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remote machine condition monitoring and fault diagnosis

DiBOX / HEVI

Classification of monitored parameter levels, built-in OLED graphic display showing the significant frequency components of vibration signal and simplified frequency spectrum, Ethernet and WiFi link, configuration via integrated web server, built-in 16GB memory card, acquisition of historical data and vibration waveforms, four popular industrial interfaces. The unique functionality and high measurement precision.
We present DiBOX™ and HEVI™ - the family of machine condition monitoring and remote diagnostic systems.

Vibration and process parameter level monitor

Four measurement channels of the DiBOX and up to eight channels of the HEVI family can be configured to work with vibration sensors (integrated power supply for the CLPS™ sensor type), temperature (Pt, NTC), voltage (AC, DC) and current signals (eg. current loop 4-20 mA). Built-in signal processing algorithms analyze the spectrum and calculate the signal levels in specific frequency bands. When the parameter values exceeded the user defined thresholds, the device reports alarm.

Memory card for parameters and waveforms

DiBOX and HEVI devices can be equipped with a memory card up to 16 GB of capability. It stores the history of the monitor operation: measurement results, information on the relative change of the signal level referred to the last calculated value and information on the alert threshold exceedances.
An additional option is the ability to acquire a vibration signal waveform in the case of the alarm. This black box feature allows to carry out a detailed analysis of the machine operation in a critical condition. This becomes particularly important in situations when it is impossible to impose the operating conditions which caused the machine malfunction. All information stored on the memory card can be accessed by the user remotely via Ethernet.

High-quality signal recorder

24-bit analog to digital converters, signal bandwidth of 25kHz, low-noise analog circuits and smart control algorithms allow to turn the DiBOX and HEVI family devices into signal acquisition units (measurement card) with excellent performance. Working with the dedicated software, they can measure and store the time waveform signals for detailed fault diagnostics. The software can be installed on a PC, smartphone or tablet.

DiBOX and HEVI devices connected to the Internet have become a unique tool for distant evaluation of machine condition and fault diagnosis. Remote system management and possibiliy of transmission the measurement data anywhere in the world bring down the overall TPM cost significantly and reduces the service response time.

OLED display

Current values of the monitored parameters, alarm statuses, sensor states, the device configuration and status are displayed on the high contrast built-in OLED display. For the AC, DC and CLPS inputs the screen displays a table of most significant frequency components of the measured signal and the simplified image of its frequency spectrum. It allows to find the outstanding frequency components of the processed signal and relate them to the rotational speed.

Versatility of communication

The primary communication interface of the DiBOXes became Ethernet 100Base-TX. Optionally, each device can be equipped with a wireless communication WiFi card. Assigning an individual IP address enables to connect them into an existing network infrastructure. The extraordinary versatility of this solution allows to create classical wired as well as wireless measurement systems with a high degree of complexity. They can include units monitoring different types of process parameters. This type of solution is supported by the dedicated communication protocol ATC MESbusTM and an additional high speed interface which ensures full synchronization of the measurements.
An integration with industrial automation systems is possible through analog interfaces (0-10 V and 4-20 mA) and digital MODBUS (RTU and TCP). Additionally, each DiBOX can be retrofitted with relay module.

Configuration website

DiBOX and HEVI devices are configured through the Web page, using any Internet browser. The integrated web server displays also the current measurement results, alarm status, sensor status. For systems equipped with a memory card, the user has the ability to determine the registration conditions of monitored parameters and signal waveforms.

Software tools

DiBOX and HEVI communicate with Alitec software dedicated to presentation the actual parameter values and data stored in the internal memory card (ATC Monitor), perform simple measurement (ATC DAQ) as well as condition monitoring and advanced machine diagnostics (mVIDIA and VIDIA). The techniques used during the software development allow for full adaptation its functionality to unique requirements of virtually each application. For users who intend to use their own software, control functions for the Matlab environment and APIs for the Java and C / C ++ languages are available.

