full charge and compensate for any small electrical loads imposed by vehicle accessories or on-board computer, or the natural gradual self-discharge of the battery itself.

NOTE: **Maintaining a battery for extended periods:** After activating the charger you should observe the LED indications every few hours until the test result is displayed. If at any time the battery is hot to touch, disconnect it from the charger and get it professionally tested using a BatteryMate™ or TestMate™ II electronic tester specifically designed for that type of battery. At least once every two weeks, check that the connections between the charger and battery are secure, and, in the case of batteries with filler caps on each cell, disconnect the battery from the charger, check the level of the electrolyte and if necessary, top up the cells (with distilled water, NOT acid), then reconnect. When handling batteries or in their vicinity, always take care to observe the SAFETY WARNINGS above.

Interpreting the charge current LEDs #8, 9, 10.

8. LED #8, which comes on when the current is slightly below 200mA, should start to indicate as the battery gradually recovers from sulphation or very deep discharge and starts to accept some charge current some time after the DESULFATE LED #3 started to indicate. It will also normally indicate during the later part of the charge verification, with LED #4 flashing (see § 4.2 above).
9. LED #9 comes on when the current is about 0,5A, so it may indicate in the circumstances described below commencing with "UNLESS the..". Furthermore, LED #9 can be expected to indicate during the early part of the charge VERIFICATION (§ 4.2), with LED #4 flashing.
10. LED #10 indicates for currents at or close to the full bulk charge current of 0,8A. If CHARGE LED #4 is indicating steadily, then LED #10 should also be on, UNLESS the DESULFATE mode (LED #3) has just been terminated by the 2 hour time limit. In such cases severe plate sulphation may well prevent the circuit from delivering the full charge current.

NOTE: If any of LEDs #8/ 9/ 10 are on, and any of LEDs #5/ 6/ 7 are also on steadily, this is a definite indication that either the battery has a short-circuited cell or, if the battery is still connected to the electrical system it supports, that something is imposing an anomalous load on the battery. If this combination of LED indications occurs when the battery has been disconnected from and removed from the electrical system it supports, send it for recycling and replace it. Otherwise, go back to § 1 above.

Charging time

The time required for the OptiMate™4 to complete a charge on a flat but not severely discharged and otherwise undamaged battery is roughly equal to the battery's Ah rating, so a 12Ah battery should take no more than about 12 hours to progress to the self-discharge check (§ 5). Deep-discharged batteries may take significantly longer.

NOTE: The total charging time of the above steps 3.2 through 4.2 is limited for safety reasons by a 48 hour timer. This should be sufficient to recharge any engine-start battery within the recommended range of rated Ah capacities (2 to 50Ah).

If using the OptiMate™4 on a severely discharged automobile battery of larger capacity, a full charge may not be achieved in the 48 hours. In this case disconnect the AC input, wait a few seconds, then switch it on again to restart the charging programme from the beginning again. In such cases, prolonged continuous charger operation at maximum output and in warm ambient temperatures may cause the charger to become quite hot. Switch off and allow the charger to cool thoroughly to room temperature before reconnecting it to complete the charge.

Disconnection

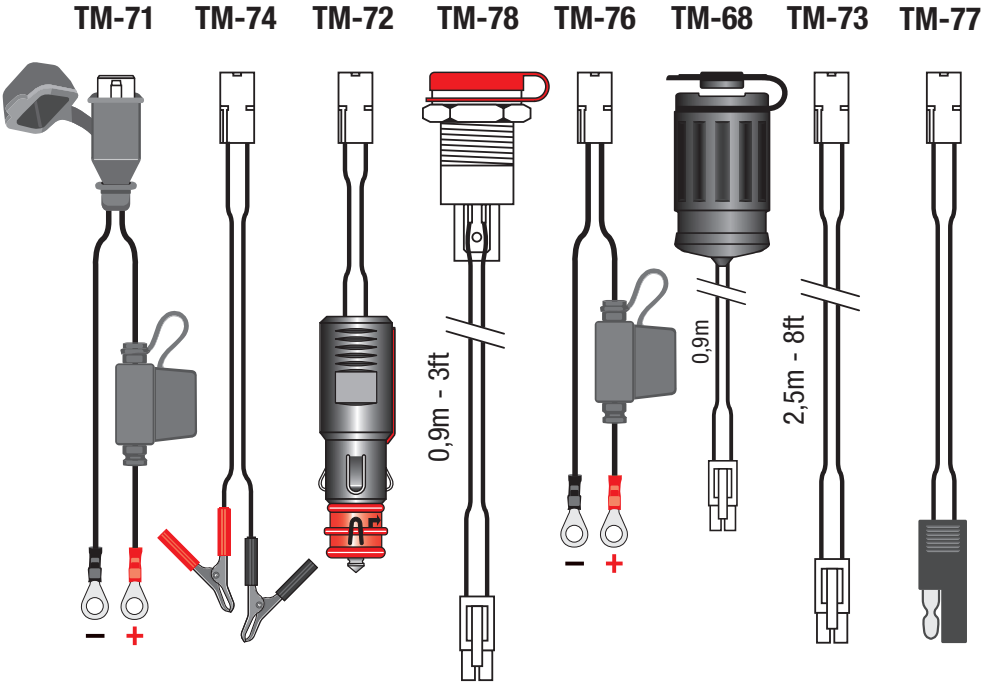
Disconnect the OptiMate™ first from the AC mains supply and then from the battery. Always disconnect from the AC mains before reconnecting to the same or another battery. Close the rubber cap on the eyelets connection lead (TM-71) if this is attached to the battery, to protect its 2-pole connector against dirt and damp while the OptiMate™ is disconnected.

LIMITED WARRANTY

TecMate (International) SA, Sint-Truidensesteenweg 252, B-3300 Tienen, Belgium, makes this limited warranty to the original purchaser at retail of this product. This limited warranty is not transferable. TecMate (International) warrants this battery charger for two years from date of purchase at retail against defective material or workmanship. If such should occur the unit will be repaired or replaced at the option of the manufacturer. It is the obligation of the purchaser to forward the unit together with proof of purchase, transportation or mailing costs prepaid, to the manufacturer or its authorized representative. This limited warranty is void if the product is misused, subjected to careless handling, or repaired by anyone other than the factory or its authorized representative. The manufacturer makes no warranty other than this limited warranty and expressly excludes any implied warranty including any warranty for consequential damages.

THIS IS THE ONLY EXPRESS LIMITED WARRANTY AND THE MANUFACTURER NEITHER ASSUMES NOR AUTHORIZES ANYONE TO ASSUME OR MAKE ANY OTHER OBLIGATION TOWARDS THE PRODUCT OTHER THAN THIS EXPRESS LIMITED WARRANTY. YOUR STATUTORY RIGHTS ARE NOT AFFECTED.

AVAILABLE ACCESSORIES



International: www.tecmate-int.com
North America: www.tecmate.com