



INVITATION TO TENDER FOR SOLE SUPPLY CONTRACT

TENDER SUMMARY AND ADDITIONAL TENDER REQUIREMENTS

The FIA's objective is to select an exclusive supplier of fuel flow meters whose task it will be to ensure the production and delivery of the fuel flow meters in the 2016 and 2017 FIA Formula One World Championship.

Interested parties are hereby invited to tender to become the exclusive supplier of fuel flow meters in the 2016 and 2017 seasons of the above mentioned Championship.

The selected tenderer will be invited to enter into a contract with the FIA that will establish the terms of the tenderer's appointment as exclusive supplier.

Bids must be submitted in accordance with the FIA's "Invitation to tender for sole supply contract - tendering instructions" available on the FIA's website: www.FIA.com, **apart from Article 1.1.8 which will not apply to this specific procedure.**

The FIA reserves the right to make amendments to this invitation to tender at any time and to issue a new invitation to tender.

Publication of invitation to tender:

1 October 2015

Tender submission date:

16 November 2015

Opening date:

17 November 2015

Notification of decision:

2 December 2015

ADDITIONAL REQUIREMENTS

1. PRICE AND LIFETIME OF THE PRODUCT

The purchase price of the fuel flow meter shall not exceed 7500 euros with a warranty of 100 hours functionality. The cost for functionality of 100 extra hours shall not exceed 2500 euros.

The lifetime of the fuel flow meter shall, in any circumstances, not be less than 400 hours.

2. NON-DISCLOSURE AGREEMENT

The selected tenderer will be required to sign a Non-Disclosure Agreement with the FIA which will be appended to the single supply contract.

DRAFT CONTRACT FOR SUPPLYING FUEL FLOW METERS
IN THE 2016 AND 2017 FIA FORMULA ONE WORLD CHAMPIONSHIP

BETWEEN

The FEDERATION INTERNATIONALE DE L'AUTOMOBILE (FIA)

Chemin de Blandonnet, 2
CH 1215 Geneva 15 - Switzerland

hereinafter referred to as the "**FIA**"

ON THE ONE HAND,

AND

[•]

hereinafter referred to as the "**PROVIDER**"

ON THE OTHER HAND.

PART 1 - GENERAL CONDITIONS

RECITALS

- (A) The FIA's authority in relation to international motor sport has been recognised since 1904 when national automobile clubs came together to establish the FIA to provide, amongst other things, an international forum to regulate motor sport internationally.
- (B) The FIA is the sole body governing international motor sport and is recognised by its members as the sole authority having the sporting power with the right to organise international FIA championships, including the CHAMPIONSHIP.
- (C) The FIA has an absolute obligation conferred on it by its members to safeguard its authority over all safety, sporting, technical and disciplinary matters relating to the CHAMPIONSHIP, as well as traditional values.
- (D) The FIA will continue the publication annually of the GOVERNING RULES.
- (E) The FIA has determined that the interests of the CHAMPIONSHIP require that a single supplier of the PRODUCT should be appointed for a limited term.
- (F) It is intended that the FIA and the PROVIDER will enter into this CONTRACT pursuant to which the PROVIDER will be appointed as the sole supplier of PRODUCT to the CHAMPIONSHIP for the term set out herein.

1. APPOINTMENT AND SUPPLY

- 1.1 The FIA hereby appoints the PROVIDER to be the exclusive supplier of the PRODUCT to the COMPETITORS for the CHAMPIONSHIP and the PROVIDER hereby accepts this appointment and agrees to supply the PRODUCT to the COMPETITORS for the CHAMPIONSHIP in accordance with the terms of this CONTRACT and the terms of the SUPPLY AGREEMENTS.
- 1.2 Following from its appointment, the PROVIDER shall enter into a SUPPLY AGREEMENT with each COMPETITOR setting out the terms upon which the PRODUCT shall be supplied.
- 1.3 The PRODUCT that is supplied by the PROVIDER to the COMPETITORS shall be compliant with the TECHNICAL REGULATIONS and the TECHNICAL SPECIFICATIONS.

2. RELATIONS BETWEEN THE PROVIDER AND THE COMPETITORS

- 2.1 The PROVIDER shall treat all COMPETITORS in accordance with the PRINCIPLES OF SPORTING EQUALITY.
- 2.2 The PROVIDER shall supply the PRODUCT to all COMPETITORS on equivalent terms. It shall enter into a standard SUPPLY AGREEMENT with each COMPETITOR.
- 2.3 All SUPPLY AGREEMENTS shall be fully compliant with the PRINCIPLES OF SPORTING EQUALITY, the CONTRACT, the SPORTING REGULATIONS and TECHNICAL REGULATIONS.

