BOSCH

IMSA Prototype Classes Scrutineering System

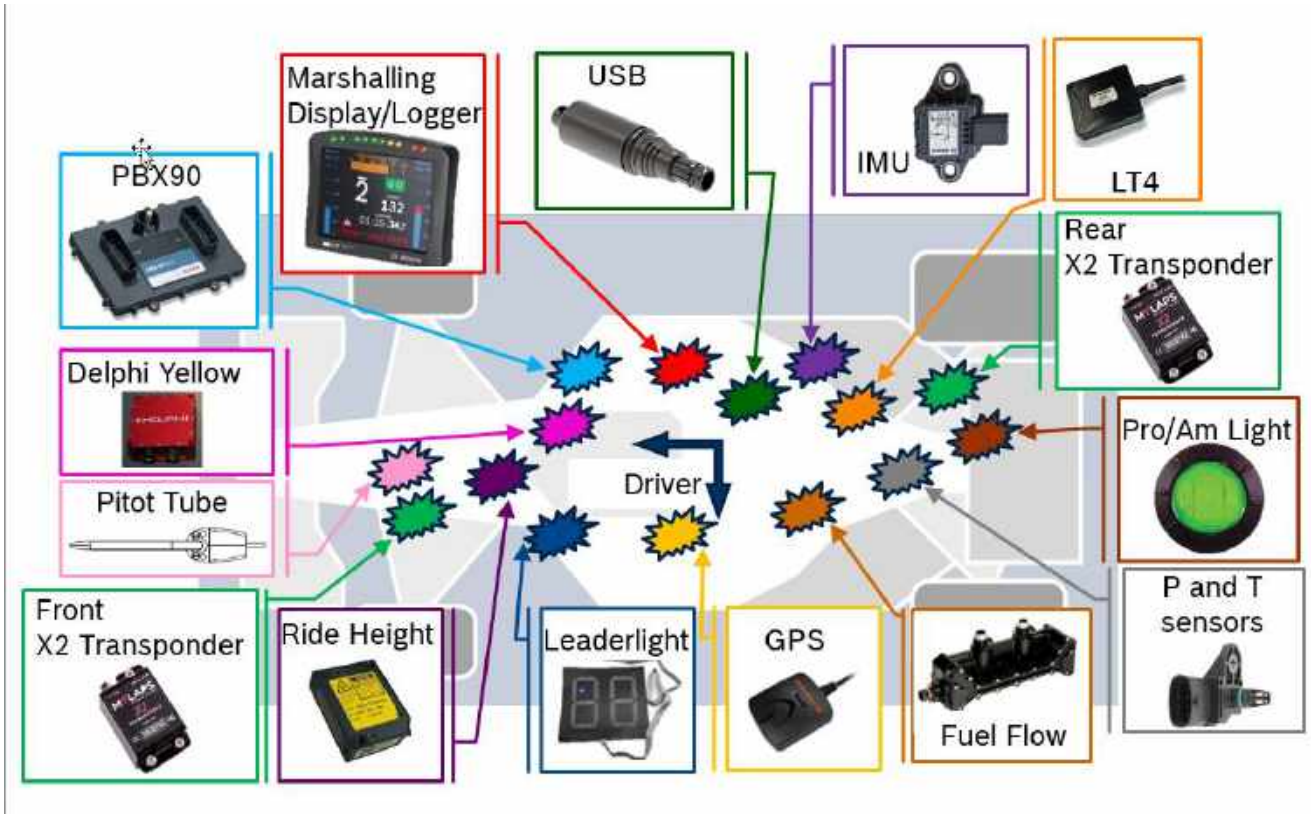
Manual

V1.2.6 12/11/2019

Table of Contents

1 Scope

This document contains application notes on the installation and operation of the IMSA Prototype Classes Scrutineering System.



2 Contact

For technical information please contact:

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AARON.PFEIFER@us.bosch.com

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2.1 Sales

Sales will be performed through Bosch Motorsports using the included order form.

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 LMP2 Architecture

LMP2 classification cars will not utilize the LT4 and LSU 4.9 lambda sensors or any engine sensor, at this time. The chassis loom of the LMP2 cars must include wiring for these components. The engine loom is not required to include provisions for these components in LMP2 cars.

3.2 Electronic Hardware

Component List:

Part Number	Mating Connector	Name	Description
F02U.V0U.290-01	AS616-35 SN	DDU9	P Scrutineering Logger
F02U.V01.794-05	F02U.B00.760-01 F02U.B00.761-01 F02U.003.574-01	PBX90	PowerBox
F02U.V01.511-02	F02U.B00.435-01	IMU	5 axis IMU
1271.032.390		IMU Plate	IMU mounting plate
F01T.A20.070-09	AS114-35PN	LT4	Lambda controller
F02U.V0U.203-01 or F02U.V0U.268-01	ASU603-03SN	GPS	10 Hz GPS unit
F02U.V0U.267-01	ASL106-05SD	1 Bar Pressure	Air pressure sensor
F02U.V0U.205-01	ASL106-05SB	3.5 Bar Pressure	Boost pressure sensor
F02U.V02.356-01	ASL106-05SN	Temperature Sensor	Air temperature sensor
F02U.V0U.264-01	ASL106-05SE	Pitot Tube	Pitot Tube
F02U.V01.342-01	02W08 F004S BK1 E1AA	USB Stick	Scrutineering data USB
0258.988.001	D261.205.356-01	LSU 4.9	Lambda Sensor
	AS108-35SN	Leaderlight panel*	Position display
	ASU603-05SN	X2 Transponder*	Timing Transponder
	ASL106-05SA-HE	Engine Speed**	RPM sensor
	ASDD606-09SD-HE	Fuel Flow*	Fuel flow sensor
	ASL606-05SC	Ride Height**	Laser ride height sensor
	DTM06-2S-E007	Delphi System*	Yellow light system
	DTM06-2S-E007	TV/Video*	Series camera power
	DTM06-2S-E007	Pro/Am Light**	Pro/Am indicator

* Denotes component available from IMSA or other spec suppliers

** Denotes component supplied by team

3.2.1 DDU9

Functional Description: Logger and Marshalling Display for IMSA Prototype Class Scrutineering System

Mounting Note:

- This device must be fitted in the cockpit 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 display can be easily seen by the driver while on course.
- This device should be mounted to sustain vibrations within the Vibration Profile 1 defined in the appendix.

Brightness Control: Brightness **must** be commanded via CAN by a value of 1-6, message details found in the DBC.

Part Number: F02U.V0U.249-01

Temperature Range: -20 to 70 °C

3.2.2 PBX90

Functional Description: Powerbox for IMSA Prototype Class Scrutineering System

Mounting Note:

- This device must be fitted in the cockpit 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 device can be easily accessed.

Part Number: F02U.V01.794-05

Temperature Range: -20 to 85 °C

3.2.3 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 and product sticker facing vertically 'up'. Mounting plate to be aligned within +/-0.5° of vehicle axes.

Part Number: F02U.V01.511-02

Mounting Bracket Part Number: 1271.032.390

Temperature Range: -20 to 85 °C

3.2.4 LT4 (DPi Only)

Functional Description: 4 channel lambda sensor controller

Mounting Note:

- This device must be fitted securely in the cockpit in an easily accessible location.
- This device should be mounted to sustain vibrations within the Vibration Profile 1 defined in the appendix.

Part Number: F01T.A20.070-09

Temperature Range: -20 to 85 °C

3.2.5 GPS

Functional Description: 10 Hz GPS unit

Mounting Note:

- This device must be fitted to the top surface of the vehicle in an IMSA approved location.

Part Number: F02U.V0U.203-01 OR F02U.V0U.268-01

3.2.6 USB Stick

Functional Description: IMSA Scrutineering USB Stick

Mounting Note:

- This device must be fitted in a plainly visible IMSA approved location.
- Device must be mounted beside the IMSA Diagnostic port on a bulkhead style plate. An example is shown below.

Temperature Range: -40 to 85 °C

Removal Note: 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.

USB Stick Possession: IMSA will distribute and collect USB Sticks at every race, teams will not receive sticks with scrutineering components nor are they required to purchase these separately.

3.2.7 X2 Transponders

Functional Description: CAN based transponder for IMSA Prototype Class Scrutineering System

Mounting Note:

- Each car will carry two X2 Transponders.
- These devices must be mounted in an IMSA approved location. See IMSA Bulletins for mounting information.

Temperature Range: 0 to 60 °C

3.2.8 Leaderlight Controller

Functional Description: Leaderlight controller boxes and panels

Mounting Note:

- This device(s) must be fitted securely.

3.2.9 Pro/Am Light

Functional Description: Pro/Am driver light indicator

Mounting Note:

- This device must be mounted away from heat sources.
- This device must be mounted in the IMSA specified location specified in IMSA technical regulations.

Harness Pinout:

Connector	DTM06-2S-E007
Pin	Description
1	12V PWR
2	GND

3.2.10 Delphi Yellow Light System

Functional Description: Delphi yellow light track condition light system

Mounting Note:

- This device must be mounted in a dry location using IMSA supplied Anti-Vibration Plate in the IMSA specified location.
- Antenna must be mounted following IMSA instructions.

3.3 Sensors

This section declares sensors that must be directly connected to the IMSA scrutineering system. IMSA will define required engine sensors and locations for each engine application. These signals will be fed back to the teams via CAN.

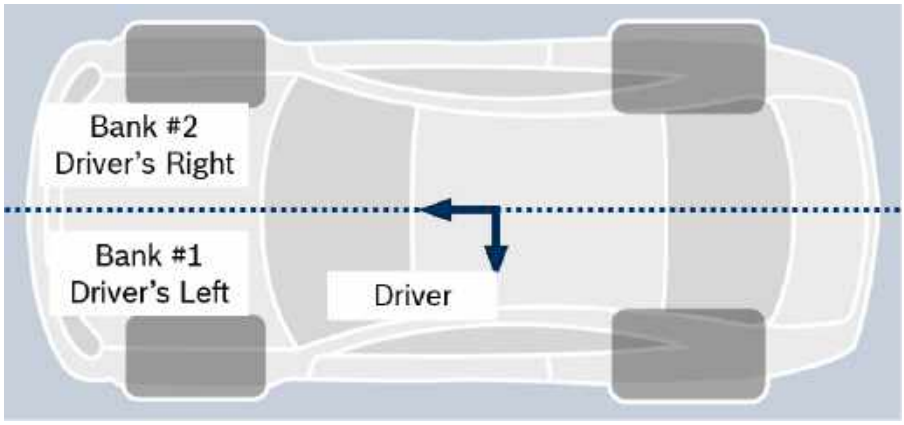
All Prototype cars must run:

- Cockpit temperature
- Pitot tube
- Laser Ride Height sensors (if used)

In addition, DPi cars must run:

- Engine Sensors
    - Intercooler Upstream temperature(s) (Turbo only)
    - Plenum pressure(s) (NA only)
    - Plenum temperature(s) (NA only)
    - Inlet Port pressure(s) (NA only)
    - Boost pressure(s) (Turbo only)
    - Inlet Port temperature(s)
    - Restrictor Throat pressure(s) (NA only)
    - Lambda(s)
    - Fuel flow meter
    - Engine speed sensor

Sensors must be installed in an IMSA approved location as identified in Scrutineering System homologation documentation with numbering referring to the fed engine bank.



3.3.1 1 Bar Pressure

Functional Description: Air pressure sensor

Use Case:

- **Plenum Pressure (NA engines):**
- **Inlet Port (NA engines):**
- **Restrictor Throat Pressure (NA engines):**

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

Part Number: F02U.V0U.267-01

Pressure Range: 0.1 – 1.15 bar

Temperature Range: -40 to 125°C

3.3.2 3.5 Bar Boost Pressure

Functional Description: Boost pressure sensor

Use Case:

- **Boost Pressure (Turbo engines):**

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

Part Number: F02U.V0U.205-01

Pressure Range: 0.5 – 3.5 bar

3.3.3 Pitot Tube

Functional Description: Temperature and pressure sensor

Use Case:

- **Dynamic Conditions:**
  - Measure dynamic conditions of air flowing over the car.
- **Mounting Note:**
  - Pitot sensor must be mounted in the IMSA homologated position. No other pitot tubes are permitted on the car.

