



IMSA GT Class Scrutineering System

Manual

V1.4.6 11/26/19

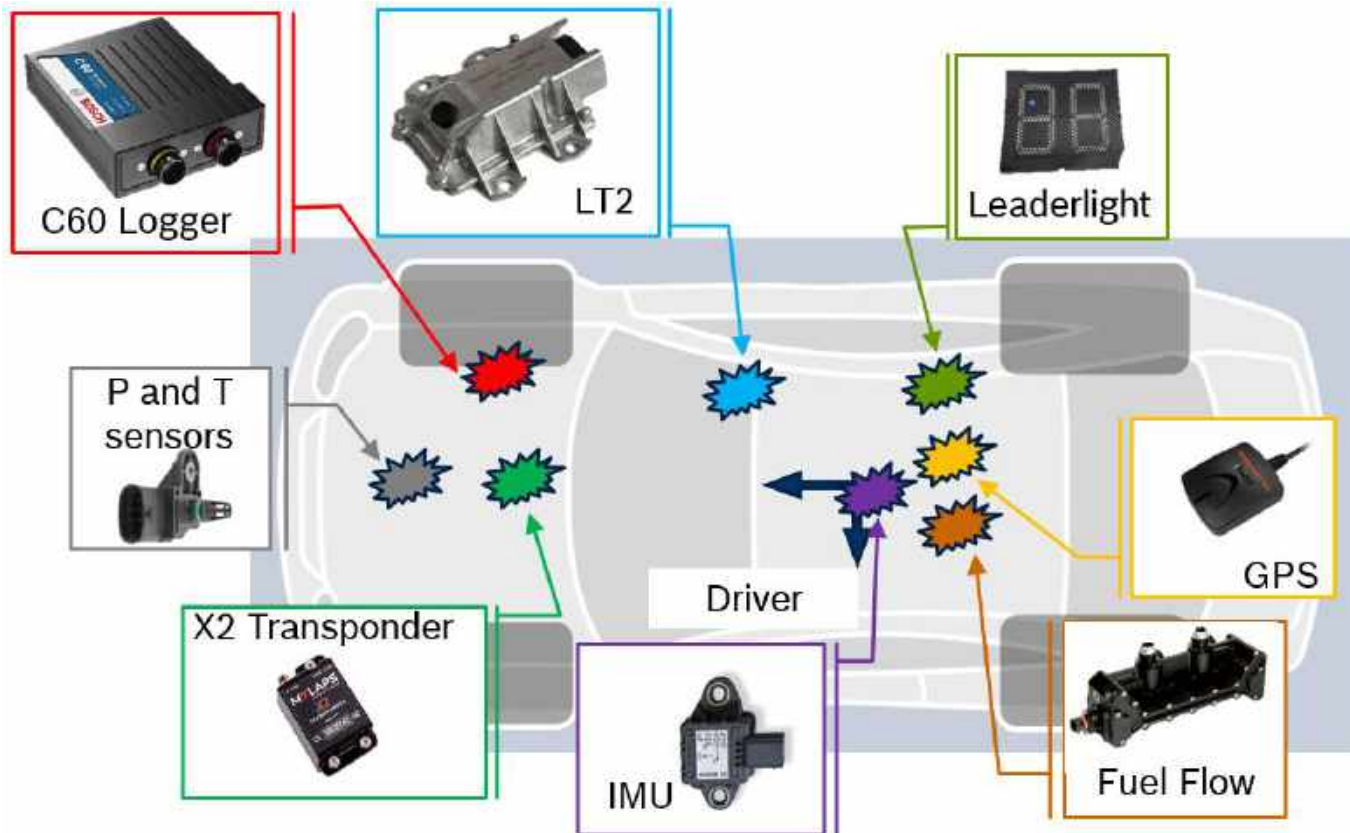
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1 Scope

This document contains application notes on the installation and operation of the IMSA GT Class Scrutineering System.



2 Contact

For technical information please contact:

~~ERICH.OHLDE@us.bosch.com~~

~~Tel: +1 248 221 0418~~

~~MAXWELL.HOUCK@us.bosch.com~~

~~Tel: +1-248-308-7689~~

OR

AARON.PFEIFER@us.bosch.com

Tel: +1-248-533-8157

For sales information please contact an approved dealer:

Mech-Tronic	
Owner / Contact: Bill Roth	
Address:	323 Coolidge Drive Centerport, NY 11721
Phone :	631-423-0523
Fax :	631-423-7769
Email :	mech-tronic@verizon.net
Sakata Motorsports Electronics, Inc.	
Owner / Contact: Brian Sakata	
Address:	1241 N. Patt ST. Anaheim, CA 92801
Phone :	714-446-9473
Fax :	714-446-9247
Email :	brian@sakatamotorsport.com
Creative Motorsport Solutions	
Owner / Contact: Colin Harmer	
Address:	222 Oakridge Blvd Suite 120 Daytona Beach, FL 32118
Phone :	386-333-9543
Email :	colin@gomuchfaster.com

2.1 Sales

Sales can be performed through the above dealers, OEM customers may purchase directly through Bosch Motorsport North America.

2.1.1 Track Sales

Customers requiring spare parts purchased and delivered at the racetrack are subject to a 10% service fee.

3 Components

3.1 Electronic Hardware

Component List:

Part Number	Mating Connector	Name	Description
F02U.V0U.207-01	ASDD612-41SN ASDD612-41SA	C60	GT Scrutineering Logger
F02U.V01.511-02	F02U.B00.435-01	IMU	5 axis IMU
1271.032.390			IMU mounting plate
F02U.V0U.152-01	F02U.V0U.150-01	LT2 Sport	Lambda controller
F02U.V0U.203-01	ASU603-03SN	GPS	10 Hz GPS unit
F02U.V0U.204-01	ASL106-05SA	1 Bar Pressure <u>TMAP</u>	Air pressure sensor
<u>F02U.V0U.267-01</u>	<u>ASL106-05SD</u>	<u>1 Bar Pressure PSA-N</u>	<u>Air pressure sensor</u>
F02U.V0U.205-01	ASL106-05SB	3.5 Bar Pressure	Boost pressure sensor
F02U.V0U.206-01	ASL106-05SN	Temperature Sensor M12	Air temperature sensor
F02U.V02.356-01	ASL106-05SN	Temperature Sensor M6	Air temperature sensor
0258.988.001	D261.205.356-01	LSU 4.9	Lambda sensor
	ASU603-05SN	X2 Transponder*	Timing Transponder
	ASL106-05SA-HE	Engine Speed**	RPM sensor
	AS108-35SN	Leaderlight*	Leaderlights
	ASDD606-09SD-HE	Fuel Flow*	Fuel flow sensor
	ASL106-05SB	ACO Oil Level*	Catch tank oil level sensor

Max current consumption for all devices: 19 amps.

Nominal current consumption for all devices: 12 amps.

* Denotes component available from IMSA

** Denotes component supplied by team

3.1.1 C60

Functional Description: Logger for IMSA GT Spec Scrutineering System

Mounting Note:

- This device must be fitted in the cockpit on the passenger side floor in an easily accessible IMSA approved location.
- This device must be mounted away from heat sources. Note maximum temperature range below.
- This device should be mounted so that the status LED's on top of the device can be easily seen.
- This device should be mounted to sustain vibrations within the Vibration Profile 1 defined in the appendix.

Part Number: F02U.V0U.207-01

Temperature Range: -20 to 65 °C

Maximum Current Consumption: 2 amps

Pinout: See "Wiring Diagram" for C60 pinout

3.1.2 IMU – MM5.10

Functional Description: 5 axis inertial measurement unit

Mounting Note:

- This device must be fitted in the cockpit on the centerline of the longitudinal axis of the vehicle in an easily accessible IMSA approved location. Use of the mounting bracket listed below is required.
- Device to be mounted with connector receptacle facing to the back of the vehicle as shown in Section 0 "Scope" and product sticker facing vertically 'up'. Mounting plate to be aligned within +/-0.5° of vehicle axes.

Part Number: F02U.V01.511-02

Electrical Connector Part Number: F02U.B00.435-01

Mounting Bracket Part Number: 1271.032.390

Temperature Range: -20 to 85 °C

Maximum Current Consumption: 0.4 amps

Pinout:

Connector	F02U.B00.435.01
Pin	Description
1	Gnd (KL.31)
2	CAN Low
3	CAN High
4	12V+ (KL.30)

3.1.3 LT2 Sport

Functional Description: 2 channel lambda sensor controller

Mounting Note:

- This device must be fitted in the cockpit on the passenger side foot-well in an easily accessible IMSA approved location.
- Device MUST be installed on anti-vibration mounts (supplied)

Part Number: F02U.V0U.152-01

Electrical Connector Part Number: F02U.V0U.150-01

Temperature Range: -20 to 85 °C

Maximum Current Consumption: 10 amps

Pinout:

Connector	F02U.V0U.150-01
Pin	Description
1	VS 1
2	VS 2
3	CAN 2 High
4	UN 2
5	IP 2
6	UN 1
7	IP 1
8	RH 2
9	12V+ (KL.30)
10	GND (KL.31)
11	CAN 2 Low
12	VM 2
13	IA 2
14	VM 1
15	IA 1
16	RH 1

3.1.4 GPS

Functional Description: 10 Hz GPS unit

Mounting Note:

- This device must be fitted to the top surface of the vehicle roof with 200mm of the roof centerline and with at least 250mm separation from all other antennas.

Part Number: F02U.V0U.203-01

Pinout:

Connector	ASU603-03SN
Pin	Description
1	5V+
2	Gnd
3	RS-232 Tx

3.1.5 X2 Transponder

Functional Description: CAN based transponder for IMSA GT Spec Scrutineering System

Mounting Note:

- This device in an IMSA approved location. See IMSA tech bulletin for mounting information.

Temperature Range: 0 to 60 °C

Maximum Current Consumption: 200 mA

Pinout:

Connector	ASU603-05SN
Pin	Description
1	12V+ KL.30
2	Gnd KL.31
3	CAN Low
4	CAN High
5	

3.1.6 Fuel Flow Meter

Functional Description: CAN based fuel flow meter for IMSA GT Spec Scrutineering System

Mounting Note:

- This device in an IMSA approved location. See IMSA tech bulletin for mounting information.

Temperature Range: 0 to 85 °C

Maximum Current Consumption: 150 mA

Pinout:

Connector	ASDD606-09SD-HE
Pin	Description
1	12V+
2	CAN_H
3	CAN_L
4	
5	
6	
7	
8	
9	GND

3.1.7 Leaderlight System

Functional Description: CAN based leaderlight panel system for IMSA GT Spec Scrutineering System

Mounting Note:

- This device in an IMSA approved location. See IMSA tech bulletin for mounting information.

Maximum Current Consumption: 6 A

Pinout:

Connector	AS108-35SN
Pin	Description
1	12V+
2	GND
3	CAN_L
4	CAN_H

3.2 Sensors

This section declares sensors that must be directly connected to the C60. These signals will be fed back to the teams via CAN.

All GT cars must run:

- Airbox pressure(s)
- Airbox temperature(s)
- Manifold/Boost pressure(s)
- Manifold/Boost temperature(s)
- Lambda(s)
- Fuel flow meter

In addition to the above sensors, all GTLM cars must run:

- Restrictor throat pressure(s) (Where applicable)
- Cockpit temperature
- Engine speed sensor
- Oil catch tank level (See IMSA tech bulletin for sensor information)
- Sensors must be installed in an IMSA approved location as identified in Scrutineering System homologation documentation with numbering referring to the fed engine bank.

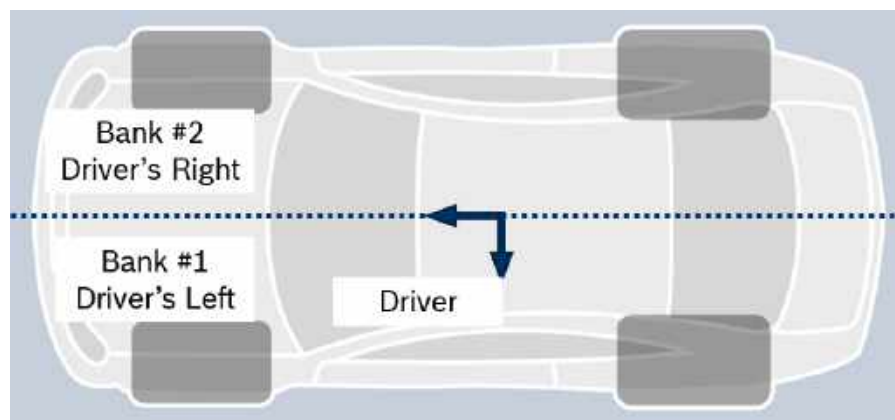


Figure 1 - Diagram displaying sensor mounting

Cars may run either 1 bar pressure sensor depending on the homologated sensor package. Only one 1 bar sensor type may be used. i.e. Either all 1 bar TMAP or 1 bar PSA-N sensor may be used. Using 1 bar TMAP for airbox and 1 bar PSA-N for intake manifold is not allowed. Loom drawings for both options are included in the wiring diagram section.

