Integrated Sensor Platform (ISP)

Integrated Sensors and Electronics:
- Multi-GNSS, Multi-Antenna Setup
- High-Grade MEMS IMU
- Cameras
- 3D-LiDAR
- Vehicle Data
- Powerful processors
- LTE module

Hardware-platform and software-framework for the combination of classical sensor fusion with artificial intelligence algorithms for autonomous driving, mapping and object detection and classification

All-In-One Solution for Positioning

Accurate Position and Attitude
High Precision Maps (2D/3D)
Artificial Intelligence

Complete Sensor-Setup for Autonomous Driving
Easy System Integration
**STANDARD* IMU FEATURES**

Linear acceleration meas. range:  
+/-16 g (configurable)

Angular rate meas. range:  
+/-4000 dps (configurable)

Linear acceleration sensitivity:  
0.061 mg/LSB with +/-2 g range

Angular rate sensitivity:  
4.37 mdps/LSB bei +/-125 dps range

Angular random walk (T=25°C):  
0.21 deg/√h

Bias stability:  
3 degree/ hour (typical)

* more powerful IMUs can be chosen.

**GNSS FEATURES**

**GNSS Constellations:**  
Galileo, GPS, Glonass, Beidou, SBAS (Egnos, WAAS, GAGAN)

**GNSS Const. concurrent:**  
All

**GNSS-Bands:**  
GPS: L1C/A, L1C, L1PY, L2C, L2P, L5  
GLO: L1CA, L2CA, L2P, L3  
GAL: E1, E5a, E5b, E5 AltBoc, E6*  
BDS: B1I, B1C, B2a, B2I, B3*  
QZSS: L1C/A, L1C, L2C, L5, L6

Channels:  
448

**GNSS data rate:**  
max. 100 Hz

**Jamming detection:**  
Yes

**Timepulse-Output:**  
Yes

* Hardware-ready

**SENSOR FUSION PERFORMANCE**

Accurate RTK Positioning * (1σ):  
Horizontal accuracy: 0.006 m + 1 ppm  
Vertical accuracy: 0.010 m + 1 ppm

Accurate PPP Positioning * (1σ):  
Horizontal accuracy: 0.20 m + 1 ppm  
Vertical accuracy: 0.40 m + 1 ppm

Accurate Attitude * (1σ):  
Accuracy: 0.25° (1m antenna spacing)

Velocity Accuracy:  
0.03 m/s RMS

Time-Stamp Accuracy:  
1 µs RMS

Solution Output-Rate:  
up to 120 Hz

RTK Initialization *:  
Initialization Time: < 7 sec

PPP Initialization *:  
Initialization Time: < 5 min

* Depends on Environment and used GNSS-Antenna

**LIDAR FEATURES*  

Type: Velodyne LiDAR

Model: Puck (VLP-16)

Channels: 16

Measurement Range: 100m

Range accuracy: up to +/- 3 cm (typical)

Field of View (Vertical): +15° to -15° (30°)

Angular res. (Vertical): 2.0°

Field of View (Horizontal): 360°

Angular res. (Horizontal): 0.1° to 0.4°

Rotation rate: 5 Hz to 20 Hz

* Other LiDARs, e.g. from Ouster, are also possible

**CAMERA FEATURES**

**CAMERA 1 FEATURES**

Type: FLIR Grasshopper3 USB3

Model: GS3-U3-23S6C-C

Description: High-quality color-camera with high frame-rate and global shutter

Frame rate: 163 FPS

Resolution: 1920 x 1200 (2.3 MP)

Image sensor: Sony IMX174

**CAMERA 2 FEATURES**

Type: Intel Real Sense Camera

Model: Tracking Camera T 265 or Depth Camera D435i

Description: Global shutter fisheye stereo-camera with integrated IMU and visual-inertial odometry, or depth camera (global shutter infrared stereo-camera) and RGB camera with integrated IMU

**ODOMETRY FEATURES**

Performance:  
Depends on resolution and quality of user-based wheel/steering measurements

Input/Output:  
Configurable with DBC-files or according to customer specification

Communication Interfaces:  
CAN, Ethernet, USB
**PROCESOR 1 PERFORMANCE**

CPU: ARM 64Bit Quad-Core with 1.4 GHz  
RAM: 1 Gbyte LPDDR2 RAM  
Flash: 16 Gbyte  
OS: Linux  
Description: Used for classical ANavS sensor fusion with GNSS, IMU and Odometry sensors

**PROCESOR 2 PERFORMANCE**

CPU: 6-core NVIDIA Carmel ARM®v8.2 64-bit CPU, 6 MB L2 + 4 MB L3  
GPU: NVIDIA Volta™ architecture with 384 NVIDIA® CUDA® cores and 48 Tensor cores  
Memory: 8 GB 128-bit LPDDR4x 51.2 GB/s  
Storage: microSD + SSD-Storage with 1 TByte  
OS: Linux  
Description: Used for deep learning algorithms, object-detection/classification, semantic maps (LiDAR-based), HD-maps (Camera-based) and SLAM.

**ELECTRICAL & INTERFACES**

Power Connector:  
12V (optional 230 V)  
via waterproofed screwable connector  
Power Consumption:  
Peak: 30 W (5A)  
Average: 20 W (3 A)  
Communication Interfaces:  
Gigabit-Ethernet, Wi-Fi, CAN, USB 2.0, LTE  
Output format:  
Standardized: NMEA format, ROS  
Proprietary: ANavS binary format

**CASING**

Dimension: 800 x 800 x 300 mm  
Weight: 7000 g  
Operating Temp.: -25°C to +65°C  
Display: Yes  
Mounting: Screwable or use of suction cups

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