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1. INTRODUCTION: Main objectives of this Regulation

This document contains the technical rules of the competition called "MotoStudent". The principal aim lies in standardizing and delimiting the broad range of possibilities in a motorcycle prototype construction. In this way, every project shall be adjusted to a preliminary and common working line. And so then, it makes possible a fair competence between the participants.

2. THE MOTORCYCLE: General Orientation and Features

The aim of the is to manufacture a 2 wheels vehicle with an internal combustion engine which shall be aimed at seating just one occupant.

The motorcycle must be a prototype designed and manufactured for speed racing

3. GENERAL DESIGN REQUIREMENTS

3.1 Dimensions

The dimensions of a motorcycle are freely except from some basic requirements:

- The minimum width between the ends of the semi- handlebars (or handlebar, in case) must be 450 mm. (Figure 1)
- The minimum angle of motorcycle side inclination must be 50° without any part meeting the ground but tyres. This measuring is taken without any driver but with the complete equipment and necessary liquids.
- The clearance to the ground, with the motorcycle in vertical position, must not be lower than 100 mm in any situation of the compressed suspensions or geometry adjustments. (Figure 2)
- Rear limit: No part of the motorcycle could exceed the vertical tangent line to the exterior circumference of the rear tyre. (Figure 2)
- The tyres must have a minimum clearance of 15 mm with any element of the motorcycle in any situation or geometry adjustments.
- The maximum width of the seat must be 450 mm. No element of the motorcycle from the seat to behind shall emerge such width but the exhaust system.

3.2. Masses

The minimum weight of the motorcycle in running order, including tank, fuel and liquids included must not be lower than 95 Kg. at the moment of the tests. The weight could be checked initially, during the competition or at the end.

Loading the vehicle in order to reach the minimum weight is allowed.

4. MECHANICAL FEATURES

4.1. Chassis

The design, process and material used to manufacture the chassis are freely, except in the considerations below:

- Using titanium or titanium alloys to produce the chassis is not allowed.
- The final chassis showed in the competition must have passed the homologation process by the Organization. (See checking criteria)

- Participants are not allowed to use a commercial chassis not even a modified unit. It shall be a self made prototype chassis.

4.2. Suspensions

4.2.1. Front Suspension

In the case of suspension design based on fork tube, shall be used the one provided by the Organization.

The fork supplied by the Organization cannot be structurally modified. The fork adjustment only based on changing springs and hydraulics fluids is allowed.

The use of titanium, light alloys and fiber composites is forbidden in the rotation axles of the components in the front suspension system.

If another type of suspension is defined, it shall not be possible to use actives or semi-actives systems and/or electronic controllers of any suspension parameter.

4.2.2. Rear Suspension

In case of using a bumper in the composition of the rear suspension, it shall be the one provided by the Organization.

The shock absorber supplied by the organization cannot be structurally modified. It is allowed the bumper adjustment only based on changing springs and hydraulics fluids.

The use of titanium, light alloys and fiber composites is forbidden in the rotation axles of the components in the rear suspension system.

It shall not be possible to use actives or semi-actives systems and/or electronic controllers of any suspension parameter.

4.3 Steering System

4.3.1. Design

No element which interferes in a tolerance of 30 mm nearby the handles of the handlebar and the activations shall exist.

The minimum steering turning angle shall be 15° measured in each side of the longitudinal axle of the motorcycle. (Figure 3)

The steering turning angle shall be limited in each side.

4.3.2. Steering damper

The use of a steering damper is allowed.

4.4. Braking system

The motorcycle shall have front and rear brake.

4.4.1. Front brake

The front brake unit (pump, brake lines and caliper) provided by the Organization shall be used.

Competitors are allowed to choose the type of the pads and brake disks. Changing the brake lines for others with different length is allowed.

The location of the brake pump lever and the modification of the operating cam are freely, bearing in mind that, if that location is in the handlebar, the length could not be more than 200 mm and its end shall have a sphere with a

minimum diameter of 18 mm. The sphere could be trimmed with a plane of a minimum width of 14 mm, and the edges of the plane shall be rounded off.