3.2.1 1 Bar Pressure TMAP

Functional Description: Air pressure sensor

Use Case:

- **Airbox Pressure:**
- **Manifold Pressure:**
- **Restrictor Throat Pressure:**

Callout: Driver's left bank will be Sensor #1

Part Number: F02U.V0U.204-01

Pressure Range: 0.1 – 1.15 bar

Pinout:

Connector	ASL106-05SA-HE
Pin	Description
1	5V+
2	Sensor Gnd
3	Signal
4	
5	

3.2.2 1 Bar Pressure PSA-N

Functional Description: Air pressure sensor

Use Case:

- **Airbox Pressure:**
- **Manifold Pressure:**
- **Restrictor Throat Pressure:**

Callout: Driver's left bank will be Sensor #1

Part Number: F02U.V0U.267-01

Pressure Range: 0.1 – 1.15 bar

Pinout:

Connector	ASL106-05SD-HE
Pin	Description
<u>1</u>	<u>12V+</u>
<u>2</u>	<u>Sensor Gnd</u>
<u>3</u>	<u>Signal</u>
<u>4</u>	
<u>5</u>	

3.2.23.2.3 3.5 Bar Boost Pressure

Functional Description: Boost pressure sensor

Use Case:

- **Boost Pressure:**

Callout: Driver's left bank will be Sensor #1

Part Number: F02U.V0U.205-01

Pressure Range: 0.5 – 3.5 bar

Pinout:

Connector	ASL106-05SB
Pin	Description
1	5V+
2	Sensor Gnd
3	Signal
4	
5	

3.2.33.2.4 Temp Sensor – M12

Functional Description: Temperature sensor

Use Case:

- **Intake Temperature:**
- **Manifold/Boost Temperature:**
- **Cockpit Temperature:**

Callout: Driver's left bank will be Sensor #1

Part Number: F02U.V0U.206-01

Temperature Range: -40 to 140 °C

Thread: M12 x 1.5

Installation Torque: 15 Nm

Pinout:

Connector	ASL106-05SN
Pin	Description
1	
2	Sensor Gnd
3	Signal
4	
5	

3.2.43.2.5 Temp Sensor – M6

Functional Description: Temperature sensor

Use Case:

- **Intake Temperature:**
- **Manifold/Boost Temperature:**
- **Cockpit Temperature:**

Callout: Driver's left bank will be Sensor #1

Part Number: F02U.V02.356-01

Temperature Range: -55 to 300 °C

Thread: M6 x 1

Installation Torque: 8 Nm

Pinout:

Connector	ASL106-05SN
Pin	Description
1	
2	Sensor Gnd
3	Signal
4	
5	

3.2.53.2.6 LSU 4.9 Lambda Sensor

Functional Description: Exhaust gas lambda sensor

Use Case:

- See Appendix for required sensor mounting information.
- One sensor per cylinder bank is required.

Callout: Driver's left bank will be Sensor #1

Part Number: 0258.988.001

Thread: M18 x 1.5

Installation Torque: 40 to 60 Nm

Pinout:

Connector	D261.205.356-01
Pin	Description
1	IP
2	VM
3	RH
4	VS
5	IA
6	UN

3.2.63.2.7 Engine Speed Sensor

Functional Description: Hall effect style speed sensor

Use Case:

- Each manufacturer may select a sensor to be approved by IMSA.

Recommendation:

- Bosch P/N: HA-N **F.02U.V0U.714-01**
- 20 tooth symmetrical wheel, no missing teeth

Trigger Wheel Requirements (for HA-N above):

- Diameter \geq 80mm
- Slot Width \geq 10mm
- Tooth Width \geq 5mm
- Height of tooth \geq 5mm
- Thickness \geq 8mm

Pinout:

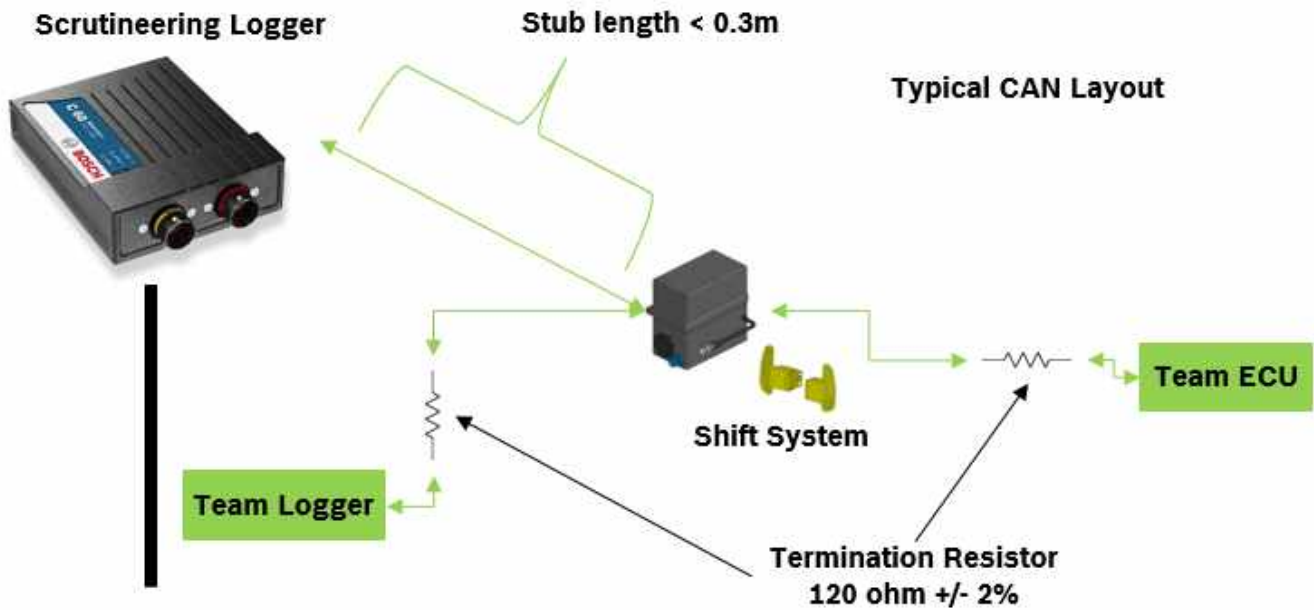
Connector	ASL606-05PA-HE
Pin	Description
1	12V+ KL.30
2	GND
3	Signal
4	
5	

3.3 Sensor Declaration Form

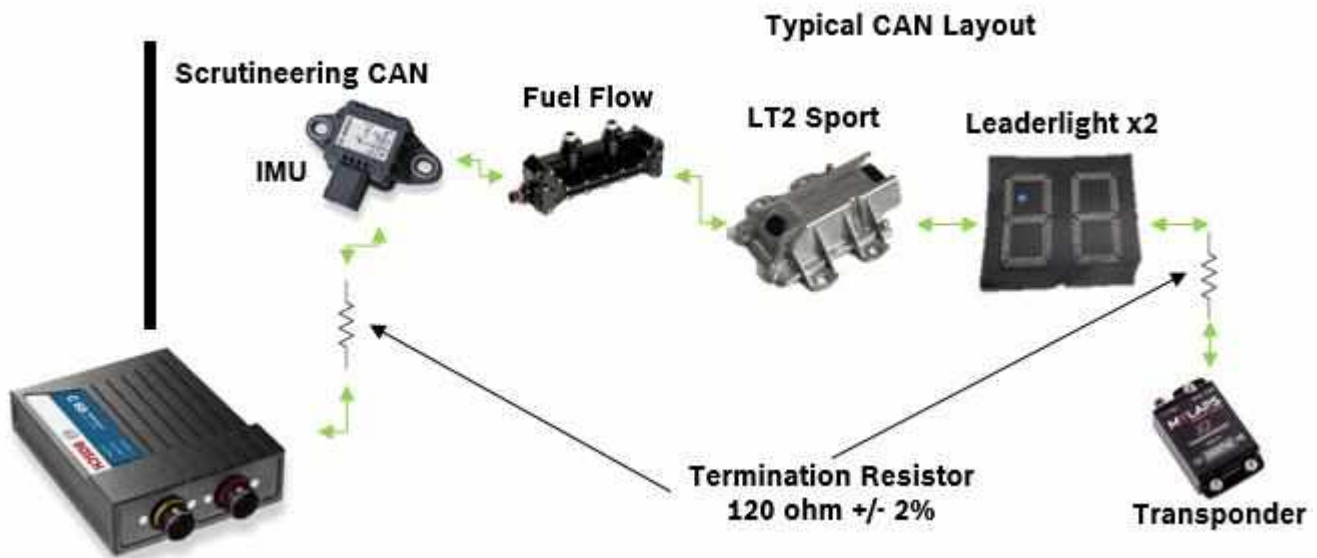
Sensor declaration forms must be submitted prior to every IWSC event. Sensor declaration forms are submitted via the TIMS system per the IWSC Technical Regulations.

4 System Architecture

4.1 Team CAN (C60 CAN #1)



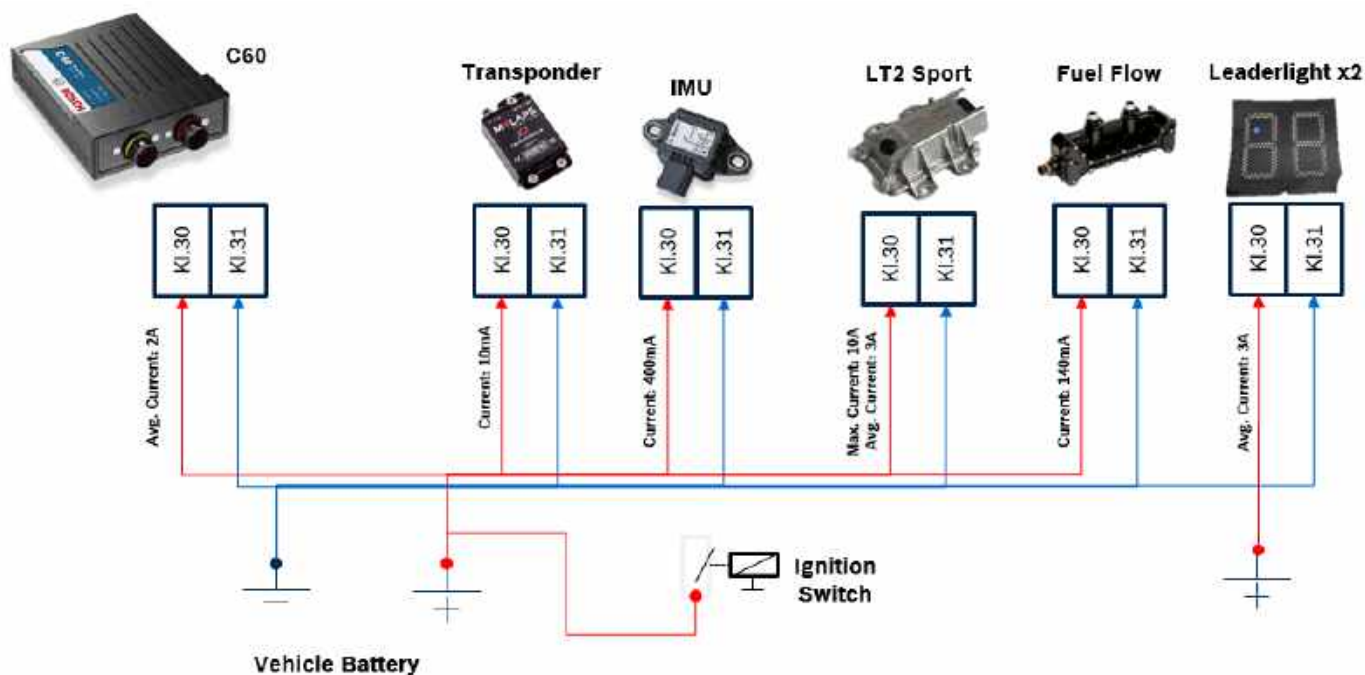
4.2 Scrutineering CAN (C60 CAN #2)



NOTE:

Order of components on the CAN bus may be changed to suit vehicle layout, however, CAN bus wiring **MUST** remain linear between components and CAN termination resistors **MUST** remain at either physical end of the bus.

4.3 Power Supply



The following notations for power signals are used:

- **KL 30** is a switched battery rail controlled by the main power relay
- **KL 31** is an un-switched ground rail (same as battery negative terminal)

4.4 USB



The USB stick is property of and will be provided by IMSA for the scrutineering system. This must be mounted in a plainly visible [bulkhead type mount](#) and marked [with "IMSA"](#) location nearest the rearward side of the passenger door opening and at an equivalent height to the lower edge of the passenger door window.

The length of the USB wiring from the C60 to the USB connector should be less than 1.5 meters. All USB wiring must be screened and drained per the diagram.

[To remove the USB stick from the connector the collar at the connector end of the USB stick must be pulled away from the connector.](#)

4.5 Driver ID

The Driver ID will be an input on the same connector as the team CAN connections and power. The Driver ID signal will be controlled by a different resistance value for each driver. The resistor will go between the two pins for Driver ID with nothing else in the circuit. The Driver ID and resistor value pairings are in the table below:

ID	Resistor Value (Ohm)
1	0
2	820
3	2.2K
4	4.7K
5	12K

5 Loom Certification

Bosch will provide certification of all scrutineering looms consisting of the following:

- HiPot testing
- Loom serialization

This service will be provided with the following cost structure:

- First time certification (per car) will be provided by Bosch
- Subsequent certifications, of additional looms or a failed test, will be provided at a cost of \$200 / test.

All pieces of the scrutineering loom must be present in order to certify any single piece.

For example team XYZ would like to certify a spare 'engine' section of the scrutineering loom, the car has three scrutineering looms pieces (cockpit, engine, rear section). All three pieces must be submitted in order to certify the spare 'engine' loom.

All looms will be checked to the wiring diagram in Section 7. Any deviation from this diagram must be approved by IMSA and Bosch.

IMSA reserves the right to require a loom certification between events.

6 CAN Specification

There are two CAN interfaces on the C60 logger. C60 CAN 1 will be used for "Team" communication, on this bus the team is required to send the "Team Transmitted Channels". The other bus (C60 CAN 2) will be used solely for scrutineering components, no components other than those listed on the wiring diagram are allowed on the Scrutineering bus.

Team CAN Bus:

The team CAN bus will be used to transfer vital information between the team and the Scrutineering System. The team CAN bus must be laid out in a linear fashion, with a termination resistor (120 ohm) at each end of the bus. The team bus is required to be 1 Mbit and conform to CAN 2.0B specifications.