Part Number: F02U.V0U.264-01

3.3.4 Laser Ride Height

Functional Description: Dynamic ride height measurement

Use Case:

- **Ride Height:**
  - Measure dynamic ride height of car in multiple locations.
  - Each manufacturer may select a sensor to be approved by IMSA.
- **Mounting Note:**
  - Ride height sensors must be mounted in the IMSA homologated position connected to the scrutineering system if run. No other ride height sensors are permitted on the car.
- **Harness Pinout:**

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

3.3.5 Temp Sensor

Functional Description: Temperature sensor

Use Case:

- **Plenum Temperature (NA engines):**
- **Intercooler Upstream Temperature (Turbo engines):**
- **Inlet Port 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

3.3.6 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

3.3.7 Engine Speed Sensor

Functional Description: Hall effect speed sensor

Use Case:

- Each manufacturer may select a sensor to be approved by IMSA.
- This sensor must be fitted in an IMSA approved location.
- Missing/extra tooth configurations are **NOT** supported

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

Harness Pinout:

Connector	ASL106-05SA-HE
Pin	Description
1	12V+ KL.30
2	GND
3	Signal
4	
5	

3.3.8 Fuel Flow Meter

Functional Description: CAN based fuel flow meter for IMSA Prototype Class Scrutineering System

Mounting Note:

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

Temperature Range: 0 to 85 °C

3.4 Sensor Declaration Form

Prior to each event weekend, a **Sensor Declaration Form** must be submitted via the IMSA TIMS system.

3.5 Component Seals

All Scrutineering system primary components (DDU9, PBX90, and LT4) units must have an IMSA Scrutineering Seal. Each device ordered through Bosch Motorsport NA using the attached order form will be delivered with the seal in place. This seal is not to be removed or transferred.

4 System Architecture

4.1 Team CAN

4.1.1 Team Connector

The pinout of the Team Connector is shown in the table. No changes are allowed to this arrangement. Termination of the CAN busses must be done in the car's loom as depicted in 4.1.2 and 4.1.3.

Team Harness Connector: AS(0/1)08-35SN

Scrutineering Harness Connector:

Connector	AS608-35PN
Pin	Description
1	CAN1_H
2	CAN1_L
3	CAN2_H
4	CAN2_L
5	Driver ID Signal
6	Driver ID GND

4.1.2 Team CAN 1

4.1.3 Team CAN 2

NOTE:

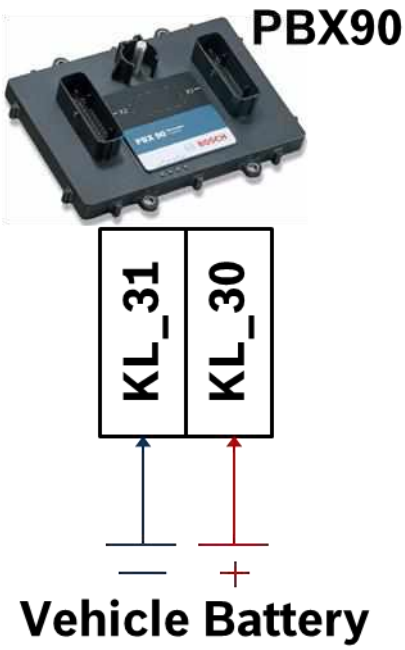
- One termination resistor will be built into the scrutineering loom. The other termination resistor must be present in the team wiring of the CAN connection, external of the scrutineering loom.
- CAN buses must be laid out in a linear fashion, with a termination resistor (120 ohm) at each physical end of the bus.

4.1.4 Driver ID

The Driver ID will be an input on the same connector as the team CAN connections. 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

4.2 Power Supply



The following notations for power signals are used:

- **KL 30** is a main relay switched battery positive rail. KL 30 must go directly to the car master relay. It may not be connected through a power box or other device.
- **KL 31** is an un-switched ground rail (same as battery negative terminal)

4.3 Harness

The scrutineering system harness has two major parts. The major pieces are the engine harness and the chassis harness. These two meet with a bulkhead connector located at the rear of the cockpit. The engine harness has an optional connector, if used the smaller rear portion must be certified. An example layout is shown in section 7. This layout may be deviated from; however, the components must remain on the same harness and use the same connector. Contact an approved harness builder for more information and specifics for individual applications.

All harness pieces must be certified individually and marked as such by a Bosch Motorsport approved dealer. Harnesses must be purchased through a Bosch Motorsport approved builder.

Initial harness builds may have extended lead times of 4-6 weeks or longer. Teams and manufacturers are responsible for ensuring their harnesses are ordered with time to be built for the first event it is to be used.

Approved builders:

DC Electronics Address: 119 Poplar Pointe Drive Mooresville, NC 28117 Phone : 704-230-4649 Email : jack@dcemotorsport.com
Sakata Motorsports Electronics, Inc. Address: 1241 N. Patt ST. Anaheim, CA 92801 Phone : 714-446-9473 Email : brian@sakatamotorsport.com

5 Loom Certification

All scrutineering looms will come certified and serialized from the builder. IMSA reserves the right to require an additional HiPot inspection at any time.

The engine or chassis loom pieces may be certified individually without the presence of the rest of the harness components. If a loom has additional connectors all components of the loom to include all connectors shown in the layout must be supplied for certification. Cost of additional inspections or re-certification to be $200 per loom.

6 CAN Specification

There are two IMSA CAN interfaces that may be used for communication, on these buses the team is required to send the "Team Transmitted Channels".

Teams will be responsible for informing IMSA and Bosch which buses will be used for ECU and team communications. These messages may be on the same bus.

CAN Buses:

The CAN buses will be used to transfer vital information between the team and the Scrutineering System. The buses are required to be 1 Mbit and conform to CAN 2.0B specifications.

6.1 Team Transmitted Channels

Channel Name	Short Name	Raster (ms)	Notes
Engine Revs	nmot	10	Engine revolutions per minute
Ignition Timing	ign_out	10	Crank angle of ignition event
Fuel Injector Mass	fuel_mass	10	Fuel mass injected per 2 engine revolutions
Fuel Rail Pressure	prail	10	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_rr	20	If only axle pressure is available, send on both L & R
Mixture Map	mappos	100	Value of engine mixture map selection switch
Boost Map	bmap	100	Value of engine boost map selection switch
Display Brightness	display_b	1000	Desired scrutineering display brightness (1-6)
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 Outlet	Cam2Exh	100	Angle of the drivers right bank exhaust CAM from park
Tire Pressure FL	ptireFL	1000	TPMS system reported absolute air pressure in FL tire
Tire Pressure FR	ptireFR	1000	TPMS system reported absolute air pressure in FR tire
Tire Pressure RL	ptireRL	1000	TPMS system reported absolute air pressure in RL tire
Tire Pressure RR	ptireRR	1000	TPMS system reported absolute air pressure in RR tire
Fuel Probe Flag	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**	LowBoostCtrOuting	20	Low overboost counter
High Overboost Counter**	HighBoostCtrOuting	20	High overboost counter
Overboost Integral**	integral	20	Live overboost integral value
DDU9 Fault	ddu9fault	20	DDU9 Fault Status
PBX90 Fault	pbxfault	20	PBX90 Fault Status
LT4 Fault*	lt4fault	20	LT4 Fault Status
Beacon	b_*	20	Beacon for s/f, Pit In, Pit Out
Position in Class	position	50	Position of car in class
Track Condition	track_cond	50	Track condition
Rainlight On	rainlight	50	Rainlight activiation status
Lap Number	lapnum	50	Current lap number
Driver ID	driver_id	50	Driver ID from Timing and Scoring
DDU9 Temp	tlogger	1000	DDU9 logger core temperature
Cockpit Temp	tcockpit	1000	Car cockpit temperature
PBX90 Temp	tpbx	1000	PBX90 core temperature
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
Pressure 1*	p21	200	Driver's left bank plenum/pre-throttle pressure
Pressure 2*	p21_2	200	Driver's right bank plenum/pre-throttle pressure
Pressure 3*	p22	200	Driver's left bank manifold/boost pressure
Pressure 4*	p22_2	200	Driver's right bank manifold/boost pressure
Pressure 5*	prestrictor	200	Driver's left restrictor throat pressure
Pressure 6*	prestrictor2	200	Driver's right restrictor throat pressure
Temperature 1*	tplenum	200	Driver's left plenum/pre-intercooler temperature
Temperature 2*	tplenum2	200	Driver's right plenum/pre-intercooler temperature
Temperature 3*	tmanifold	200	Driver's left manifold/post-intercooler temperature
Temperature 4*	tmanifold2	200	Driver's right manifold/post-intercooler temperature
Pitot Pressure	ppitot	20	Pitot tube pressure
Pitot Temperature	tpitot	20	Pitot tube temperature
Logger Status	logger_status	20	DDU9 logger status
USB Status	usb_status	20	USB stick recording status
Lambda 1*	lambda	20	Driver's left lambda value
Lambda 2*	lambda2	20	Driver's right lambda value
Ride Height Front Left*	ride_fl	20	Front left dynamic ride height
Ride Height Front Right*	ride_fr	20	Front right dynamic ride height
Ride Height Rear*	ride_r	20	Rear dynamic ride height
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
Fuel Temperature*	Tfuel	200	Fuel flow meter reported fuel temperature
Flow meter service time*	FFM_ServiceTime	200	Hours until service required for fuel flow meter

Engine Speed*	nmot_imsa	20	Scrutineering sensor reported engine speed
Flow meter calibration*	b_FFMService	200	Flow meter calibration required
Lambda Integral*	lam_integral	200	Live lambda integral
Low Lambda Counter*	lam_LowLamCtrOuting	200	Low lambda counter
High Lambda Counter	lam_HighLamCtrOuting	200	High Lambda Counter
Filtered Lambda**	lambda_filt	50	Filtered average of lambdas
Ambient Pressure*	pambient	1000	IMSA declared live ambient pressure

* Denotes DPi only

**Denotes turbocharged DPi only

6.3 Message Bus

Manufacturers may specify which bus (ECU or team) the team transmitted messages are received on.

6.4 DBC file

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

7 Display Pages

There are two pages on the display. A mechanic page used for IMSA safety checks and sensor installation verification is displayed when the vehicle is stationary. A driver page with alarms and information for the driver is shown while the vehicle is moving.

7.1 Driver Page

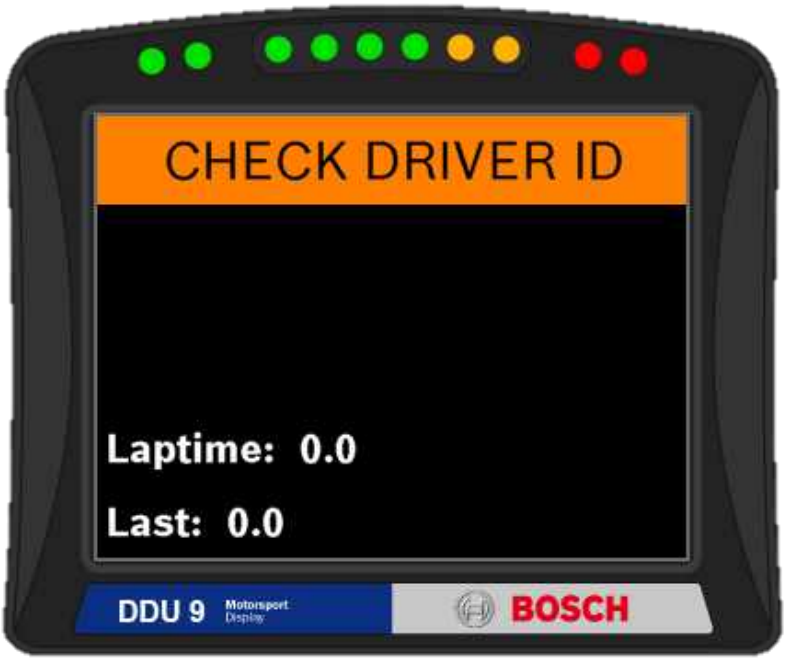
7.1.1 Standard

While on track the DDU9 display will look as shown below. The laptime shown is calculated internally by the DDU9 and is not the timing and scoring laptime.

7.1.2 Alerts

A series of alerts are set to show on the screen based on scrutineering system status and race control messages. If the Driver ID is changed a banner will appear for a short amount of time showing the new Driver ID based on the resistor connected.

If no resistor is present for the Driver ID, a banner will appear as shown below. This banner will appear until a resistor is connected.