4.4.2. Rear brake

The rear brake unit (pump, brake lines and caliper) provided by the Organization shall be used.

Choosing the type of pads and brake disk is allowed. Changing the brake lines to other ones with different length is allowed.

The location of the brake pump activation and the modification of the operating cam are freely, however if the location is in the handlebar, the length can not be more than 200 mm and its edge shall have a sphere with a minimum diameter of 18 mm. The sphere could be trimmed with a plane of a minimum width of 14 mm, and the edges of the plane shall be rounded off.

4.5. Foot rests

As a requirement, the extremes shall be protected with a nylon limit with a minimum radius of 8 mm.

They shall have side protections to avoid that the driver's boot can interfere with mobile elements such the chain or the rear tyre.

4.6. Handlebar

The handlebar width, measured between the ends of the handles could not be less than 450 mm. (Figure 1)

The ends of the handlebar shall be protected with a round nylon cap with a minimum radius of 8 mm.

The handlebars or semi handlebars made by light alloys are not allowed.

The handlebars or semi handlebars brackets shall be designed with the aim of minimizing the risk of breakage, in case of fall. Minimum radius of 2 mm shall be used in the anchorages to make deformations easier without breakage.

4.7 Swing arm

The swing arm shall be self made. The use of titanium, light alloys and fiber composites is not allowed to manufacture rotation axles of the swing arm.

The use of a chain protector is compulsory to avoid the interference between the rider's body and the sprocket in the rear wheel.

4.8. Rims and tyres

The Organization shall supply with rims and tyres, and their modification is not allowed.

Their dimensions shall be:

Front: 2.50"x17"

Rear: 3.50"x17"

The use of titanium, light alloys and fiber composites is not allowed to manufacture the wheels' axles.

The use of nylon protectors in the axles end is allowed in order to avoid possible falls. These protectors shall be rounded with a diameter not less than the used axle.

The stem ends of the wheels shall not emerge more than 30 mm from its location. Nylon protectors shall not be considered as a possibility to be used.

4.9. Falls Protections

It's recommendable the use of nylon limits to protect the motorcycle in case of fall. Fiber protectors for chassis and engine crankcase are also allowed.

5. FAIRINGS

5.1. Dimensional restrictions

Every edge and finish of the fairing shall be rounded. Minimum radius shall be 1 mm.

The maximum width of the fairing shall be 600 mm. (Figure3)

Frontal Limit: the front fender could not project the front tangent vertical line to the exterior circumference of the front tyre by no means.

Rear Limit: the rear fender could not project the rear tangent vertical line to the exterior circumference of the rear tyre by no means.

Sides: The fairing could not cover the rider's side, except from the forearms (this exception is only in the rider's minimum aerodynamic position The rear rim could not be covered more than 180°.

The maximum height between the seat and the higher point of the rear cowl shall be 150 mm.

The use of fenders is not compulsory.

The front fender could not cover more than 135° of the tyre measured from the rear part of the tyre with the origin of the angle in the horizontal line that cross with the stem of the wheel. In those 135° the dimensions of the fender are free.

The use of aerofoil is allowed as fairing pieces. They shall not project the width of the fairings or rear cowl and not even project the height of the handlebar extremes. The minimum radius shall be 2 mm. The use of aerodynamic mobile devices is allowed.

5.2. Safety

All the overflow pipes of the motorcycle shall be conducted to a tank of 250 cm³ capacity to avoid the leak of liquids. (Overflow pipes of oil crankcase, fuel tank, coolant)

6. ENGINE

It shall be used the engine provided by the Organization. The engine shall be sealed and its internal manipulation is forbidden.

6.1. Type

One cylinder of 250 cm³, 4 stroke engine with liquid cooling system.

6.2. Cylinder

No modification is allowed.

6.3. Cylinder head

No modification is allowed.

6.4. Crankcase

Modification of the crankcase is not allowed, not even of its external anchorages.