Scrutineering CAN Bus:

The scrutineering CAN bus will link all of the IMSA GT Spec Scrutineering System components. This bus must be laid out linearly with a termination resistor (120 ohm) on each end of the bus. **Only those components listed in this document may exist on the scrutineering CAN bus!**

6.1 Team Transmitted Channels

Channel Name	Short Name	Raster (ms)	Notes
Engine Revs	nmot	5	Engine revolutions per minute
Ignition Timing	ign_out	5	Crank angle of ignition event
Fuel Injector Mass	fuel_mass	5	Fuel mass injected per 2 engine revolutions
Fuel Rail Pressure	prail	5	Pressure measured in the high pressure fuel rail
Gearbox Drum Position	gear_drum	20	Voltage of gearbox drum angle sensor
Gearbox Flag	shift_*	20	Flag denoting, up/down shift, shift error, and shift strategy active
Gear	gear	20	Engaged gear in transmission
FL Wheelspeed	vwheel_fl	20	Speed of FL wheel
FR Wheelspeed	vwheel_fr	20	Speed of FR wheel
RL Wheelspeed	vwheel_rl	20	Speed of RL wheel
RR Wheelspeed	vwheel_rr	20	Speed of RR wheel
Throttle Pedal	aps	50	Throttle pedal percentage
Engine Throttle(s)	ath(2)	50	Throttle blade open percentage
FL Brake Pressure	pbrake_fl	20	If only axle pressure is available, send on both L & R
FR Brake Pressure	pbrake_fr	20	If only axle pressure is available, send on both L & R
RL Brake Pressure	pbrake_rl	20	If only axle pressure is available, send on both L & R
RR Brake Pressure	pbrake_rl	20	If only axle pressure is available, send on both L & R
Mixture Map	mappos	100	Value of engine mixture map selection switch
Fuel Consumption Calculation	fuelcons	100	Counter starts from 0 each session Does NOT reset during session/race
Steering Angle	steer	20	Angle of steering wheel from center
Clutch Pressure	pclutch	20	Pressure in the clutch disengagement system
Cam Angle Left Bank Intake	Cam1Int	100	Angle of the drivers left bank intake CAM from park
Cam Angle Left Bank Exhaust	Cam1Exh	100	Angle of the drivers left bank exhaust CAM from park
Cam Angle Right Bank Intake	Cam2Int	100	Angle of the drivers right bank intake CAM from park
Cam Angle Right Bank Exhaust	Cam2Exh	100	Angle of the drivers right bank exhaust CAM from park
Tire Pressure FL	TireFL	1000	TPMS system reported absolute air pressure in FL tire
Tire Pressure FR	TireFR	1000	TPMS system reported absolute air pressure in FR tire
Tire Pressure RL	TireRL	1000	TPMS system reported absolute air pressure in RL tire
Tire Pressure RR	TireRR	1000	TPMS system reported absolute air pressure in RR tire
Fuel Probe Flag - GTLM Only	b_fuelprobe	20	Fuel Probe sensor, 0 = not connected, 1 = connected

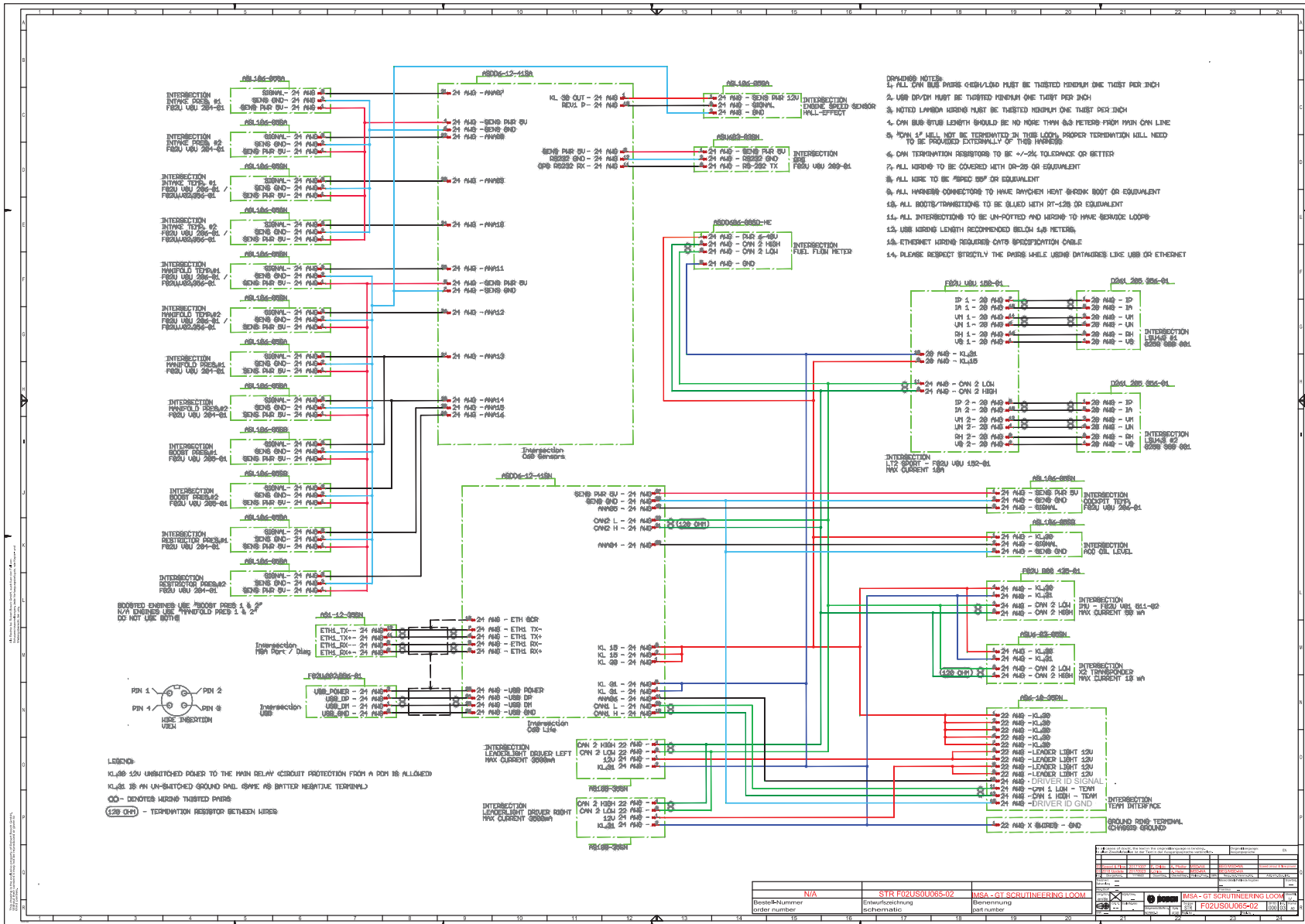
6.2 Team Received Channels

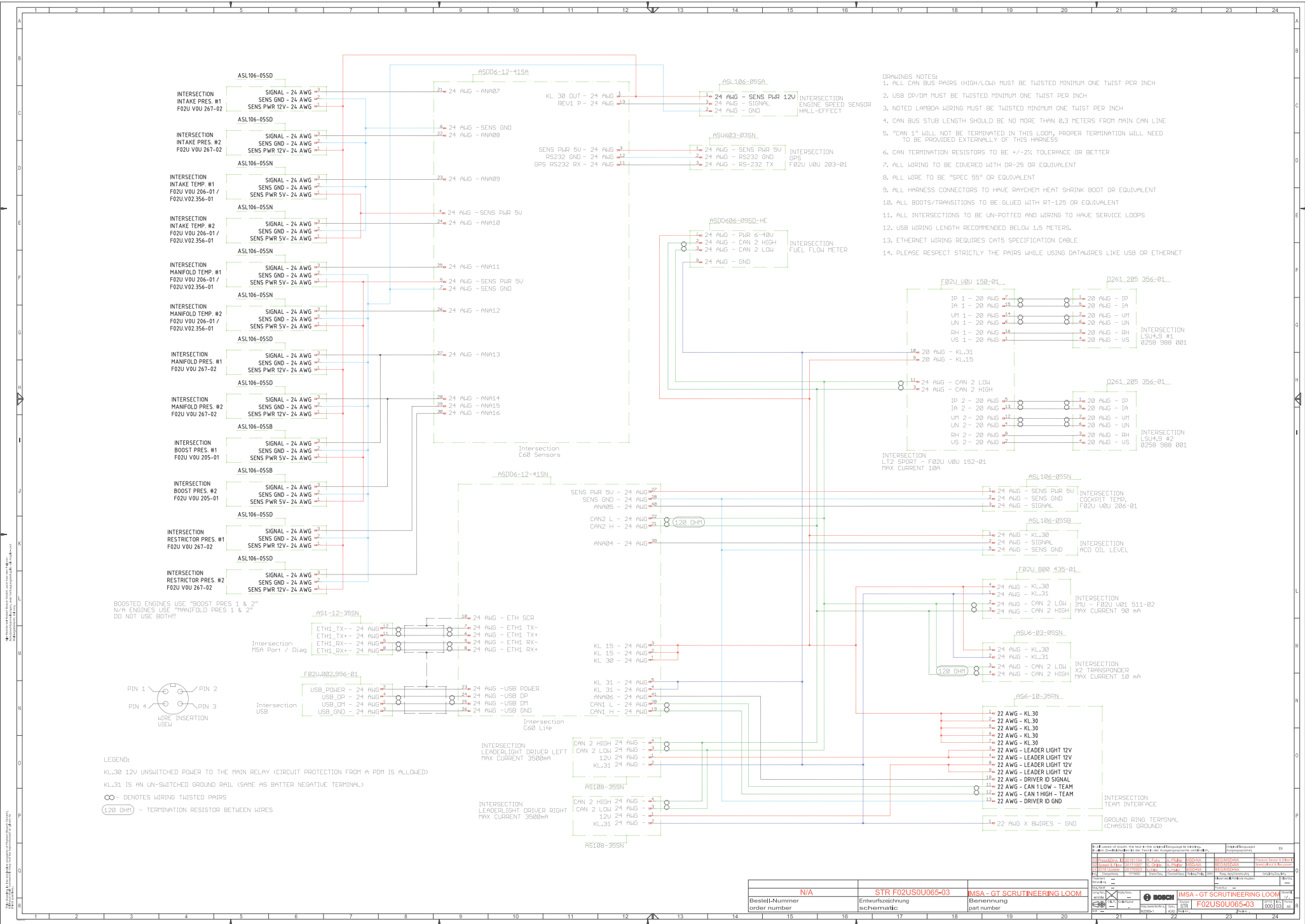
Channel Name	Short Name	Raster (ms)	Notes
Low Boost Counter**	low_overboost_counter	20	Low overboost counter
High Overboost Counter**	high_overboost_integral	20	High overboost counter
Overboost Integral**	Integral	20	Live overboost integral value
Beacon	beacon_imsa	20	Beacon for S/f, Pit In, Pit Out
Position in Class	class_position	50	Position of car in class
Track Condition	track_condition	50	Track condition
Rainlight On	Rainlight	50	Rainlight activation status
Driver ID	DriverID	50	Driver ID from Timing and Scoring
Lap Number	LapNum	50	Current lap number
Cockpit Temp*	tcockpit	1000	Car cockpit temperature
C60 Temp	tlogger	1000	Scrutineering system C60 core temperature
Oil Level*	oillevel	1000	Catch tank oil level
GPS Latitude	gpsLatitude	50	GPS latitude
GPS Longitude	gpsLongitude	50	GPS longitude
GPS Speed	gpsSpeed	50	GPS speed
GPS Altitude	gpsAltitude	50	GPS altitude
GPS Time	gpsTime	50	GPS time
Airbox Pressure 1	pairbox	50	Driver's left bank airbox pressure
Airbox Pressure 2	pairbox_2	50	Driver's right bank airbox pressure
Airbox Temperature 1	tairbox	50	Driver's left bank airbox temperature
Airbox Temperature 2	tairbox_2	50	Driver's right bank airbox temperature
Manifold Pressure 1	pmanifold	50	Driver's left bank manifold pressure
Manifold Pressure 2	pmanifold_2	50	Driver's right bank manifold pressure
Manifold Temperature 1	tmanifold	50	Driver's left bank manifold temperature
Manifold Temperature 2	tmanifold_2	50	Driver's right bank manifold temperature
Restrictor Pressure 1*	prestricator	100	Driver's left restrictor throat pressure
Restrictor Pressure 2*	prestricator_2	100	Driver's right restrictor throat pressure
Logger Status	logger_status	100	C60 logger status
USB Status	usb_status	100	USB stick recording status
Lambda 1	lambda1	100	Driver's left lambda value
Lambda 2	lambda2	100	Driver's right lambda value
Volumetric Flow Rate	q_fuelflow	20	Instantaneous volumetric fuel flow rate
Total Volume	V_fuelflow	20	Total volumetric fuel flow
Mass Flow Rate	dm_fuelflow	20	Instantaneous fuel mass flow rate
Total Mass	m_fuelflow	20	Total mass fuel flow
Engine Speed*—GTLM	nmot_sens	50	Sensor measured engine speed
Fuel Temperature	tfuel	200	Fuel flow meter reported fuel temperature
Flow meter service time	FFM_MinutesServiceTime	200	<u>Hours until service required for fuel flow meter</u> <u>Number of minutes FFM in use</u>
Flow meter calibration	b_FFMService	200	Flow meter calibration required
Ambient Pressure*	pambient	<u>1000</u>	<u>IMSA declared live ambient pressure</u>

* Denotes GTLM Only

6.3 DBC file

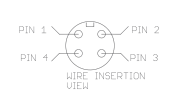
A DBC file for the transmitted and received channels is available at IMSA.com and bosch-motorsport.com.





