

THREE-PHASE EVOLUTION PRO BATTERY CHARGER



USER AND MAINTENANCE MANUAL

Dear Customer,

Thank you for your trust and for buying this high-quality T.C.E. product. These instructions will help you to know the battery charger. A careful reading of these instructions will assure you to learn about the many different features offered by this T.C.E. product.

Please, note the safety standards to ensure greater safety when using the product. Careful handling of the product will repay you with years of safe and reliable operation.

Safety rules



CAUTION! Indicates a possible dangerous situation that, if not avoided, can provoke mild injuries or material damage.



WARNING! Indicates a dangerous situation that, if not avoided, can provoke serious injuries or death.



DANGER! Indicates a direct and imminent threat that, if not avoided, will provoke death or serious injuries.



IMPORTANT! Indicate the correct use of the machine and other useful information. This sign doesn't stand for any dangerous nor threatening situation.

Proper use

The device is manufactured using recognized safety standards. Any incorrect use can cause:

- injury or death to the operator or a third party
- damage to the device itself and other material or assets belonging to the company
- inefficient operations

All personnel involved in commissioning, operating, maintaining and servicing the device must:

- have suitable qualification
- read and follow these operating manual carefully

All safety and danger warnings on the device must:

- be in a legible state
- not to be damaged
- not to be removed
- not to be covered or painted over.

Before switching on the battery charger, rectify any faults that could compromise its safety.

The device is to be used exclusively for its intended purpose. Any use above and beyond is deemed improper. The manufacturer is not responsible for any damage, unexpected or incorrect results caused by such misuse.

The use includes:

- reading and obeying all operating instructions and safety and danger warnings
- performing all inspection and maintenance work
- following all instructions on the battery and vehicle manufacturers.

Mains line connection

Devices with a higher rating may affect the energy quality of the mains, due to their voltage input.

This may affect a number of battery chargers and cause connection restrictions like:

- insufficient network capacity
- insufficient dimensioning of the electrical system

If one of these things occurs, the plant operator or the person using the device should check whether the device may be connected, asking for a confirmation to a skilled technician.

- Connect the battery charger to a mains plug easily reachable in case of need.

NOTE! Make sure that the mains line connection is grounded properly.

Risks caused by mains voltage and charging current

The user of the charger is exposed to many risks such as:

- risk of electrocution from mains voltage and charging current
- dangerous electromagnetic fields, which can risk the lives of those using cardiac pacemakers

An electric shock can be deadly. To avoid electric shocks while using the charger:

- do not touch any live parts inside or outside the charger
- never touch the battery poles
- do not short-circuit the charger lead or charging terminals.

All cables and leads must be secured, undamaged, insulated and adequately dimensioned. Loose connections, scorched, damaged or inadequately dimensioned cables and leads must be immediately repaired.

Risks from acid, gas and vapor

Batteries contain acid which is harmful to the eyes and skin. Wear protective goggles and suitable protective clothing. In case of direct contact rinse any acid splashes and seek medical advice if necessary.

During charging, gas and vapor are released, that can be harmful and could be highly explosive.

- Only use the charger in well ventilated areas to prevent the accumulation of explosive gases. Battery areas with less than 4% hydrogen are deemed not to be at risk of blast. This environment situation is provided by a good ventilation
- While charging, maintain a distance of at least 50 cm between battery and charger. Possible sources of ignition must be kept away from the battery
- The battery connection must not be disconnected while charging.
- Do not inhale any of the gas and vapor released
- Make sure that the charger and battery area is well ventilated
- To prevent short circuit, do not place any tools or conductive metals on the battery

How to handle the battery

- Protect battery from dirt and mechanical damage
 - Store charged battery in a cool place. Self discharge is kept to a minimum at approx. 20°C
 - Every week, perform an inspection of the battery to ensure that the electrolyte level is correct
- If any of the following occurs, do not start the battery charger and have the battery checked:

- Uneven electrolyte levels or high water consumption in individual cells: possible fault
- Battery is overheating (temperature over 55°C)

Protecting others

While the charger is in function, keep all non-authorized personnel out of the working area.

If there are people in the vicinity:

- Warn them about all the dangers (hazardous acids and gas, danger from mains voltage and charging current, etc.)
- Provide suitable protective equipment

Before leaving the work area, make sure it's safe even if the operator is absent.