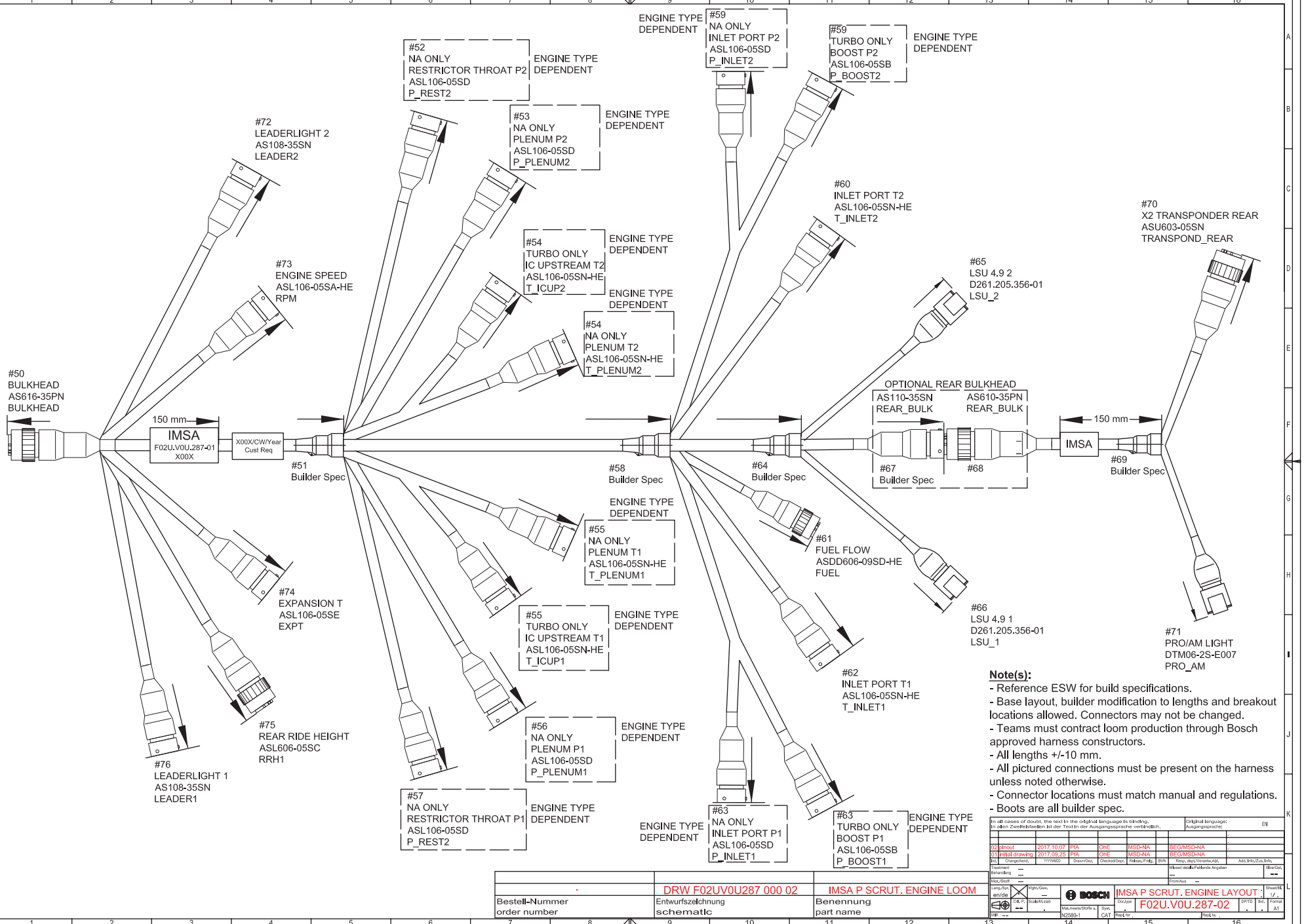
Rainlight On will appear and the outside LED lights turn on blue if the Rainlight should be on as indicated by Race Control.

A Red Flag block will appear and the LED lights turn on red in the case of a Red Flag as indicated by Race Control. The lights and message will be solid until the track condition is no longer red and the car is moving on track.

Under full course yellow track conditions the LED lights will alternate blinking yellow and off and a message will be displayed on screen. The yellow condition is triggered by the Delphi Box and will turn off when the track condition is no longer yellow.

7.2 Mechanic Page

Below is an example of a Mechanic Page. Included on the display while the car is stationary are the values of select scrutineering system sensors for installation verification. Yellow, red, rainlight, and driver ID change functionality will work as well.



Note(s):

- Reference ESW for build specifications.
- Base layout, builder modification to lengths and breakout locations allowed. Connectors may not be changed.
- Teams must contract loom production through Bosch approved harness constructors.
- All lengths +/-10 mm.
- All pictured connections must be present on the harness unless noted otherwise.
- Connector locations must match manual and regulations.
- Boots are all builder spec.

Bestell-Nummer order number	DRW F02UV0U287 000 02 Entwurfszeichnung schematic	IMSA P SCRUT. ENGINE LOOM Benennung part name

In all cases of doubt, the text in the original language is binding. In allen Zweifelsfaellen ist der Text in der Ausgangssprache verbindlich. Original language: EN

02	pinout	2017.10.07	PfA	OhE	MSD-NA	BEG/MSD-NA
01	initial drawing	2017.09.25	PfA	OhE	MSD-NA	BEG/MSD-NA

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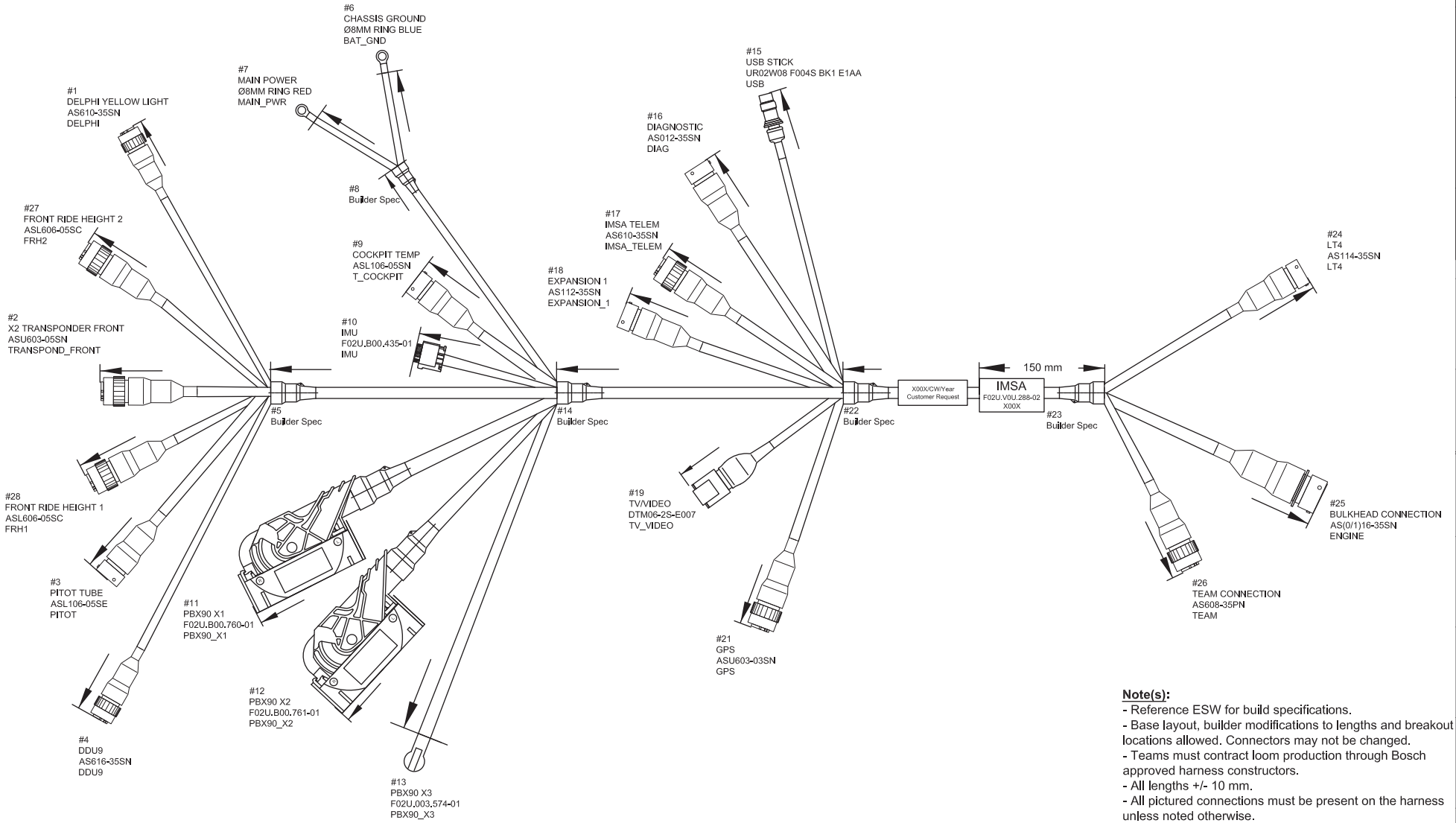
IMSA P SCRUT. ENGINE LAYOUT

F02U.V0U.287-02



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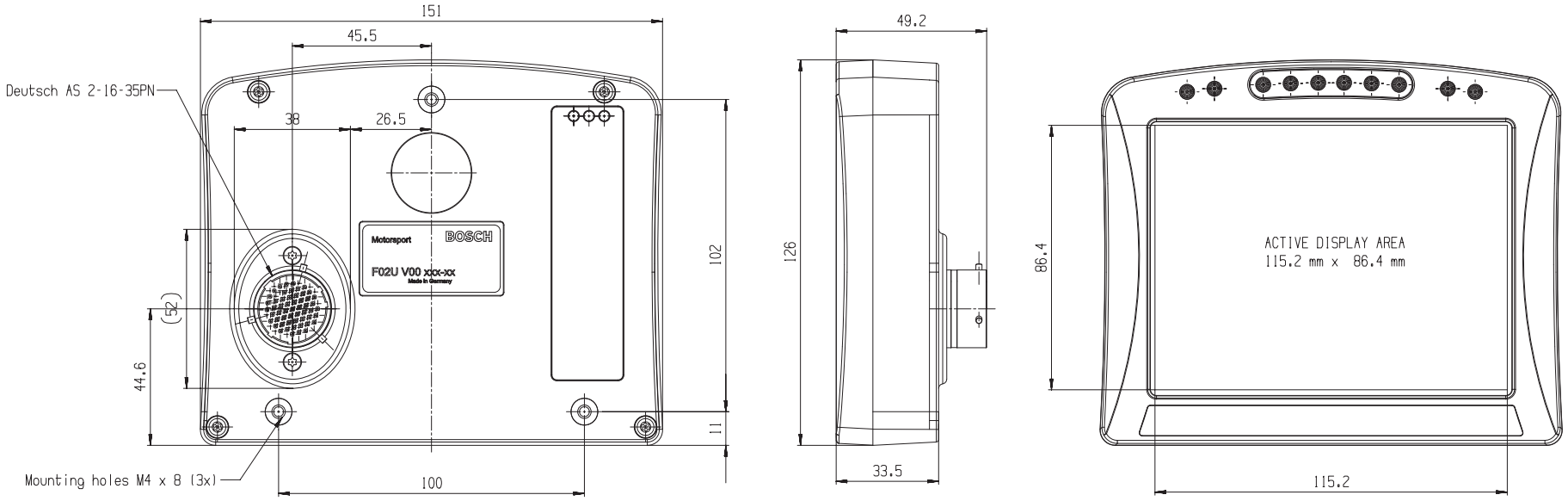
Bestell-Nummer order number	Entwurfszeichnung schematic	Benennung part name
-	DRW F02UV0U288 000 02	IMSA P SCRUT CHASSIS HARNESS

02	Blue ring term	2017.10.07	PfA	OhE	MSD-NA	BEG/MSD-NA		
01	Initial drawing	2017.09.15	PfA	OhE	MSD-NA	BEG/MSD-NA		

IMSA P SCRUT CHASSIS LAYOUT

F02U.V0U.288-02



GENERAL DESCRIPTIONS AND REFERENCES FOR THE DRAWING:
Allgemeine Angaben und Hinweise zur Zeichnung:

DISPLAY UNIT (DDU) CAN DEVIATE FROM THIS DRAWN CONSTRUCTION IN NOT DIMENSIONED NON-FUNCTIONAL GEOMETRIES.
Display Einheit (DDU) kann in unbemassten nicht funktionsrelevanten Geometrien von der Darstellung in dieser Zeichnung abweichen.

IT HAS TO BE ASSURED IN MOUNTING POSITION THAT WATER CANNOT INFILTRATE THROUGH WIRING HARNESS INTO THE DDU.
Es muss im Einbau sichergestellt sein, dass ueber den Leitungsstrang kein Wasser in die DDU gelangen kann.