- 2.4 Separate from the SUPPLY AGREEMENT, the PROVIDER shall be free to enter into separate agreements with COMPETITORS, containing such commercial terms, including, for the avoidance of doubt, in relation to advertising, publicity and other promotional arrangements, as those parties may agree. However, any such arrangements must not compromise the PRINCIPLES OF SPORTING EQUALITY, or be contrary to the SUPPLY AGREEMENT entered into with all COMPETITORS. In particular, the conclusion of any supplemental arrangement must in no way confer any sporting advantage upon one COMPETITOR over another.
- 2.5 Each SUPPLY AGREEMENT requiring a COMPETITOR to purchase the PRODUCT for use at more than one COMPETITION shall include a clause permitting the COMPETITOR and/or PROVIDER to terminate the SUPPLY AGREEMENT without a penalty of any kind in the event of expiry or earlier termination of the CONTRACT.
- 2.6 If requested by the FIA, the PROVIDER shall supply a copy of each SUPPLY AGREEMENT in order to demonstrate that the PRINCIPLES OF SPORTING EQUALITY are maintained. With respect to the FIA, the PROVIDER hereby waives and confirms that it shall not assert or seek to rely on any confidentiality provision in any SUPPLY AGREEMENT or other agreement relevant to the supply of the PRODUCT to prevent the FIA from reviewing relevant agreements or carrying out its regulatory functions (including ensuring that the PRINCIPLES OF SPORTING EQUALITY are maintained).
- 2.7 The FIA may request amendments to a SUPPLY AGREEMENT if it considers that the SUPPLY AGREEMENT is not consistent or compatible with, or is otherwise contrary to, the PRINCIPLES OF SPORTING EQUALITY. For the avoidance of doubt, the PROVIDER's obligation to abide by the PRINCIPLES OF SPORTING EQUALITY shall not be limited or otherwise affected by the FIA's review of a SUPPLY AGREEMENT and/or a request for an amendment to be made.
- 2.8 In the event of uncertainty regarding whether any action taken or proposed to be taken by the PROVIDER may breach the PRINCIPLES OF SPORTING EQUALITY, the PROVIDER shall request guidance from the FIA, which shall make a determination in this regard. Where such a determination is made by the FIA, the PROVIDER's actions in complying with that determination shall be deemed to be in compliance with the PROVIDER's obligation in GENERAL CONDITION 2.1 to treat all COMPETITORS in accordance with the PRINCIPLES OF SPORTING EQUALITY.

3. LIABILITY

- 3.1 Without prejudice to the FIA's other rights, the PROVIDER shall indemnify and hold harmless the FIA from and against all reasonably foreseeable losses incurred by the FIA as a direct result of the PROVIDER's:
- (a) failure to supply the PRODUCT of the requisite quantity;
 - (b) failure to supply the PRODUCT of the requisite quality;
 - (c) negligence in the supply of the PRODUCT;
 - (d) any other failure in the supply of the PRODUCT.

- 3.2 The PROVIDER represents and warrants that it is in a position to meet any liability that may arise under clause 3.1 of this CONTRACT and hereby covenants to maintain such position for the period of time during which the PROVIDER may be liable.

4. WARRANTIES

- 4.1 The PROVIDER represents and warrants that it has full power and authority to enter into and fully perform its obligations under the CONTRACT and the provisions of the CONTRACT, when executed, will constitute valid and binding obligations on the PROVIDER in accordance with its terms. The PROVIDER also represents and warrants that it has full power and authority to enter into and fully perform its obligations under the SUPPLY AGREEMENTS when executed.

- 4.2 The FIA represents and warrants that it has full power and authority to enter into and fully perform its obligations under the CONTRACT and the provisions of the CONTRACT, when executed, will constitute valid and binding obligations on the FIA in accordance with its terms.

5. TERMINATION

- 5.1 Notwithstanding any other provision hereof, either party may terminate the CONTRACT with immediate effect by written notice to the other if any of the following events occur:

- (a) the other party has committed a material breach of the CONTRACT which is not capable of remedy or, if remediable, has not remedied it within 30 days of the non-breaching party's written notice requiring the default to be remedied (for the avoidance of doubt, a breach by the PROVIDER of any of GENERAL CONDITIONS 1.2, 1.3, 2, 3 and 4.1 and any of SPECIAL CONDITIONS is acknowledged by the parties to be a material breach);
- (b) steps (including any steps analogous to those following) have been taken to wind up the other party or to place the other party into administration or to have a receiver appointed over any of its assets, other than as part of a scheme of solvent reconstruction or amalgamation; or
- (c) the other party shall cease or threaten to cease carrying on business or the other party shall make any composition or arrangement with its creditors or become subject to any other insolvency process or proceeding (other than as part of a scheme of solvent reconstruction or amalgamation) or have all or any of its assets or undertakings seized by a government or governmental agency or authority (including any acts analogous to the above).

6. GOVERNING RULES

- 6.1 The GOVERNING RULES constitute the legal, administrative and technical framework of the CHAMPIONSHIP and the conditions set forth therein shall have binding force and prevail among the parties to the CONTRACT.

- 6.2 The CONTRACT shall in principle be interpreted in a manner that gives effect to the provisions of the GOVERNING RULES, the intention of the parties being to construe the provisions of the CONTRACT in the context of the more general framework of the GOVERNING RULES.

6.3 The PROVIDER acknowledges that the TECHNICAL SPECIFICATIONS and GOVERNING RULES are subject to amendment from time to time. The PROVIDER will be responsible (at its own cost) for all research and development associated with the manufacture of the PRODUCT, including the making of any changes to the PRODUCT to be supplied pursuant to the CONTRACT that may be necessitated by any amendment to the TECHNICAL SPECIFICATIONS or the GOVERNING RULES.

6.4 The PROVIDER acknowledges that the FIA may take decisions regarding the supply of the PRODUCT, this CONTRACT and any obligations accruing from the GOVERNING RULES through whatever structure it deems appropriate, including through its disciplinary structures. The PROVIDER shall not challenge the competence of an FIA disciplinary body acting in accordance with the GOVERNING RULES.

7. GOVERNING LAW AND LANGUAGE

7.1 The language that shall prevail for the interpretation of the CONTRACT shall be English and the CONTRACT and all documents connected with the CONTRACT shall be written in English. In the event of any conflict between the language of the CONTRACT and any translation thereof, the language of the CONTRACT shall prevail. In the event of any conflict between the language of any document connected with the CONTRACT and any translation thereof, the language of the document connected with the CONTRACT shall prevail.