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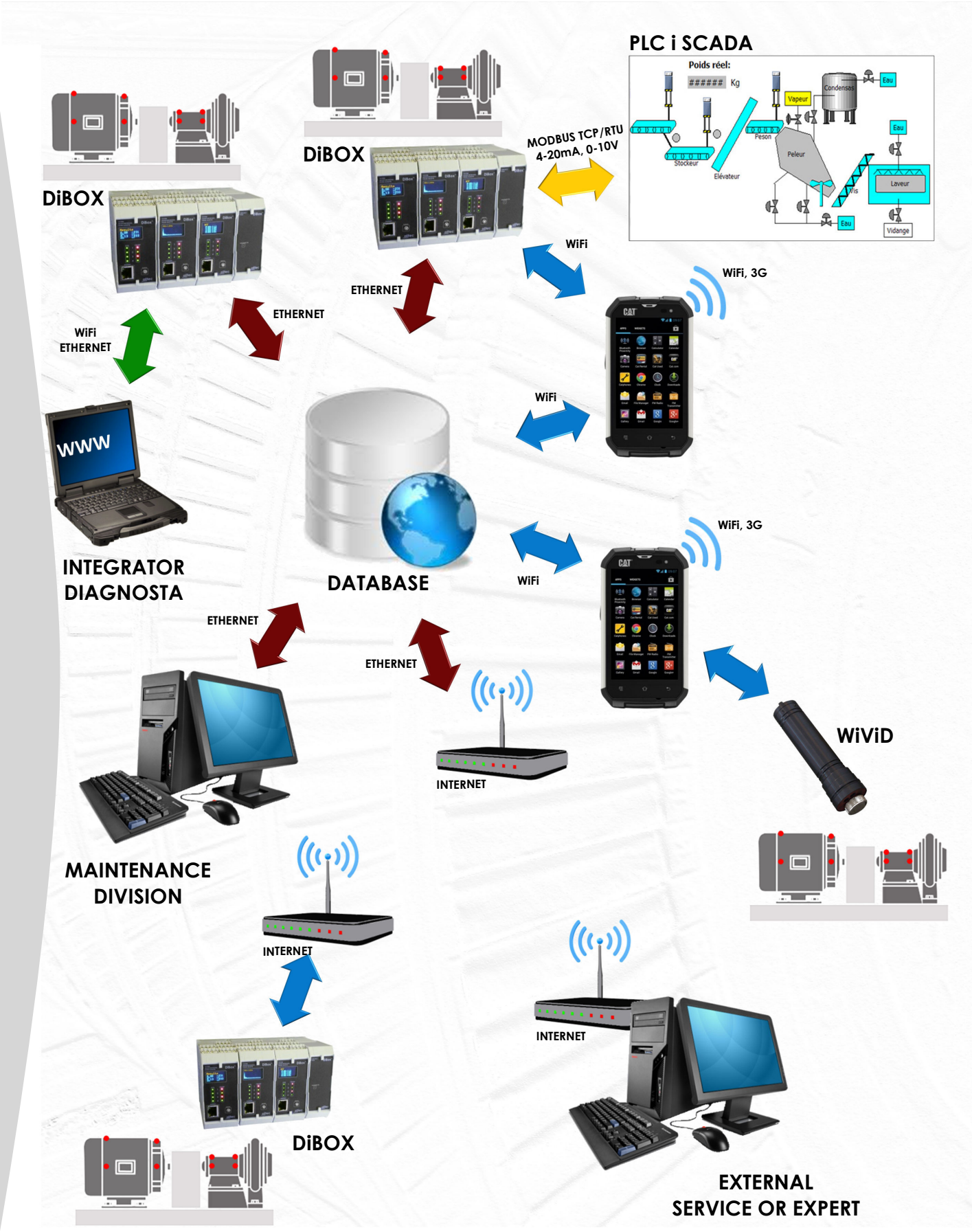
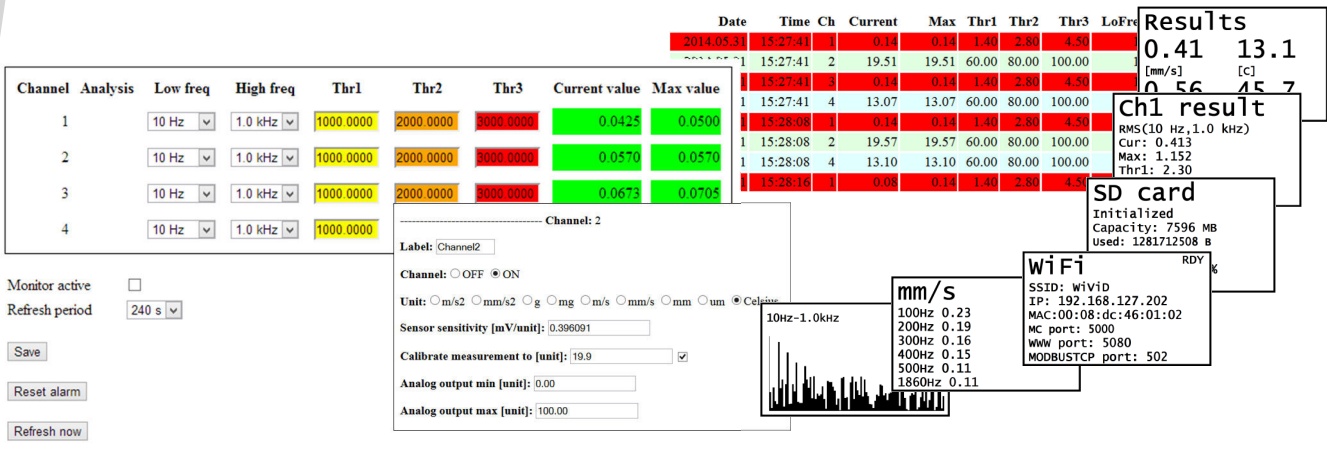