DDU FULFILLS REQUIREMENTS ACCORDING TO PROJECT SPECIFIC TCD. PERMITTED APPLICATION AREA: ACCORDING TO ENVIROMENTAL CONDITIONS SPECIFIED IN PROJECT SPECIFIC TCD.
PERMITTED MOUNTING LOCATION: CHASSIS AND ENGINE COMPARTMENT,SO THAT THE ENVIRONMENTAL CONDITIONS SPECIFIED IN PROJECT SPECIFIC TCD ARE COMPLIED WITH.
DDU erfuellt Anforderungen nach projektspezifischer TKU. Zulaessiger Einsatzbereich: Gemaess der in projektspezifischer TKU definierten Umweltbedingungen.
Zulaessiger Anbauort: Karosserie und Motorraum, so dass die in der projektspezifischen TKU beschriebenen Umweltbedingungen eingehalten werden.

MOUNTING DDU IN VEHICLE:
Einbau DDU im Fahrzeug:

THE FASTENING OF THE DDU IN THE VEHICLE HAS TO BE DESIGNED IN A WAY THAT BOUNCING OF DDU AGAINST OTHER VEHICLE PARTS AND
OPTIONALLY ADDITIONAL FASTENING ELEMENTS OF THE DDU CANNOT OCCUR.
Die Befestigung der DDUim Fahrzeug muss so ausgefuehrt werden, dass ein Prellen der DDU gegen andere Fahrzeugteile und
eventuell zusaetzliche Befestigungselemente der DDU ausgeschlossen ist.

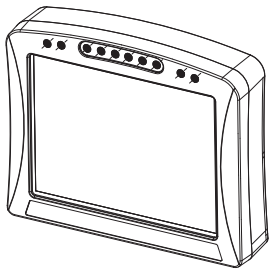
THE PERMITTED MECHANICAL INTERFACES TO VEHICLE AND RESULTANT LOAD ON COVER AND BOTTOM HAVE TO BE DISCUSSED WITH
BOSCH ENGINEERING GMBH IN CASE OF DEVIATIONS FROM THIS DRAWING.
Die zulaessigen Schnittstellen zum Fahrzeug sowie die resultierenden Kraefte auf Deckel und Boden sind im Falle von Abweichungen
von dieser Zeichnung mit Bosch Engineering GmbH abzustimmen.

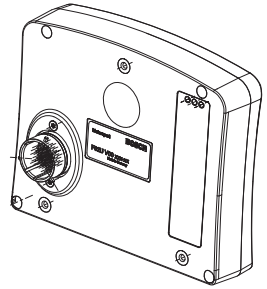
WIRING HARNESS PLUG:
Kabelbaumstecker:

THE WIRING HARNESS PLUG IS NOT INCLUDED IN DELIVERY.
Der Kabelbaumstecker gehört nicht zum Lieferumfang:

WIRING HARNESS NEEDS TO BE FIXED MECHANICALLY AT THE AREA OF EECU IN A WAY THAT EXCITATION OF ECU HAS THE SAME SEQUENCE.
Kabelbaeume sind im Bereich der Anbaustelle des SG mechanisch so abzufangen, dass eine phasengleiche Anregung des SG erfolgt.

MAXIMUM INTERNAL TEMPERATURE ACCORDING TCD; WATER PROTECTION ACCORDING TCD
Maximale Innentemperatur gemaess projektspezifischer TKU; Eigenschaft gegen Eindringen von Feuchtigkeit gemaess projektspezifischer TKU

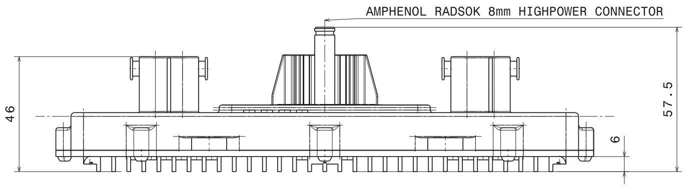




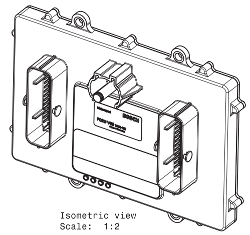
general tolerances for/Allgemeintoleranzen fuer		
lin. dim./L.-masse	radii/Radien	angles/Winkel
±,mm	±,mm	±,°

01	Init Release	20160511	rebilo			6720 BEG/EMS	
Ind.	Change/Aend.	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Releas./Freig.	BWN Resp. dept./Verantw. Abt.	Add. info./Zus. Info.

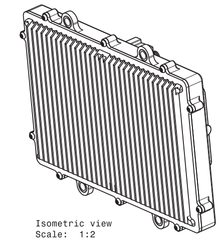
Lang./Spr. en/de	Syst. UG	Wght./Gew. .	BOSCH	DISPLAY DISPLAY	DDU9 .	Sheet/Bl. 1 / 1
		Scale/M.stab 1:1	OFFER DRAWING ANGEBOTSZEICHN.	Doc. type AGZ	F 02U V02 300	DP/TD 000 / Ind. 01 / Format A2
MNR .				Repl. for .	Repl. by .	



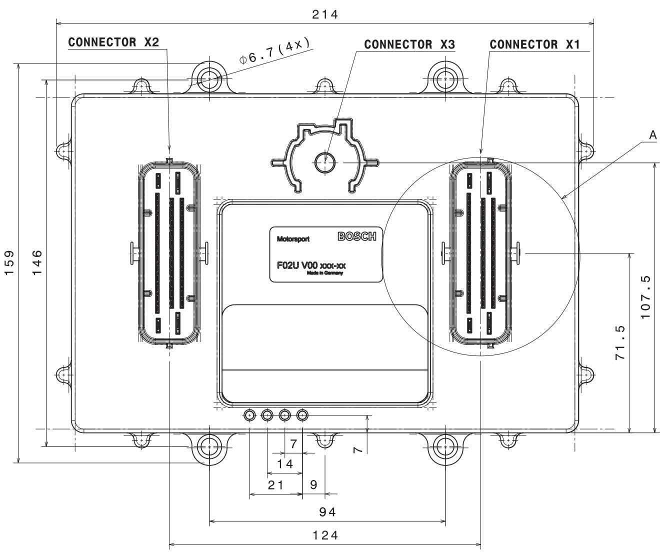
Bottom view
Scale: 1:1



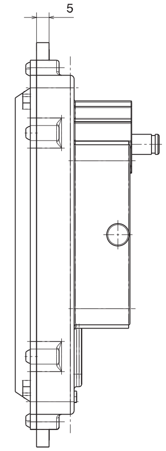
Isometric view
Scale: 1:2



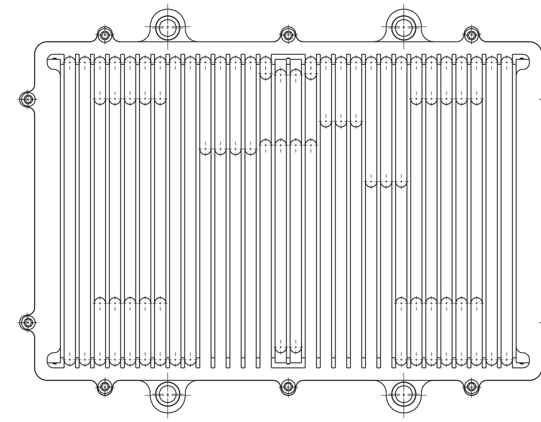
Isometric view
Scale: 1:2



Front view
Scale: 1:1

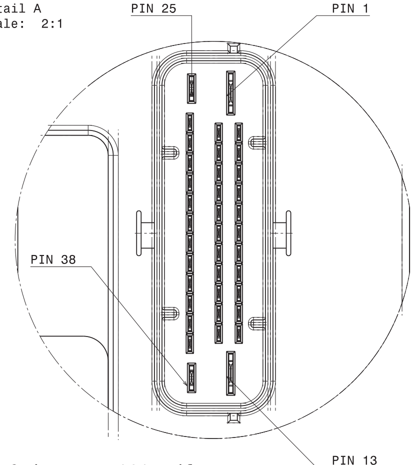


Left view
Scale: 1:1



Rear view
Scale: 1:1

Detail A
Scale: 2:1



NOTE

HARNESS PARTS:

F02U.B00.760-01 Harness Connector 38-pole code 1
F02U.B00.761-01 Harness Connector 38-pole code 2
F02U.003.575-01 STECKER; ACTIVE PIN LOCK 8MM 50MM2 RED
F02U.003.574-01 STECKER; ACTIVE PIN LOCK 8MM 35MM2 RED
Crimping reccomendation acc. Amphenol N_50_380_0017_Rev01_Crimpspec_080.pdf
Additional connector info:
http://www.bosch-connectors.com/bogscoca/category/125
Amphenol_active_PinLock_connector.pdf
Amphenol_8mm_active Pinlock_connector.pdf

GENERAL DESCRIPTIONS AND REFERENCES FOR THE DRAWING:
Allgemeine Angaben und Hinweise zur Zeichnung:

ELECTRONICAL ENGINE CONTROL UNIT (EECU) CAN DEVIATE FROM THIS DRAWN CONSTRUCTION IN NOT DIMENSIONED NON-FUNCTIONAL GEOMETRIES.
Elektronisches Steuergeraet (SG) kann in unbemassten nicht funktionsrelevanten Geometrien von der Darstellung in dieser Zeichnung abweichen.

IT HAS TO BE ASSURED IN MOUNTING POSITION THAT WATER CANNOT INFILTRATE THROUGH WIRING HARNESS INTO THE EECU.
Es muss im Einbau sichergestellt sein, dass ueber den Leitungsstrang kein Wasser in das SG gelangen kann.

IT HAS TO BE ASSURED IN MOUNTING POSITION THAT THE PCE AND THE SEALING IN THE REVOLVING GROOVE DO NOT GET SUBMERGED IN WATER.
Es muss im Einbau sichergestellt sein, dass das DAE und die Dichtung im umlaufenden Nutbereich nicht in Wasser getaucht werden.

ECU FULFILLS REQUIREMENTS ACCORDING TO PROJECT SPECIFIC TCD.
PERMITTED APPLICATION AREA: ACCORDING TO ENVIROMENTAL CONDITIONS SPECIFIED IN PROJECT SPECIFIC TCD.
PERMITTED MOUNTING LOCATION: CHASSIS AND ENGINE COMPARTMENT,SO THAT THE ENVIRONMENTAL CONDITIONS SPECIFIED IN PROJECT SPECIFIC TCD ARE COMPLIED WITH.
SG erfuellt Anforderungen nach projektspezifischer TKU.
Zulaessiger Einsatzbereich: Gemaess der in projektspezifischer TKU definierten Umweltbedingungen.
Zulaessiger Anbauort: Karosserie und Motorraum, so dass die in der projektspezifischen TKU beschriebenen Umweltbedingungen eingehalten werden.

MOUNTING ECU IN VEHICLE:
Einbau SG im Fahrzeug:

THE FASTENING OF THE ECU IN THE VEHICLE HAS TO BE DESIGNED IN A WAY THAT BOUNCING OF ECU AGAINST OTHER VEHICLE PARTS AND EVENTUALLY ADDITIONAL FASTENING ELEMENTS OF THE EECU CANNOT OCCUR.
Die Befestigung des SG im Fahrzeug muss so ausgefuehrt werden, dass ein Prellen des SG gegen andere Fahrzeugteile und eventuell zusaetzliche Befestigungselemente des SG ausgeschlossen ist.

THE PERMITTED MECHANICAL INTERFACES TO VEHICLE AND RESULTANT LOAD ON COVER AND BOTTOM HAVE TO BE DISCUSSED WITH BOSCH ENGINEERING GmbH IN CASE OF DEVIATIONS FROM THIS DRAWING.
Die zulaessigen Schnittstellen zum Fahrzeug sowie die resultierenden Kraefte auf Deckel und Boden sind im Falle von Abweichungen von dieser Zeichnung mit Bosch Engineering GmbH abzustimmen.
WIRING HARNESS PLUG:
Kabelbaumstecker:

THE WIRING HARNESS PLUG IS NOT INCLUDED IN DELIVERY.
Der Kabelbaumstecker gehört nicht zum Lieferumfang:

WIRING HARNESS NEEDS TO BE FIXED MECHANICALLY AT THE AREA OF EECU IN A WAY THAT EXCITATION OF ECU HAS THE SAME SEQUENCE.
Kabelbaeume sind im Bereich der Anbaustelle des SG mechanisch so abzufangen, dass eine phasengleiche Anregung des SG erfolgt.