Safety measures in normal operation

- The charger must only be operated on a mains supplied with a ground conductor and a socket with a ground conductor contact. The manufacturer will not be held responsible for any damage caused by misuse
- Only operate the device in accordance with the degree of protection IP20 instructions.
- Never operate the charger if there is any evidence of damage
- Any safety devices or parts that are not functioning properly or are in a condition that won't assure its proper functioning must be repaired before switching the charger on
- Never bypass or disable protection or safety devices

INSTALLATION

Install the charger in an aired and dry place, far from warm sources and corrosive environments (alkaline/acid,...). Leave an empty space of 20 cm on the sides and 1 m in height.

You can't reach more than 40° C in your working location.

Avoid pouring water on/in the battery charger. It has an IP20 protection level.

Make sure the charger fits the battery (check the info plate on the battery charger before use).

Protect the network with a delayed switch or a charging fuse larger than the greater absorption of the battery charger.

Respect the battery connector polarity (black cables mark negative (-) polarity and red cables mark positive (+) polarity).

NETWORK LINKING

Our rectifier works only with a three phase 400 Vac network operation.

Before connecting make sure that the network voltage is close to its normal value. If the charging values are not correct, in case of anomalies in the supply line or because it's being used in a different time band when the voltage is higher (ex. Night band), it's possible to correct the power of the transformer up to the Measured voltage value.

To correct the network voltage you have to act on the terminal block inside the rectifier. It's important to check out these values:

+10% +5% Rated -5%

Use a socket that corresponds to the parameter between measured and rated voltage.

Example:

Rated voltage 400 Vac

Line voltage 420 Vac

Ratio % +5%

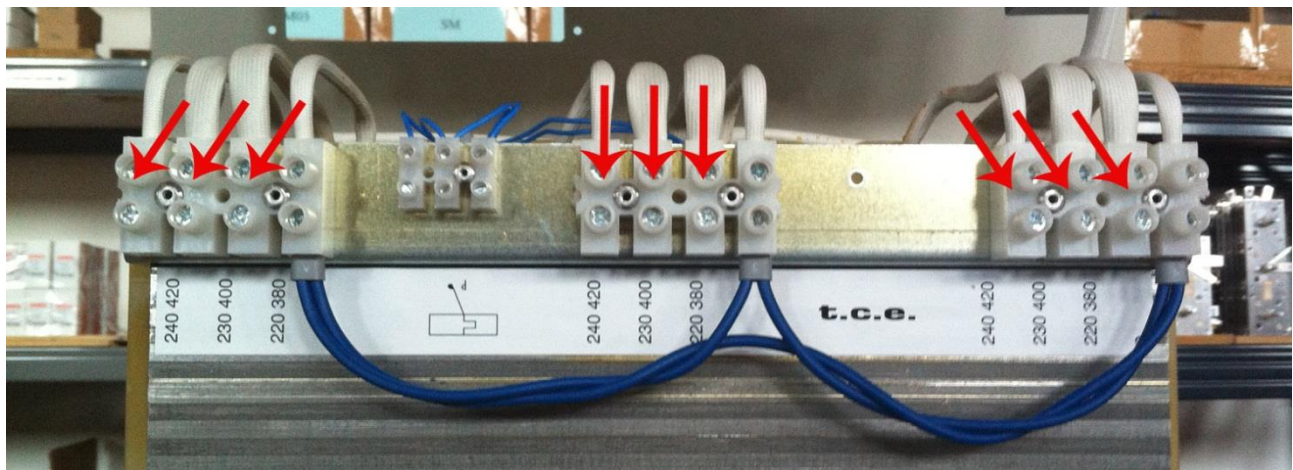
Terminal block position 420

Rated voltage 400 Vac

Line voltage 380 Vac

Ratio -5%

Terminal block position 380



Devices inside the shell case work with electricity voltage. ONLY qualified personnel is allowed.

PROTECTION DEVICE

A fuse protects c.c. circuit in case of extended overvoltage or polarity inversion.

If there is no network, charging process will TEMPORARILY interrupt.

Charge will reactivate AUTOMATICALLY when the electricity network will come back on.

