Moto3 Class, 2012

Technical Regulations

24 November 2011

Technical Regulations:

1. Engine

Engine Specification

1.1 4-stroke reciprocating piston engines only.

1.2 Engine capacity: maximum 250cc.

1.3 Single cylinder only.

1.4 Maximum bore size: 81mm. Oval pistons are not permitted (refer to Art. 2.3.1 of the FIM Grand Prix Regulations).

1.5 Engines must be normally aspirated. No turbo-charging, no super-charging.

1.6 Crankshaft speed limited to maximum: 14,000 rpm.*

1.7 Maximum of 1 ignition driver.*

1.8 Pneumatic and/or hydraulic valve systems are not permitted.

1.9 Valve timing system drive must be by one chain. An intermediate drive gear which rotates on only one axle or rotation centre is allowed in the system (refer to ANNEX1 for some examples of permitted systems).

1.10 Variable valve timing and/or variable valve lift systems are not permitted.

Engine Supply

1.11 The engine is defined as the complete engine including intake system (throttle body, injectors), and one complete transmission. ‘Complete engine’ here means ready to undergo the Initial Mapping procedure (refer to Art. 1.16), therefore including necessary sensors and electrical items to run for calibration (eg. spark plugs, pickups, idle bypass motor [if used], etc.).

1.12 The maximum price of the engine must not exceed 12,000 Euros. No optional parts or service contracts may be used to circumvent this price limit.

a) If the engine is sold as a base unit plus a “tuning kit” then the total price of original engine & kit must not be more than 12,000 Euros. The base unit manufacturer is considered as the engine manufacturer.

b) In order to ensure this price limit, any Team competing in the race will be granted the right to buy the engine used in the race from another Team, at the end of the race for a fixed price of 12,000 Euros (*details TBA*).

1.13 Each engine manufacturer must undertake to supply sufficient engines and spare parts to supply 15 riders per season, if requested, and is responsible that the same amount of tuning kits (if any, see 1.12) are available, regardless where the tuning kit comes from.

a) For a manufacturer entering the Moto3 championship for the first time, the minimum engine supply requirement will be 8 riders during that first season only.

b) The minimum supply number may be comprised of complete motorcycles or separate engines. Manufacturers supplying complete motorcycles must allow their customers to also purchase spare complete engines and parts as necessary to complete the season.

c) Engine supply requests which comply with the manufacturer’s requirements for payment and terms, will be noted in chronological order to determine the first officially accepted requests up to the minimum requirement.

d) This minimum supply applies to each separate engine specification (according to Art. 1.16) offered by the manufacturer.

<u>Engine Parts</u>

1.14 Each engine manufacturer must submit a price and lead-time list of all the parts of the engine as defined in 1.11 and 1.12 (which are considered the “stock” parts) for the season for approval by the Organiser and may not charge more than these published prices. Approval is based on the prices and lead-times being in line with current market norms for these parts and technologies.

a) In case the engine is sold as a base unit plus a tuning kit (see 1.12.a) then all the parts of the tuning kit must be included in the above mentioned list, and the parts they replace (if any) will not be listed. Therefore this “stock parts” list will be comprised of either the standard part or any kit part which replaces the standard part. No different options for the same parts are allowed in the list, except for the transmission parts (see 4.2.).

b) This list must include the price and lead-time of one complete engine, and also a sum total of all parts required to build one complete engine.

c) The following may also be included in the price list:

i. A complete engine minus throttle body and/or transmission parts.
ii. Engine maintenance procedures (ie. parts & labour), provided parts and labour charges are clearly itemised.

d) Lead-time of complete engines is maximum of 4 calendar months regardless of quantity. Lead-time starts from the official order receipt [see 1.13], or the completion date of the engine entry procedure [see1.16], whichever is the later.

d) Updates to the list are permitted at any time, always subject to approval by the Organiser.

e) Engine parts not included in the stock parts list (so-called “aftermarket parts”) from third-party suppliers can be used under the following conditions:

- The engine manufacturer is not involved in any way in the design, production and/or sale of such parts.
- The parts are available to at least the same number of riders as in 1.13.
- A price and lead-times list of such parts is submitted to the Organiser for publishing, where the lead-times and the prices are the same as the stock parts. An exception is made for a Slipper Clutch (back-torque limiter clutch) assembly that can be priced as much as double the cost of the stock assembly, if the original is of the conventional “non-slipper” type.
- The stock crankcase, cylinder, and cylinder head may not be replaced by aftermarket items.
- Updates to the published parts list are permitted at any time, always subject to approval by the Organiser.
- Any part that can be obtained by simple machining of a stock part (e.g. polishing/porting/lightening), and generic ancillaries not specialised to the specific engine design (such as bolts, fasteners, filters) are not considered as aftermarket parts, and so no conditions apply.