MAXIMUM INTERNAL TEMPERATURE ACCORDING TCD
WATER PROTECTION ACCORDING TCD
Maximale Innentemperatur gemaess projektspezifischer TKU
Eigenschaft gegen Eindringen von Feuchtigkeit gemaess projektspezifischer TKU

general tolerances for/Allgemeintoleranzen fuer		
lin. dim./L.masse	radii/Radien	angles/Winkel
+/-0,75		

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

Ind.	Change/Aend.	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Releas./Freig.	BWN	Resp. dept./Verantw.Abt.	Add. info./Zus. Info.
03	PCB Change	20150330	reb1lo	.	.	672	BEG/EMS2	.
01	First Edit	20131127	hos3si	.	.	672	BEG/EMS2	PRELEMINARY

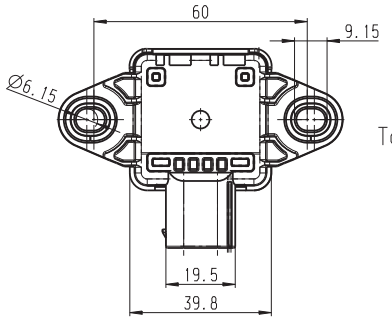
Lang./Spr. en/de	Syst. CAT	Wght./Gew. <1000g	BOSCH	Power distributor / Energieverteiler			Powerbox PBX90	Sheet/Bl. 1/1
		Scale/M.stab 1:1	OFFER DRAWING / ANGEBOTSZEICHN.	Doc. type AGZ	F02UV01794-03	DP/TD .	Ind. .	Format A1
MNR .				Repl. for .		Repl. by .		

Mounting Instructions

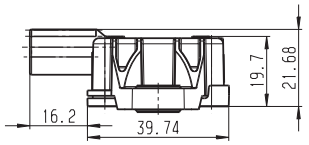
-Sensor is to be mounted at a location close to the center of gravity of the vehicle. Correct mounting position of the sensor is required for its proper function.

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

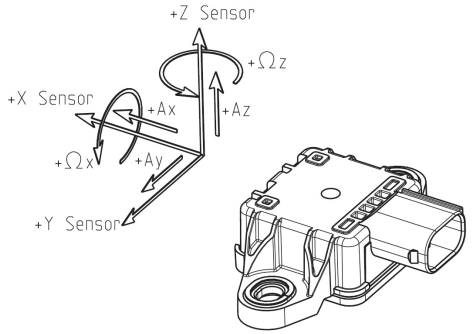
-Correct vehicle mounting orientation of the sensor is shown in drawing(s) below

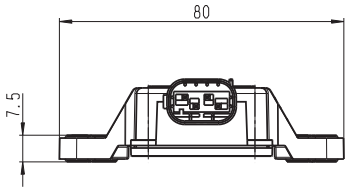


Top

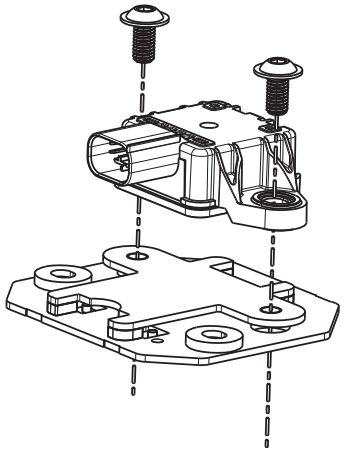


Side

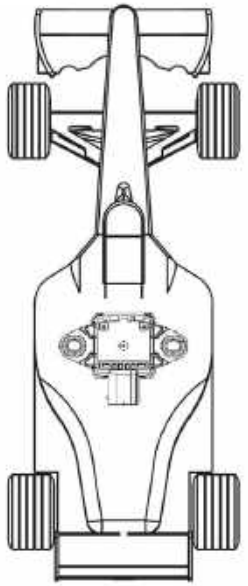




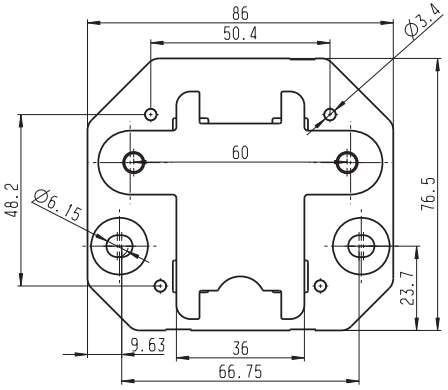
Front



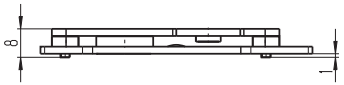
Isometric



Front



Top

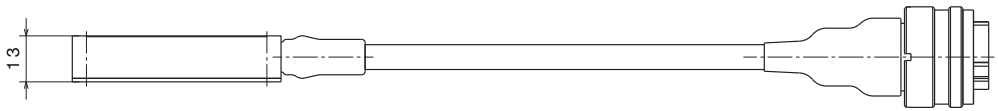


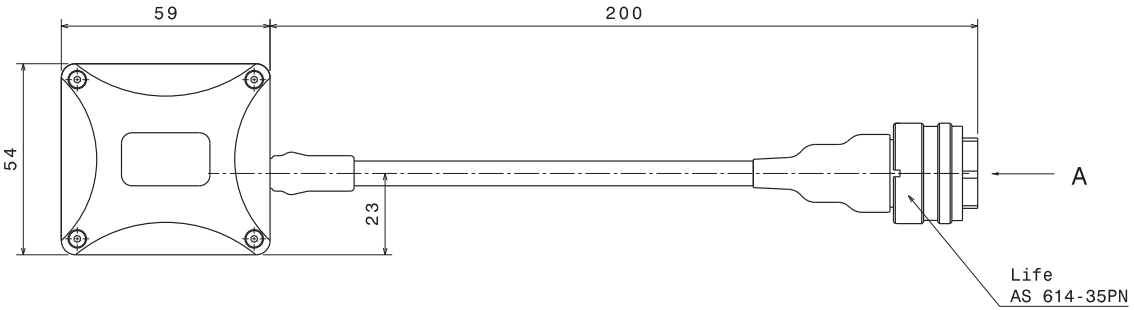
Side

02	Mounting	20151202	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.	Add. info./Zus. Info.

Lang./Spr. en/de	Syst. CAT	Wght./Gew. --	BOSCH	IMU5.10 - IMSA_____FO2U.V01.511-02	Sheet/Bl. 1/1
	Scale/M.stab NTS		OFFER DRAWING ANGEBOTSZEICHN.	Damping Plate- IMSA_____1 271.032.390	DP/TD .	Ind. .	Format A2
MNR --				Doc.type . . Repl. for . Repl. by .	

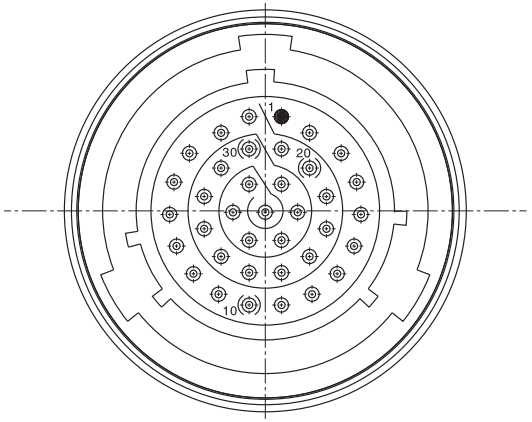
F 01T A22 070





Life-Stecker	AS6.14.35.PN
Pin	Funktion
1	UBAT
2	UBAT
3	GND
4	GND
5	B_D_DIAK
6	B_D_CAN1_H
7	B_D_CAN1_L
8	A_A_UA1
9	A_A_UA2
10	A_A_UA3
11	A_A_UA4
12	GND_REF
13	M_C_GND
14	E_A_LSUIP1
15	M_R_LSUVM1
16	A_S_LSH1
17	U_U_LSUH1
18	E_A_LSUIA1
19	E_A_LSUUN1
20	E_A_LSUIP2
21	M_R_LSUVM2
22	A_S_LSH2
23	U_U_LSUH2
24	E_A_LSUIA2
25	E_A_LSUUN2
26	E_A_LSUIP3
27	M_R_LSUVM3
28	A_S_LSH3
29	U_U_LSUH3
30	E_A_LSUIA3
31	E_A_LSUUN3
32	E_A_LSUIP4
33	M_R_LSUVM4
34	A_S_LSH4
35	U_U_LSUH4
36	E_A_LSUIA4
37	E_A_LSUUN4

Ansicht A
Scale: 4:1



Weit. fremdspr. Angebotszeichnungen
FURTHER FOREIGN LANGUAGE OFFER DWGS

-	-	-	-
-	F 01T A20 070	AS 614-35PN	200mm
Entwurfs - Zeichnung DRAFT DRAWING NUMBER	Bestell - Nummer ORDER NUMBER	Stecker connector	Länge L length L

Nr NO	Aenderung CHANGE	gez. DWN.	gueltig VALID	gepr CHK.
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Nicht tol. Masse
NON TOLERANCED DIMENSIONS
± - mm, ± - °

ISO E

Dokumentenart/ DOCUMENT TYPE AGZ

Gr.St. VOLUME -
DIN A2
CAT

	Datum/DATE	Name/NAME
gez/DWN	19.07.2007	Cr
gep/CHK	-	-
ges/APP	-	-

Original: BEG/MSD

Massstab SCALE 1:1 -
Gewicht WEIGHT -

Angebots- zeichnung
OFFER DRAWING

Benennung/ TITLE
Angebotszeichnung LT4F1

BOSCH

Nr./ NO. F 01T A22 070

de/en

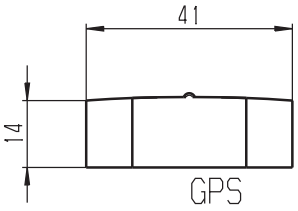
Blatt SHEET 1 - Bl/SH

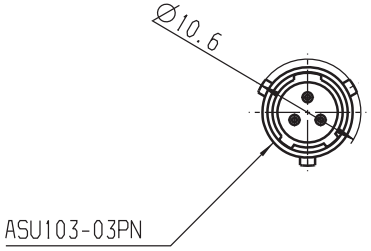
Ers.f./REPLACES - - Ers.d./REPLAC.BY - -

OBSERVE INSTRUCTIONS FOR FILLING OUT N12A D11/1

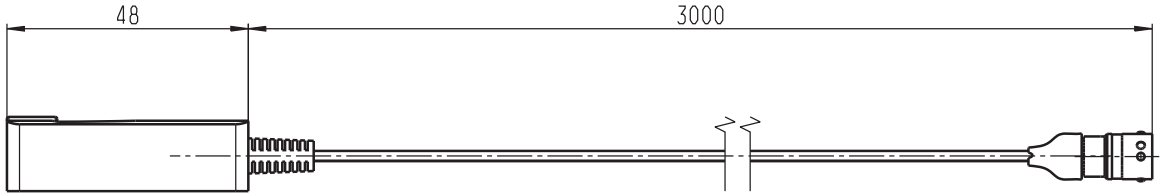
Ausfuellanleitung N12A D11/1 beachten!