6.5. Gearbox

Any modification of the gearbox in any of its components is not allowed. Only the sensors installation for the data acquisition is allowed.

6.6. Secondary transmission.

The type of transmission is up to the competitors.

6.7. Clutch

The location of the clutch cam lever is freely with the restriction that its length shall not be higher than 200 mm and its end shall be a sphere of minimum 18 mm diameter. The sphere could be trimmed with a plane of a minimum width of 14 mm, and the edges of the plane shall be rounded off.

6.8. Throttle

The throttle shall return automatically to its position so that, its closing device was secure, if the rider drops it.

7. FUEL FEED SYSTEM

7.1. Carburetor / Injection

The election of the carburetor is up to the participants. The use of ceramic carburetors is forbidden.

Only one single control valve of the throttle, which shall exclusively be controlled by mechanics elements and operated only by the rider, is allowed. Other mobile devices are not allowed (but the injectors) in the intake system upstream of the engine input valve.

Participants are allowed to use carburant injection systems additional to the carburetor and the electronic programming. The fuel injectors shall be located upstream of the engine input valve.

Systems type RAM Air are allowed

7.2. Fuel Tank

The vent of the fuel tank shall be provided with a retention valve. The vent shall pour into the overflow tank.

Any kind of fuel tank shall be filled with flame retardant material or dispose of other internal flexible safety tank. In the case of non metallic tanks, the use of a second extra tank made of rubber or resin is compulsory. The aim of this safety tank is to avoid the fuel leakage in case of any tank breakage. If an approved tank is used there are no more requirements.

Pressurizing the fuel tank is forbidden.

The fuel tank shall be approved as "passed" by the Organization before the test according to the considerations above.

7.3. Fuel pipes

Every fuel pipe from the tank to the carburetor or injection system shall be provided with sealed safety fittings. So that, in case of the separation of the tank from the motorcycle, then the racord shall be disconnected and not other joins of the pipe. Therefore, to open the fitting the necessary force shall be, maximum, 50% of the necessary force to separate any other join or breakage of the pipe material.

7.4. Filling System

The tap of the fuel tank shall be watertight and be provided with a safe closing system which avoid the possibility to come off in case of fall.

7.5. Fuel Type

The fuel supplier will be selected by the Organization.

The use of additives in the fuel is forbidden. No agents different from atmospheric air and the fuel provided by the Organization could go into the combustion chamber.

8. COOLING SYSTEM

8.1. Internal cooling of the Engine.

The modification of the internal cooling system of the engine is not allowed.

8.2. Radiator

The number, location, size and composition of the radiator are freely, if they fulfill with the dimensional requirements of the motorcycle's general dimensions.

8.3 Coolants liquids

The used coolants shall not be others than water and oil. The use of additives in these coolants is forbidden. In the dynamic tests the organization shall supply with common coolant to every team.

9. AIR ADMISSION SYSTEM

9.1. Admission pipes

The composition, dimensions and location of every air admission pipes are freely, if they fulfill with the dimensional requirements of the motorcycle's general dimensions.

9.2. Overpressure systems

The use of "turbo" systems to increase the gasses pressure in the admission is forbidden. Only the aerodynamic optimization from the vehicle in movement by means of air inlets is allowed.

10. EXHAUST SYSTEM

The exhaust system shall be a free choice whenever it fulfills the dimensional requirements of the motorcycle's general dimensions and the sound level regulation.

Variable length exhaust systems are not allowed.

The sound level shall not be higher than 115 db/A, measured in a static test.

Mobile elements in the exhaust system are not allowed.

11. ELECTRIC INSTALLATION

The composition of the electric installation shall be made by each team. The use of any complete commercial installation is forbidden.

11.1. Wiring

The cable type, design and the implementation of the group of wires are freely.

11.2. Connectors

The connector type is freely. It has to be considered that the electric installation of the motorcycle shall work under raining conditions.

11.3. Components

The use of commercial components is allowed. (Coils, batteries, regulators, connectors,...)