SECURITY CERTIFICATION



Devices with the CE mark satisfy the essential requirements of the low-voltage and electromagnetic compatibility standards.

CHARGING CURVES

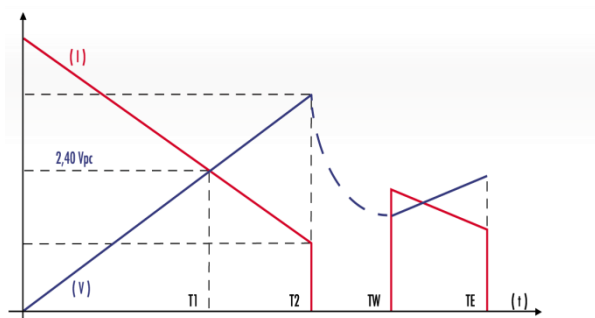
Charging curves installed in T.C.E. battery chargers (models: EVO-EVO PRO-TR-COMPACT) are Wa, with decreasing current, or WoWa for fast charge with two levels of intensity, according to DIN41774 standard. To obtain the right charge for the battery, the battery charger must be able to supply a charge as exact as possible to that of the standard: indeed it allows a starting charging current equal to 16% of the battery capacity and a decreasing trend.

To choose the right battery charger, you have to define the charging current you would need, calculating the 16% of the capacity of the battery in Ampere-hour (Ah). (For example: for a 600Ah battery, you have to use a 100A battery charger.

WA CURVE

The Wa curve, displayed in the below diagram, is characterized by a decreasing trend of the charging voltage to the increasing of the battery tension. The charger executed with Wa curve has a duration which changes from 10 to 12 hours. At the end of the charge, in all T.C.E. battery chargers, the equalization cycle takes place (usually during weekends): it allows the charger to eliminate little voltage differences between the battery elements that, through time, would considerably reduce its performances.

It takes place through extra charging cycles with a default duration and it starts 10 hours after the end of the charge.

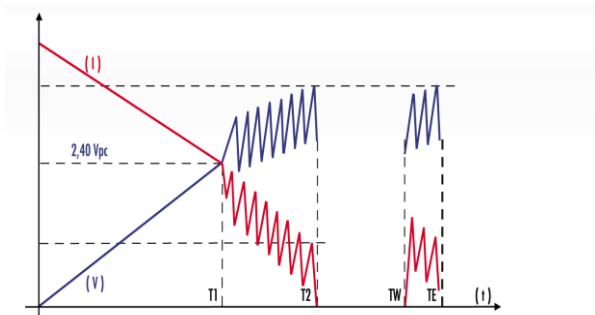


WO PULSE CURVE

Wo Pulse charging curve, shown in the diagram below, is used when you have only 7 to 8 hours to charge the battery.

It represents an evolution of Wa curve as, to reduce the charging time, the value of the starting current is incremented up to 20-30% of the battery capacity.

This increase, compared to Wa curve, is maintained as far as the battery tension reach a value equal to 2.40 Volt/element. At this point the current is reduced to the value expected from Wa curve and the pulse phase starts, during which time and current are adjusted by a microprocessor, in order to prevent useless and dangerous overheating.



MAINTENANCE

If the battery won't be used for long periods, for example during holidays, it would have to be maintained charged, to not compromise its performances.

