BOB*Lab* d.o.o.
GOOD VIBRATION

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MARINE TORSIONMETER

BOB*Lab* d.o.o., - Trgovačko društvo s ograničenom odgovornošću / *Limited Liability Company*
Reg. U Trgovačkom sudu u Zagrebu / *Registered at the Commercial Court in Zagreb* MBS: 080546278
Direktor / *Director: Prof.dr.sc. Nenad Bobanac, dipl.ing*
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Matični broj / *Identification number:* 2017164

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INTRODUCTION

The BOB*Lab* Marine Torsionmeter System provides an accurate tool to access and monitor the performance and efficiency of the ships shafting.

The transducer accurately measures the on-shaft torque (Nm), shaft rotation speed (rpm) and the transmitted power (kW). The information can also be directly interfaced to ship management systems.

Condition monitoring of a system of this type is important to any modern day vessel. Being able to accurately measure and record the ships static and dynamic torque, the ships power and speed data can help towards determine equipment condition and efficiency. It's a pro-active measure with specific purpose of improving performance and efficiency through a ship shafting system.

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OVERVIEW

Overall system highlights:

- modular, flexible and customizable measuring system
- suitable for sea trials and permanent installations
- easy installation, suitable for all shaft sizes
- high-precision torque and rotational speed measurements
- high-accuracy torque measurement due to digital data transmission (no signal degradation in data transmission paths between sensor and control module)
- on-shaft digital signal processing (torque averaging and peak AC calculation)
- two torque measuring modes:
  - averaged – on-shaft processed and averaged DC and peak AC (for robust operation in permanent installations)
  - dynamical – torque waveform transmission (for sea trials) (optional)
- suitable for single / dual shaft systems
- programmable analog (4 – 20 mA, ± 10V) and digital (RS – 232, RS – 485) signal outputs

Primary measuring quantities:

- torque, power, rotational speed (averaged)
- shaft direction indication (ahead / astern)
- support for torque bidirectional measurements

Optional measuring quantities:

- torque, power, rotational speed (dynamical)
- AC torque component peak amplitude,
- AC torque component peak amplitude / DC torque ratio
- programmable alarm states indication
- running hours, energy, fuel consumption, efficiency

User interface:

- 7-segment LED, foil keyboard (basic version)
- touch screen programmable color LCD graphics display 320 x 240 (optional)

PC data logging (optional) (for sea trials only):