All the motorcycles shall have safety stop button on the left side of the handlebar. It shall be indicated in red in order to be found easily in emergency case. Such stop button shall cut off the electric power to any motorcycle component.

12. ELECTRONIC SYSTEMS

12.1. Engine control unit

A control unit for the electronic management shall be supplied by the Organization to the teams who may need it with its cost.

12.2. Control Panel

The control panel system is freely.

12.3. Other electronic system

The use of other electronic system such a semiautomatic gearbox, revolutions limiter, data systems, speed limiter, hydraulic system control, etc are freely allowed.

13. DATA ACQUISITION SYSTEM

The use of data acquisition systems related to engine parameters, motorcycle dynamic and rider driving is allowed.

Commercial systems or adaptation systems of other type of vehicles could be used.

Therefore, the use of all kind of sensors either self-manufactured or re-use of adaptations is allowed.

The used software could be commercial or self designed.

14. OTHER COMMERCIAL COMPONENTS

The use of commercial acquisition elements is allowed except from the ones forbidden in this regulation.

15. TECHNICAL VERIFICATION PROCEDURE

In order to control and check the vehicles, a verification sheet shall be made for each prototype. The technical officials shall fill this form out in the previous stage to the competition. Once all the points have been checked, the qualification of "pass" will be given to each vehicle in order to participate in the different tests. Then the Organization shall provide with a sticker which should be attached to the vehicles, as a proof of the prototype acceptance.

15.1. Chassis approval

The Organization has the right to check the chassis by means of a test before the competition. A load theoretical report of the chassis shall be shown in advance to the competition.

The test shall be done in a static bench. A progressive horizontal force shall be applied on the steering hube of 275 kg in the longitudinal direction (driving direction) to the motorcycle and vertical 200 kg in the rear support (sub-chassis). These forces shall be successively applied 5 consecutive times and it shall be verified than the measurement is

repetitive as for an error between measurements is lower than 10% and there is no breakage or failure either in the components or in the joins. The sketch of the bench and the supplementary components that every team shall provide to the organization for these tests, are shown in the website.

15.2. General dimensions verification

The general dimensions stipulated in this regulation shall be measured and supervised by the officials.

15.3. Masses verification

A checking and control center where the participants could check their vehicle shall be set up.

The Organization has the right to ask for masses examinations in any phase of the competition.

The examinations shall be done with the vehicle in running order with all its systems and components as well as the necessary liquids for its use.

At the beginning the measure system shall be calibrated.

They shall weigh the vehicle up, three times and the average of the three results shall be the assigned value.

The tolerance in the measure is 1 kg lower than the minimum.

15.4. Noise emissions verification

The prototype shall be tested in an open area where there are no obstacles within 10 m radius. The background noise shall not be more than 90 dB/A within 10 m radius area. The measured shall be done 50 cm from the extreme of the exhaust pipe and with an angle of 45°. The limit shall be 115dB/A. The test shall be done at a revolutions range of 7000 min⁻¹

15.5. Checking of the safety regulation fulfillment

A complete examination of every point in reference to safety points shown in this regulation shall be done. The safety of the participant is considered the most important issue it is above all technical criteria of vehicle performance or vehicle construction. For that, every prototype shall fulfill the safety requirements in any phase of the competition. Specially after having an accident, the vehicle shall be checked in order to guarantee its safety.

16. MOTORCYCLE IDENTIFICATION

16.1. Numbers and backgrounds

The minimum dimensions of the identifications level shall be 140 mm high and 30 mm wide.

The minimum dimensions of the frame shall be 275 mm wide and 200 mm high.

The numbers colour shall be black on white background.

At least 25 mm around the numbers shall be free of any drawing.

16.2. Front Identification

The motorcycle shall be identified with a front number which makes possible to see it clearly during the competition.

16.3. Lateral numbers

In the same way the motorcycle shall be identified from the side view, with the assigned number.

16.4. Chassis number of identification in the motorcycle

Every prototype shall have the frame number to identify it in any situation.

16.5. University Name

All prototypes must have the University name or the initials. These letters must not be lower than 50 mm high and 30 mm wide.