- DRAWINGS NOTES:
1. ALL CAN BUS PAIRS (HIGH/LOW) MUST BE TWISTED MINIMUM ONE TWIST PER INCH
 2. USB D+/D- MUST BE TWISTED MINIMUM ONE TWIST PER INCH
 3. NOTED LAMBDA WIRING MUST BE TWISTED MINIMUM ONE TWIST PER INCH
 4. CAN BUS STUB LENGTH SHOULD BE NO MORE THAN 0.3 METERS FROM MAIN CAN LINE
 5. "CAN 1" WILL NOT BE TERMINATED IN THIS LOOM, PROPER TERMINATION WILL NEED TO BE PROVIDED EXTERNALLY OF THIS HARNESS
 6. CAN TERMINATION RESISTORS TO BE +/-2% TOLERANCE OR BETTER
 7. ALL WIRING TO BE COVERED WITH DR-25 OR EQUIVALENT
 8. ALL WIRE TO BE "SPEC 55" OR EQUIVALENT
 9. ALL HARNESS CONNECTORS TO HAVE RYCHEN HEAT SHRINK BOOT OR EQUIVALENT
 10. ALL BOOTS/TRANSITIONS TO BE GLUED WITH RT-125 OR EQUIVALENT
 11. ALL INTERSECTIONS TO BE UN-POTTED AND WIRING TO HAVE SERVICE LOOPS
 12. USB WIRING LENGTH RECOMMENDED BELOW 1.5 METERS.
 13. ETHERNET WIRING REQUIRES CAT5 SPECIFICATION CABLE
 14. PLEASE RESPECT STRICTLY THE PAIRS WHILE USING DATAWIRES LIKE USB OR ETHERNET

BOOSTED ENGINES USE "BOOST PRES 1 & 2"
 N/A ENGINES USE "MANIFOLD PRES 1 & 2"
 DO NOT USE BOTH



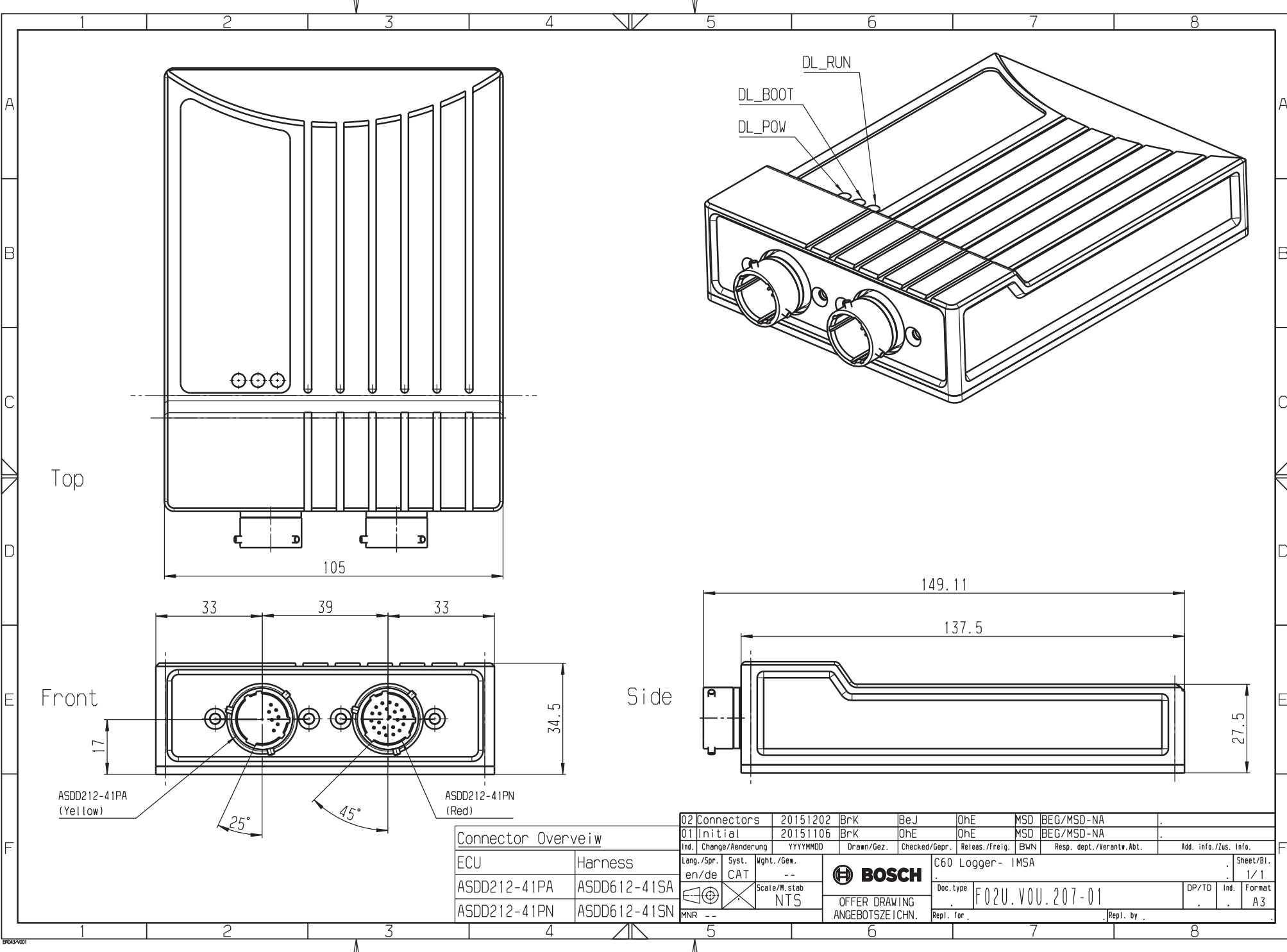
- LEGEND:
- KL.30 12V UNSWITCHED POWER TO THE MAIN RELAY (CIRCUIT PROTECTION FROM A PDM IS ALLOWED)
 - KL.31 IS AN UN-SWITCHED GROUND RAIL (SAME AS BATTERY NEGATIVE TERMINAL)
 - ∞ - DENOTES WIRES TWISTED PAIRS
 - (120 OHM) - TERMINATION RESISTOR BETWEEN WIRES

Part Number	Description	Quantity	Unit
ASL106-055D	INTAKE PRES. #1	1	PCB
ASL106-055D	INTAKE PRES. #2	1	PCB
ASL106-055N	INTAKE TEMP. #1	1	PCB
ASL106-055N	INTAKE TEMP. #2	1	PCB
ASL106-055N	MANIFOLD TEMP. #1	1	PCB
ASL106-055D	MANIFOLD TEMP. #2	1	PCB
ASL106-055D	MANIFOLD PRES. #1	1	PCB
ASL106-055D	MANIFOLD PRES. #2	1	PCB
ASL106-055B	BOOST PRES. #1	1	PCB
ASL106-055B	BOOST PRES. #2	1	PCB
ASL106-055D	RESTRICTOR PRES. #1	1	PCB
ASL106-055D	RESTRICTOR PRES. #2	1	PCB
AS112-39SN	ETH1 TX	1	PCB
AS112-39SN	ETH1 RX	1	PCB
AS112-39SN	ETH2 TX	1	PCB
AS112-39SN	ETH2 RX	1	PCB
F82U-082-996-01	USB POWER	1	PCB
F82U-082-996-01	USB DP	1	PCB
F82U-082-996-01	USB DM	1	PCB
F82U-082-996-01	USB GND	1	PCB
AS108-39SN	CAN 2 HIGH	1	PCB
AS108-39SN	CAN 2 LOW	1	PCB
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AS108-39SN	CAN 1 H	1	PCB
AS108-39SN	CAN 2 HIGH	1	PCB
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AS108-39SN	CAN 1 L	1	PCB
AS108-39SN	CAN 1 H	1	PCB
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AS108-39SN	CAN 1 H	1	PCB
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AS108-39SN	CAN 1 L	1	PCB
AS108-39SN	CAN 1 H	1	PCB
AS108-39SN	CAN 2 HIGH	1	PCB
AS108-39SN			

8 Appendix

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Connector Overview	
ECU	Harness
ASDD212-41PA	ASDD612-41SA
ASDD212-41PN	ASDD612-41SN

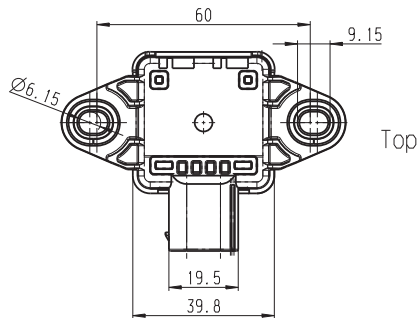
02 Connectors	20151202	Brk	BeJ	OhE	MSD	BEG/MSD-NA	
01 Initial	20151106	Brk	OhE	OhE	MSD	BEG/MSD-NA	
Ind. Change/Änderung	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Released/freig.	EWN	Resp. dept./Verantw. Abt.	Add. info./Zus. Info.
Lang./Spr.	Syst.	Vght./Gew.	C60 Logger - IMSA		Sheet/Bl.		
en/de	CAT	--			1/1		
Scale/M.stab	NTS	BOSCH		Doc. type	F02U.VOU.207-01		DP/TD
MNR	--	OFFER DRAWING ANGEBOOTSZEICHN.		Repl. for			Ind. Format
				Repl. by			A3

Mounting Instructions

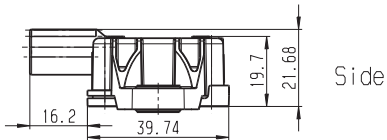
-Sensor is to be mounted at a location close to the center of gravity of the vehicle. Correct mounting position of the sensor is required for its proper function.

-Tightening torque for M6 screws mounting the sensor to the damping plate: 6Nm ±1Nm.

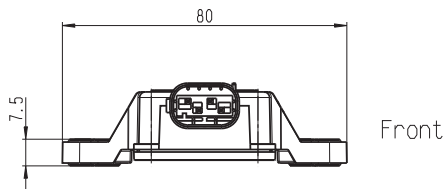
-Correct vehicle mounting orientation of the sensor is shown in drawing(s) below



Top



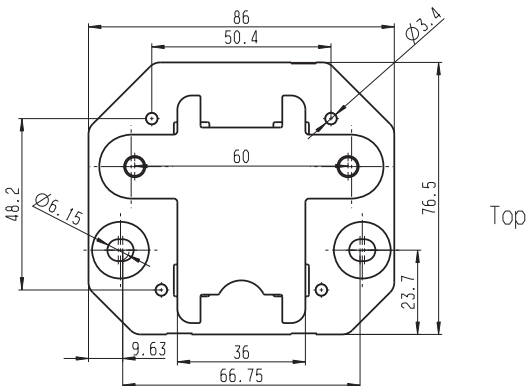
Side



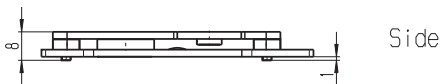
Front



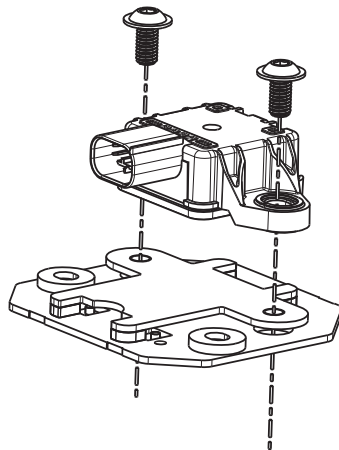
Front



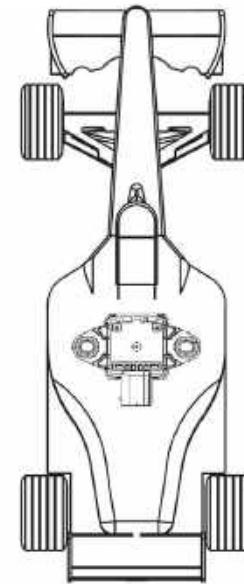
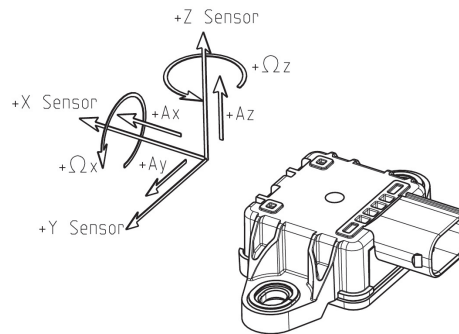
Top



Side



Isometric



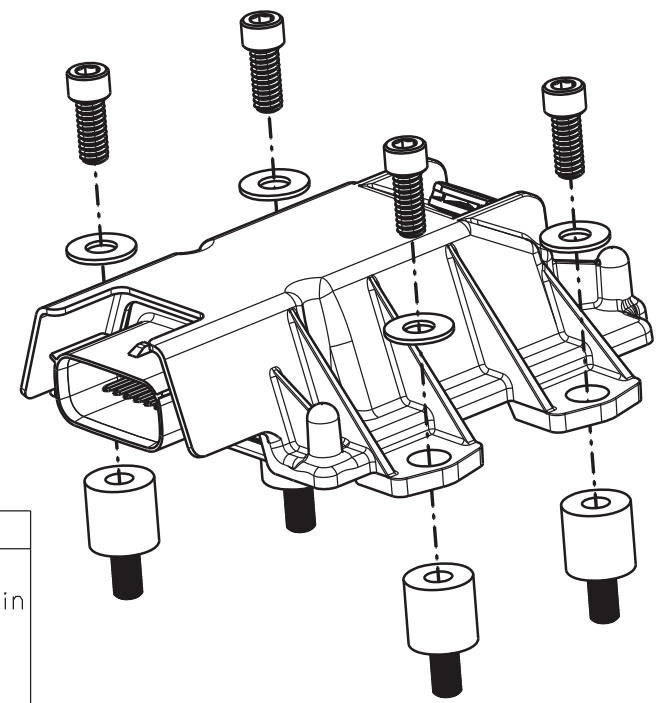
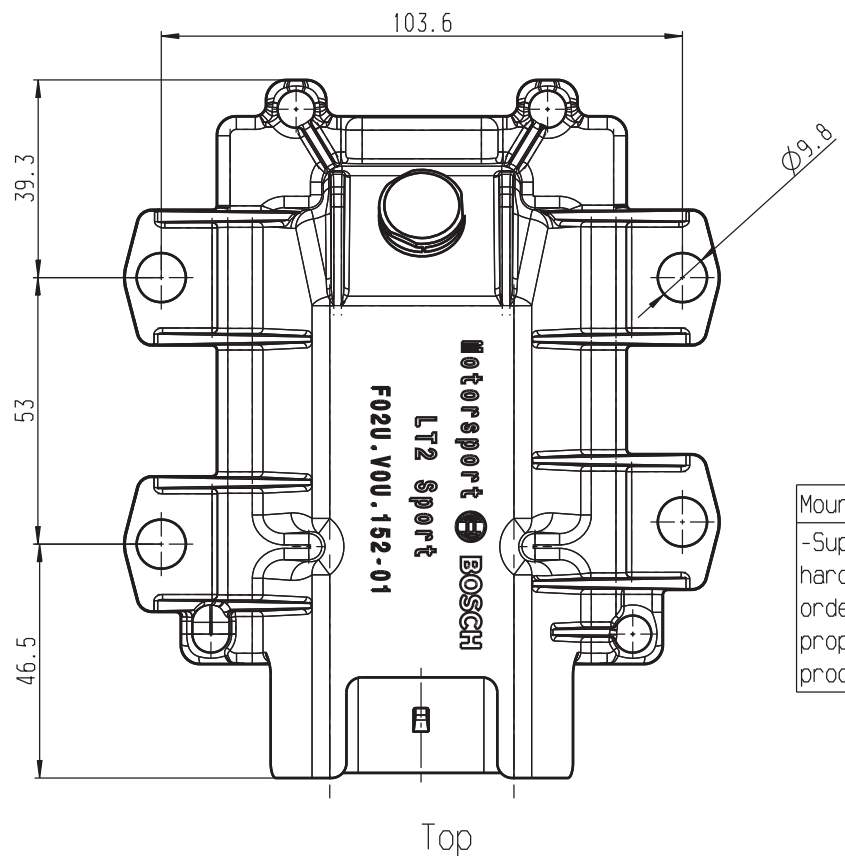
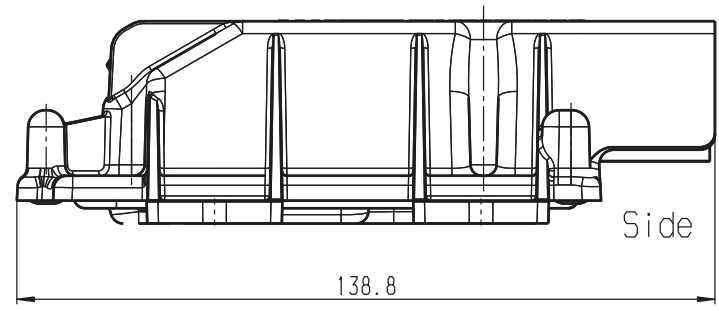
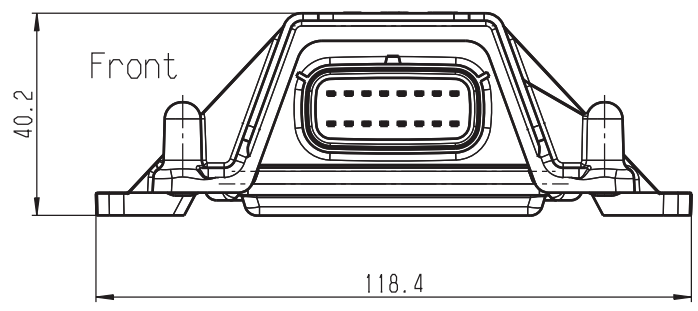
02 Mounting	20151202	Brk	BeJ	OhE	MSD	BEG/MSD-NA		
01 Initial	20151106	Brk	OhE	OhE	MSD	BEG/MSD-NA		
Ind. Change/Änderung	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Released./Freig.	EBW/N	Resp. Dept./Verantw. Abt.	Mod. Info./Äus. Info.	
Lang./Spr.	Syst.	Wght./Gew.	IMUS_10 - IMSA		F02U.V01.511-02		Sheet/Bl.	
en/de	CAT		Damping Plate- IMSA		1 271 032 390		1/1	
Scale/ Maßstab		N1S		Doc. type		DP/1D	Ind. Format	
MNR		OFFER DRAWING ANGEBOTSZEICHN.		Repl. for:		Repl. by:		