7.2 The governing law of the CONTRACT shall be French law.

7.3 The Tribunal de Grande Instance de Paris, France, shall have sole jurisdiction to settle any dispute that may arise between the FIA and the PROVIDER in connection with the CONTRACT, subject at all times to the provisions of Article 6.4 above.

7.4 Without any prejudice to Article 7.3 above, the PROVIDER undertakes to strictly respect the Statutes and Code of Ethics of the FIA as well as the GOVERNING RULES. The PROVIDER hereby agrees to be subject to the internal judicial and disciplinary bodies of the FIA.

8. GENERAL

8.1 Nothing in the CONTRACT guarantees or shall be construed as guaranteeing the solvency of a COMPETITOR. The FIA is not responsible for ensuring that the COMPETITORS satisfy the terms of the SUPPLY AGREEMENTS and the FIA shall not be liable for a failure by any COMPETITOR to satisfy the terms of a SUPPLY AGREEMENT.

8.2 No delay or omission or failure to exercise any right or remedy provided herein shall be deemed to be a waiver thereof.

8.3 The CONTRACT shall be binding on and enure to the benefit of the parties and their respective successors and permitted assigns. The PROVIDER shall not be entitled to assign or sub-contract its rights or obligations under the CONTRACT in whole or in part without the prior written consent of the FIA.

8.4 Any notice to be given under the CONTRACT shall be given in writing delivered to the other party by any one or more of the following methods:

- (a) personal delivery to one of its corporate officers, in which case notice shall be treated as having been given at the time of such personal delivery;
- (b) first class registered post or courier delivery service (such as DHL or UPS) to the address mentioned above (or such other address as may be notified to the other party in writing from time to time), in which case notice shall be treated as having been given on the date of actual receipt at that address (or on the next local business day if delivered on a local non-business day or after 4.00 p.m. local time on a local business day), which shall rebuttably be presumed to be the second local business day after posting; or
- (c) facsimile to the numbers below (or such other facsimile number as may be notified to the other party in writing from time to time), in which case notice shall be treated as having been received at the time of actual receipt (or on the next local business day if delivered on a local non-business day or after 4.00 p.m. local time on a local business day) and rebuttably be presumed to have been duly received at the time indicated on the automatic acknowledgement transmitted by the recipient fax machine:

PROVIDER: [•]

FIA: [•]

8.5 Any variations of the CONTRACT shall be ineffective unless agreed in writing and signed by the parties.

8.6 If any term, provision or condition of the CONTRACT is held by a court of competent jurisdiction to be invalid, void or unenforceable such invalidity, voidness or unenforceability shall not invalidate the remainder of the CONTRACT, all of which shall remain in full force and effect.

8.7 The CONTRACT may be executed in any number of counterparts (whether original or facsimile counterparts) and upon due execution of all such counterparts by all parties, each counterpart shall be deemed to be an original hereof.

8.8 GENERAL CONDITIONS 3, 7 and 8 shall survive expiry or termination of the CONTRACT for any reason (but shall terminate at the time expressly provided in the relevant GENERAL CONDITION, if any).

PART 2 - SPECIAL CONDITIONS

1. SUPPLY OF THE PRODUCT

- 1.1 The PROVIDER shall supply such quantity of the PRODUCT as is required for each COMPETITOR at each:
- (a) COMPETITION (see **Appendix I**);
 - (b) OFFICIAL TESTING;
 - (c) private testing;
- 1.2 The PRODUCT supplied by the PROVIDER shall be of a strictly uniform quality throughout the duration of the CHAMPIONSHIP and strictly comply with the TECHNICAL SPECIFICATIONS detailed in **Appendix II**.
- 1.3 The FIA does not guarantee the PROVIDER a minimum quantity of the PRODUCT to be supplied.
- 1.4 The PROVIDER shall draw up and make available to the FIA a record of PRODUCTS supplied which may be consulted at any time by the FIA.
- 1.5 All PRODUCTS supplied must be suitable for use at all times during the COMPETITIONS.
- 1.6 The PROVIDER undertakes to report to the FIA any issues with the PRODUCT and the COMPETITOR concerned. Should the problem of the PRODUCT during the first 100 hours of functioning not be considered as due to an installation problem by the FIA, the PROVIDER shall replace free of charge the PRODUCT and refund the calibration cost prorated according to the hours of use.
- 1.7 The PROVIDER shall loan free of charge a minimum of 5 PRODUCTS to the FIA with no usage limitations and replace them within a week if the FIA considers that they need to be replaced or checked.

2. DELIVERY OF THE PRODUCT

- 2.1 The PROVIDER shall be present on the two first COMPETITIONS of the 2016 season and during two additional COMPETITIONS as requested by the FIA. The PROVIDER shall ensure that there shall be at least one appropriately qualified and senior representative of the PROVIDER available on-site on these COMPETITIONS.
- 2.2 The PROVIDER shall be present for OFFICIAL TESTING as requested by the FIA.
- 2.3 The PROVIDER shall make available, to the FIA five samples of the PRODUCT, free of charge, for approval on 15 December 2015 at the latest.
- 2.4 A minimum of two PRODUCTS per COMPETITOR must be made available for private testing on 1 January 2016. The PRODUCTS must not be supplied to anyone other than the FIA before that date.