16.6. Area on the chassis for the technical verification sticker

There shall be a place on the chassis of minimum 70 mm wide and 40 mm high to fix the verification sticker of the Organization. If it is not directly on the chassis, a plate shall be fitted out to stick it.

16.7. Area for the support and transponder placement

The motorcycle must have a place in order to fit the transponder and its bracket. This place shall be minimum height of 120 mm, width of 120 mm and length of 60 mm.

The place shall be located on the right side of the vehicle and in a protected position in case of falls.

There shall not be any obstacle in the line between the transponder and the receptor in the measurement area. The Organization shall propound the dimension specifications of the transponder as well as the type of bracket.

The team has the responsibility of the correct attach of the transponder.

17. FIGURES

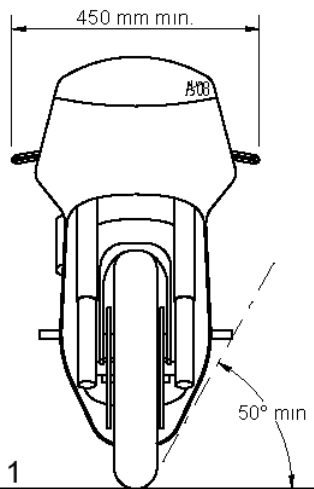


Figure 1

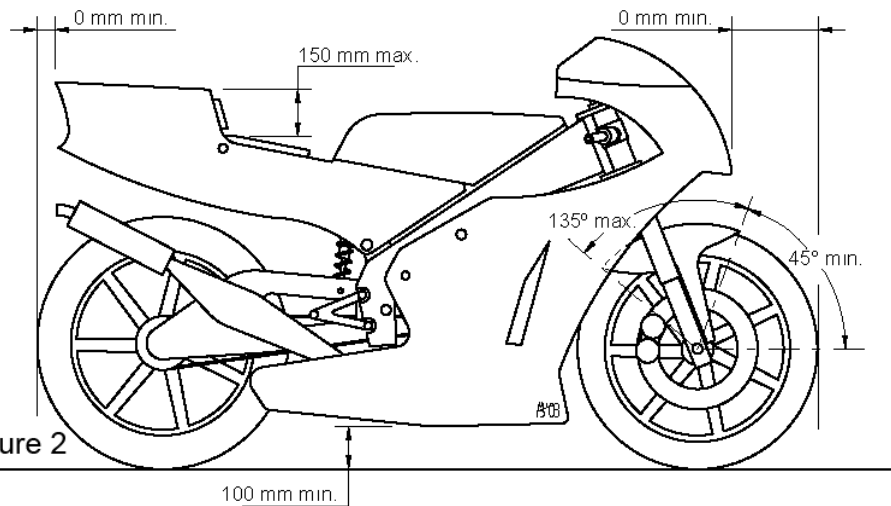


Figure 2

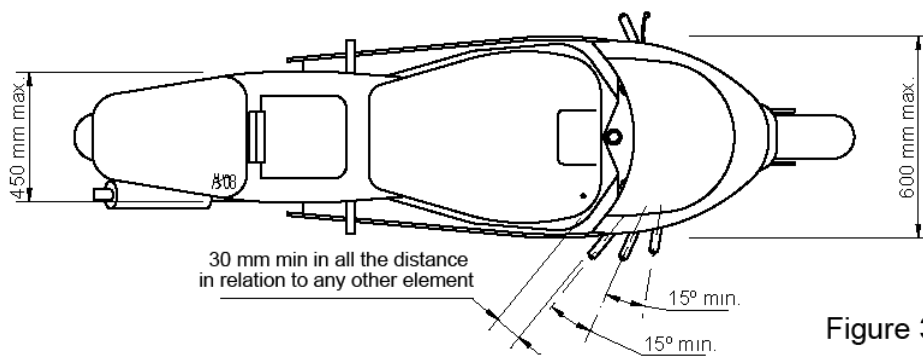


Figure 3