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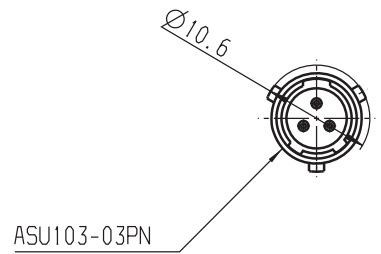
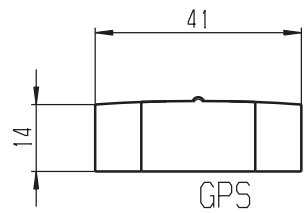


Mounting:
-Supplied mounting hardware must be used in order to ensure the proper function of the product

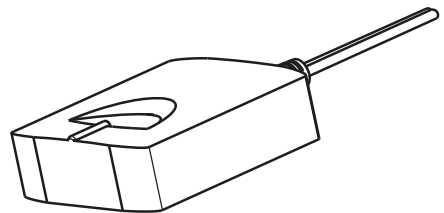
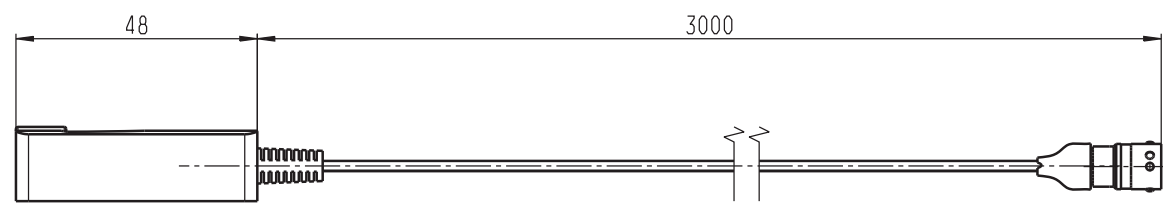
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Lang./Spr.	Syst.	Vght./Gew.	LT2 Sport- IMSA				Sheet/Bl.
en/de	CAT	--					1/1
	Scale/M.stab	NTS	BOSCH		Doc. type	F02U.V0U.152-01	DP/TD
MNR	--		OFFER DRAWING ANGEBOOTSZEICHN.		Repl. for		Repl. by
							Ind. Format
							A3

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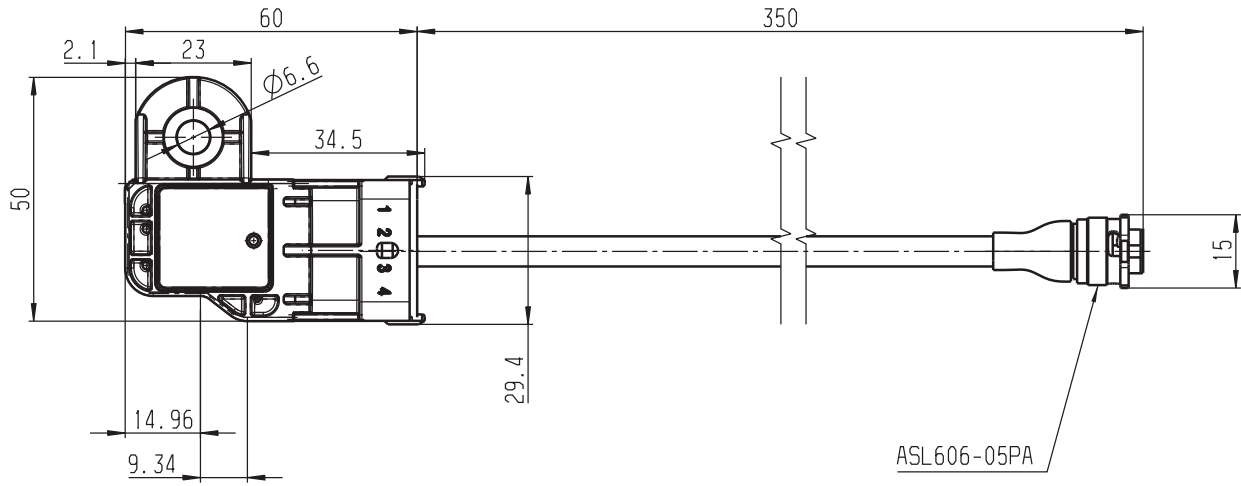
Pin Out	
1	Sens 5v
2	RS232 GND
3	RS232 TX
Mating Connector: ASU603-03SN	



01	Initial	20151109	Brk	OnE	OnE	MSD	BEG/MSD-NA		
Ind.	Change/Änderung	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Released/freig.	BWN	Resp. dept./Verantw. Abt.	Add. info./Zus. Info.	
Lang./Spr.	Syst.	Wght./Gew.				GPS Module- IMSA		Sheet/Bl.	
en/de	CAT	--						1/1	
	Scale/M. stab	1:1	OFFER DRAWING		Doc. type	F02U.VOU.203-01	DP/TD	Ind.	Format
	MNR	--	ANGEBOTSZEICHN.						

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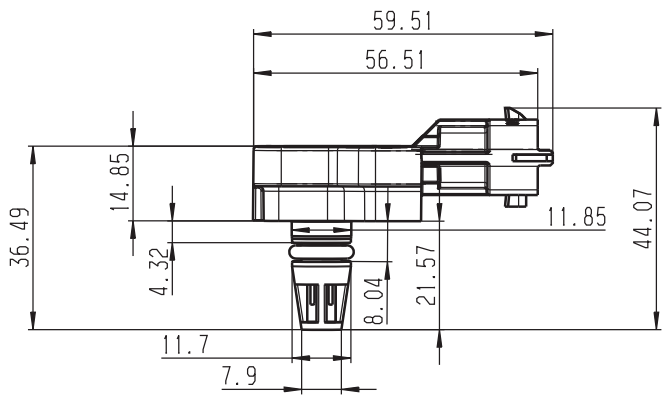


Pin Out	
1	Sens 5v
2	Sens GND
3	Signal
4	N-C
5	N-C

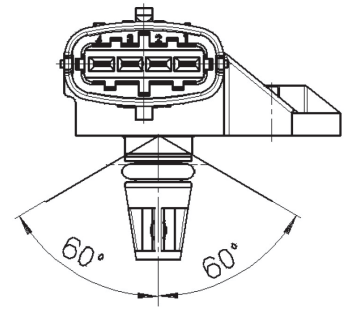
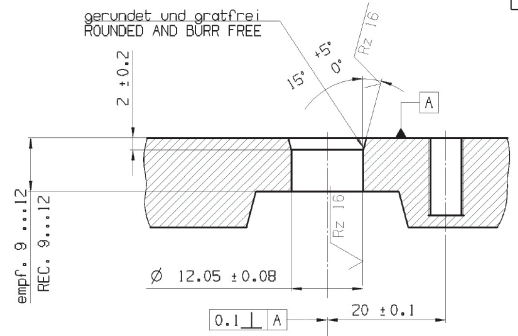
Mating Connector:
ASL106-05SA

Mounting Instructions:

- Recommended position: 0...±60° in all directions from vertical; orifice facing downwards
- Sensor should be mounted on a flat surface, with the base of the sensor sufficiently supported
- Mounting screw: M6x1
- Installation torque: 3.3 Nm



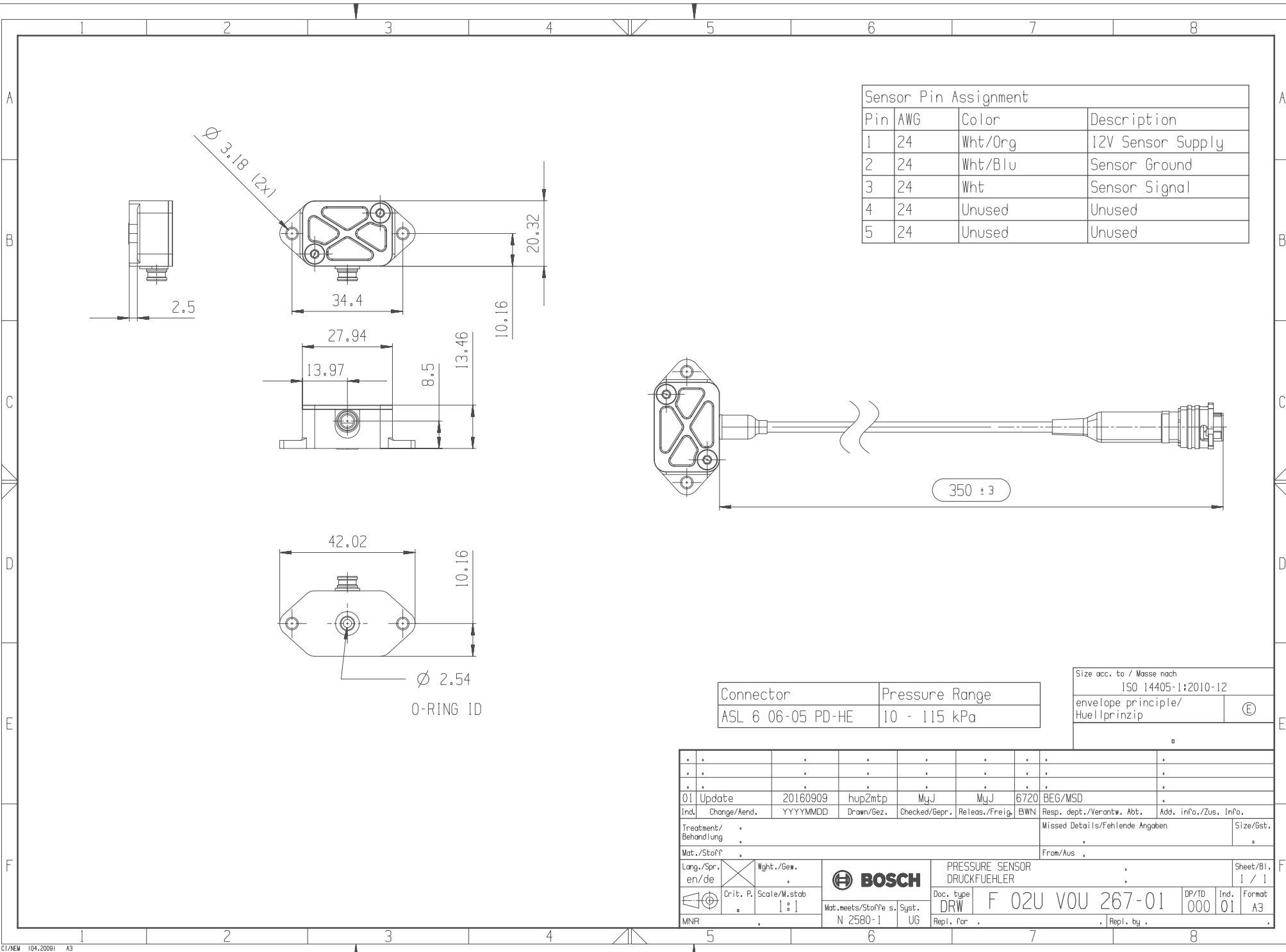
Sensor



02	Mounting	20151203	Brk	BeJ	OhE	MSD	BEG/MSD-NA		
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Ind.	Change/Änderung	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Released/freig.	BWN	Resp. dept./Verantw. Abt.	Add. info./Zus. Info.	
Lang./Spr.	Syst.	Wght./Gew.				Pressure Sensor: 1 Bar - IMSA			Sheet/Bl.
en/de	CAT	--				OFFER DRAWING ANGEBOOTSZEICHN.			1/1
en	Scale/M. stab	NTS	Doc. type			F02U.VOU.204-01			DP/TD
MNR	--		Repl. for			Repl. by			Ind. Format
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Sensor Pin Assignment			
Pin	AWG	Color	Description
1	24	Wht/Org	12V Sensor Supply
2	24	Wht/Blu	Sensor Ground
3	24	Wht	Sensor Signal
4	24	Unused	Unused
5	24	Unused	Unused