1.15 In the event of engine updates or upgraded parts being developed, these must be made available to all customers at the same time, and respecting the price limits described in Art. 1.14.

<u>Initial Mapping and Set Up Procedure</u>

1.16 The official ECU start-up procedure is to ensure manufacturers will be supplied with the official ECU with an initial map to suit their engine in time for the first official Moto3 tests. The initial map is intended for safe and trouble-free engine function, and not maximum performance. Performance mapping is the responsibility of the engine manufacturer or the Team.

For an engine to be eligible for the Moto3 class, one of the following two options for the ECU start-up procedure must be followed:

1. Manufacturers will be guaranteed supply of the official ECU with initial maps to suit their engine in time for the first official Moto3 tests provided that, by October 15th of the preceeding year:

a) the Moto3 Engine Manufacturer Entry Form is completed and submitted to the organisers (see ANNEX 3),

b) two complete and working engines (including throttle body, idle bypass actuator, transmission, sensors, spark plugs, complete wiring harness with ECU connector) and one complete airbox, cooling system, and exhaust are delivered to the organisers for mapping tests (engines will be returned in January of the following year at the latest),

c) a deposit of 10,000 Euros is lodged with the organisers.

or

2. Manufacturers can make an agreement with the ECU supplier to carry out their own initial mapping, with the following conditions:

a) the Moto3 Engine Manufacturer Entry Form is completed and submitted to the organisers (see ANNEX 3).

b) the ECU will be delivered to the manufacturer in the first instance only by the ECU supplier, and the ECU supplier representative must be present to initiate setup of the mapping process.

c) the organisers and the ECU supplier provide no guarantee of any completion date for the mapping process.

d) there is no set deadline for this second option, but option 1 takes precedence and requests for option 2 made before Oct. 15th, 2011 will be processed at a time determined by the ECU supplier.

2. Inlet, Fuel System & Lubricant

2.1 Variable-length inlet tract systems are not permitted.

2.2 Only one throttle control valve per throttle body is permitted to control the power demand by the rider, which must be controlled exclusively by mechanical means (eg. cable) operated by the rider only. No other powered moving devices (except injectors and the idle control air bypass) are permitted in the inlet tract before the engine intake valve. No interruption of the mechanical connection between the rider's input and the throttle is allowed.

Idle speed (including engine braking) adjustment by means of an air bypass system, controlled by the ECU is allowed (see also 5.4).* The maximum size of such air bypass is 12mm equivalent diameter, control systems may include a butterfly-type control valve.

2.3 Fuel injectors must be located upstream of the engine intake valves.

2.4 Maximum of 2 fuel injectors per throttle body and 2 independent fuel injector drivers.*

2.5 Relative fuel pressure must not exceed 5.0 bar.

2.6 Other than engine sump breather gases, only air or air/fuel mixture is permitted in the inlet tract and combustion chamber.

2.7 Only fuel from the official supplier may be used, which must comply with the FIM "Moto3" specification *(TBA).*

2.8 Only engine lubricating oil from the official supplier may be used *(specifications TBA)*.

3. Exhaust system

3.1 Variable length exhaust systems are not permitted.

3.2 No moving parts (e.g. valves, baffles) are allowed in the exhaust system.

3.3 Noise tests will be according to Article 2.14 of the FIM Grand Prix Regulations. Test rpm: 5,500. Maximum permitted noise level: 115 dB/A.

4. Transmission

4.1 A maximum of 6 gearbox speeds is permitted.

4.2 A maximum of 2 possible gear ratios for each gearbox speed, and 2 possible ratios for the primary drive gear is permitted. Teams will be required to declare the two gearbox ratios chosen for each gear at the beginning of the season, and only these ratios may be used during the entire season.
The alternate gearbox ratios and primary gears must have the same list price and lead-times as the original supplied gearbox (see Art. 1.11 to 1.15).

4.3 Gearbox systems must be of the conventional type. That is: constant-mesh with engagement dogs as an integral part of the gear, actuated by shift forks and shift cam or drum, with only one set of gears engaging at one time. So-called

"seamless shift" transmissions (also known as Automated Manual Transmission, Instantaneous Gearchange System) are not permitted.