- dynamical torque, power and rotational speed log
- FFT analysis

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BLOCK DIAGRAMS

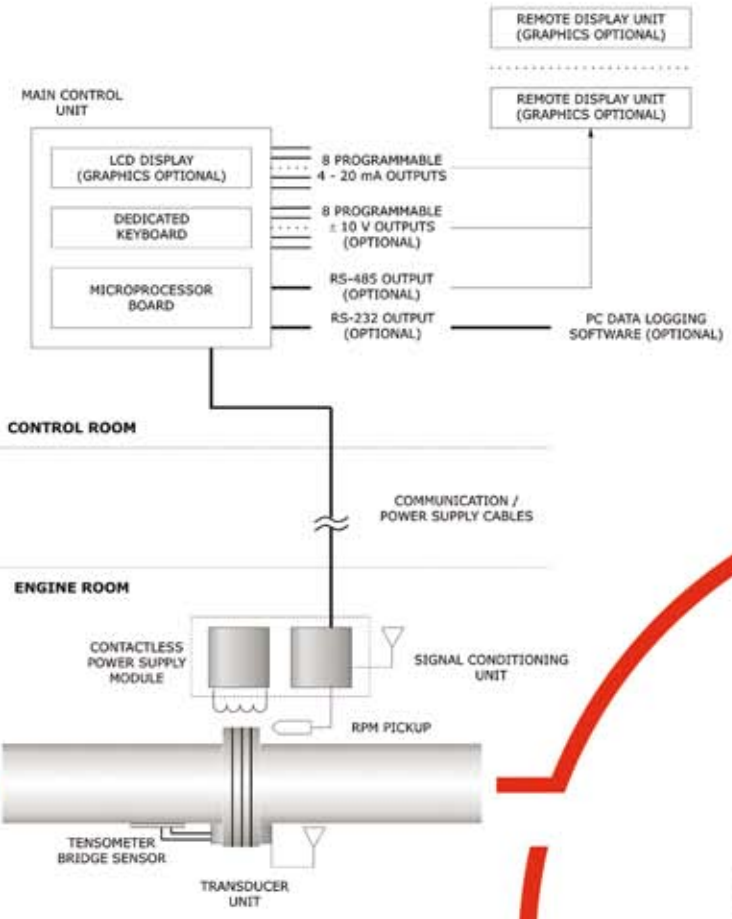

Fig 1. System block diagram

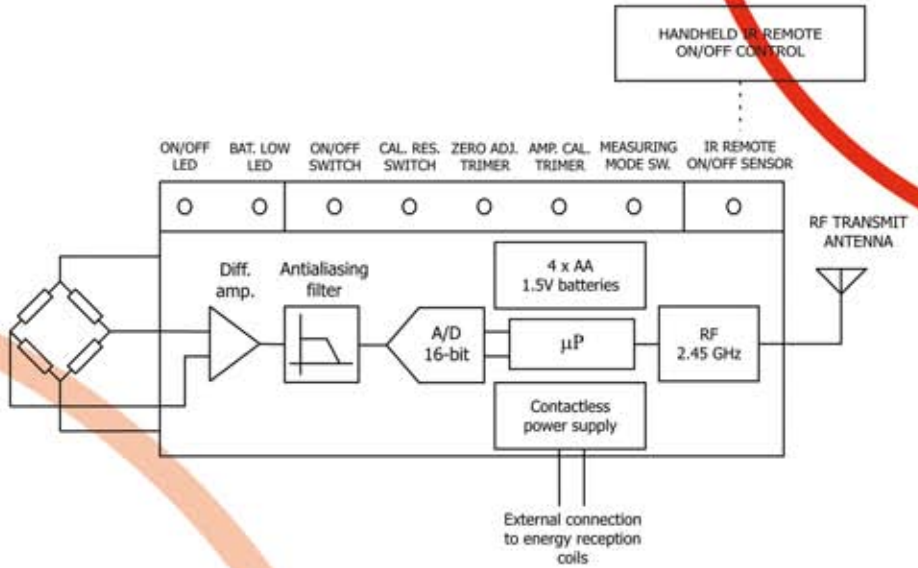

Fig 2: Transducer unit

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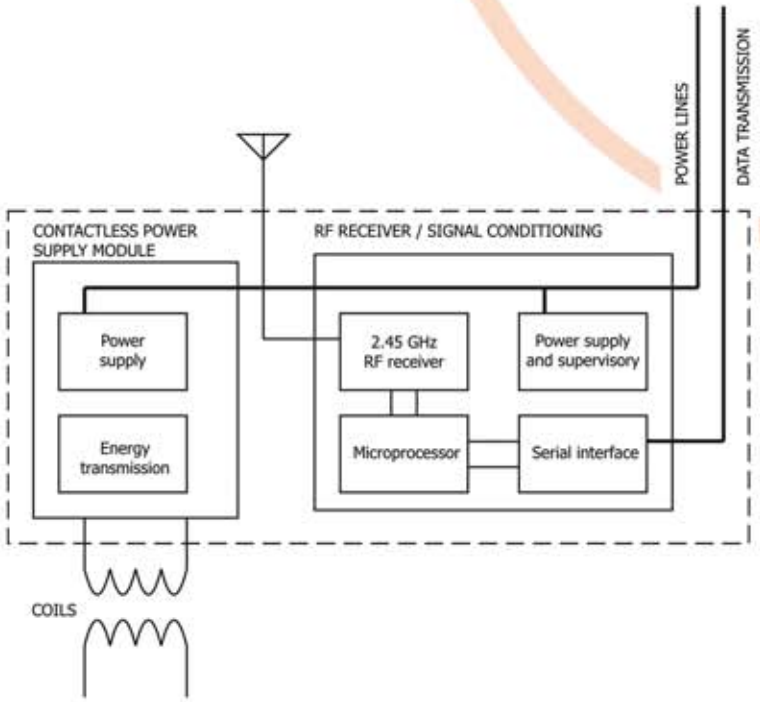
BLOCK DIAGRAMS

