



**FIM ELECTRIC
REGULATIONS**

2024

FIM Electric Regulations

(no applicable on electric assisted bike)

2024

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Any references to the male gender in this document are made solely for the purpose of simplicity and refer also to the female gender except when the context requires otherwise.

01 INTRODUCTION

The FIM Electric Regulations are reserved for electric polyvalent all-terrain motorcycles. **(no-electric assisted e-bike)**.

The technical concept of an electric polyvalent all-terrain motorcycle is a motorcycle that is propelled by an electric motor without pedals and that is designed to ride in different surfaces.

The technical concept is reserved to solo motorcycles powered by an electric motor without pedals and by the action of one wheel in contact with the ground

Amendments to these technical regulations may be made at any time in order to ensure fair competitions.

01.01 FREEDOM OF CONSTRUCTION

A motorcycle must conform to the requirements of the FIM regulations, to the Supplementary Regulations, as well as to a number of specific conditions that the FIM may require for certain competitions. No restriction is placed on the make, construction or type of motorcycle used.

01.02 DEFINITION OF A PROTOTYPE

A prototype motorcycle is a vehicle which must conform to the safety requirements as required by the FIM Sporting Code and Appendices applicable to the type of competition for which it is to be used.

01.03 DEFINITION OF A FRAME OF A SOLO MOTORCYCLE

The structure or structures used to join any steering mechanism at the front of the machine to the motor/gear box unit and to all components of the rear suspension.

01.04 GENERAL VEHICLE SPECIFICATIONS

All motorcycles must comply in every respect with all the requirements for racing as specified in the FIM General Technical Specifications, unless otherwise specified below.

For the purpose of the following technical specifications, the power circuit consists of all those parts of the electrical equipment which are used to propel the motorcycle. The on-board circuit consists of all those parts of the electrical equipment which are used for signalling, lighting or communication. The accumulator is defined as any on-board equipment used for the storage of electrical energy supplied by the charging unit.

Recovering energy generated by the kinetic energy of the vehicle is permitted.

The use of any external source of energy in any form whatsoever with the aim of improving the performance of the vehicle is strictly prohibited.

The following specifications apply to all vehicles taking part in the FIM Electric competitions.

They should also be applied to all national competitions unless the FMNR (National Motorcycling Federation) has otherwise directed.

Further specifications for some competitions may also be required and these will be detailed in either the appropriate FIM Appendix or in the Supplementary Regulations for the competition in question.

Concerning material verification, in case of doubt, a sample or the part in question shall be taken and analysed at a Material Testing laboratory.

02 ELECTRICAL REQUIREMENTS

02.01 ELECTRICAL SAFETY

It must be ensured that the components used cannot cause injury under any circumstances, either during normal operation or in foreseeable cases of malfunction.

It must be ensured that the components used for protecting persons or objects can reliably fulfil their function for an appropriate length of time.

It must be ensured that a single point of failure of the electric system cannot cause electric shock hazardous to the life whatever the conditions (rains, etc.) in normal operation.

There must not be any exposed live conductive parts in the voltage class B (>60 V in DC (**pulsating DC**) / >30 V rms in AC). The protection elements (carter, protective covers, etc.) against the direct contact could not be removed without **using** tools.

02.02 ELECTRICAL COMPONENTS

All parts of the electrical equipment must be protected to at least the equivalent of IP66D type protection (dust proof, splash proof no object intrusion). Exposed connectors/wires must be protected against abrasion in case of accident (side covers).

02.03 POWER BUS MAXIMUM VOLTAGE

The maximum allowed voltage in the main power bus is:

CLASS A	Trial motorcycles: 60 V DC & 30 V AC (rms) (pulsory DC < 60V)
CLASS B	420 V DC & 300 V AC (rms) 800 V DC & 600 V AC (rms) for MotoE 1500 V DC & 1000 V AC (rms) (max. voltage for class B) for Land Speed World Records

A secondary power bus may be used to supply energy to the critical systems at a maximum voltage of ~~20V DC or 14V AC~~. **(replaced by 60 V DC or 30 V AC – pulsory DC <60V)**

The secondary power cannot **be** used to charge the main battery or to participate at the traction.