3. MANUFACTURING CONDITIONS OF THE PRODUCT AND TECHNICAL CONTROL

- 3.1 The PROVIDER shall provide to the FIA a detailed technical study of the PRODUCT, for the approval of the FIA ENGINEER. In the event that an amendment is made to the TECHNICAL SPECIFICATIONS or the TECHNICAL REGULATIONS that requires an amendment to the PRODUCT supplied pursuant to the CONTRACT, the PROVIDER shall provide to the FIA a detailed technical study of the amended PRODUCT to be supplied pursuant to the CONTRACT to take account of such amendment.
- 3.2 The PROVIDER shall make such modifications to the PRODUCT to be supplied pursuant to the CONTRACT as the FIA ENGINEER may require.
- 3.3 Technical checks may be carried out on samples taken either directly from the PROVIDER or during the COMPETITION (PRODUCT used by the COMPETITORS during the running of the COMPETITION) comparing the quality of the PRODUCT distributed with that of the samples taken.

4. PRICING OF THE PRODUCT

- 4.1 The price of the PRODUCT supplied shall be [...] (as further detailed on the PRICING FORM), which amount shall be inclusive of all taxes and charges and which amount shall not be increased for any reason except in accordance with SPECIAL CONDITION 4.3.
- 4.2 VAT (value added tax) shall not be charged to those COMPETITORS that are exempt from VAT and that have supplied proof of such exemption to the PROVIDER.
- 4.3 The price stated in SPECIAL CONDITION 4.1 may be adjusted for the seasons 2017 in accordance with the indexation formula provided in **Appendix IV**.

5. INTELLECTUAL PROPERTY

- 5.1 The PROVIDER shall supply the FIA with the requested amount and types of devices (software, specifications, looms, licences, etc.) that the FIA will need to freely and independently programme and use the PRODUCT and conduct all checks that the FIA deems appropriate. This includes the right for the FIA to access any logging data during bench, track testing and the COMPETITIONS.
- 5.2 The software must be provided in accordance with the FIA's requirements (see **Appendix III**).
- 5.3 The PROVIDER agrees and acknowledges that all rights, title and interest of the data and/or results generated by the PRODUCT are owned by the FIA.
- 5.4 The FIA acknowledges that the PRODUCT as provided by the PROVIDER, including the software as well as any related documentation, information, data, methodologies, know-how and materials, is the property of the PROVIDER and that the only right which the FIA obtains to the PRODUCT is the Licence granted by the PROVIDER in compliance with Appendix III.
- 5.5 The PROVIDER grants to the FIA and the FIA accepts, an irrevocable, non-exclusive, worldwide, royalty-free, fully paid-up license (a) to use the PRODUCT, including the source and object codes and related documentation and specification, and (b) to

sublicense the use of the PRODUCT and any subsequent versions and/or modifications thereof to third parties as decided by the FIA (the "FIA Authorised sublicensees").

- 5.6 The PROVIDER hereby undertakes to provide the licenses (as set forth under Appendix III) only to the FIA and the FIA Authorised sublicensees to the express exclusion of any third party including without limitation competitor or team involved in the CHAMPIONSHIP.
- 5.7 Save for the purposes of providing the PRODUCT under this CONTRACT, the PROVIDER agrees and acknowledges that no parts of the PRODUCT and no DATA relating to a COMPETITION may be reproduced, stored in a retrieval system or transmitted in any form or by any means electronic, mechanical, photocopying, recording, broadcasting means or otherwise to any other party than the FIA without the FIA's express prior written approval.
- 5.8 The PROVIDER agrees to use reasonable endeavours not to do anything or permit anything to be done at any time during and/or after the term which would in any way devalue, prejudice the ownership, management and/or exploitation of the data during and/or after the term of the CONTRACT.

PART 3 - DEFINITIONS

The following terms shall be understood to have the following meanings for the purposes of the "CONTRACT".

- 1.1 **CHAMPIONSHIP** means the 2016 and 2017 FIA Formula One World Championship.
- 1.2 **COMPETITION** (referred to as EVENT in the FIA Formula One World Championship regulations) means any race forming part of the CHAMPIONSHIP and entered on the International Sporting Calendar of the FIA. A COMPETITION is deemed to commence at the scheduled time for scrutineering and sporting checks and includes all practice, qualifying and the race itself and ends at the expiry of the deadline for the lodging of a protest under the terms of the International Sporting Code.
- 1.3 **COMPETITORS** means the racing teams that have been accepted by the FIA to take part in the CHAMPIONSHIP.
- 1.4 **CONTRACT** means the GENERAL CONDITIONS, the SPECIAL CONDITIONS and the DEFINITIONS.
- 1.5 **DEFINITIONS** means the definitions set out in this Part 3 of the CONTRACT.
- 1.6 **FIA** means the Fédération Internationale de l'Automobile (FIA).
- 1.7 **FIA ENGINEER** means the technician appointed by the FIA to carry out all technical checks and controls and to grant the necessary approval prior to the starting up of production.
- 1.8 **GENERAL CONDITIONS** means the provisions contained in Part 1 of the CONTRACT.
- 1.9 **GOVERNING RULES** means:
 - (a) the International Sporting Code and the Appendices thereto;
 - (b) the SPORTING REGULATIONS; and
 - (c) the TECHNICAL REGULATIONS.
- 1.10 **PRICING FORM** means the pricing form provided at **Appendix V** stating the prices at which the PRODUCT will be supplied at the COMPETITIONS, the PRODUCTION SITE and the OFFICIAL TESTING, if any, to the COMPETITORS.
- 1.11 **PRINCIPLES OF SPORTING EQUALITY** means the equal treatment by the PROVIDER of all COMPETITORS with respect to:
 - (a) anything which may affect the performance of the PRODUCT;
 - (b) the terms on which the PRODUCT is supplied;
 - (c) the support, access and information made available to COMPETITORS in relation to the PRODUCT; and