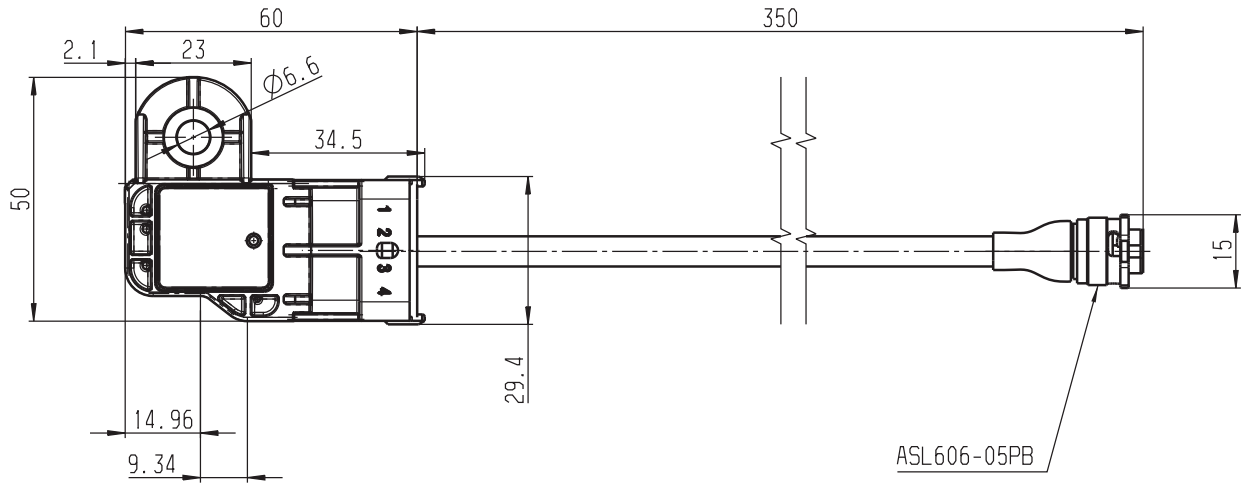
Connector	Pressure Range
ASL 6 06-05 PD-HE	10 - 115 kPa

Size acc. to / Masse nach ISO 14405-1:2010-12	
envelope principle/ Huellprinzip	E

01 Update	20160909	hup2mtp	MjJ	MjJ	6720	BEG/MSD		
Ind. Change/Änd.	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Released/Freig.	BWN	Resp. dept./Verantw. Abt.	Add. info./Zus. Info.	
Treatment/ Behandlung						Missed Details/Fehlende Angaben	Size/Gst.	
Mat./Stoff						From/Aus		
Lang./Spr. en/de	Wght./Gew.	BOSCH				PRESSURE SENSOR DRUCKFUEHLER		Sheet/Bl. 1 / 1
⊕	Crit. P.					Scale/M.stab	Doc. type DRW	F 02U VOU 267-01
MNR	Mat.meets/Stoffe s.		Syst. UG	Repl. for	Repl. by			

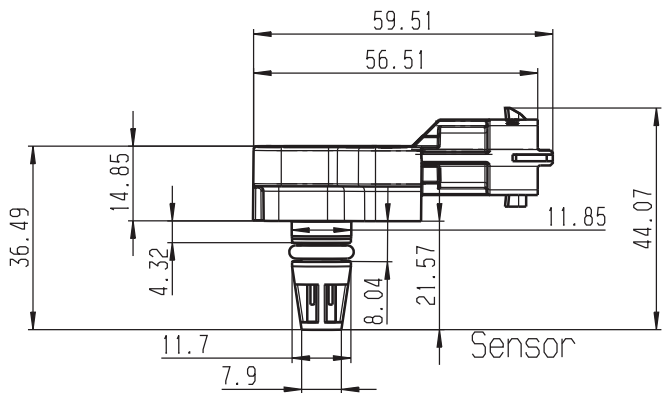
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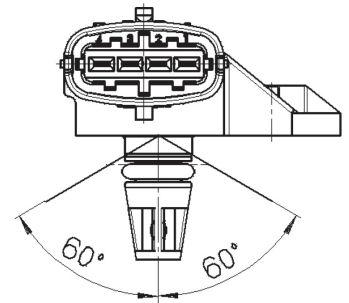
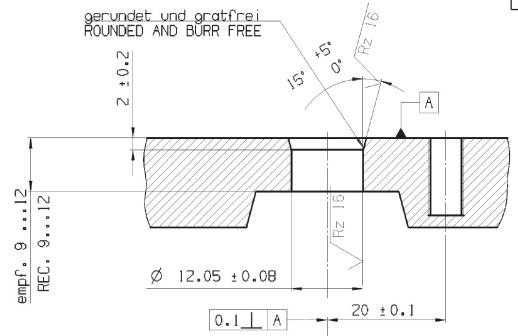
Pin Out	
1	Sens 5v
2	Sens GND
3	Signal
4	N-C
5	N-C

Mating Connector:
ASL106-05SB



Mounting Instructions:

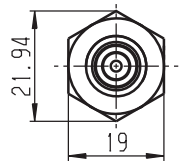
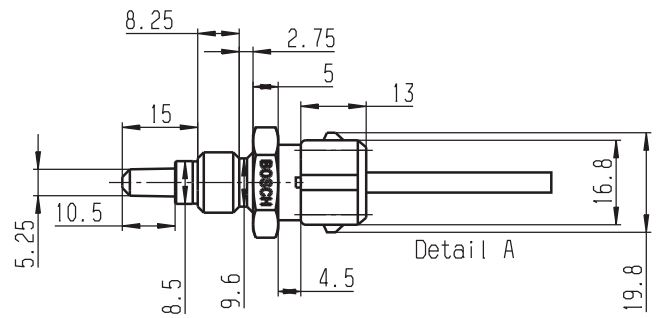
- Recommended position: 0...±60° in all directions from vertical; orifice facing downwards
- Sensor should be mounted on a flat surface, with the base of the sensor sufficiently supported
- Mounting screw: M6x1
- Installation torque: 3.3 Nm



02	Mounting	20151203	Brk	BeJ	OhE	MSD	BEG/MSD-NA	
01	Initial	20151106	Brk	OhE	OhE	MSD	BEG/MSD-NA	
Ind.	Change/Änderung	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Released/freig.	BWN	Resp. dept./Verantw. Abt.	Add. info./Zus. Info.
Lang./Spr.	Syst.	Wght./Gew.				Pressure Sensor: Boost-IMSA		Sheet/Bl.
en/de	CAT	--	OFFER DRAWING			F02U.V0U.205-01		1/1
Scale/M.stab	NTS		ANGEBOTSZEICHN.			Doc. type		DP/TD
MNR	--					Repl. for		Format
						Repl. by		A3

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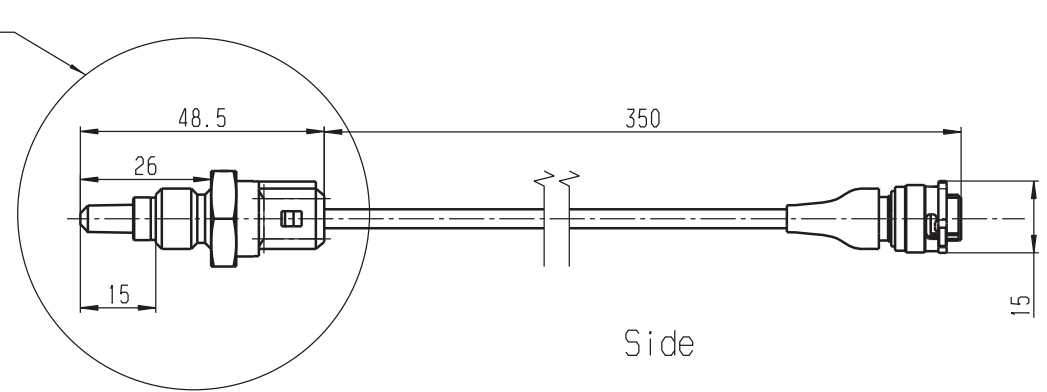


ASL606-05PN

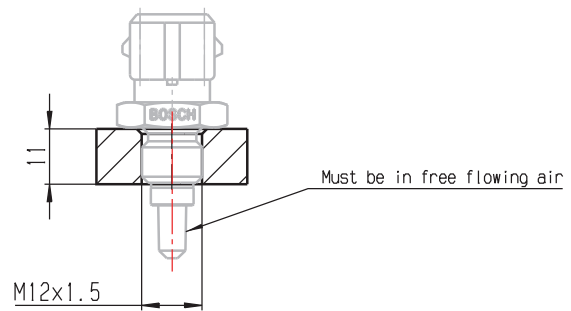
PIN	
1	N-C
2	Sens GND
3	Signal
4	N-C
5	N-C

Mating Connector:
ASL106-05SN

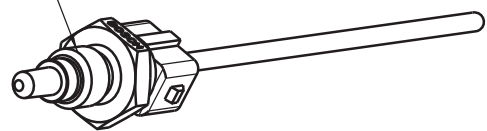
Mounting Recommendation:
 -Maximum sensor installation torque: 15Nm
 -A portion of the end of the sensor (shown below) must be in the free flowing stream of air for proper sensor function



Side



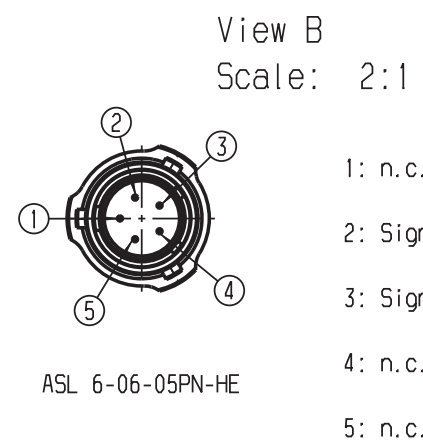
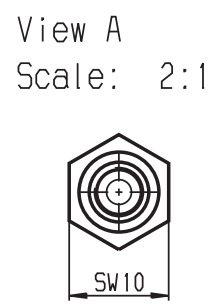
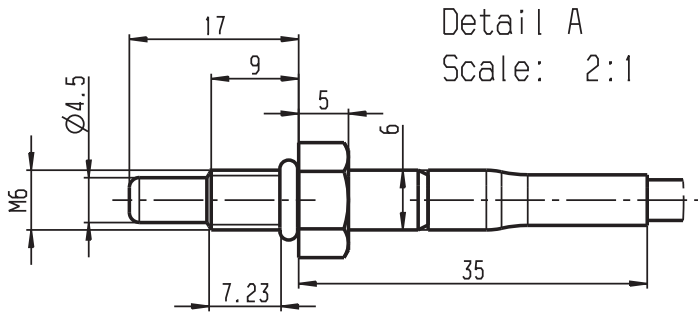
M12x1.5 Thread



02 Pin/ Mount	20151204	Brk	BeJ	OhE	MSD	BEG/MSD-NA	
01 Initial	20151106	Brk	OhE	OhE	MSD	BEG/MSD-NA	
Ind. Change/Änderung	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Released/freig.	BWN	Resp. dept./Verantw. Abt.	Add. info./Zus. Info.
Lang./Spr.	Syst.	Wght./Gew.	Temp Sensor: Cockpit- IMSA				Sheet/Bl.
en/de	CAT	--					1/1
Scale/M.stab	NTS			Doc. type		DP/TD	Ind.
MNR	--	OFFER DRAWING ANGEBOTSZEICHN.		F02U.VOU.206-01			Format
				Repl. for			A3
				Repl. by			

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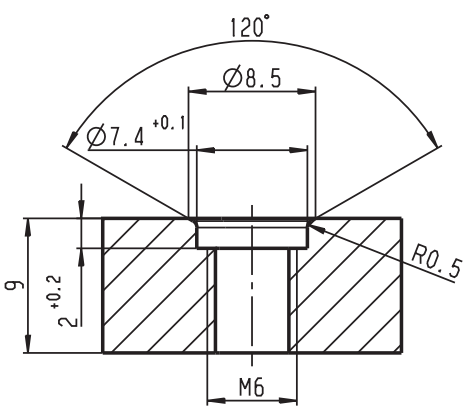
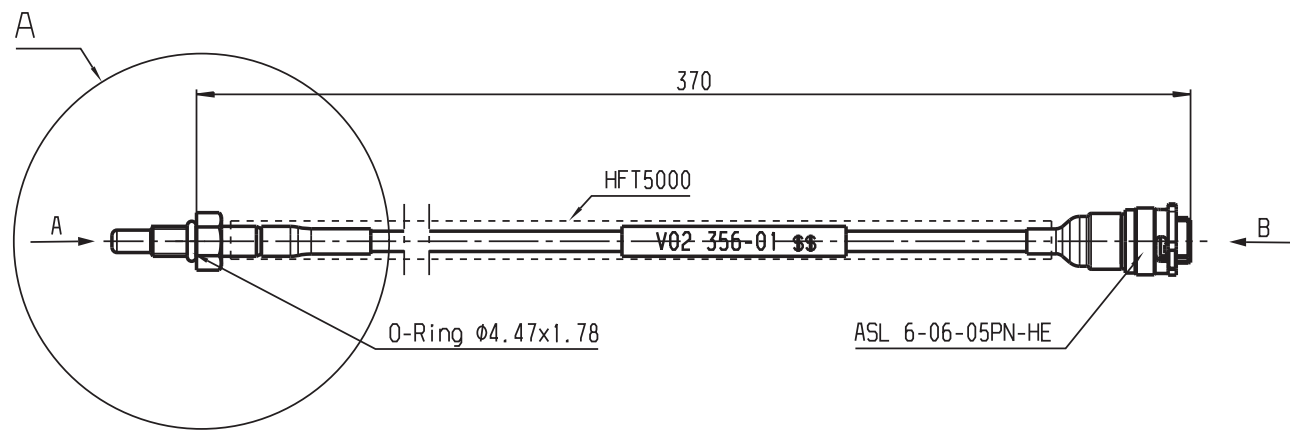
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- 1: n.c.
- 2: Signal -
- 3: Signal +
- 4: n.c.
- 5: n.c.