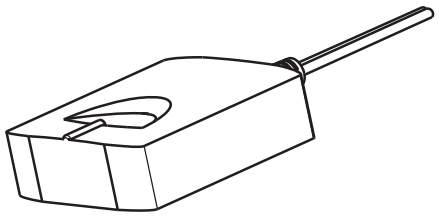
DI/EAM1 106.2002) O A2





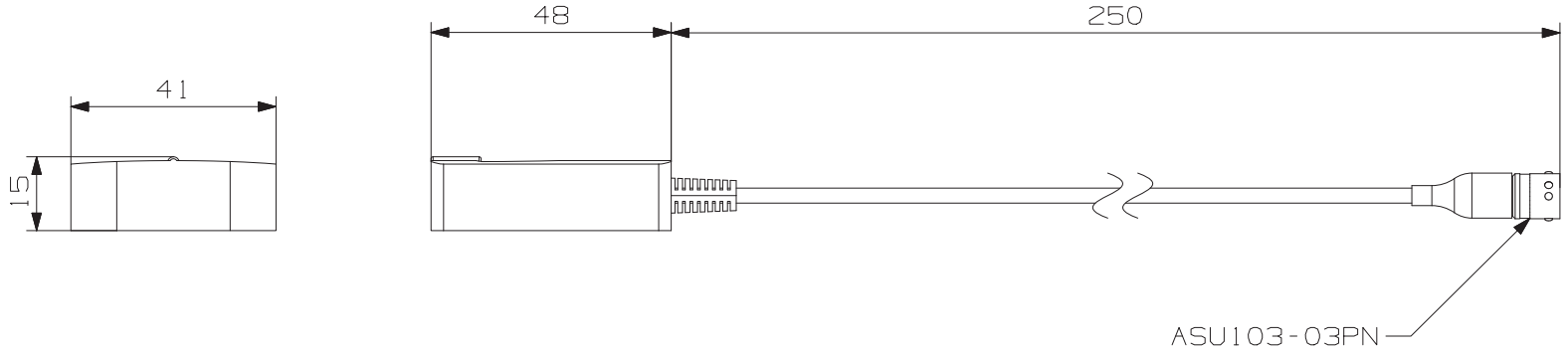
Pin Out	
1	Sens 5v
2	RS232 GND
3	RS232 TX
Mating Connector:	
ASU603-03SN	

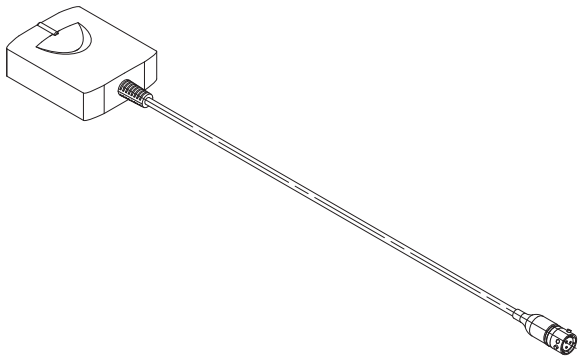




Ind.	Change/Aenderung	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Releas./Freig.	BWN	Resp. dept./Verantw.Abt.	Add. info./Zus. Info.
01	Initial	20151109	BrK	OhE	OhE	MSD	BEG/MSD-NA	

Lang./Spr.	Syst.	Wght./Gew.		GPS Module- IMSA	Sheet/Bl.
en/de	CAT	--	BOSCH		1/1
		Scale/M.stab 1:1	OFFER DRAWING ANGEBOTSZEICHN.	Doc.type F02U.V0U.203-01	DP/TD . / Ind. . / Format A3
MNR --				Repl. for . / Repl. by .	





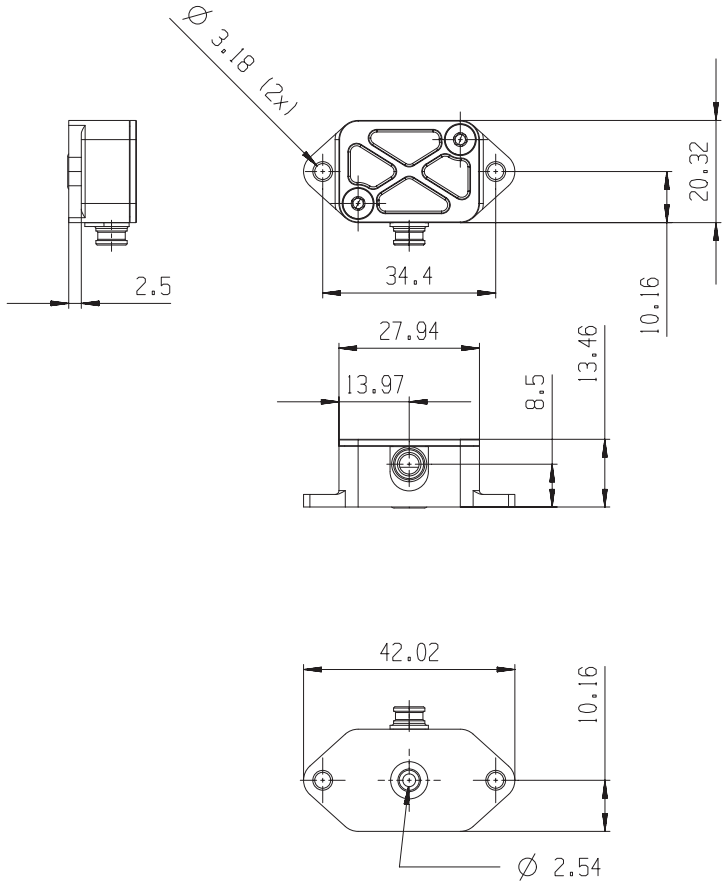
Pin Out	
1	Sens 5V
2	RS232 GND
3	RS232 TX
Mating Connector: ASU603-03SN	

01	Issued	20160926	HnP	.	.	6720	BEG/MSD	.
Ind.	Change/Aend.	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Releas./Freig.	BWN	Resp. dept./Verantw. Abt.	Add. info./Zus. Info.

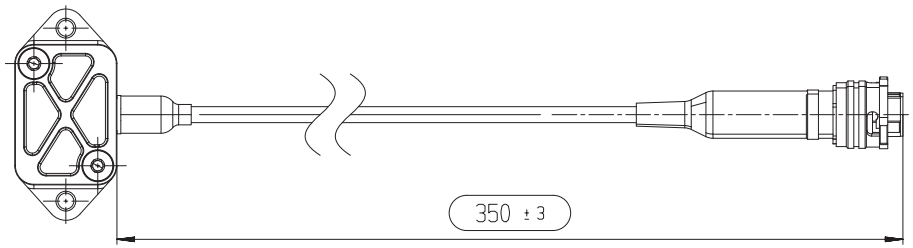
Size acc. to / Masse nach ISO 14405-1:2010-12

envelope principle/ Huellprinzip Ⓔ

Treatment/ Behandlung .			Missed Details/Fehlende Angaben .		Size/Gst. .
Mat./Stoff .			From/Aus .		
Lang./Spr. en/de	Wght./Gew. .	BOSCH	GPS ANTENNA . GPS-ANTENNE .		Sheet/Bl. 1 / 1
Crit. P. .	Scale/M.stab 1 : 1	Mat.meets/Stoffe s. N 2580-1	Syst. UG	Doc. type DRW	F 02U V0U 268-01 DP/TD 000 Ind. 01 Format A3
MNR .				Repl. for .	Repl. by .



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 Ⓔ

Ind.	Change/Aend.	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Releas./Freig.	BWN	Resp. dept./Verantw. Abt.	Add. info./Zus. Info.
01	Update	20160909	hup2mtp	MyJ	MyJ	6720	BEG/MSD	

Treatment/ Behandlung

Missed Details/Fehlende Angaben

Size/Gst.

Mat./Stoff

From/Aus

Lang./Spr. en/de

Wght./Gew.

Crit. P.

Scale/M.stab 1 : 1

MNR

BOSCH

Mat.meets/Stoffe s. N 2580-1

Syst. UG

PRESSURE SENSOR
DRUCKFUEHLER

Sheet/Bl. 1 / 1

Doc. type DRW

F 02U V0U 267-01

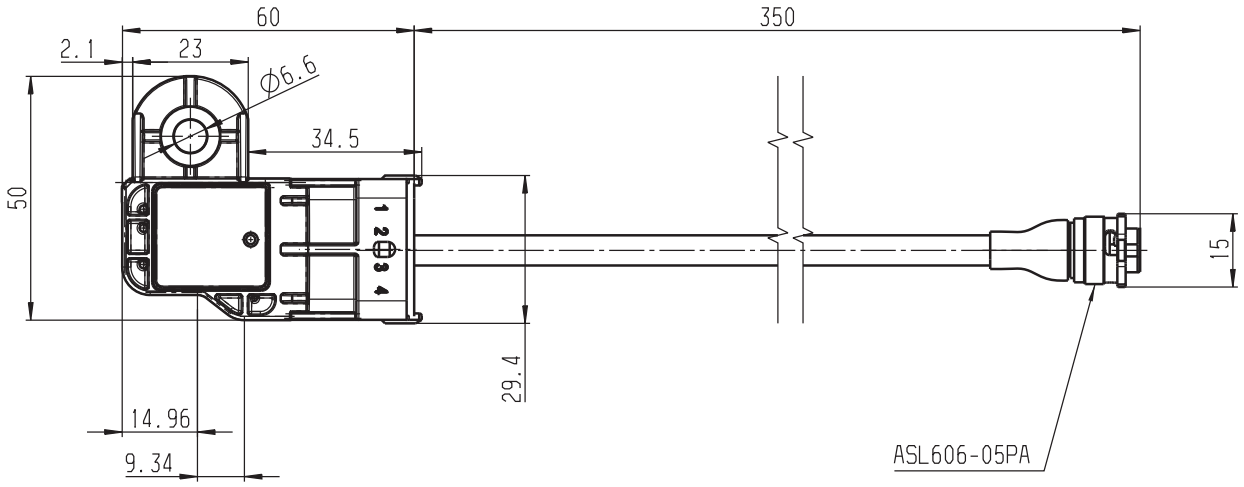
DP/TD 000

Ind. 01

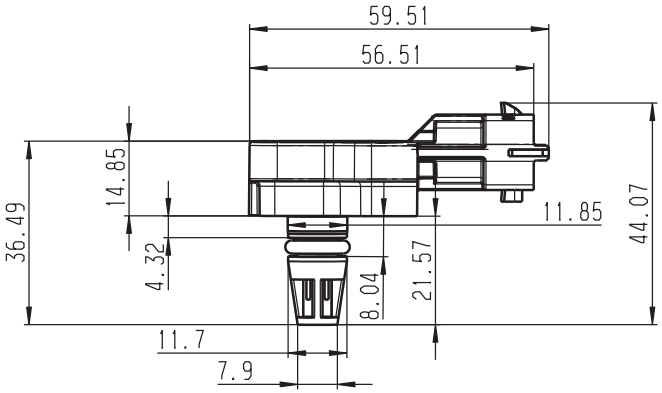
Format A3

Repl. for

Repl. by



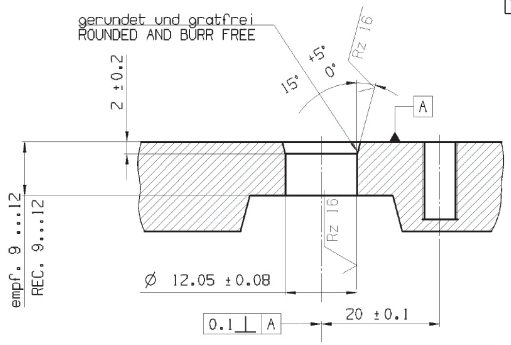
Pin Out	
1	Sens 5v
2	Sens GND
3	Signal
4	N-C
5	N-C
Mating Connector:	
ASL106-05SA	

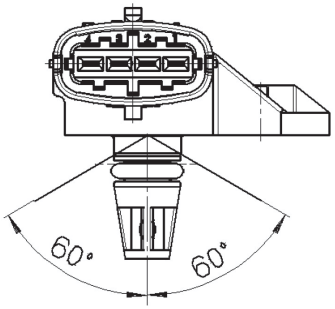


Sensor

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

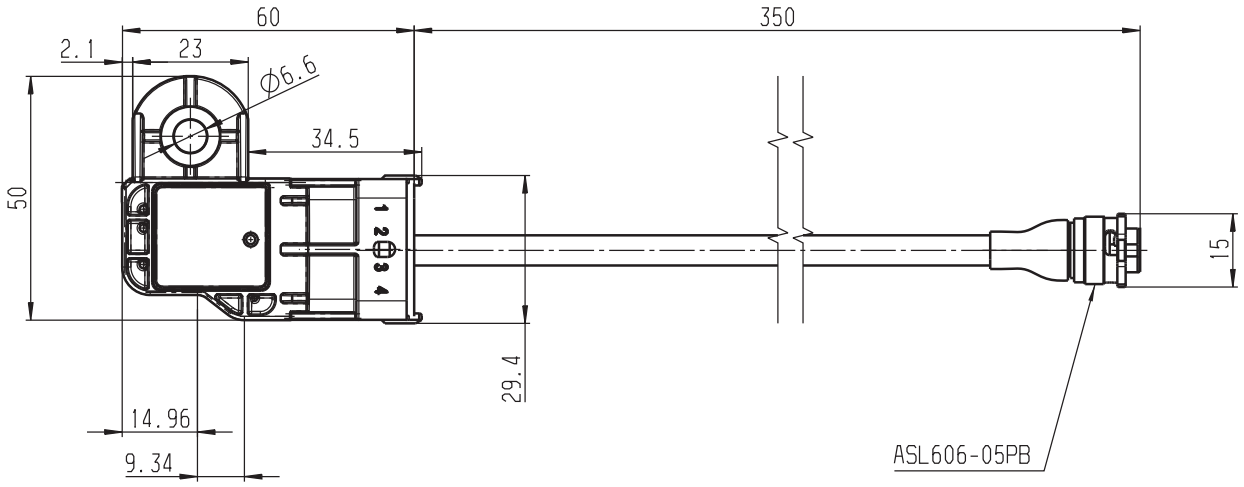




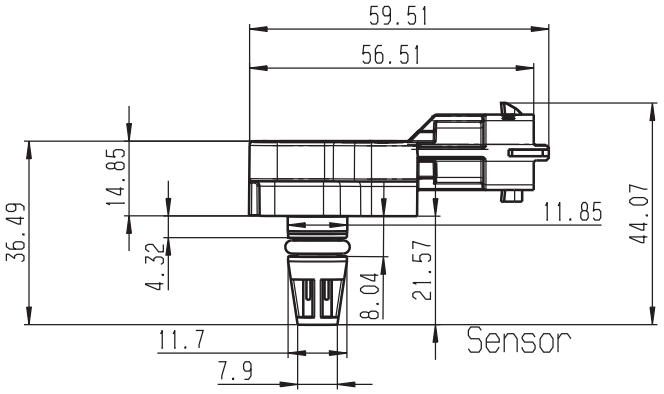
Ind.	Change/Aenderung	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Releas./Freig.	BWN	Resp. dept./Verantw.Abt.	Add. info./Zus. Info.
02	Mounting	20151203	BrK	BeJ	OhE	MSD	BEG/MSD-NA	.
01	Initial	20151106	BrK	OhE	OhE	MSD	BEG/MSD-NA	.