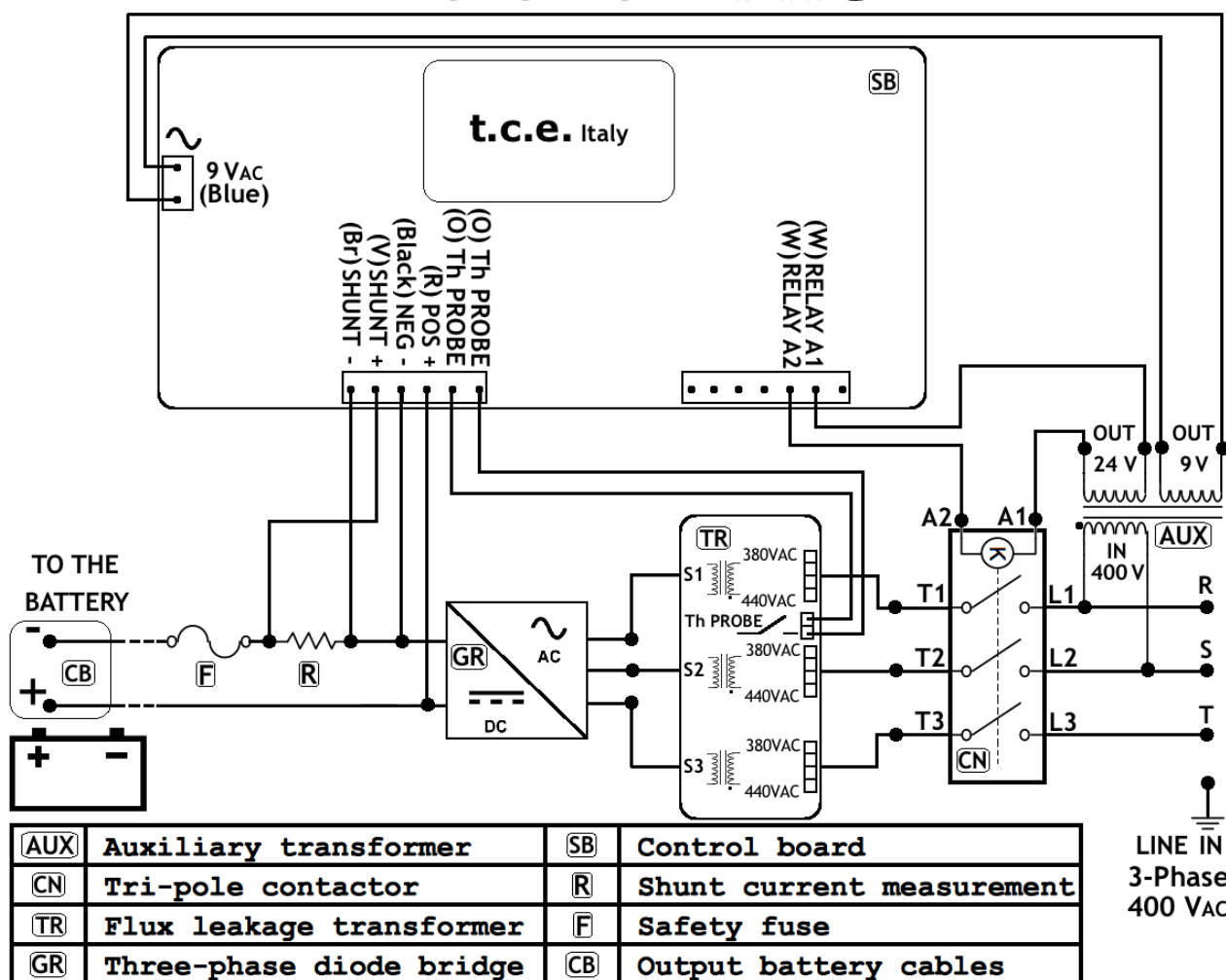
It's a better charge the battery before if left unused for long periods. To protect it from the auto-discharge, in T.C.E. battery chargers it's possible to complete the program with the maintenance function. It maintains the battery at 100% charge, even if it won't be used for months; this function goes through the microprocessor, which is able to autonomously putting to use extra charging cycles, that maintain the battery current in predefined charging values.

BEFORE CALLING THE TECHNICIAN

- Read carefully the "Mains line connection" section
- Verify that the battery charger is correctly supplied (in case of three-phase devices, check the presence of the three phases)
- Verify on the display if the battery is connected
- Check the battery current
- Verify that the available network power is larger than the maximum absorption of the battery charger (see data plate)
- Check the integrity of connectors.

If the problem continues, call an authorized technician.