ASL 6-06-05PN-HE

Installation Recommendation
Scale: 3:1



Tightening Torque: 8Nm

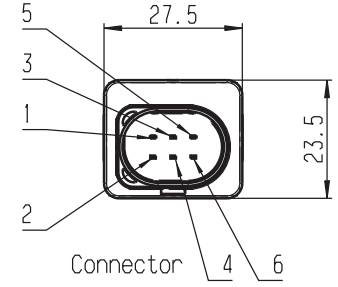
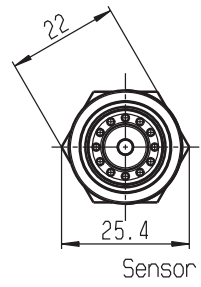
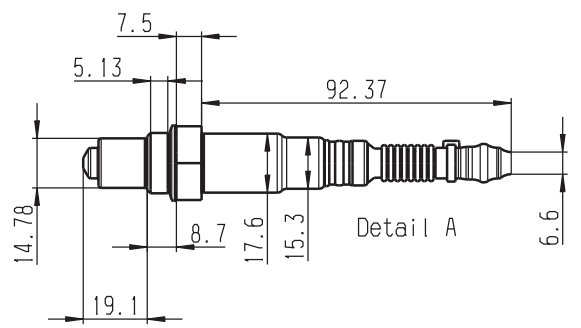
F 02U V02 356-01 DH	-55...300
Order Number	Temperature Range [°C]
Bestellnummer	Temperaturbereich [°C]

01 Erstellung	20151126	SKR	672	BEG/MSD-P Behrens			
Ind. Change/Änd.	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Releas./Freig.	BWV	Resp. dept./Verantw. Abt.	Add. info./Zus. Info.
Lang./Spr.	Syst.	Wght./Gew.	Temperature Sensor NTC-M6HS		Sheet/Bl.		
en/de	CAT	--	Temperatursensor NTC-M6HS		1/1		
Scale/M.stab	1:1	OFFER DRAWING		Doc. type	DP/TD	Ind.	Format
MNR	--	ANGEBOTSZEICHN.		AGZ F 02U V02 356-01			A3
Repl. for		Repl. by					

General tolerances for/Allgemeintoleranzen fuer		
lin. dim./L. Masse	radii/Radien	angles/Winkel
± 1	± 0.5	± 2°
Size acc. to/Masse nach		
ISO 14405-1:2010-12		
envelope principle / Hüllprinzip		(E)

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Pin Out	
1	IP
2	VM
3	RH
4	VS
5	IA
6	US
Mating Connector:	
D261 205 356-01	

Installation Torque:
40-60 Nm

Apply Never-Seez Regular Grade NS 42 B
M18x1.5 Thread

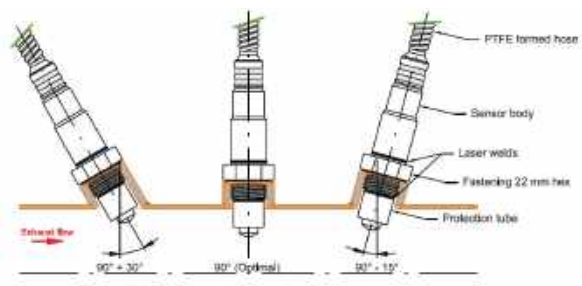


Fig. 1: LSU4.9 mounting w.r.t. exhaust stream

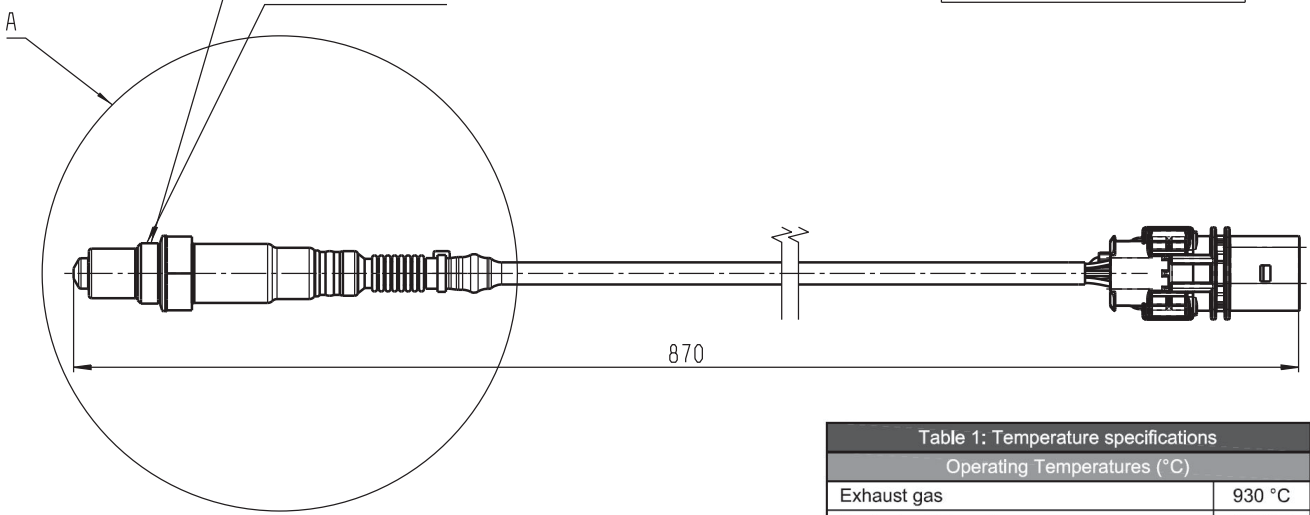


Table 1: Temperature specifications	
Operating Temperatures (°C)	
Exhaust gas	930 °C
Fastening 22 mm hex	600 °C
PTFE formed hose (sensor side)	250 °C
PTFE formed hose (upperhose crimp)	200 °C
Cable / protective sleeve	250 °C
Connector (OEM)	140 °C
Maximum Temperatures (°C)	
Exhaust Gas	1030 °C
Fastening 22 mm hex	680 °C

Table 2: Thread boss depth specifications		
Operating Temperatures (°C)	y (mm)	
Exhaust gas < 930	10.5	
Fastening 22 mm hex < 600	10.5	
Exhaust gas ≥ 930	13.0	
Fastening 22 mm hex ≥ 600	13.0	

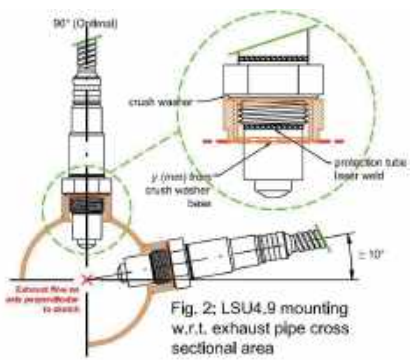


Fig. 2: LSU4.9 mounting w.r.t. exhaust pipe cross sectional area

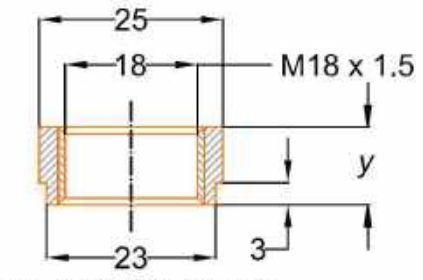


Fig. 3: LSU4.9 thread boss

02 Mounting	20151203	Brk	BeJ	OhE	MSD	BEG/MSD-NA	
01 Initial	20151106	Brk	OhE	OhE	MSD	BEG/MSD-NA	
Ind.	Change/Aenderung	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Releas./freig.	BWN	Resp. dept./Verantw. Abt.
Lang./Spr.	Syst.	Vght./Gew.			LSU 4.9- IMSA		Sheet/Bl.
en/de	CAT	--			-- / 1		
encl		Scale/M.stab	NTS		Doc. type		DP/TO
MNR		--	OFFER DRAWING ANGEBOOTSZEICHN.		0 258.988.001		Ind.
					Repl. for		Format
					Repl. by		A3

Vibration Profile 1

Broadband noise: 8h/direction

Frequency (Hz)	Acceleration density (m/s ²) ² /Hz
20	50.4
55	26.0
180	1.0
300	1.0
360	0.56
1,000	0.6
2,000	0.6
Effective value a_{eff}	55.4 m/s ²

Sine: 8h/direction

Frequency (Hz)	Acceleration peak (m/s ²)
100	50
180	200
250	200
350	60
2,000	60



Customer Information		Dealer Contact Information		CMS	Email	colin@gomuchfaster.com
				Florida	Phone	+1 (813) 482-2178
Team Name Here		Sakata Motorsport Electronics		California	Email	brian@sakatomotorsport.com
Car Make and Competition Class					Phone / Fax	+1 (714) 446-9473 / +1 (714) 446-9247
Contact Name		Mech-Tronic		New York	Email	mech-tronic@verizon.net
Contact Email / Phone Number					Phone / Fax	+1 (631) 423-0523 / +1 (631) 423-7769

Product Description	Part Number	Qty.	Use Case	Price	Comments
Spec Kit					
IMSA GT Spec Scrutineering Kit	F02U.V0U.202-01			\$ 9,072.42	Includes: C60 logger with USB Stick, GPS Module, LT2 Sport Lambda Controller, MM5.10 IMU with mounting plate.
Spec Sensors					
Pressure Sensor - 1 Bar	F02U.V0U.204-01		Airbox, Manifold, Restrictor	\$ 257.50	
Pressure Sensor - 1.15 Bar	F02U.V0U.267-02		Airbox, Manifold, Restrictor	\$ 437.50	
Pressure Sensor - 3.5 Bar	F02U.V0U.205-01		Turbo Boost	\$ 257.50	
Temperature Sensor - M12	F02U.V0U.206-01		Intake, Cockpit	\$ 206.00	
Temperature Sensor - M6	F02U.V02.356-01		Intake, Cockpit	\$ 412.00	
Lambda Sensor	0258.988.001		Lambda	\$ 145.00	
Individual Spare Parts					
IMSA C60 - Data Logger	F02U.V0U.207-01			\$ 7,318.50	IMSA C60 logger
LT2 Sport - Lambda Controller	F02U.V0U.152-01			\$ 659.00	
MM5.10 - IMU	F02U.V01.511-02			\$ 782.47	
GPS Module	F02U.V0U.203-01			\$ 360.00	
IMU Mounting Plate	1271.032.390			\$ 70.87	Mounting plate for MM5.10 sensor
Matting Connectors (Wiring Harness Side)					
LT2 Sport - Lambda Controller - Connector Kit	F02U.V0U.150-01			\$ 9.75	Includes housing, pins, and seals
MM5.10 - IMU - Connector Kit	F02U.B00.435-01			\$ 12.08	Includes housing, pins, and seals
Lambda Sensor Connector Kit	D261.205.356-01			\$ 13.74	Includes housing, pins, and seals
USB Stick Matting Connector Kit	F02U.002.996-01			\$ 63.63	For C60 data logger USB interface

Notes

To order parts please fill out this orderform with requested quantities of each part and send it back to one of the approved distributors.

All prices are in USD and are valid until 12/31/2020.

Parts are only able to be dispatched after payment has been verified.

Shipping charges are additional to kit/piece prices.

For sales/deliveries at the track, there is a 10% service charge

Motorsport Sales Terms & Conditions

Robert Bosch LLC

Bosch Engineering North America Division



BOSCH

1. **General.** The sale of the "Products" (defined below) by Robert Bosch LLC, through its Bosch Engineering North America Division ("BEG") to the buyer ("Buyer") is expressly limited and subject to Buyer's acceptance of BEG's quotation and the terms and conditions contained herein. No modification or waiver of any of the terms and conditions herein and no additional or different terms or conditions proposed by Buyer shall be effective unless agreed to in writing by both parties. Buyer's acceptance of the Products sold hereunder constitutes Buyer's acceptance of the terms hereof.

2. Scope.

2.1 The terms and conditions set forth herein apply to the supply of various products (the "Products") to be used by Buyer in motorsport vehicles, including: (a) Products which are produced via BEG's standard serial production processes for use on the public roads ("Serial Production Products"); (b) Serial Production Products which have been modified; and (c) Products which are not Serial Production Products but are Products which have been produced in accordance with Buyer's specifications.

2.2 Buyer acknowledges that Serial Production Products, whether or not modified, are not designed to meet the requirements and demands of motorsport racing.

2.3 Buyer acknowledges that modified Serial Production Products and Buyer specified Products cannot be tested to the same degree as Serial Production Products and that production of such modified Serial Production Products or Buyer specified Products does not follow the testing and validation standards applicable to Serial Production Products.

2.4 Buyer acknowledges that the use of the Products in motorsport racing applications will lead to early wear, and that modified Serial Production Products or Buyer specified products are produced with a focus on race performance and not on endurance.

2.5 The terms of Sections 2.1 to 2.4 above apply irrespective of the Customer's application of the Products.

3. Use of the Products.

3.1 The Products are provided solely for use by racing professionals and Buyer warrants and represents that it possesses the appropriate engineering and professional racing experience to use the Products for motorsport racing. Buyer acknowledges that the use of the Products may be dangerous and that the Products shall not be used in any consumer application.

3.2 Buyer shall use the Products: (i) only for motorsport racing purposes; (ii) only through engineers and mechanics who are trained and experienced in motorsport racing; (iii) only in vehicles which are suitable for use in motorsport racing; and (iv) only in such suitable vehicles that are operated by trained, professional motorsport race drivers.

3.3 Buyer shall not use, nor permit any other party to use, the Products in any vehicle operated on the public roads, or in connection with any consumer application.

3.4 BEG shall not be liable for any use of the Products on the public roads.

3.5 Should a Product be used on the public roads or in connection with any consumer application, all Product warranties are void.

4. Prices and Taxes.

4.1 All prices are subject to the shipping terms defined in Section 6 below.

4.2 All BEG fees and charges are exclusive of all applicable federal, state, provincial and local taxes including, without limitation, sales, use, property, value added, goods and services, excise, and similar taxes, and all such taxes shall be assumed and paid by Buyer, excluding taxes on BEG's net income. In the event that BEG determines that any such taxes are subject to withholding requirements, BEG may bill Buyer for such taxes, and Buyer shall promptly pay the amount billed. If any such tax for which Buyer is responsible hereunder is paid by BEG, Buyer agrees to promptly reimburse BEG therefor.