4.4 Electro-mechanical or electro-hydraulic clutch actuating systems are not permitted.

5. Ignition, Electronics & Data-Logging

5.1 a) Only the ignition/fuel injection control units (ECU)** supplied by the series Organiser are allowed**. This ECU must remain unmodified in hardware and software, as delivered by the Organiser.

b) During Moto3 race events only the official "Race" version of ECU software supplied by the ECU manufacturer may be used to write to (flash) the ECU. The only permitted changes are the setting (tuning) options included in this software.

c) The Technical Director may require the team to change the ECU on any machine for another standard one at any time.

5.2 This official ECU will include an engine rpm limiter.

5.3 This official ECU will include an inboard data logger, and no other additional data loggers may be used.
The datalogger download connector must be of a standard type (see Art. 5.5 below).
Data analysis software is not controlled.

5.4 Recommended engine management and electronics features:
- dashboard: Dell'Orto **
- idle speed control stepper motor (ref. 2.2): Dell'Orto **
- UEGO (O_2) sensor: Bosch LSU 4.9,
- Knock sensor: Bosch or NGK piezo-ceramic
- two timing options:
    1. only crankshaft pickup: the crankshaft timing pattern being the "n-2" type, where "n" can be from 12 to 30 (for optimum performance it is advised that the first tooth "after" the missing ones is corresponding to the top dead centre), or
    2. crankshaft and camshaft pickups: the crankshaft timing wheel having from 12 to 30 teeth and the camshaft timing pattern being 1 single tooth.

The above mentioned features are guaranteed to work properly, different choices and the relevant development costs and timings must be agreed separately with the ECU manufacturer.

5.5 Compulsory engine management features:

- ignition must be of the inductive type, the maximum ignition coil current must be less than 30A,
- the throttle position sensor voltage output must be 0-5V,
- the crankshaft pickup sensor must be of the inductive type, voltage at 300rpm must be at least 0,8V and maximum voltage must be less than 100V,
- the camshaft pickup sensor, if any (see timing option no. 2 in 5.4), must be of the Hall-effect type, “0” voltage must be less than 0,5V, “1” voltage must be 4,5±0,5V,
- a battery is compulsory; proper engine management function is ensured only when the battery voltage is in the 8÷18V range.
- the datalogger download connector on the harness must be of the Lemo PEN.1F.308.XLM type or one which is completely compatible with it **, connected as detailed in the online Dell’Orto documents**.

NB. * all the parameters identified by this symbol are set/controlled via the above mentioned ECU.

** for all items identified by this symbol, details are available at the website: http://www.dellorto-pe.com/

6. Chassis

6.1 Chassis must be a prototype, the design and construction of which is free within the constraints of the FIM Grand Prix Technical Regulations.

6.2 Minimum total weight of Motorcycle + Rider: 148kg

6.3 Brake discs must be made from ferrous materials.

6.4 Suspension systems must be of a conventional, mechanical type. Active and semi-active suspension systems and/or electronic control of any aspect of the suspension and ride height is not permitted. Springing must be by means of coil springs made of ferrous materials.

6.5 Referring to Article 2.7.7.9 of the FIM Grand Prix Regulations, the lower fairing minimum capacity to retain spilled engine fluids is 2.5 litres for Moto3.

7. Wheels & Tyres

7.1 The materials permitted for wheel construction are Magnesium and Aluminium alloys.

7.2 The only permitted wheel rim sizes are: Front, 2.50” x 17”
Rear, 3.50” x 17”

7.3 The number and specification of tyres allocated to each rider per event will be controlled.

7.4 Only tyres from the official supplier may be used.

8. Materials & Construction

8.1 Construction materials must comply with Article 2.7.10 of the FIM Grand Prix Regulations.

8.2 Camshafts, crankshafts, piston pins must be made from ferrous materials. Inserts of a different material are allowed in the crankshaft for the sole purpose of balancing.

8.3 Engine crankcases, cylinder blocks and cylinder heads must be made from cast aluminium alloys.

8.4 Pistons must be made from an aluminium alloy.

8.5 Connecting rods, valves and valve springs must be made from either ferrous or Titanium-based alloys.

8.6 Definitions:
"X-based alloy" or "X materials" means the element X (e.g. Fe, for ferrous or iron-based alloy) must be the most abundant element in the alloy, on a % w/w basis.

9. General

9.1 Number of machines: the team can present only one motorcycle per rider for technical control. Replacement motorcycles may only be used subject to Article 1.15.3 of the FIM Grand Prix Regulations

9.2 Number of engines: a maximum of 8 engines per rider may be used during all Grand Prix race events comprising the season. A rebuilt engine will be counted as a new engine (see Art. 9.4).