Lang./Spr.	Syst.	Wght./Gew.		Pressure Sensor: 1 Bar- IMSA	Sheet/Bl.
en/de	CAT	--	BOSCH	.	1/1
		Scale/M.stab		Doc.type . F02U.V0U.204-01	DP/TD . / Ind. . / Format A3
		NTS	OFFER DRAWING ANGEBOTSZEICHN.		
MNR --				Repl. for . / Repl. by .	

BR043-V001

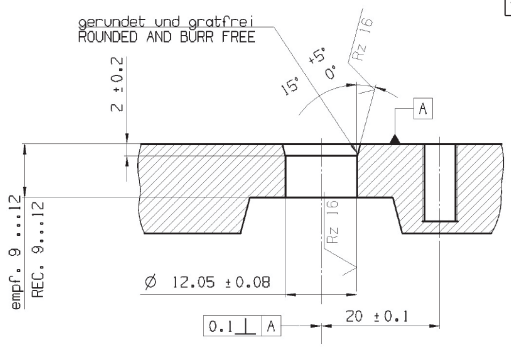


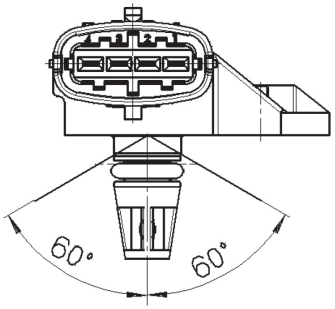
Pin Out	
1	Sens 5v
2	Sens GND
3	Signal
4	N-C
5	N-C
Mating Connector:	
ASL106-05SB	



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

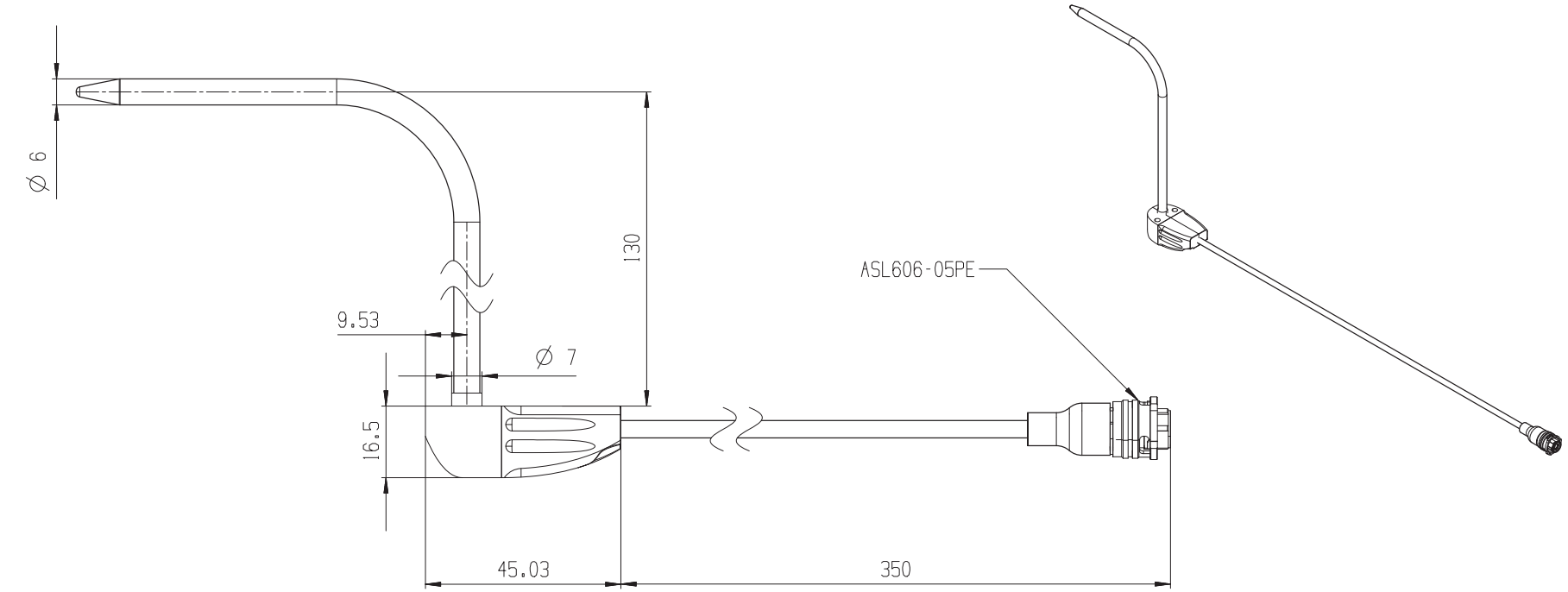


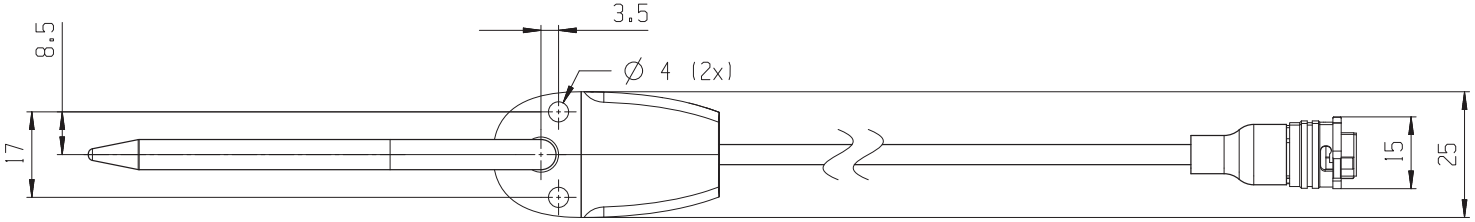


Ind.	Change/Aenderung	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Releas./Freig.	BWN	Resp. dept./Verantw.Abt.	Add. info./Zus. Info.
02	Mounting	20151203	BrK	BeJ	OhE	MSD	BEG/MSD-NA	.
01	Initial	20151106	BrK	OhE	OhE	MSD	BEG/MSD-NA	.

Lang./Spr.	Syst.	Wght./Gew.		Pressure Sensor: Boost- IMSA	Sheet/Bl.
en/de	CAT	--	BOSCH	.	1/1
		Scale/M.stab		Doc.type . F02U.V0U.205-01	DP/TD . / Ind. . / Format A3
		NTS	OFFER DRAWING ANGEBOTSZEICHN.		
MNR --				Repl. for . / Repl. by .	

BR043-V001



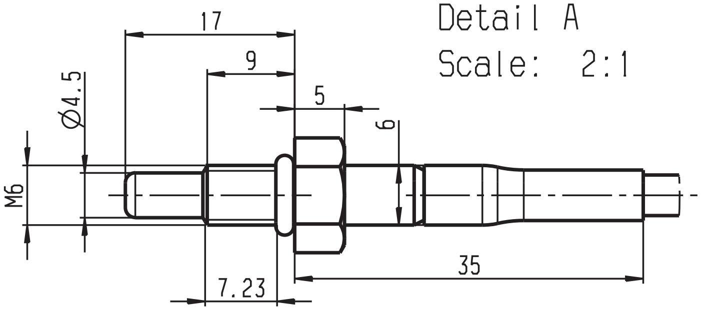


general tolerances acc. to/Allgemeintoleranzen n.	
dimensional tol./Masstol. ISO 2768-1:1989-11	tol.-class/T.-kl. f
geometrical tol./Form-und Lagetol. ISO 2768-2:1989-11	tol.-class/T.-kl. H
Size acc. to / Masse nach ISO 14405-1:2010-12	
envelope principle/ Huellprinzip	Ⓔ

Ind.	Change/Aend.	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Releas./Freig.	BWN	Resp. dept./Verantw. Abt.	Add. info./Zus. Info.
02	UPDATE	20160912	Hummon	.	.	6720	BEG/MSD	.
01	ISSUE	20160818	Hummon	.	.	6720	BEG/MSD	.

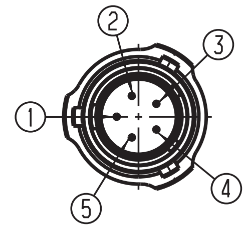
Treatment/ Behandlung .				Missed Details/Fehlende Angaben All dimensions in mm	Size/Gst. .
Mat./Stoff .				From/Aus .	
Lang./Spr. en/de	Wght./Gew. .	BOSCH	PRESSURE SENSOR . DRUCKFUEHLER .		Sheet/Bl. 1 / 1
Crit. P. .	Scale/M.stab 1 : 1	Mat.meets/Stoffe s. N 2580-1	Syst. UG	Doc. type DRW F 02U V0U 264-01	DP/TD 000 / Ind. 02 / Format A3
MNR .				Repl. for .	Repl. by .

Detail A
Scale: 2:1



View A
Scale: 2:1

View B
Scale: 2:1



ASL 6-06-05PN-HE

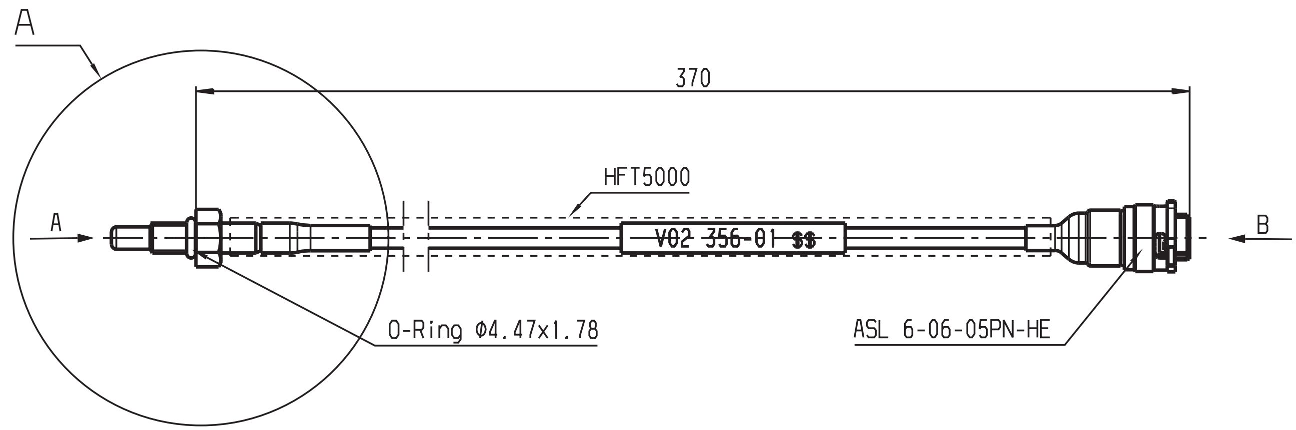
1: n.c.

2: Signal -

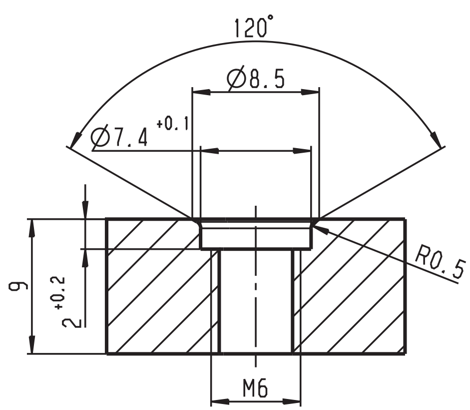
3: Signal +

4: n.c.