5. **Payment Terms.** Unless otherwise specified in BEG's quotation, payment terms are net thirty (30) days from date of shipment, with no discount allowed for early payment. BEG reserves the right to alter or suspend credit terms, require C.I.A. or C.O.D., whenever BEG has reasonable doubt as to Buyer's credit

worthiness. If Buyer becomes delinquent in payment or refuses to accept C.I.A. or C.O.D. payment terms, BEG shall have the right, in addition to all other available rights and remedies, to cancel any or all Buyer orders, withhold further deliveries, and declare all unpaid amounts for Products previously delivered immediately due and payable. Amounts past due shall be subject to an interest charge of the lower of 1.5% per month or the highest rate permitted under applicable law. All costs and expenses incurred by BEG relating to non-payment or delinquent payment by Buyer, including collection costs, interest, and reasonable attorneys' fees, shall be paid by Buyer.

6. **Shipment and Delivery.** All delivery dates are estimates only. BEG's only obligation with respect to delivery dates shall be to use reasonable efforts to meet same. Delivery terms, unless otherwise specified in BEG's quotation, shall be FCA (Incoterms 2000) at the BEG named location. Title to the Products shall transfer upon completion of delivery of the Products per the applicable delivery term specified above. Unless otherwise instructed, BEG will ship via industry standard means for the applicable Products. BEG will not be liable for any delays, breakage, loss or damage after having made delivery. Unless otherwise specified in BEG's quotation, standard packing for domestic shipment is included in the quoted price. When special domestic or export packing is requested, Buyer will be charged any additional expenses. Shipments shall be deemed accepted by Buyer unless written notice of rejection is received by BEG within ten (10) days after delivery of the Products.

7. **Cancellations and Changes.** No cancellations of or changes to the Products ordered by Buyer shall be effective without BEG's written consent. Without such consent, a cancellation of, or change to, the Products ordered by Buyer shall entitle BEG to all remedies available by law or equity including, but not limited to, cancellation costs and/or increased prices.

8. Termination; Cancellation.

8.1 Either party may terminate this Agreement: (a) upon breach of any material term of this Agreement by the other party which is not remedied within thirty (30) days after notice of such breach; or (b) if a party becomes insolvent or makes an assignment for the benefit of creditors, or such party institutes any voluntary proceeding under bankruptcy, reorganization, arrangement, readjustment of debt or insolvency law of any jurisdiction or for the appointment of a receiver or trustee in respect to any of the party's property, then termination shall be automatic and immediate; however, in the event any such proceeding is initiated by a third party against such party, termination shall be automatic if the such proceeding is not dismissed or cured by the party within thirty (30) days after the filing thereof.

8.2 In the event that Buyer cancels the program after business award but before the agreed upon end of program duration, Buyer shall reimburse appropriate cancellation charges for unrecovered BEG investment including but not limited to capital equipment, BEG paid tooling, engineering costs, and material obsolescence. Buyer payment is expected in lump sum by the end of the calendar year of the cancellation.

9. **Intellectual Property.** When title to the Products transfers to Buyer, such title shall only mean and refer to the specific physical representation of the Products, and shall not include any intellectual property rights whether patent, copyright, trademark, trade secret, know-how or other form of right (collectively "Intellectual Property Rights"), with all such Intellectual Property Rights remaining at all times the sole property of BEG.

10. Warranty.

10.1 Unless specified otherwise in BEG's quotation BEG warrants that, upon delivery, the Products will be free of defects in material and workmanship. BEG's warranty covers only defects, that existed at the time of delivery. The foregoing warranty: (i) is personal to Buyer and does not extend to any subsequent owner of the Products; and (ii) does not cover defects which occur due to the use in a motorsport environment.

10.2 Buyer acknowledges that the Products are designed for race performance, with reduced durability and stability, and that the extreme wear inherent in a racing environment may result in Product malfunction which will not be covered by the limited warranty set forth above.

10.3 BEG does not warrant that modified Serial Production Products or Buyer specified Products will display the features or operational performance requested or expected by Buyer.

10.4 BEG will provide free of charge to Buyer, replacement Products or, at BEG's option, credit in a fair amount not to exceed the purchase price for Products which prove to be defective under the limited warranty set forth above, provided, however, that Buyer has returned to BEG 100% or a statistically relevant share, as mutually agreed upon, of any Products claimed to be defective. BEG shall have the right to request reasonable evidence of, and impose reasonable requirements for, submission of a warranty claim including, by way of example and not limitation, printouts of diagnostic test results performed at the Buyer's dealer level or by Buyer.

10.5 In the event of (a) improper installation or misuse of the Products, (b) use of Products outside of BEG approved applications, specified environments or installation conditions, (c) use of Products for racing or testing applications, (d) failure to maintain Products in accordance with applicable maintenance instructions, or (e) alteration or damage caused to the Product, or similar circumstances, no warranty shall apply and BEG shall not be liable for such Products or any damage caused by such products.

10.6 THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED INCLUDING OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE FOREGOING WARRANTY DOES NOT APPLY TO ANY ISSUES STEMMING FROM BUYER'S USE OF THE PRODUCT IN ANY APPLICATION. THE REMEDIES SET FORTH IN THIS SECTION REPRESENT BUYER'S SOLE AND EXCLUSIVE REMEDIES FOR ANY BEG BREACH OF WARRANTY.

11. **Prototype and Sample Parts Warranty.** Prototype components and sample parts are for use only in Product testing/evaluation by qualified Buyer representatives in an appropriate test environment. Prototype components and sample parts are provided "AS IS" and all warranties are expressly excluded. BEG shall have no liability for claims related to the prototype components or sample parts. Buyer shall indemnify and hold BEG harmless from claims related to the prototype components and sample parts.

12. **Indemnity.** In the event of any third party claim for property damage, personal injury or death, resulting from the use of a Product, Buyer shall defend, indemnify and hold BEG harmless from and against any such claims, irrespective of the legal grounds for such claims, including any costs necessary for legal defense.

13. **Limitation of Liability.**

13.1 The liability of BEG, and its respective affiliates, officers, directors, employees, shareholders, agents, licensors, or representatives (collectively the "BEG Parties") for any claim, regardless of the form of action, whether in contract, tort or negligence, for any damages resulting from or in any manner connected with this Agreement and any Products, shall be limited to the lesser of (i) Buyer's actual direct damages related thereto, or (ii) the amount of the fees paid by Buyer for the portion of the Products which are in error. In no event shall the liability of the BEG Parties exceed the fees paid by Buyer during the period such damages were incurred, such period not to exceed three (3) months, for the specific Products that allegedly give rise to the damages.

13.2 In no event shall any of the BEG Parties be liable for any indirect, incidental, special or consequential damages including, but not limited to, loss of data, lost business, lost profits and other economic damages, whether foreseeable or not, even if advised of the possibility of such damages. Without limiting the generality of the foregoing, the BEG Parties shall not be liable to Buyer with respect to the quality or sufficiency of any business results or motorsport racing results to be achieved with the use of the Products.

13.3 Buyer agrees, acknowledges and confirms that the limitations of liability set out in this Section are fair and reasonable in the commercial circumstances of this Agreement and that BEG would not have entered into this Agreement but for Buyer's agreement to limit the liability of the BEG Parties in the manner, and to the extent, provided herein. The limitations of liability set out in this Section shall apply even in the event of a breach of condition, a breach of an essential or fundamental term, or a fundamental breach of this Agreement.

14. **Patents; Trademarks.**

14.1 BEG warrants that the Products shall be delivered free of rightful claims for infringement of any United States patent, provided, however, that this warranty shall not apply to claims for patent infringement to the extent that any Products are (a) manufactured and/or modified to Buyer's specifications, or (b) used in combination with Products not purchased from BEG in a manner which infringes a

patent covering the combination. BEG's obligation hereunder is conditioned upon Buyer: (i) giving BEG prompt written notice of any infringement claim; (ii) cooperating fully with respect to the defense of such claim; and (iii) upon BEG's request, providing BEG full control of the defense including settlement and/or litigation of such claim.

14.2 BEG shall be entitled, at its option, to obtain a license on Buyer's behalf for the Product which (allegedly) infringes an intellectual property right or to modify the Product in such a way that it does not infringe the intellectual property right, or replace the Product by a similar product which does not infringe the intellectual property right.

15. **Confidential Information.** Any and all information concerning the Products or the transactions covered hereunder which BEG discloses to Buyer, or which Buyer otherwise obtains knowledge of hereunder, remains the exclusive property of BEG and shall not be disclosed by Buyer to third parties without BEG's prior written consent. Buyer shall have no right whatsoever to such information other than to use it for purposes of the transactions covered hereunder. BEG will not disclose, without Buyer's prior written consent, information submitted to it by Buyer which is confidential and proprietary to Buyer and clearly designated as such.

16. **Force Majeure.** In the event either party is unable to fully perform its obligations hereunder (except for Buyer's obligation to pay for Products ordered) due to events beyond its reasonable control including but not limited to acts of God, action by any governmental authority (whether valid or invalid), fires, floods, windstorms, explosions, riots, natural disasters, wars, sabotage, labor problems (including lockouts, strikes, slowdowns), inability to obtain power, material, labor, equipment or transportation, or court injunction or order, that party shall be relieved of its obligations to the extent it is unable to perform. Timely notice of such inability to perform shall be given to the other party. In the event of BEG's inability to perform due to force majeure, Buyer shall be entitled to reduce its purchase obligations towards BEG by the quantities purchased from other sources, but shall not have the right to terminate this Agreement.

17. **Waiver.** Any delay by a party in exercising its rights hereunder will not constitute a waiver of its rights or its ability to enforce any such rights.

18. **Set-off.** Buyer is not entitled to set-off any amounts due or allegedly due from BEG to Buyer from the amounts owed by Buyer to BEG.

19. **Assignment.** Neither party shall assign its rights or obligations hereunder without the other party's prior written consent. A corporate reorganization, which does not result in a change of control or beneficial owner, shall not be deemed an assignment.

20. **Relationship of the Parties.** Buyer and BEG are independent contracting parties. Nothing hereunder or in the course of performance of this Agreement shall grant either party the authority to create or assume any obligation on behalf, or in the name, of the other party, or shall be deemed to create the relationship of joint venture, partnership, association or employment between the parties.

21. **Severability.** In the event that any provision of this Agreement shall by a court be declared void or unenforceable, the validity of any other provisions and of the entire Agreement shall not be affected thereby.

22. **Applicable Law; Arbitration.** This Agreement and all disputes between the parties arising out of or related to this Agreement shall be governed by the laws of the State of Michigan except for its choice of law rules; the United Nations Convention on the International Sale of Goods shall not apply. The parties agree to submit all such disputes to binding arbitration which shall be held in the metropolitan area of Detroit, Michigan, in accordance with the rules of the American Arbitration Association ("AAA") pertaining to commercial arbitration. Within thirty (30) days after either party has notified the other in writing that it is submitting a dispute to arbitration, three (3) arbitrators shall be appointed in accordance with said rules. Neither party shall be allowed to object to an arbitrator appointed by the other party. The arbitrators shall have no authority to award punitive damages or any other damages excluded herein. The arbitration award shall be final and binding, and it may be entered in and enforced by any court of competent jurisdiction. The party prevailing in the arbitration or any other legal proceedings shall be entitled to recover its costs including reasonable attorney's fees incurred due to the arbitration or other legal proceedings.

23. **Validity of Quotation.** Each quotation issued by BEG shall be valid for thirty (30) days from the date of issuance unless otherwise stated therein, and such quotation is deemed revoked if not accepted by Buyer prior to the end of the defined period.

~~11~~12 Revisions

V1.4.6

- Clarified USB mount and removal notes
- Add pambient CAN channel to team CAN received
- Update FFM service time to hours until calibration
- Add drawing for 12V 1 bar sensor loom
- Change Bosch contact to Max Houck
- Updated order form
- Add 12V 1 bar pressure sensor option and offer drawing

V1.4.5

- Update Creative Motorsport address
- Add b_FFMService CAN channel
- Update pricing for 2019

V1.4.4

- Removed sensor declaration form
- Updated CAN channels sent to include Fuel Temp and FFM Minutes On
- Add Driver ID
- Clarify connectors on components

V1.4.3:

- Updated device table with recommended speed sensor connector
- Updated schematic
 - o Pinout of recommended engine speed sensor
 - o Power source of fuel flow sensor

V1.4.2:

- Corrected pinout of recommended engine speed sensor

V1.4.1:

- Added additional information about engine speed sensor

V1.4.0:

- Added fuel flow meter, leaderlight, and RPM sensor sections
- Updated loom drawing
- Updated CAN diagram
- Updated power diagram
- Sensor locations all as mandated by IMSA
- Added vibration profile 1
- Remove KL 15
- Declaration sheet updated
- Order form updated

V1.3.5:

- DBC Available Online
- CAN message table removed

- Team received CAN table added
- Rainlight CAN message added
- Example serial number added on declaration form

V1.3.4:

- Driver ID added to 0x251
- Declaration form included

V1.3.3:

- Split CAM and TPMS CAN messages
- Added CMS as dealer
- Updated TPMS quantization
- KL15/KL30 Clarification
- 0x250 Integral added
- 0x245 Fuel Probe status added
- 0x251 Position in Class and Track Condition added

V1.3.0:

- Included LT2 Sport drawing w/ vibration isolation mounts
- Added CAN message descriptions
- Updated Tx rate on 0x240
- Updated 0x244 message details
- Added 0x24B message
- Added 0x25C message
- Highlighted callout for sensor/bank 1 to be Drivers Left
- Added section 3.3
- Wording in USB section
- Loom certification requirements update
- X2 transponder current consumption
- Added section 2.1 and 2.1.1

V1.2.0:

- Included IMU mounting bracket part number
- Added specification to C60 of LED light visibility
- Added mounting requirement to GPS sensor
- Added M6 temperature sensor
- Updated Team received channel CAN specification
- Updated C60 offer drawing to show correct connector clocking
- Updated IMU offer drawing to show fastener spec
- Added section 4.4 USB
- Added section 5 Loom Certification

V1.1.0:

- Clarification on sensor numbering vs. left bank/right bank
- Added restrictor pressure sensor wiring to schematic

- Added notation on USB wiring length to schematic
- Updated section 3.1, mating connectors
- Updated LSU4.9 offer drawing
- Added mounting information on IMU to section 3.1.2
- Added Throttle 2 to TEAM CAN Spec
- Added order form to Appendix

V1.0.0 – Initial Release

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