9.3 Teams will be required to register engines at Technical Control on the day before the first practice at each event. Such registered engines will be sealed and seals may not be removed except under supervision of the Technical Director and staff. Only sealed and registered engines may be used on track at Grand Prix race events. An engine presented for Technical Control or used on track without intact security seals will be counted as a new engine.

9.4 1) Engine seals: The engines will be sealed by means of wiring and identification tabs and/or other systems, so that major components (including but not limited to:

crankshaft and it's bearings, conrod and it's bearings, piston, piston rings and piston pin, valves and their springs, camshafts) can not be replaced. Sealing positions must be approved by the Technical Director so that:

a) the timing system is accessible for the sole purpose of adjusting the valve clearance (e.g. the cylinder head cover/cam cover can be removed from the cylinder head), but valve shims must be the only parts that can be replaced (or valve clearance adjusters can be reached) without breaking the security seals. If the engine design does not allow such adjustments without removing security seals, then valve shims cannot be replaced (e.g. it must not be possible to remove camshafts and rocker arms, if any, without breaking the seals).

b) the cylinder head and the cylinder (if any) cannot be removed from the engine (e.g. the cylinder head is wired to the cylinder and the cylinder is wired to the engine crankcase),

c) the crankcase cannot be opened (e.g. the crankcase halves are wired together).

2) All parts that are accessible without removing the security seals may be replaced. Breaking or removing the security seals or wiring without supervision by the Technical Director or staff will be deemed to be "engine rebuilding" and engines with broken, tampered with or missing security seals will be treated as a new engine in the allocation.

3) As an exception to the above, it will be possible for the 2012 season to break the seals if the following conditions apply:

a) under supervision of the Technical Director and staff *(details TBA)*,

b) with the sole purpose of:

I. changing the gearbox ratios (see Art. 4.2), on an engine design where seals need to be broken for internal gearbox access.

II. replacing the timing chain, on an engine design where seals need to be broken to access the timing chain.

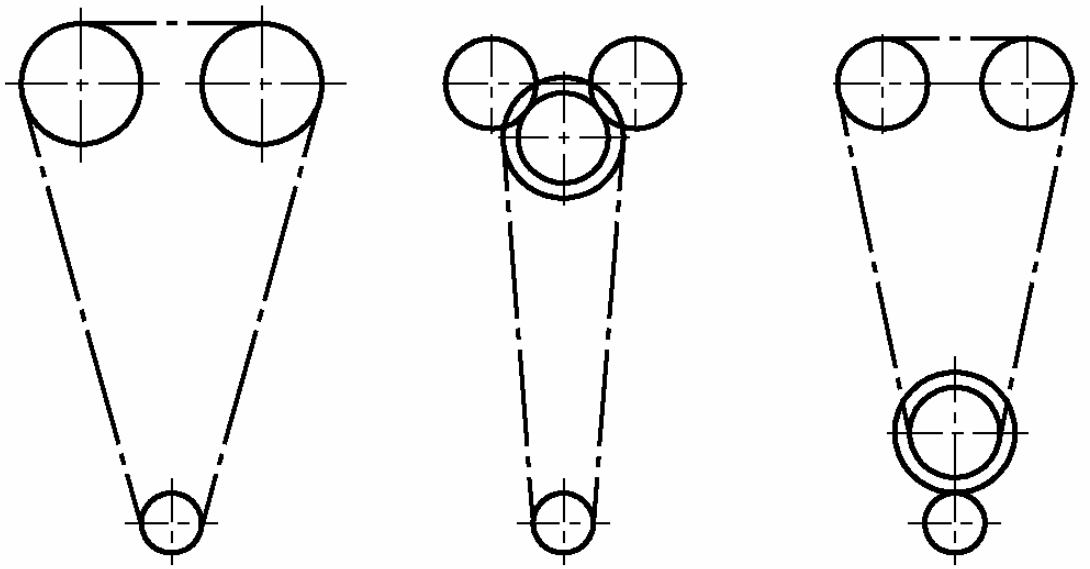
c) operations b) I and b) II may be performed once per race event per rider at a time and place determined by the Technical Director *(details TBA)*, i.e. the operations mentioned in b) I. and b) II. must be performed at the same time, if both are required.

d) at the sole discretion of the Technical Director the supervised work periods may be used to inspect, clean and repair damage to sealed engine parts caused solely by a crash. The only parts that may be replaced during such supervised repairs are non-moving items (eg. covers, cases and related seals), exhibiting crash damage as determined by the Technical Director.