02.04 HIGH VOLTAGE SYMBOLS (class B application)

Symbols warning of 'HIGH VOLTAGE' must be displayed on or near the electrical equipment protective covers; all symbols must comprise a black flash of lightning inside a yellow triangle with a black border.

The sides of the triangle must measure at least 80 [mm] **(if possible)**, but it may be larger if practical.



The cable or outer covering for voltage class B circuits not within enclosures or behind the barriers shall be marked in orange.

02.05 INSULATION (class B application)

Every part of the electrical equipment (class B) must be electrically insulated relative to all live components and system ground.

Wiring insulators can be required to be checked at any time by the FIM Technical Director/Chief Technical Steward. Double insulation will be required in high voltage or high current wires. Technical datasheets of the wires used will prevail under all circumstances.

For class B, the power circuit wire shielding must be connected to chassis ground. The insulation surveillance system will serve device for an insulation fault.

The shielded cable is only recommended if case of direct access or possibility to damage the power cable (battery-inverter or inverter-motor).

For class B, plus and minus wires from the battery must be insulated with respect to the chassis to withstand battery maximum voltage at least. The insulation resistance requirements of 100 Ohms/V for DC or 500 Ohms/V for AC allow body currents of 10 mA and 2 mA respectively.

For class B, an insulation surveillance system must be used to monitor the status of the insulation barrier between the class B system and the chassis.

All electrically conducting non-live parts must be connected with the system ground.

For class B, it is mandatory that all major conductive parts of the body are equipotential the motorcycle chassis with cable or conductive parts. The resistance **must be** $< 0,1$ Ohms between the exposed conductive parts which can be touched by a person simultaneously.

In cases where the voltage of the power circuit exceeds 60V DC or 30V AC (rms), the power circuit must be separated from the on-board circuit by an appropriate insulator.

Insulating material not having sufficient mechanical resistance, i.e. paint coating, enamel, oxides, fiber coatings (soaked or not) or insulating tapes are not accepted.

If you have to repair after initial technical controls (using tape for example), the FIM technical director must check the conformity of the repair again.

Electric cable and equipment must be protected against any risk of mechanical damage (stone, mechanical failure, ...) as well as any risk of fire and electrical shock.

Every part of the electric equipment, including wires and cables must have an appropriate insulation resistance between live components and chassis.

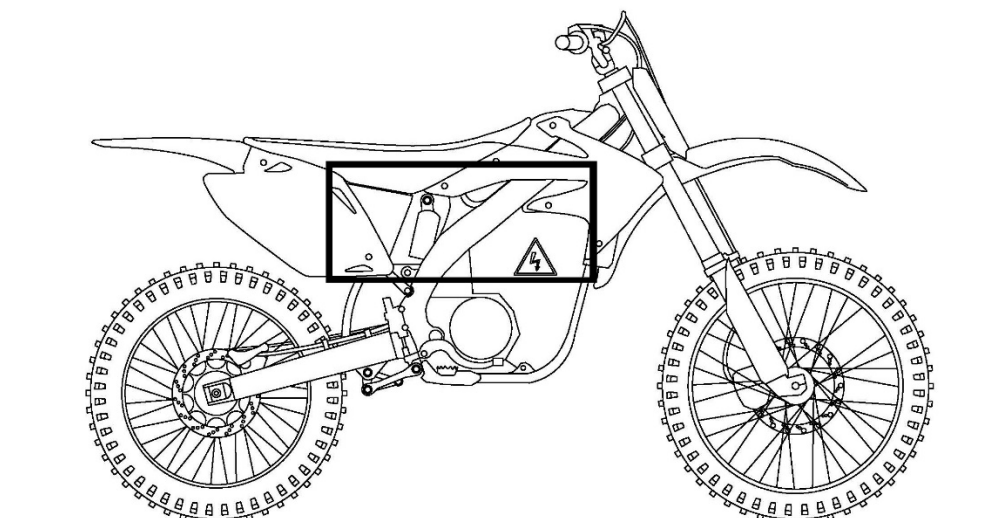
02.06 POWER INDICATOR(S)

To clearly define and identify the condition of the motorcycle, there must be at least three clear visible indicators:

- **Compulsory requirement for classes A and B:** ONE light or instruction message on the instruction panel/dashboard (located in the identified area, please see the diagram hereunder).



