

PRESS ARTICLE

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New Power IMU 2023 - Improved dynamic accuracy

Following the successful market launch of the GEMAC Motus[®], GEMAC will expand the sensor portfolio with innovative new developments from 2023. In addition to the GEMAC Motus[®] *BLACKLINE* version in a plastic housing, the cost-benefit optimized GEMAC Motus[®] *GREENLINE* variant will complete the portfolio.

With the GEMAC Motus[®] - the first power IMU for mobile power machines - a sensor measuring unit configurable for a wide range of applications has been developed, which enables 6-axis motion detection on mobile machines, such as construction machinery, agricultural and forestry machinery, cranes and lifting technology, as well as ships.

GEMAC Motus[®] *BLACKLINE*



Figure 1: GEMAC Motus[®] *BLACKLINE* – New Power-IMU for Mobile Power-Machines.

GEMAC Motus[®] *BLACKLINE* will have comparable technical and mechanical properties and also offers cost-effective variants with the plastic housing and different accuracy types.

- High precision measurement of static ($\pm 0.1^\circ$ bis $\pm 0.3^\circ$) and dynamic ($\pm 0.25^\circ$ bis $\pm 0.5^\circ$) accuracy
- Increase of the measuring speed by calculations in the measuring unit itself
- Automatic and individual configuration of the mounting position and axes for tilt output
- Flexible zero point adjustment and precise calculation of all angle formats
- Individual configurations of sensor fusion

The sensor fusion algorithm developed in-house for GEMAC Motus® BLACKLINE for high-precision orientation calculation has become even more robust through optimization.

Excursus: Sensor Fusion Filter - Improving Dynamic Accuracy and Robustness with "Enhanced Kalman Filter"

The previous algorithm is combined with a Kalman filter specially optimized for motion detection. In contrast to conventional Kalman filters, the "**Enhanced Kalman Filter**" developed by GEMAC enables the correction of nonlinear disturbance variables that typically occur in motion detection. This results in even better attenuation of external accelerations or vibrations.

Another new feature is the automatic adaptation of the filter parameters according to the sensor's state of motion. The sensor detects its current position as well as the type of its movement and independently adapts the sensor fusion filter. Disturbances such as impacts or jerky rotations are reliably detected and compensated for by the sensor.

An improved offset correction of the gyroscope enables a reduced drift of the output data. The sensor thus provides even more reliable values even in very dynamic applications and continuous movement of a mobile machine and leads to improved dynamic accuracy - even with temperature changes.

Thanks to the more robust sensor fusion filter, the algorithm works even more precisely under all conditions and no longer requires complex configuration. More user-friendliness is additionally achieved by simplifications of the sensor configuration. Nevertheless, the sensor has an extended expert mode that allows further individual configurations, e.g. deactivation of the filter dynamics (adaptive damping) and manual setting of the damping factor.

GEMAC Motus® *BLACKLINE* will be available in three basic types with various technical specifications:

1. Recording of static and dynamic inclination, acceleration and Gyroscope
2. Recording of static and dynamic inclination
3. Recording of static inclination

GEMAC Motus® *GREENLINE*

The new GEMAC Motus® *GREENLINE* product line will complete the sensor portfolio in the future as a cost-benefit-optimized variant and replace the previous economicLINE.

With an accuracy of $\pm 0.5^\circ$, the main focus is on the size and flexibility of the sensor. In the compact plastic housing and slimmer design, GEMAC Motus® *GREENLINE* offers the possibility of flexible mounting of the sensor on the mobile machine using a variable (and customized) mounting plate with different hole patterns.

All product lines are available with five different interfaces: the analog interfaces current and voltage and the digital interfaces CAN, CANopen and SAE J1939. On request, *BLACKLINE* and *GREENLINE* are also available in different colors for customer-specific projects.



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GEMAC – An expert with passion. Chemnitz-based GEMAC has been developing and producing modules, components, and complex subassemblies in the fields of sensor and measuring technology and medical electronics for nearly 30 years. With a team of more than 70 experts, GEMAC's consistent focusing on two ranges of products provides deep understanding and comprehensive knowledge in the field of inclination and acceleration sensors and fieldbus diagnostic.