Fig 3: Contactless power supply module and RF receiver / signal conditioning unit



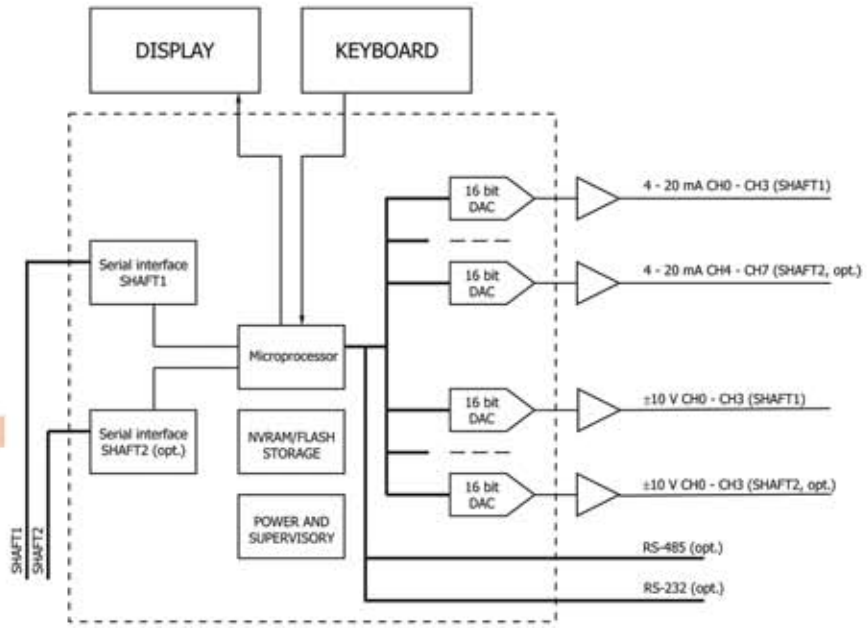


Fig 4: Main control unit

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TECHNICAL SPECIFICATIONS

Torque		
Range	>	flexible
Resolution	>	4.5 digits
Rotational speed		
Range	>	0.01 - 10,000 rpm
Resolution	>	1 ms
Overall system accuracy		
Torque	>	±0.5% F.S.
RPM	>	±0.1% F.S.
Power	>	±0.5% F.S.
Linearity		
Torque	>	±0.1% F.S.
RPM	>	±0.1% F.S.
Power	>	±0.1% F.S.
Torque measuring modes	>	DC torque, AC torque peak, AC/DC ratio
Averaged Time intervals	>	1 s, 5 s, 10 s, 25 s
Dynamical (optional)	>	torque waveform DC – 600 Hz (-3 dB)
Input chain freq. response		
(- 3dB) [Hz]	>	0 – 600
ADC resolution		
bits	>	16 bit
full scale resolution	>	15 ppm
Zero adjustment span		
(torque measurements)	>	0 – 50 % full scale
Amp. gain span		
(torque measurements)	>	100 - 3000
Analog outputs		
4 – 20 mA	>	8 outputs, programmable
±10 V (opt.)	>	8 outputs, programmable
RS - 485 (opt.)	>	proprietary protocol
RS - 232 (opt.)	>	proprietary protocol
Shaft sizes	>	suitable for all shaft sizes
Wireless torque	>	433 MHz ISM license-free band
transmission	>	128 kbps
RF transmission power	>	6 - 10 dBm
Temperature range	>	- 10 to 65 °C