- (d) any other matter which affects or may have an effect, however minor, on sporting performance.
- 1.12 **PRODUCT** means the fuel flow meter as such word is described in the SPORTING REGULATIONS and TECHNICAL REGULATIONS.
- 1.13 **PROVIDER** means [•].
- 1.14 **PRODUCTION SITE** means the factory that will produce the PRODUCT supplied pursuant to the CONTRACT.
- 1.15 **SPECIAL CONDITIONS** means the provisions contained in Part 2 of the CONTRACT.
- 1.16 **SPORTING REGULATIONS** means the Sporting Regulations applicable to the CHAMPIONSHIP as published and amended by the FIA from time to time.
- 1.17 **SUPPLY AGREEMENT (Appendix [•])** means any agreement, and all amendments thereto, between the PROVIDER and a COMPETITOR pursuant to which the PROVIDER shall supply the PRODUCT to the COMPETITOR.
- 1.18 **TECHNICAL REGULATIONS** means the Technical Regulations applicable to the CHAMPIONSHIP as published and amended by the FIA from time to time.
- 1.19 **TECHNICAL SPECIFICATIONS (Appendix II)** means the technical requirements applicable to the PRODUCT as issued and amended by the FIA from time to time.

APPENDICES

I – 2016 CALENDAR

II – TECHNICAL SPECIFICATIONS

III – FIA REQUIREMENTS

IV – INDEXATION FORMULA

V – PRICE

SUPPLY AGREEMENT (to be supplied by PROVIDER)

NON-DISCLOSURE AGREEMENT (to be appended to the supply contract)

APPENDIX I

2016 Calendar

The calendar of the 2016 season will be available on the FIA website: www.fia.com.

APPENDIX II

2016 Technical Specifications

REQUIRED SPECIFICATIONS FOR THE FUEL FLOW METER
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1. Introduction

1.1 *Scope*

This specification defines the requirements for the fuel flow meter.

The sensor will be used in Formula 1.

2. System Overview

2.1 *Measurement Description*

The device to measure fluid velocity, fluid direction, temperature.

The device to compute volumetric flow rate, cumulative mass flow and mass flow rate. Mass flow can be determined from a calculated density-temperature equation/lookup table.

The sensor should measure the total time on power since last reconditioning.

The sensor should measure the total time with flow since last reconditioning.

The sensor should measure the total time since last power cycle was done.

2.2 *Environment Description*

The flow sensor must operate in the fuel line of an F1 engine, on the low pressure side (<10 barA).

2.3 *Atmospheric Environment*

The sensor must operate submerged in the fuel cell of a Formula 1 vehicle (2 barA maximum fuel cell pressure)

2.4 *External End-user Instruments*

The device will typically be one instrument of several on the CAN bus. The data output from the sensor will be recorded by the FIA Single ECU over the CAN bus.

At the discretion of the regulatory body (the FIA), the teams will also have access to CAN bus data.

The acquisition system will be the FIA single ECU.

The device shall have the ability to exchange its measurement data via CAN.

2.5 *Power Source*

System power for the device to be low voltage DC, provided typically from the data logger or power distribution module. Alternatively a laptop may be used to interrogate the sensor.

3. General Design Requirements

3.1 *Reliability and Service Life*

3.1.1 Operation Time

The device shall run up to 5 hours continuous with flow without need for cleaning/power cycling.

3.1.2 Lifetime between reconditioning

The device shall achieve 100 hours of running and still be within performance specification.

3.1.3 Lifetime

The device shall perform 400 hours of service before its end of life.

3.2 *Safety Requirements*

The device shall not contaminate the fuel line with particulate.

The device shall not contain materials that could contaminate the fuel.

4. Physical Requirements

4.1 *General*

The device shall have a volume of less than or equal to 500 cm³.

The device shall weigh less than or equal to 400grams.

The device shall be fitted with std -6AN male fluid couplings.

4.2 *Identification*

The following identifications shall be visible as a minimum:

Sensor manufacturer Logo,

Unit Serial Number,

Sensor Reference,

Sensor Part Number.

4.3 *Tamper Proofing*

The device shall be protected by anti-tamper seals suitable for in fuel operation.

4.4 *External Connections*

The device shall use a fuel proof electrical connector

5. Functional Requirements

5.1 *Measurement*

5.1.1 General Performance*

The device shall measure between a range of +/- 0-4000ml/min.

The repeatability from one measurement to another under steady state conditions shall be no greater than +/- 0.25% uncertainty.

The device shall have an accuracy of no less than +/-0.5% for post filtered instantaneous flow measurement.

The device shall have a 1 kHz minimum actual measurement rate.

The device measurement shall be repeatable from one sensor to the next to +/- 0.25% independent of sensor life.

The device shall operate within its performance specification independent of flow direction.

The device shall operate within its performance specification within a range of fuel pressure (0.5 to 10 barA).

The device shall operate within its performance specification regardless of mounting orientation.

The device shall measure cumulative total flow to an accuracy of +/-0.5%

The device shall be capable of applying a 4th order low pass Butterworth with 25Hz -3 dB cut-off frequencies to instantaneous flow measurement for CAN transfer

The device shall be capable of making mass flow conversions based upon a temperature density equation or look up table.

The device shall be within performance specification when undergoing measurement of any of the fuels stated within section 5.8.1 over the specified fuel temperature range.