MACHINE CONDITION MONITORING AND FAULT DIAGNOSTICS COMPLEX SYSTEM

TECHNICAL SPECIFICATION

Number of analog and digital measurement channels	up to 4 with simultaneous sampling
Analog input type	voltage, unipolar/bipolar, input impedance 200 kΩ DiBOX: screw connector, HEVI: M12 connector
Available input configuration	DC voltage mode DC voltage mode with integrated current source for ICP/ IEPE (CLPS™) sensors supply (voltage 12 V or 20 V) AC voltage mode current mode 0-20mA Pt and NTC temperature sensor modes digital mode
Analog input voltage range	±0,6 V; ±1,2 V; ±3 V; ±6 V; ±12 V; ±15 V; ±25 V; 0÷20 V (depending on version, switchable mode avaliable)
Analogue to digital converter type	4 converters of ΔΣ type
Analogue to digital converter resolution	24 bits
Analog input overall noise level	6 μV_{RMS} (for f_{out} = 32,768 kHz, frequency range 12,6 kHz, measurement range ±0,6 V) 90 μV_{RMS} (for f_{out} = 32,768 kHz, frequency range 12,6 kHz, measurement range ±15 V)
Signal sampling frequency (f_s)	1..8 MHz
Effective sampling frequency (f_{out}) (output data actualization frequency)	65,536 kHz maximum
Applied filters	• 3rd order Butterworth analog low-pass filter , frequency limit $f_{3dB\ high}$ = 68 kHz • 1st order analog high-pass filter, frequency limit $f_{3dB\ low}$ = 0,5 Hz (for AC inputs only) • anti-aliasing low-pass filter, linear phase, frequency limit set automatically to $f_{3dB\ high} = 0{,}49f_{out}$ ($f_{0.005dB\ high} = 0{,}39f_{out}$, $f_{-100dB\ high} = 0{,}54f_{out}$)
Signal gain error	±0,05 % (with calibration in the measurement condition)
Overall maximal measurement error (without/with sensor)	±0,1 % of measurement range (with calibration in the measurement condition)
Calibration	• the reference measurement path factory calibrated • built in mechanism of zero level and gain calibration
CLPS™ sensor power supply	4 mA / 12 V or 20 V (other as an option)
Analog output type	Galvanically isolated: • current 4-20 mA, maximum error 0,1%; • voltage 0-10 V, maximum error 0,1%;
Communication interface	Ethernet 10/100Base/TX, TCP/IP; WiFi (IEEE 802.11bgn), TCP/IP, WPA2; high speed digital interface for precise synchronisation of the measurement process EIA-RS485
Communication protocol	ATC MESbus, MODBUS/TCP, MODBUS/RTU
Data memory	built-in microSD memory card, up to 16 GB
Operation condition	temperature: –5..+60°C; humidity: 10..90% RH
Software	ATC Monitor (free of charge); mVIDIA; VIDIA; ViMEA DAAC/VSI; ATC DAQ; as an option: API, Matlab control function, application specified
Power supply	24 VDC 1A
Dimension	DiBOX: 99mm x 45,2mm x 113,6mm, HEVI: 140mm x 140mm x 75mm



AVALIABLE CONFIGURATIONS

OPERATING MODE		INTERNAL MEMORY[1]			ANALOG INPUT NUMBER AND TYPE[2]		AMPLIFICATION		DIGITAL INPUT NUMBER		DIGITAL INTERFACES[4]		COMMUNICATION PROTOCOLS		RELAY OUTPUT	4..20 mA 0..10 V OUTPUT NUMBER
0	special version	0	NO	•	1	DC input with integrated power supply for CLPS sensors[3]	0	single measurement range	1..4	•	0	Ethernet 100Base-Tx	1	Modbus TCP	0/1	0..4
4	acquisition unit (measurement card)	1	signal waveform acquisition activated by switch or digital input (event)		2	DC input	1	adjustable signal amplification			1	WiFi 802.11 bgn	2	Modbus RTU		
5	monitor	2	signal waveform acquisition activated by alarm		3	AC input	2	single measurement range, higher voltage range (+-25 V)			2	system synchronisation interface				
		4	signal waveform acquisition activated by alarm and periodical		4	PT temperature sensor input	3	adjustable signal amplification, higher voltage range (+-25 V)								
					5	gauge sensor input (eg. strain sensors)										

[1] The sum of choosen options; avaliable for operating mode 0 and 5;
[2] Avaliable combination of analog input types 1, 2, 3, 4; input type 5 can't be mixed with other types; maximum number of analog input 4 per device;
[3] CLPS (Current Loop Powered Sensors) correspond to ICP, IEPE (sensor type names are trademarks of their respective owners and are used for information purposes only)
[4] The sum of choosen options, eg. selection WiFi (1) and system synchronisation interface (2) gives 3 (1 + 2)

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