EVOLUTION PRO



PROBLEM SOLVING

Section reserved for the technician

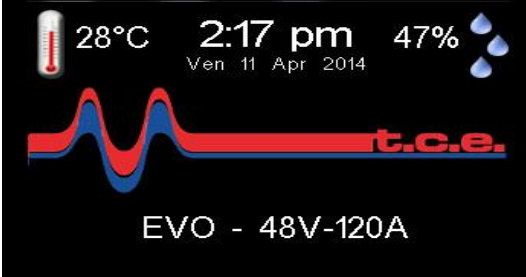


The battery charger doesn't light on







- Check the presence of the correct network voltage on the direct plug and the efficiency of fuses
- Check that the network voltage is the same as the input of the transformer (380V, 400V, 420V, 440V)
- Verify the efficiency of the fuse in the battery charger
- Check the connection between connectors and control card
- Check the continuity of thermal probes of the transformer (orange conductor)
- Verify the correct lock of screws that tie cables to the rectifier connection
- Check the operation of the remote control switch and the auxiliary wiring
- Verify the output tensions of the auxiliary transformer
- Check if the voltage arrives to the power transformer



The connection-to-the-battery cable doesn't exit (only for Easy Wire)

- Check if it isn't gone out from its slot.
- Verify if something doesn't block the unwinding of the cable.

HOW IT LOOKS WHEN WORKING


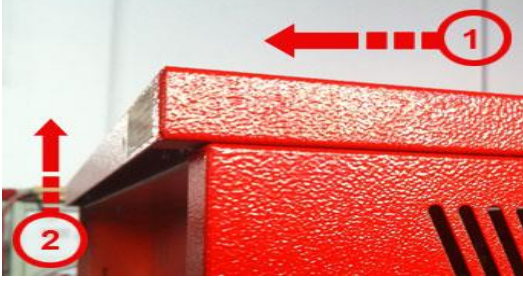

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|  | <p>Supply the battery charger (the display lights on). Connect the battery connector. The charge start automatically after an initial test that recognize the battery. Connection control: if it's positive, the battery charger will start; if it's negative, the message "battery disconnected" will appear. If there is a loss of a phase a message with "loss of network phase" will appear.</p> |
|  | <p>After the starting test, the battery symbol "bar" will appear in the display, signaling the state of the charge and displaying parameters like: charging time, time and date, current, voltage, ampere\hour, temperature and humidity.</p> |
|  | <p>The battery charger accomplish the charge, monitoring the state of the charge and the efficiency of the battery, with a resulting decrease of charging times and energy consumption. A safety system blocks the maximum charging time. In this phase the processor will accomplish the calculation to give the best charge to the battery.</p> |

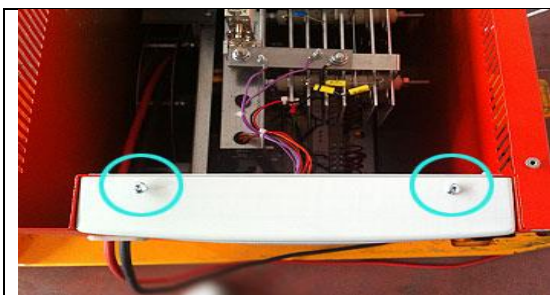
| | |
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|  | <p>At the end of phase 1, that is at the achievement of 2.4V/element, the ending charge phase will begin. Its duration will be calculated according to the battery status, noticed during phase1.</p> |
|  | <p>After a scheduling time (more or less 10 hours) there is an on impulse equalization charge. If the battery is not used, the battery charger will go directly to the maintenance phase (if preset by the operator).</p> |
|  | <p>This window is visualized touching the right arrow under below the display. It allows the visualization of the past 1000 charging cycles showing the following data: date of charge, time of the end of the charge, result, max voltage, max current. To enter the memory, touch the central button. To visualize the memory recordings touch the right arrow.</p> |
|  | <p>In case of anomaly, it allows the visualization of: supply suspension, suspension for overheating, block for loss of a network phase, overcurrent (starting current too high), excess of 12 hour of charge and broken battery.</p> |
|  | <p>Memory windows can be skimmed, as soon as you enter, with right and left arrows. It's possible to visualize errors like: battery disconnected while charging and suspension requested</p> |
|  | <p>To enter in the programming pages the user has to touch the left arrow. It will appear the "Language" symbol. Pushing the central button, enter in the reserved page and with the left arrow it shows the many languages, with the central button it's possible to confirm the choice. At the end of the selection, the display will always come back to the main window.</p> |

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|  | <p>To enter in the programming pages the user has to touch the left arrow. It will appear the “Date” symbol. Pushing the central button, it enters in the reserved page and with the left arrow you can see the languages, with the central button it's possible to confirm the choice.</p> |
|  | <p>This kind of programming is available for every function. In the “Temperature” window you can choose the measure you prefer. It's useful to visualize the temperature in the battery charger while charging.</p> |