The device shall be able to power up and begin full functionality regardless of startup temperature and flow condition in under 3 seconds. This time must be consistent sensor to sensor.

The device shall be able to recover automatically and without action from an incorrect fluid composition (Air bubbles for example).

When unable to read flow the device must store the last correct data and count no flow until it is able to measure flow again.

On powerup the device shall restore Cumulative volume flow (Stored in the device at a rate of 1Hz).

On powerup the device shall restore Cumulative mass flow (Stored in the device at a rate of 1Hz).

On powerup the device shall restore Max and Min Fuel Temps (Maximums & minimums only written when exceeded and then at a max rate of 1 Hz).

On powerup the device shall restore Max and Min PCB Temps (Maximums & minimums only written when exceeded and then at a max rate of 1 Hz).

On powerup the device shall restore Max and Min Accelerometer values x,y,z axis (Maximums & minimums only written when exceeded and then at a max rate of 1 Hz).

On powerup the device shall restore Elapsed time (Total time on power) ([Mins:Secs] (Stored in the device at a rate of 1Hz).

On powerup the device shall restore Service time (Total time with flow) [Mins:Secs] (Stored in the device at a rate of 1Hz).

5.1.2 Temperature Measurement

The device shall produce two fuel temperature measurements from two separately immersed temperature sensors that are accurate to within 0.15°C between 0°C and +110°C without factory calibration. The fuel information used for the density calculation shall be the average of the two measurements and it shall switch to one of the two when one is declared faulty. The device shall display the fuel temperature measurement status.

The fuel temperature measurements shall have a response time of T95% of 4seconds.

The device shall produce a PCB temperature data output that is accurate to within 0.5°C between 0°C and +85°C without factory calibration.

5.2 CAN address

The device should allow the FIA approved calibration company to adapt the CAN address. A minimum of 6 CAN address should be available, 3 of which can be the same as the auto loom detect CAN addresses.

5.3 Calibration

The device shall be able to be calibrated on top of the factory calibration.

The following maps must be programmable only via a protected RS-232 or RS-485 connection:

- Information related to density calculation,
- Complete calibration map (Temperature/flow).

5.4 CAN / DATA LOGGING

The device should communicate by CAN the channels listed in the following documents. This CAN communication must be done in accordance with the following CAN specification:

Fuel Flow Sensor CAN Interface

Bus Speed 1Mb/s
Base ID 0x190 for F1
Base IDs 0x190, 0x194, 0x198 for WEC
All data big endian integers MS byte first.

Race Transmit Messaging

Base ID, 100Hz – Filtered flow values (Butterworth filter as detailed in the specifications)

bytes 0-1	signed word volume flow rate, 0.5 ml/min/bit
bytes 2-3	signed word mass flow rate, 0.5 g/min/bit
bytes 4-5	signed word integrated volume flow quantity, 10 ml/bit
bytes 6-7	signed word integrated mass flow quantity, 10 g/bit

Base ID+1, 100Hz

See Excel sheet.

Based ID+1	100Hz						
Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Speed of sound, 0.1m/s/bit	0		CAN ID select (1, 2, 3 - Unsigned)		Fuel temperature (0.01degC/bit signed)		PCB temperature (0.1degC/bit signed)
	1		CAN control processor SW version (unsigned)		Min fuel temperature (0.01degC/bit signed)		Max fuel temperature (0.01degC/bit signed)
	2		Measuring processor SW version (unsigned)		Min PCB temperature (0.1degC/bit signed)		Max PCB temperature (0.1degC/bit signed)
	3		Boot SW version (unsigned)		Hardware version (unsigned)		Supply voltage (0.1V/bit unsigned)
	4		Datalogger SW version (unsigned)		Diagnostics bitword (unsigned)		Seconds from hardware reset (s unsigned)
	5		SW programming counter		Latched diagnostics bitword (unsigned)		Service time indicator (min unsigned)
	6		Manufacturer calibration counter		Manufacturer status bitword (unsigned)		Elapsed time indicator (min unsigned)
	7		Third party calibration counter		Sensor serial number (unsigned)		resistor sense input voltage (0.01V/bit unsigned)
	8		Density calibration counter		CAN control processor software checksum (unsigned)		density calibration checksum (unsigned)
	9				Bootloader checksum (unsigned)		density value in use (0.1kg/m3/bit, unsigned)
	10				GILL Configuration checksum (unsigned)		Reference density at a reference temperature
	11				GILL calibration checksum (unsigned)		Reference temperature for density calibration
	12				Third party calibration checksum (unsigned)		Slope (Density vs temperature)
	13				PCB serial number		
	14				Measuring processor software checksum (unsigned 32 bits)		
	15						X axis accelometer ABS integral (1g.s/bit unsigned)
	16				Y axis accelometer ABS integral (1g.s/bit unsigned)		Z axis accelometer ABS integral (1g.s/bit unsigned)
	17				Min X axis acceleration (0.1g/bit signed)		Max X axis acceleration (0.1g/bit signed)
	18				Min Y axis acceleration (0.1g/bit signed)		Max Y axis acceleration (0.1g/bit signed)
19				Min Z axis acceleration (0.1g/bit signed)		Max Z axis acceleration (0.1g/bit signed)	
Diagnostics bits							
	0						Flow measurement in error
	1						Fuel temperature 1 in error
	2						Fuel temperature 2 in error
	3						PCB temperature in error
	4						Invalid speed of sound
	5						Invalid density
	6						Power supply 1 in error
	7						Power supply 2 in error
	8						Power supply 3 in error
	9						CAN error
	10						PCB overtemperature
	11						Service required
	12						
	13						
	14						Accel limit exceeded on at least one axis
	15						Flow measurement outside specification

+ Confidential Command (To be precised selected sensor Manufacturer).
CAN communications shall meet ISO 11898-2 (High Speed Applications)

5.5 Encryption

The device shall not allow unauthorised access to firmware and memory locations over RS-232, RS-485 or CAN.

