

# Tester for physical network diagnostics



*Gemac, a specialist in the field of physical fieldbus diagnostics, has been dealing with its technological fundamentals for almost 30 years. The company presented the first diagnostic solutions for CAN-based networks on the market about 20 years ago.*

(Source: Adobe Stock)

Fieldbus Diagnostics is a concept applied in industrial networks and automation systems to monitor the performance and integrity of CAN-based networks (e.g. such supporting CANopen and SAE J1939 higher-layer protocols) and to identify any faults or errors. A fieldbus is a digital communication system that enables communication of different devices and sub-systems in an industrial environment. The central system of communication in mobile machines are typically CAN-based networks. Main objectives of fieldbus diagnostics are improved availability, reliability, and efficiency of the machines and systems, as well as reduced downtimes.

The current diagnostics solutions from Gemac are applied primarily in the environment of mobile machines, but also in stationary automation of railway and logistics systems, for example, and in the field of development of CAN-based systems. Continuing this technology, the company is going to present a new generation of Intensive Fieldbus Diagnostics (IFD), which alongside physical diagnostics also includes digital and functional diagnostics.

## CAN-Bus Tester GT3

The new CAN-Bus Tester GT3 is a handheld diagnostic unit. It provides a robust outdoor housing with a standardized Vesa mount. With its 10-inch rugged touch display, it constitutes an optimum basis for use in mobile and industrial work environments. The remote measuring head for direct connection of the measuring circuit to CAN CC and CAN FD networks (without stubs distorting the signals) allows measurements even at inaccessible spots or in environments placing special demands.

The software of the mobile tester can be adapted to the used network (e.g. CAN CC, CAN FD) and higher-layer protocol (e.g. CANopen, DeviceNet, or SAE J1939) used in the appropriate application. It can be released by way of a license key as necessary. The tester integrates an M12 plug connector and is shipped with an adapter for the 9-pin D-Sub connection. This ensures interoperability and increases the convenience for the user.

In addition, comprehensive project management, including segment, node, and measurement management, will be integrated. Furthermore, an expansion by a database solution for a large variety of machine documents (e.g., circuit diagrams, manuals, machine log books) is planned.

Even more comprehensive measurements at the CAN networks are possible at the physical level. The combination of a two-channel oscilloscope, which is equipped with a 12-bit ADC (analog-digital converter) with decoding and automatic determination of the signal quality, makes the GT3 tester a powerful tool for troubleshooting, signal analysis, protocol monitoring, and development of CAN-based circuits and systems. This is useful in the fields where signals and communication logs are used to monitor and analyze the communication between micro-controllers, sensors, actuators, or other devices.

The protocol monitor function is provided at the digital level. Furthermore, it can also receive and analyze CAN frames to monitor the communication between different nodes. Sending and receiving of CAN CC and



Figure 1: CAN-Bus Tester GT3 in combination with a high-resolution oscilloscope enables users to decode CAN CC or CAN FD messages (Source: Gemac)



Figure 2: CAN-Bus Tester GT3 (Source: Gemac)

CAN FD frames and frame sequences, as well as symbolic decoding of CAN CC, CAN FD, CANopen, and SAE J1939 are possible.

Integration of OBD-II analysis for the functional level is also planned as a service extension. OBD-II (on-board diagnostics) is a system for standardized vehicle diagnostics and intends to facilitate the vehicle repair. Although OBD-II uses a common set of error codes, vehicle manufacturers can also implement manufacturer-specific codes to provide further diagnostic information going beyond the general codes. In this field, Gemac intends to closely cooperate with mobile machines manufacturers to be able to provide users with relevant information in a compact and customized form.

A complete solution for fieldbus diagnostics for mobile machines is planned to be offered in the future. This will combine the digital and functional levels in one diagnostics solution.

All in all, with Intensive Fieldbus Diagnostics (IFD) for mobile machines, the company offers a solution for monitoring and control of machines to increase their safety, efficiency, and reliability. Technology plays an important part in state-of-the-art construction and agricultural machines as well as other mobile applications. Proactive diagnostics help avoid expensive breakdowns and increase the total efficiency of the enterprise. Gemac Academy offers training courses on this topic for beginners and professionals.

## Presented at Agritechnica 2023

The CAN-Bus Tester GT3 was presented for the first time at Agritechnica in November 2023 in Hanover (Germany), one of the world's largest trade fairs for agricultural technology, agricultural machinery, and equipment.



Figure 3: The Motus sensor family enables inclination measurements in mobile work environments and is available in three performance classes (Source: Gemac)

Furthermore, the manufacturer has presented its recent Gemac Motus sensor family. The IMU (inertial measurement unit) for mobile machines is a configurable sensor measuring unit, which enables 6-axis motion tracking at mobile machines. There are product lines with three performance classes:

- ◆ Gemac Motus as the premium product provides a dynamic precision of  $\pm 0,25^\circ$  and a robust zinc pressure die casting housing;
- ◆ Gemac Motus Blackline possesses similar technical properties, but due to its availability in plastic housings and as an inclination sensor for purely statistic purposes, it also offers affordable variants;
- ◆ Gemac Motus Greenline with its slim design sets the focus on flexibility and price. The two standard housing variants are offered for 2- or 4-point assembly on the mobile machines.

The device is available as a static or as a dynamic inclination sensor and as an inertial measurement unit (IMU) with automatic configuration of the mounting position and flexible zeroing. All product lines support analog (current and voltage), CAN CC, CANopen, and SAE J1939 interfaces. ◀

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