- **Additional compulsory requirement for class B only:** TWO lights (like LED repeaters) must be visible from 10 meters away positioned on the both sides of the motorcycle (located in the identified area, please see the diagram hereunder). These two sides indicators must be protected from any possible contact (rider, environment, etc.).

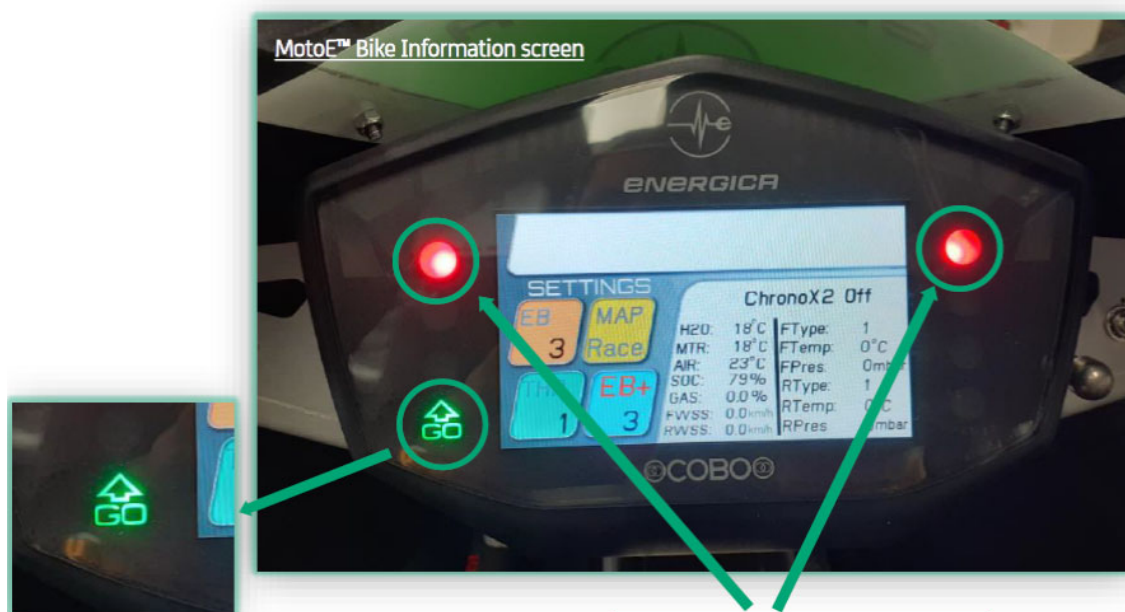


Motorcycle condition: LED colours **protocol:** the indicators warn if the motorcycle is:

- **SAFE:** GREEN **BLINKING** PERMANENT (Power ON, voltage > 60V DC, Drive mode is OFF) (**blinking frequency: 1Hz**)
- **SAFE IN DRIVE MODE ON:** GREEN **PERMANENT** BLINKING (blinking frequency: 1Hz)
Strongly recommended: Indication on the dashboard: GO (example hereunder)

MotoE™ BIKE SAFETY DEVICES

Dashboard indicators when the bike is **active**



Condition light ON indicates that the bike and throttle are active*

Red blinking lights will activate automatically when the bike is active and the speed is less than 3 km/h

*As long as the GO icon is green, the bike is active

- **NOT SAFE: RED PERMANENT** or NO LIGHT (in a hazardous state (insulation failure, etc.))

For the Class B only: The indicators must show when there is a voltage on the power circuit above 60 V in DC – for ready to move or interventions.

- **CHARGING (only recommended): Free colour, but different from previous indications.**

The choice of these indicators is free, but must be previously approved with the CTI – FIM. A list of pre-approved indicators could be delivered.

02.07 GENERAL CIRCUIT BREAKER – 'EMERGENCY STOP' (class B application, but recommended for Class A)

The general circuit breaker must disconnect from the cut-off switch and discharge the main bus voltage below 60V. This system will be referred to as general circuit breaker or “Emergency stop”.