The device should create and display checksums allowing to determine if the correct calibration data are programmed in the sensor.

The device should create and display checksums allowing to determine if the correct firmware and hardware is present in the sensor.

5.6 Electrical Requirements

5.6.1 Power Supply

A Minimum Supply Voltage of 5.5V_{Min} shall apply.

A Maximum Supply Voltage of 22V_{Max} shall apply.

A Nominal Supply of 12V_{Nom} shall apply.

Overvoltage (Non-destructive) of 30V_{TransientClamp} shall apply.

Maximum Continuous Reverse Supply (Non-destructive) of -30V_{RevMax} shall apply.

The supply current shall be less than or equal to 100mA from 12-17VDC.

The supply current shall be less than or equal to 180mA from 5.5VDC.

The devices power supply circuitry shall be protected from reverse polarity.

The devices power supply circuitry shall be protected from ground and battery short circuits.

5.6.2 Reset

The device should be able to receive a reset (Power Cycle) command by CAN.

The device should be able to reset the cumulative mass and volume data from a CAN command.

5.7 Electromagnetic Compatibility

5.7.1 Immunity Requirements

The device shall meet EMC Immunity SAE J1113/2 1996.

5.8 Environmental Requirements

5.8.1 Fluid Compatibility

The sensor shall be compatible with the following fuels:

Unleaded Formula One Fuel (as defined in the F1 FIA Technical Regulations)

5.8.2 Temperature

5.8.2.1 Fluid Temperature

The device must operate with a maximum fuel temperature of 80°C.

The device must operate with a minimum fuel temperature of 0°C.

5.8.2.2 Unit Operating Temperature

The device must operate with a maximum PCB temperature of 85°C.

The device must operate with a minimum PCB temperature of 0°C.

5.8.2.3 Storage Temperature

The device must not be adversely affected by a storage temperature minimum of -40°C.

The device must not be adversely affected by a storage temperature maximum of 85°C.

5.8.3 Pressure

The pressure drop of the device shall be no greater than 1000 mbar @ 6000ml/min in a 3mm²/s viscosity fluid at 40degC.

The device must be burst resistant to 60barA.

The device shall operate with a liquid pressure of up to 20 barA.

5.8.4 Vibration

Vibrations should not affect measurement precision of the sensor.

5.8.5 Sealing

The device must be fully sealed to IP68

6. Glossary/Nomenclature

6.1 Nomenclature

F1- Formula One World Championship

* Acceptance criteria or tests and defined by FIA.

APPENDIX III

FIA Requirements

The fuel flow meter manufacturer undertakes to fulfil the below requirements:

- 1) The fuel flow meter manufacturer must provide the FIA, free of charge, a minimum of 5 fuel flow meters. These products must be identical to the fuel flow meter accepted by the FIA for the single supply. The FIA will be able to use them as needed, on any car or bench. The fuel flow meter manufacturer will maintain, update and replace these products free of charge as requested by the FIA.
- 2) The fuel flow meter manufacturer must provide to FIA a GUI in accordance with the following specification:

Objective :

- Automatically recognise connection and disconnection of a sensor
- Reboot a sensor.
- Read and display second calibration table + density data from sensor.
- Create an lfc file from calibration table + density data read in sensor.
- Read and display lfc file from a computer.
- Import and display lfc file from computer into sensor checking that the serial number within the lfc file matches that of sensor
- Compare the calibration table + density data read from sensor with an lfc file read from computer. Present both side and Highlight differences in sensor's data**.
- Read and display all* checksums and versions from sensor.
- Read serial number and base CAN address of the sensor.
- Create a "Checksums-Versions file" from sensor in a text format.
- Compare the Checksums and Versions read from sensor with a "Checksums-Versions file" read from computer. Present both side and Highlight differences in sensor's data**.
- Open and display an lfc file or a "Checksums-Versions file" without sensor being connected.
- Reset cumulative flow values.
- Reset latched diags.
- Provide some sensor diagnostic channels.
- Change sensor's base CAN address:
 - o Enable/Disable Auto CAN Address.
 - o Actually choose which base CAN address to use is in Fix Can address mode.
- With specific rights or even specific version:
 - o Read a manufacturer calibration file and write in sensor.
 - o Read a manufacturer configuration file and write in sensor.
 - o Program software in the sensor.
 - o Upload program from the sensor.

Provide keyboard shortcuts for the following functions (for easier handling at the track):

- Read or write the calibration table + density data.
- Read and display the checksums and versions.
- Open and display lfc and checksum/version files from the computer. The application should remember the folder location of the last lfc or checksum/version file accessed.
- Compare lfc and checksum/version files with the sensor.
- Single shortcut to send both clear min/max and clear latched diagnostics commands.
- Reset cumulative flow values.

Ask for confirmation before sending a reset or clear command to the sensor or before writing an lfc to the sensor.

A message should be displayed to confirm successful or failed completion of any command to or from the sensor.

When an upload is made (Calibration map, software...), the result of this upload must be identical to the actual file used to program the sensor with. In other words, if a sensor is programmed with, for example, a calibration map using an .lfc file, then the lfc file created from an upload of this sensor must be identical to the lfc file used to program this sensor.