9.5 Apart from the above regulations, all other construction criteria, dimensions and specifications are as per the FIM Grand Prix Regulations.

ANNEX 1

Examples of permitted valve timing systems with a single chain as the principal drive mechanism (NB. general concept illustrations only, not an exhaustive list. Other layouts may be possible provided they comply with Art. 1.10)



a) simple chain drive

b) chain drive + upper gear

c) chain drive + lower gear

FÉDÉRATION INTERNATIONALE DE MOTOCYCLISME

MOTO3 ENGINE MANUFACTURER ENTRY FORM

RETURN TO & FOR MORE INFORMATION

CORRADO CECCHINELLI
motogpdot@1984cc.it

MIKE WEBB
mike@mikewebb.biz

The Manufacturer	
Manufacturer's name:	
Manufacturer's address (Country):	
Manufacturer's address (city):	
Manufacturer's address (road…):	
Manufacturer's address (ZIP code):	
Manufacturer's legal representative (last name, name):	
Manufacturer's legal representative (e-mail):	
Manufacturer's legal representative (telephone):	
Manufacturer's representative for initial mapping (last name, name):	
Manufacturer's representative for initial mapping (e-mail):	
Manufacturer's representative for initial mapping (telephone):	

The engine	
Engine name/code:	
Engine bore (mm):	
Engine stroke (mm):	
Crankshaft inductive pickup sensor (V at 300rpm):	
Crankshaft inductive pickup sensor (V max):	
Crankshaft timing pattern (teeth):	
Camshaft Hall-effect pickup sensor (V min):	
Camshaft Hall-effect pickup sensor (V max):	
Camshaft timing pattern (teeth):	
Fuel injectors (1 or 2):	
Fuel injectors (type, make, code):	
Throttle Position Sensor (contact/contactless):	
Throttle Position Sensor (single/double output):	
Throttle bypass motor (make, code):	
Throttle bypass motor (stepper/DC):	
Ignition coil maximum current:	
Spark plug(s) (make, code):	
Gear Position sensor type & details (eg. 0-5V linear, or other type)	

ANNEX:
 Engine overall drawings (side and top view, sufficient to make a dyno mount) with:
Engine mounting points (with threads dimensions if not through-holes).
Power output position (side and top view pinion position).
Overall engine dimensions, including separate drawings for identification of cylinder head, cylinder, crankcases showing serial number locations.
 Spare parts price list and lead-time list (see 1.14 in Moto3 regulations press release). NB. The list must include one complete engine price and lead-time, and a sum total price of all separate parts required to build one complete engine.
In addition to the price of a complete engine, the manufacturer may also offer a price for a complete engine minus throttle body and/or transmission.
"Spare parts" may include rebuild prices (ie. parts & labour) for maintenance procedures and mapping or setting updates, provided parts and labour charges are clearly itemised.
Prices may be updated at any time, always subject to approval by the Organiser.
 Throttle bypass motor complete datasheet (if not as recommended in 5.4 of Moto3 regulations press release).
 Idle by-pass valve, manufacturer technical specification including admissible voltage [V], nominal power [W], admissible driving speed, recommended driving speed, pin-out, actuation schemes.
 Ignition Coil, manufacturer technical specification including dwell time [ms].
 Fuel Injectors, manufacturer technical specification including dead time [ms].
 Temperature & Pressure Sensors, manufacturer technical specification including characteristic curves.

The Engine Manufacturer undertakes that:
 Any change in the above mentioned technical characteristics may be deemed by the Organisers to require a new ECU start-up procedure, as prescribed in 1.16 of Moto3 regulations press release.
 By submitting this form the Engine Manufacturer commits to supply engines to at least 15 riders, if so requested, at a maximum price of 12'000€ each (see 1.12 and 1.13).
 The Manufacturer's representative for initial mapping must attend the initial mapping (estimated 1 week, to be agreed with the ECU supplier) if it is performed according to 1.16.1.

NB. Documentation for engine control strategies is available from the ECU supplier, upon completion of a Non Disclosure Agreement. Refer to www.dellorto-pe.com or contact moto3@dellorto.it

Signed by the manufaturer's legal representative in _____
on ____/____/____

_____
The Engine Manufacturer's legal representative (see above)

_____
Received and accepted by the Organisers on ____/____/____

_____
MotoGP Technical Director