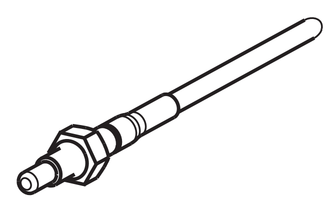
5: n.c.



Installation Recommendation
Scale: 3:1



Tightening Torque: 8Nm



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

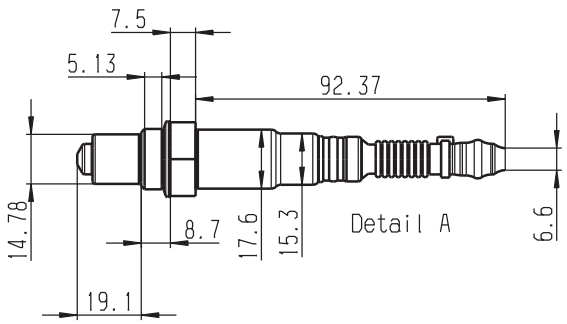
general tolerances for/Allgemeintoleranzen fuer		
lin. dim./L.masse	radii/Radien	angles/Winkel
± 1	± 0.5	± 2°

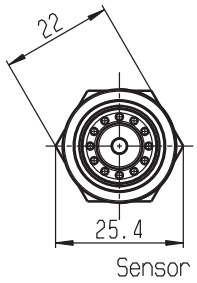
size acc. to/Masse nach ISO 14405-1:2010-12

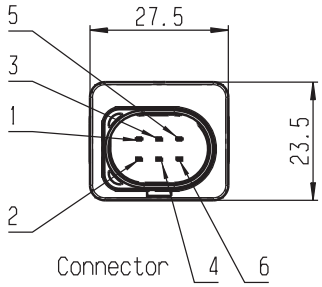
envelope principle / Huellprinzip (E)

Ind.	Change/Aend.	YYYYMMDD	Drawn/Gez.	Checked/Gepr.	Releas./Freig.	BWN	Resp. dept./Verantw.Abt.	Add. info./Zus. Info.
.	.	.	.	.	.	.	.	.
01	Erstellung	20151126	SkR	.	.	672	BEG/MSD-P Behrens	.

Lang./Spr.	Syst.	Wght./Gew.	BOSCH	Temperature Sensor NTC-M6HS Temperatursensor NTC-M6HS	Sheet/Bl.
en/de	CAT	--			1/1
		Scale/M.stab 1:1	OFFER DRAWING ANGEBOTSZEICHN.	Doc. type AGZ · F 02U V02 356-01	DP/TD . · Ind. . · Format A3
MNR --				Repl. for .	Repl. by .





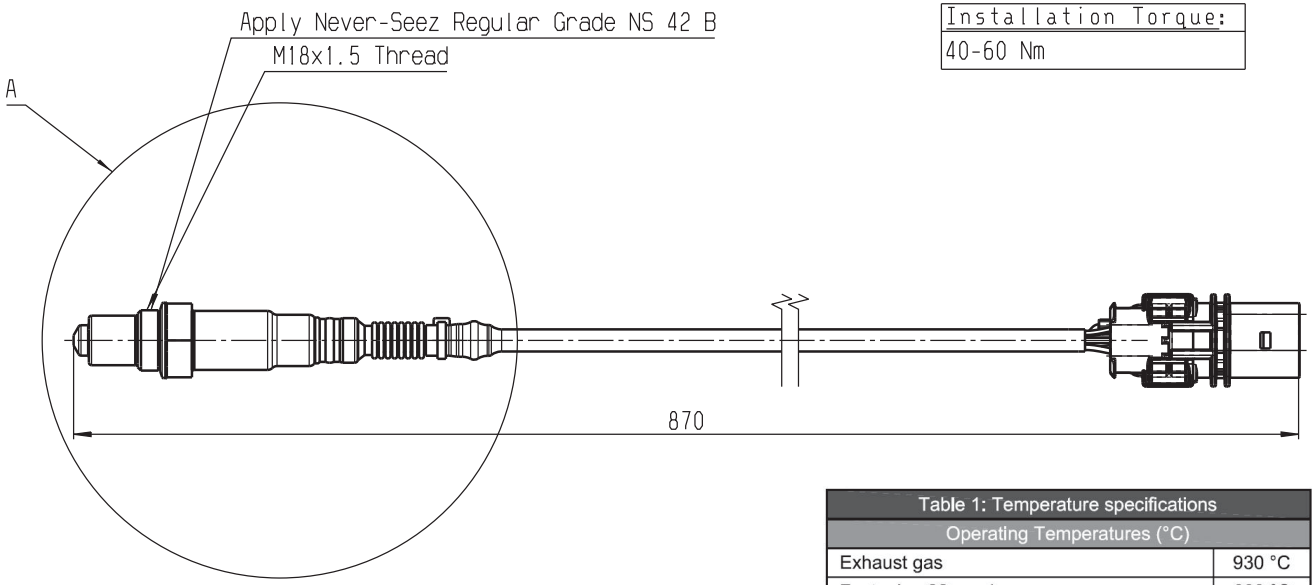


Pin Out	
1	IP
2	VM
3	RH
4	VS
5	IA
6	US

Mating Connector:

D261 205 356-01

Installation Torque:
40-60 Nm



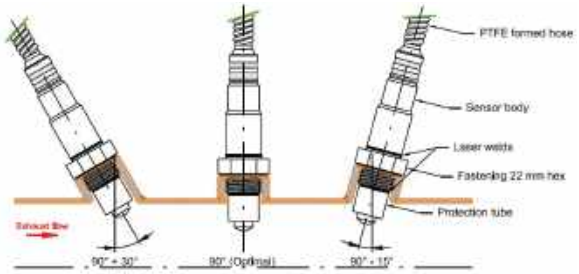


Fig. 1: LSU4.9 mounting w.r.t. exhaust stream

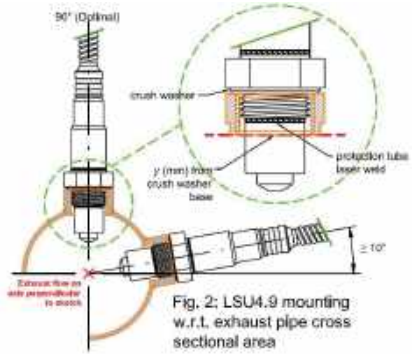


Fig. 2: LSU4.9 mounting w.r.t. exhaust pipe cross sectional area

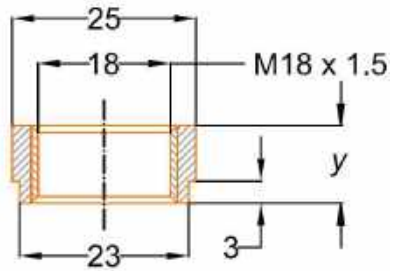


Fig. 3: LSU4.9 thread boss

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

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

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.	Add. info./Zus. Info.

Lang./Spr.	Syst.	Wght./Gew.	BOSCH	LSU 4.9- IMSA			Sheet/Bl.
en/de	CAT	--		.			1/1
		Scale/M.stab		Doc.type	0 258.988.001	DP/TD	Ind.	Format
		NTS	OFFER DRAWING ANGEBOTSZEICHN.	.		.	.	A3
MNR --				Repl. for .		Repl. by .		

BR043-V001

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

Motorsport

IMSA Prototype Class Scrutineering System Order Form - 2020

BOSCH

Customer Information		PO Number:	Customer PO# if issued
Team Name			Contact Name
Car Make and Competition Class			Contact Email / Phone Number
Shpping Preference (FedEx or UPS)			Shipping Address Line 1
Shipping Account Number			Shipping Address Line 2

Product Description	Part Number	Qty.	Use Case	Price	Comments
Spec Kit					
DPi Kit (DDU9, PBX, LT4)	F02U.VOU.247-01			$ 12,649.95	Includes: DDU9, PBX, LT4
P2 Kit (DDU9, PBX)	F02U.V0U.248-01			$ 9,865.80	Includes: DDU9, PBX
Spec Sensors					
Pressure Sensor - 0-1.15 Bar	F02U.V0U.267-02		Restrictor, Plenum, Inlet Port (NA)	$ 437.50	
Pressure Sensor - 0-3.5 Bar	F02U.V0U.205-01		Boost (Turbo)	$ 257.50	
Pitot Tube	F02U.V0U.264-01		Dynamic conditions	$ 1,180.00	
Temperature Sensor - M6	F02U.V02.356-01		Engine, Cockpit	$ 412.00	
Lambda Sensor	0258.988.001		Lambda	$ 145.00	
Individual Spare Parts					
DDU9 Display Unit	F02U.V0U.290-01			$ 6,090.00	Includes IMSA configuration and seal
DDU9 Input Expansion	F02U.V02.205-01			$ 812.00	Required for all scrutineering DDU9's purchased before 1/1/2018 to be used in 2018+
PBX90 - Control Module	F02U.V01.794-05			$ 4,095.15	Includes IMSA configuration and seal
MM5.10 - IMU	F02U.V01.511-02			$ 782.47	
GPS Module - 3000mm Lead	F02U.V0U.203-01			$ 360.00	
GPS Module - 250mm Lead	F02U.V0U.268-01			$ 360.00	
Bosch LT4 Lambda to CAN	F01T.A20.070-09			$ 3,065.00	Includes IMSA configuration and seal
IMU Mounting Plate	1271.032.390			$ 70.87	Mounting plate for MM5.10 sensor
Rental Spec Kit (Prices per event)					
DPi Kit (DDU9, PBX, LT4)	F02U.VOU.247-01			$ 4,077.26	Includes: DDU9, PBX, LT4
P2 Kit (DDU9, PBX)	F02U.V0U.248-01			$ 3,554.53	Includes: DDU9, PBX
					GPS, IMU, and any additional required sensors will be purchased by and remain property of the team in question. Pricing will be held at 'purchased separately' level above. The Roar & Rolex 24 to be considered one event as well as official Sebring test & Sebring 12 Hours.

Notes

To order parts please fill out this order form and create a Purchase Order matching your order and send both to Aaron Pfeifer: Aaron.Pfeifer@us.bosch.com.

All orders submitted are subject to the Bosch Motorsport terms and conditions.

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

Unless customer has credit terms established with Bosch, all orders will require payment before parts will be shipped. All rental kits will be pay in advance.

Customer is responsible for all shipping costs.

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

Released 11/26/2019

Motorsport Sales Terms & Conditions

Robert Bosch LLC
Bosch Engineering North America Division

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.

12 Revisions

V1.2.6

- Add lambda filtered to team CAN received list
- Add note to pull USB collar
- Change FFM service to hours until calibration
- Add pambient to team CAN received list
- Change Bosch contact
- Price sheet update
- Remove Bosch Motorsport as Harness Supplier

V1.2.5

- Add b_FFMService to team CAN received list
- Add lambda integral regulation channels to CAN list
- Update order form for 2019

V1.2.4

- Updated DDU9 screenshots
- USB stick ownership reiterated
- Part number corrections in Component Table
- LT4 part number update to -09
- Add FFM time and fuel temp to CAN channels sent table
- Update nmot_imsa description in CAN channels sent table
- Sensor Declaration Form removed
- Laser ride height wording clarified
- Connector clarifications

V1.2.4

- Added laser ride height sensor pinout

V1.2.3

- Updated engine speed sensor pinout

V1.2.2

- Updated information related to engine speed sensor

V1.2.1

- Corrected Laser Ride Height Connector

V1.2.0

- Modified engine speed sensor pinout and recommendation

V1.1.0

- Added laser ride height, engine speed sensor, and fuel flow meter sections.
- Sensor use case reduced text (now see manufacturer homologation form)
- Updated display screens with rainlight.
- Harness layout drawing updated.
- Scope overview updated.
- IMSA supplied components marked.
- Vibration profile 1 added.
- Declaration form available online.
- Declaration sheet updated.

- Order form updated.

V1.0.2

- DDU9 brightness range defined in main body.
- PBX90 mounting position clarified to in cockpit.
- Display Pages section added.
- CAN message Tables Removed.
- CAN channel Short Names updated.
- Team received CAN list added.
- DBC available online.
- Harness drawings updated to Rev -04, label location changes.
- Declaration sheet clarifications.

V1.0.1 – Release

V1.0.0 – Draft Release