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Universal Transducer / RF Transmitter Module (for permanent installation and sea trials)

Torque sensor		
strain gage range	>	120Ω - 1000Ω
RPM sensor	>	magnetic proximity sensor
Power supply		
contactless power supply module	>	50 VA
energy transmission	>	coupled coils
enclosure	>	IP 65
batteries (ortable version)	>	4 x AA 1.5 V
Calibration resistance	>	200 kΩ
Zero adjustment span	>	0 – 50 % F.S.
Gain adjustment span	>	11 – 3000
Temperature zero drift	>	15 ppm/°C (0.0015 %/°C)
Temperature gain drift	>	10 ppm/°C (0.0010 %/°C)
A/D resolution	>	16 bit
Sampling frequency	>	1500 Hz
Analog bandwidth (- 3 dB)	>	0 - 600 Hz
Input chain linearity	>	0.1 %
RF transmission frequency	>	433 MHz
Signal to noise ratio	>	60 dB
RF transmission output power	>	6 dBm
Consumption	>	25 mA (without sensor)
Battery life (600 W gage)	>	> 24 h
Enclosure	>	IP 65, drip proof
Indications	>	ON/OFF, LED BAT. LOW, LED
Adjustments	>	ON/OFF, switch ZERO ADJ., trimmer GAIN ADJ., trimmer CAL ADJ., switch MEAS. MODE., switch
Remote control	>	IC remote ON/OFF control (for extending battery life in ad hoc sea trials installation)

Notes: Universal transducer/transmitter module can be mounted as standalone unit (in battery powered mode, for sea trials) or with contactless power supply (for permanent installation). In sea trial installations RF receiver may be located in a range of few meters (depending on room configuration and nearby metal objects arrangement).

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Control module

Inputs		
from SHAFT1, SHAFT2		
torque, power, rotational speed	>	proprietary serial protocol (digital values)
Outputs		
4 – 20 mA	>	8, programmable
	>	signal modes: averaged, dynamical (opt.)
± 10 V (opt)	>	8, programmable
	>	signal modes: averaged, dynamical (opt.)
RS – 485 (opt)	>	proprietary protocol
	>	signal modes: averaged, dynamical (opt.)
RS – 232 (opt)	>	proprietary protocol
	>	signal modes: averaged, dynamical (opt.)
Embedded software modules	>	measuring quantities monitoring
	>	measuring system calibration
	>	shaft constants entry
	>	quantities monitoring configuration
	>	analog/digital outputs programming
	>	single/dual shaft mode selection
Display	>	7 segment indicator (basic version)
	>	Graphics LCD display 320 x 240 (opt.)
Display quantities	>	torque, power, rotational speed
	>	AC peak, AC/DC ratio (optional)
	>	programmable alarms (optional)
	>	working hours, energy, fuel consumption, efficiency (opt.)
Keyboard	>	foil, dedicated (basic version)
	>	touch screen (optional)
Power supply	>	110 – 220 V, 50 – 60 Hz
Surge protection	>	power supply unit
	>	input/output stages isolation

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Remote displays

Version: ***basic*** (single/dual shaft)

Display type	>	7 – segment display
Signal inputs		
analog (single/dual)	>	4 / 8 inputs 4 – 20 mA
digital (single/dual)	>	RS – 485
Display quantities	>	torque, power, rotational speed,
	>	AC/DC ratio (optional)
	>	programmable alarms (optional)
Keyboard	>	dedicated foil

Version: ***advanced*** (single/dual shaft)

Display type	>	touch screen graphics LCD, 320 x 240, color
Signal inputs		
analog (single/dual)	>	4 / 8 inputs 4 – 20 mA
digital (single/dual)	>	RS – 485
Display quantities	>	torque, power, rotational speed
	>	AC peak, AC/DC ratio (optional)
	>	programmable alarms (optional)
	>	working hours, energy, fuel consumption, efficiency (opt.)
Keyboard	>	touch screen

Contact:

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Director

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