Low power accumulators provided for low voltage circuits, e.g. auxiliary circuits, do not have to be isolated by the general circuit breaker (Emergency Stop) provided that they are completely isolated from the main power accumulators.

The rider circuit breaker must be accessible by the rider when the rider is sitting on the motorcycle. The rider circuit breaker must be separated from the general circuit breaker.

In case of an emergency stop, the general circuit breaker must isolate the plus and minus of the battery, not motor torque, enable the active discharge, isolate the auxiliary battery from the auxiliary circuit. **The cut-off must be materialized by a red button (no electrical conductor/plastic) and must be located in the identified area (please see the diagram hereunder).**



The choice of this red button is free, but must be previously approved with the CTI – FIM. A list of pre-approved buttons could be delivered.

02.08 FUSES (OVER-CURRENT TRIP SWITCHES)

An over-current trip switch is a device which automatically interrupts the electrical current in which it is installed if the level of this current exceeds a defined limit value for a specific period of time.

Fuses must under no circumstance replace the general circuit breaker (Emergency Stop). The fuses must be fitted inside the battery pack.

The fuses will be used during the charge.

02.09 CAPACITORS

Voltage across capacitors belonging to the power circuit should fall below 60 volts within 5 seconds after the general circuit breaker is opened or the over current trips of the accumulator are blown. An active discharge could be used.

Capacitive couplings between class B potential and electric chassis are used for EMC reasons. The manufacturer must provide to the FIM Technical Director the EMC self-certification (or external laboratory certification).

The energy caused by the discharge for the current DC shall be $< 0,2 \text{ J}$.

For AC body currents cause by capacitive couplings when touching AC high voltage that the AC current shall not exceed 5 mA.

02.10 MOTOR CUT-OUT SWITCH(ES) (IT DEPENDS OF THE CATEGORY ESPECIALLY FOR THE LANYARD)

All motorcycles must have an operational cut-out switch fitted to operate when the rider leaves the motorcycle. This cut-out system must stop the motor (**mandatory: stop the traction**). This cut-out switch (ie. lanyard) must be attached from the motorcycle to the rider arm wrist.

This motor cut-out switch must be operated by a lanyard with adequate length (max. length - 1m) and thickness. Once the rider steps off the motorcycle, the lanyard must disconnect from the cut-off switch and the motor. The lanyard must be fastened to the cut-out switch firmly in a way that it cannot be disconnected inadvertently but only when the rider leaves the motorcycle.

The cut-out switch cannot be taped, glued wired or fitted solidly in place.

02.11 ACCUMULATOR/RESS (Rechargeable Energy Storage System)

The type, dimensions and weight of accumulator/s cannot be changed between official practices and race.

All on-board electrical equipment, unless consisting of items originally powered by dry batteries, small accumulators or their own solar cells, must receive its energy supply from the vehicle's official accumulators.

For the assistance operation, the battery must be capable of being isolated from the power circuit by at least two independent systems (relays, ...) and disconnection device.

In case of relay failure, the electrical technician with appropriate PPE disconnects the battery.

The battery system must avoid the overvoltage.

A drop test is required (height of 1m then charge/discharge at 1C). The manufacturer must proceed to the drop test procedure (in 6 different impact points) and provide to the FIM Technical Director the self-certification form of this test.

A splash test (or under rain) is required, then a cycle discharge/charge.

The battery compartment must prevent the build-up of an ignitable gas/air, dust/air or hydrogen concentration inside the compartment. The hydrogen exhaust must not be excessive.

The BMS (Battery Manager System) must protect against the over-voltage, under-voltage, over-current, over-temperature, **under-temperature** and prevent thermal runaway, during overcharge or battery failure.

The BMS is a security system that detects internal defaults then can trigger the power reduction (charge or discharge) until the switch off.

IMPORTANT: As a condition of entry, a Material Data Safety Sheet must be supplied with the race entry for the machine, including all relevant details as to the accumulator chemistry, human and environmental hazards, handling and specific fire risks and precautions.

02.12 CHARGING THE ACCUMULATOR

Energy supply will be provided in the paddock at the times and locations determined by the race Organiser.