HOW TO OPEN EVOULTION PRO BATTERY CHARGER

NOTE! The incorrect execution of the instructions or the fall of the devices could cause serious personal injuries and material damage. The opening is to be executed only by skilled technicians. Follow safety standards for security, reported in the user instruction of the battery charger.

| | |
|---|--|
|  | <p>PHASE 1: Make sure that the supply cable and battery cables are disconnected.</p> <p>Remove the two Phillips screw on the back of the battery charger, As shown in the image.</p> |
|  | <p>PHASE 2: Let the top scroll backward for 15 mm to release it from the tracks and lift it up to remove. As shown in the image.</p> |
|  | <p>PHASE 3: As soon as you take off the top, it's possible to: test the good condition of the power fuse, verify the lock of the bolts on the diode bridge and check the wiring of the power transformer (380V, 400V, 420V). As shown in the image.</p> |



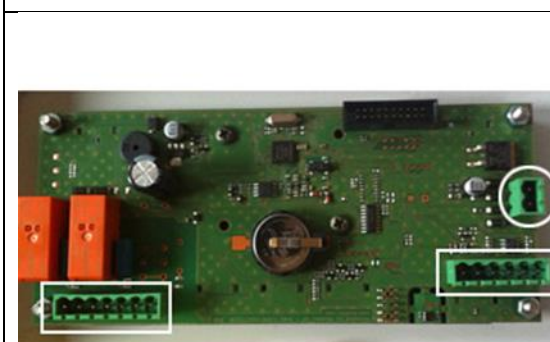
PHASE 4: To remove the front board it is required to: take off the hexagonal socket head screws that are at the top of the board. As shown in the image.



PHASE 5: Push out the top of the board, paying attention to not pull the supply cables of the electric card up. Remove connectors from the card, lift up the ABS board and remove it. As shown in the image.



PHASE 6: It's also possible to access to the clumping box of the power transformer and to adapt the input voltage to that of the network. As shown on the example in the section "Mains line connection". As shown in the image.



PHASE 7: It's possible to check the integrity of the motherboard and the proper insertion of connectors which supply it. As shown in the image.

N.B.: When reassembling the ABS board, make sure that connectors are properly inserted in their sites.



PHASE 8: Now it's possible to verify if, during delivery, inner components of the battery charger wouldn't be damaged. You can check: remote control switch, auxiliary transformer, power transformer, cables, fuses, electric card etc. As shown in the image.

WARRANTY TERMS

This battery charger is manufactured according to basic standards that assure its good quality and every assembling phase is checked by our skilled technicians.

The warranty is recognized only in case of anomalies caused by manufacturing or components. Complaints recognized in warranty terms cause the restoration or the replacement with an identical product, without expense, provide that the device is brought to our site in Saletto (Pd).

Anything else that is not mentioned above won't be considered (ex. material or moral damages, stop of devices, ...)

Warranty duration is 24 months after the first use of the product or after 24 months of the date of the VAT invoice.

Warranty duration is calculated according to a standard 12 hours/day job; if the battery charger is exposed to a double turn shift, the duration is proportionally reduced.

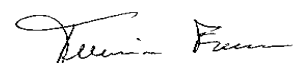
Warranty is immediately revoked in these cases: modification without permission, illegible serial number, malfunctions caused by natural events, corrosive or damaging environment for electric circuits, unusual impact, delivery damage and misuse.

Shipment cost is not refunded unless the anomaly or malfunction of the device is caused by bad manufacture or problem related to the components. T.C.E. can modify and update its devices, without noticing to the customers, but guaranteeing replacement parts.

Restorations of replaced parts are guaranteed for 6 (six) months.

The buyer agrees with the terms of warranty.

Relating to the manufacturer's responsibility, T.C.E. would be subjected to obligations on its products only if the technician would correctly execute user instructions and if the user would observe with scrupulousness the instructions found in the technical manual enclosed to the battery charger.





EVOLUTION PRO



EVOLUTION



TR



COMPACT



HF EVOLUTION TRIFASE

EVOLUTION MONOFASE



HF EVOLUTION MONOFASE



TCS HF