***Checksums - Versions list:**

- Serial number of the sensor
- CAN Control Processor Software Checksum
- Measuring Processor Software Checksum
- Bootloader Checksum
- Sensor Manufacturer Calibration Checksum
- Sensor Manufacturer configuration Checksum
- Density Calibration Checksum
- Third Party Checksum
- Hardware Version
- Datalogger Software Version
- Measuring Processor Software Version
- CAN Control Processor Software Version
- Bootloader Version

Checksums must be displayed in Hex format

(Example: CAN Control Processor Software Checksum = 7D6E)

Software versions should be displayed as integers.

The list of checksums may be altered with the consent of FIA.

****Comparison examples**

	File	Sensor
CAN Control Processor Software Checksum	7D6E	7D6E
Measuring Processor Software Checksum	F9FD0	F9FD0
Bootloader Checksum	6CBF	6CBF
Sensor Manufacturer Calibration Checksum	E836	E836
Sensor Manufacturer configuration Checksum	7ECE	7ECF
Density Calibration Checksum	38A	38A
Third Party Checksum	EA7B	EA7B
Hardware Version	1	1
Datalogger Software Version	100	100
Measuring Processor Software Version	100	100
CAN Control Processor Software Version	100	100
Bootloader Version	100	100

File

	Temp 0	Temp 1	Temp 2	Temp 3	Temp 4	Temp 5
Flow 0	1.002	1.002	1.002	1.002	1.002	1.002
Flow 1	1.002	1.002	1.002	1.002	1.002	1.002
Flow 2	1.002	1.002	1.002	1.002	1.002	1.002
Flow 3	1.002	1.002	1.002	1.002	1.002	1.002
Flow 4	1.002	1.002	1.002	1.002	1.002	1.002
Flow 5	1.002	1.002	1.002	1.002	1.002	1.002
Flow 6	1.002	1.002	1.002	1.002	1.002	1.002
Flow 7	1.002	1.002	1.002	1.002	1.002	1.002
Flow 8	1.002	1.002	1.002	1.002	1.002	1.002
Flow 9	1.002	1.002	1.002	1.002	1.002	1.002
Flow 10	1.002	1.002	1.002	1.002	1.002	1.002
Flow 11	1.002	1.002	1.002	1.002	1.002	1.002
Flow 12	1.002	1.002	1.002	1.002	1.002	1.002
Flow 13	1.002	1.002	1.002	1.002	1.002	1.002
Flow 14	1.002	1.002	1.002	1.002	1.002	1.002
Flow 15	1.002	1.002	1.002	1.002	1.002	1.002

Ref. Density	750
Ref.Temp	0
Slope	-0.91

Sensor

	Temp 0	Temp 1	Temp 2	Temp 3	Temp 4	Temp 5
Flow 0	1.002	1.002	1.002	1.002	1.002	1.002
Flow 1	1.002	1.002	1.002	1.002	1.002	1.002
Flow 2	1.002	1.002	1.002	1.002	1.002	1.002
Flow 3	1.002	1.002	1.002	1.002	1.002	1.002
Flow 4	1.002	1.002	1.002	1.002	1.002	1.002
Flow 5	1.002	1.002	1.002	1.002	1.002	1.002
Flow 6	1.002	1.002	1.002	1.002	1.002	1.002
Flow 7	1.002	1.002	0.99	1.002	1.002	1.002
Flow 8	1.002	1.002	1.002	1.002	1.002	1.002
Flow 9	1.002	1.002	1.002	1.002	1.002	1.002
Flow 10	1.002	1.002	1.002	1.002	1.002	1.002
Flow 11	1.002	1.002	1.002	1.002	1.002	1.002
Flow 12	1.002	1.002	1.002	1.002	1.002	1.002
Flow 13	1.002	1.002	1.002	1.002	1.002	1.002
Flow 14	1.002	1.002	1.002	1.002	1.002	1.002
Flow 15	1.002	1.002	1.002	1.002	1.002	1.002

Ref. Density	750
Ref.Temp	0
Slope	-0.89

- 3) The fuel flow meter manufacturer must provide to FIA all needed licences allowing the access and actions describe in the GUI specification.
- 4) The fuel flow meter manufacturer accepts that the FIA will sub-licences these licences to any third party which will, according to the FIA, need the access and be able to perform the actions described in the GUI (any other party will include but not be limited to the FIA representatives on track and the FIA homologated calibration company).
- 5) The licences should be dealt by MAC Addresses.
- 6) All licences must be valid until the end of the contract period, renewable every season.

APPENDIX IV

Indexation formula

Concerning the season 2017, the prices charged to COMPETITORS shall be the amount that equals the amount shown in the PRICING FORM increased annually in accordance with the positive variation of the "Consumer Prices – All items" index published by the Organisation for Economic Cooperation and Development (OECD) in "Main Economic Indicators". The indexation shall be in accordance with the variation between such base index and the index published in the October edition of "Main Economic Indicators" for the year to which the indexation applies.

APPENDIX V

Pricing form

Name of the Company:.....

	*PRICE BEFORE TAX	*PRICE INCLUSIVE OF ALL TAXES AND CHARGES
Fuel Flow Meter for competition and official testing	€	€
100 hour service		

*The purchase price of the fuel flow meter shall not exceed 7500 euros with a warranty of 100 hours functionality. The cost for functionality of 100 extra hours shall not exceed 2500 euros.

The lifetime of the fuel flow meter shall, in any circumstances, not be less than 400 hours.