The charge is operated safe of the sun and rain, in the ventilated area.

Charging may only be done with the energy supply provided by the race Organiser.

The charging system must be separate from the machine and comply with all electrical safety requirements including thermal overload trip, fusing and be equipped with an earth leakage protection breaker.

Charging must always be done with the control of the BMS.

The traction system is off during the charge or charge cable is plugged without power. No movement of the motorcycle during the charge (Drive mode OFF).

No operation during the charge (no mechanical or electrical intervention)

The charger must be connected by the grid's earth to the motorcycle ground. The motorcycle traction system must be checked for ground faults before the charge start.

The charger must have a fuse to protect the charging cable.

02.13 ACCUMULATOR FASTENING

The accumulator must be installed securely inside the vehicle and be protected against short-circuits and leakage. The accumulator must be attached to the frame or chassis using metal clamps with an insulating covering (for Class B only).

The fixing method must be designed in such a way that neither the accumulator nor the fastening device itself nor its anchorage points can come loose, even when subjected to a crash. A solid partitioning bulkhead must separate the location of the accumulator from the rider.

Each accumulator box must provide its own cooling and/or venting system. In modular battery systems, a heat shield is strongly recommended between modules, by means of an adiabatic shield or intumescent.

The accumulator installation must ensure that in the event of accumulator cell leakage or explosion, the contents are kept away from the rider and do not interfere in any way with the rider's vision or the safe handling of the machine.

The battery shall be installed in the motorcycle in order to avoid the possibility inadvertent or unintentional detachment. The battery shall not be ejected when the motorcycle is tilted.

02.14 CRASH DETECTION

It's highly recommended for both Class A & Class B a crash detection system, based on bank angle sensor or IMU or similar, in order to give more safety to riders and track marshals.

03 STAFF EQUIPMENT OPERATED ON ELECTRIC CIRCUIT OF THE MOTORCYCLE (Class B application)

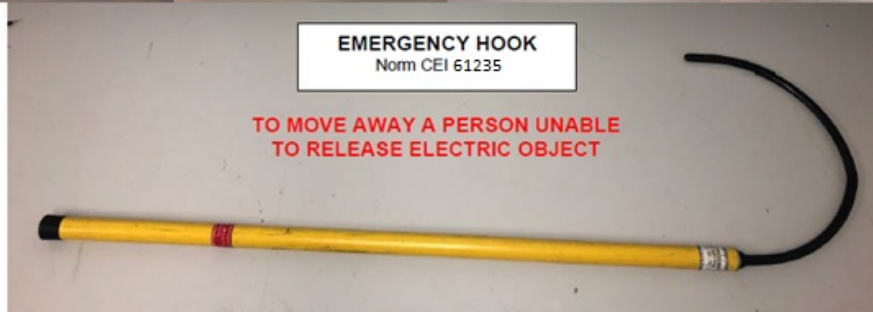
Equipment required to be used (and to be familiar with) for each pit box (provided by the team except if agreed differently according to each Championship/event organization/Promoter):

- Gloves: class 0 CEI 60903-2002 or CEI 60903-2003 (until 1000 V) – Class 1 (above 1000 V.)
- Robust shoes with insulated soles
- Safety glasses (helmet or visor)
- CO2 fire extinguisher for HV system (min. 1 with a valid certification) - optional
- F500 extinguisher for Lithium-Ion battery (min. 1 with a valid certification)
- Insulation Matting: CEI 61111 – **Class 0** around each motorcycle

- Emergency hook: CEI **61235** 61230
- **EV-rated fire blanket (min. 3 x 3 m)**

For the main garage:

- Automatic defibrillator
- Trauma first aid kit



NB:

- The team must provide its own PPE (Personal Protective Equipment) for its staff (except if agreed differently according to each Championship/event organization/Promoter).
- The National Federation must ensure that their Officials are properly equipped with the same PPE as listed here above.

04 TECHNICAL VERIFICATIONS

As a condition of entry, all safety items on-board the motorcycle must be precisely described and presented at the Technical Verifications.

The FIM Technical Director/Chief Technical Steward shall check both the machine and the rider for compliance with the technical specifications, as well as the employment of good engineering construction practice, and the presence of adequate electrical insulation and weatherproofing. The motorcycle model must be compliant with the EMC regulations ECE-R10 (**recommended**).

Damaged machines must be returned to the technical control area for examination after race or practice. In such circumstances it is the responsibility of the competitor to ensure both his machine and clothing have been rechecked and approved before further use in the event. If stickers/marks are used, a new sticker/mark must be in place.

It is the responsibility of the rider to ensure that a machine used in competition is electric, mechanically and structurally in a safe condition.

The FIM Technical Director may ask access and download to some data (battery voltage, battery current, etc). If necessary, and in accordance with the rest of stakeholders, the motorcycle could be limited in power or any other aspects.

In case of a dispute, the decision of the FIM Technical Director will be final.

04.01 CONFORMITY

It is the duty of each competitor to show the Technical Stewards of the meeting that his vehicle fully complies with these rules and the rules governing the meeting, in their entirety at all times.

04.02 VERIFICATIONS

- The Technical Verifications before the official practice and before the race should last at least one hour, after the race last at least 30 min.
- The Technical Verifications must be carried out in conformity with the procedure and times fixed in the CEB Rules and the Supplementary Regulations of the event.

- An example of minimum verifications that shall be performed is given below:

INITIAL TECHNICAL VERIFICATIONS	CHECK	MARKING
MOTORCYCLE		
Make + model	<input type="checkbox"/>	
Frame	<input type="checkbox"/>	<input type="checkbox"/>
Cut-off switch (lanyard)	<input type="checkbox"/>	
Self-closing throttle	<input type="checkbox"/>	
Brakes (front and rear)	<input type="checkbox"/>	
LED colours strategy according to motorcycle state	<input type="checkbox"/>	
Class B electrical parts marking (yellow triangle)	<input type="checkbox"/>	
Class B wires in direct access (in orange colour)	<input type="checkbox"/>	
Battery Output voltage	<input type="checkbox"/>	
Weight + ballast	<input type="checkbox"/>	
Battery fastening	<input type="checkbox"/>	<input type="checkbox"/>
Guard for the countershaft sprocket and rear sprocket	<input type="checkbox"/>	
Handlebar ends + protection + levers	<input type="checkbox"/>	
Front/rear brake disc protection	<input type="checkbox"/>	
TEAM STAFF ELECTRIC PROTECTIVE EQUIPMENT (Class B)		
Electrical accreditation for one person	<input type="checkbox"/>	
VAT (Voltage Absence Tester)	<input type="checkbox"/>	
Emergency hook: CEI 61235 61230	<input type="checkbox"/>	
Insulating matting: CEI 61111 – Class 0	<input type="checkbox"/>	
Safety glasses (helmet or visor)	<input type="checkbox"/>	
Gloves: class 0 CEI 60903-2002 or CEI 60903-2003 (until 1000 V) – Class 1 (above 1000 V.)	<input type="checkbox"/>	
Robust shoes/boots with insulated soles	<input type="checkbox"/>	
CO2 fire extinguisher for HV system	<input type="checkbox"/>	
F500 extinguisher for Lithium-Ion battery	<input type="checkbox"/>	
EV-rated fire blanket (min. 3 x 3 m)	<input type="checkbox"/>	
Automatic defibrillator (for main garage)	<input type="checkbox"/>	
Trauma first aid kit (for main garage)	<input type="checkbox"/>	
RIDER PROTECTIVE EQUIPMENT		
Rider helmet(s)	<input type="checkbox"/>	<input type="checkbox"/>
Rider chest and/or back protector	<input type="checkbox"/>	<input type="checkbox"/>
Rider protective clothing (boots, gloves, suits)	<input type="checkbox"/>	

- An overall inspection of the motorcycle must be carried out in conformity with the FIM rules. On accepted motorcycles a sticker or paint will be applied on the front of the main frame.
- The Technical Verifications will only be carried out when the Technical Verifications form of the motorcycle has been presented by the rider or his mechanic.

- For the Technical Verifications taking place after the race, it shall be ensured that the selected machines used during the race go directly to the Closed Parc (Parc Fermé).



**FEDERATION INTERNATIONALE
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