

# MULTI-CHANNEL EMA ULTRASONIC FLAW DETECTOR OKO-22M-EMA

THE BEST INDUSTRIAL SOLUTION FOR  
IN-LINE AND IN-SERVICE SYSTEMS

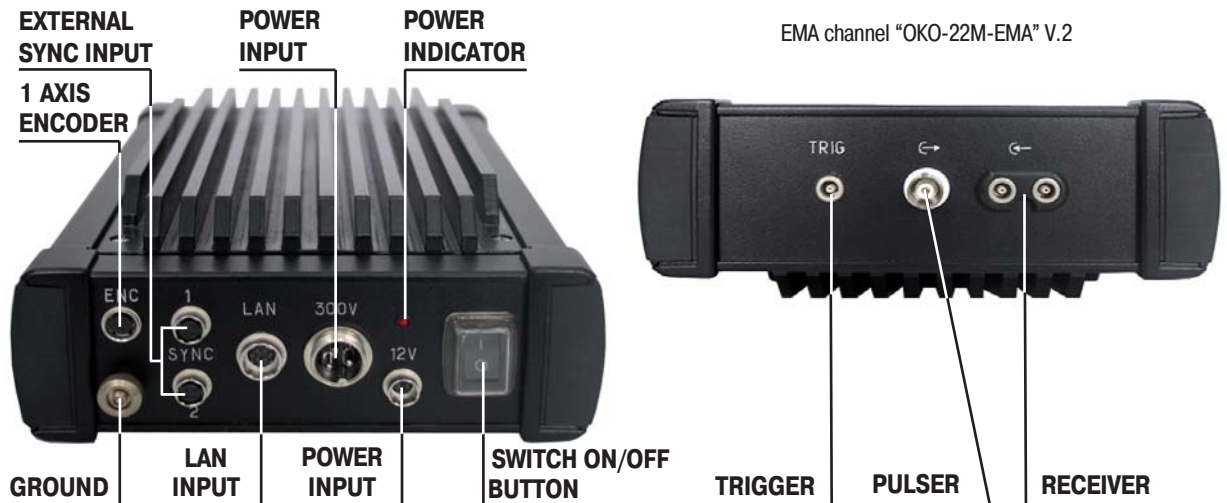
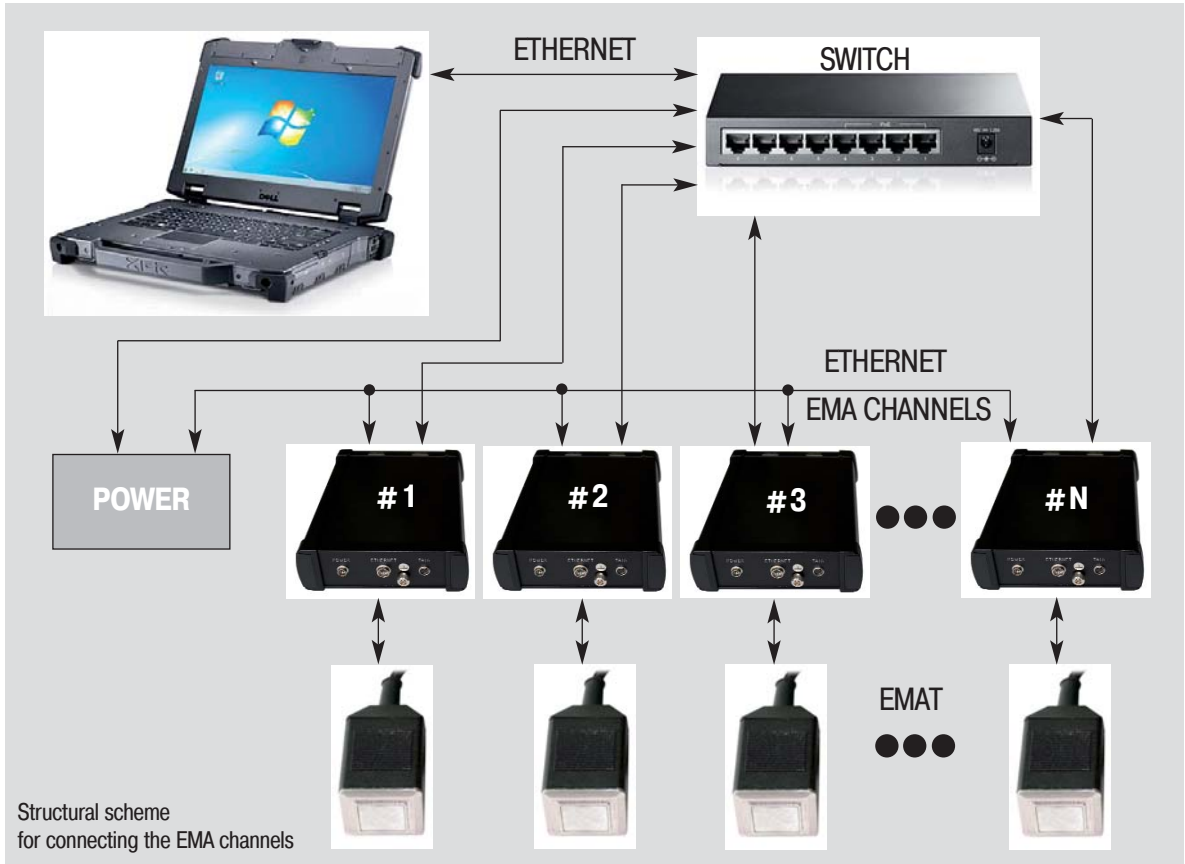


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**PURPOSE**

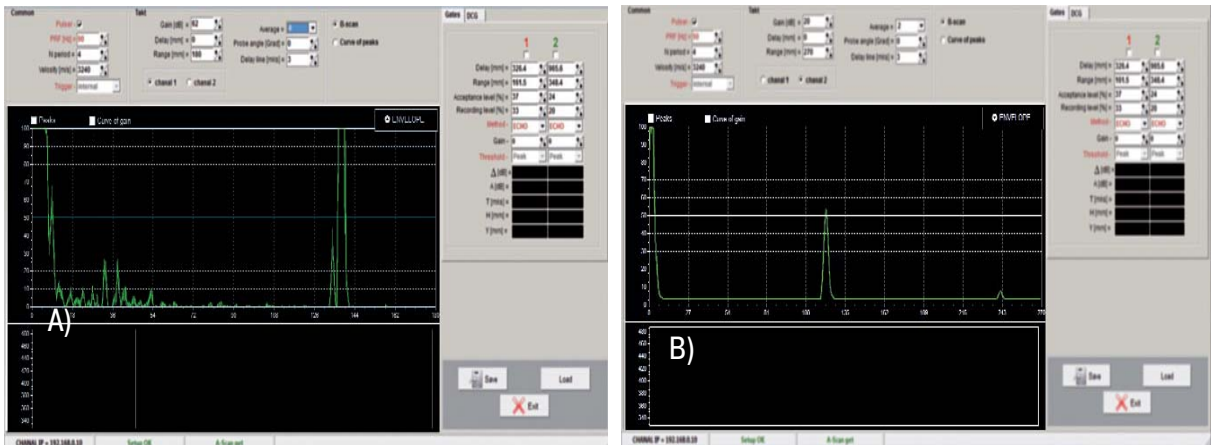
The OKO-22M-EMA ultrasonic flaw detector is an independent electronic device and is designed for application in stationary high-performance systems (automated multi-channel NDT Systems), transportable systems (mechanized NDT systems) or for manual testing.

Due to the flaw detector is designed in a form of a standalone device with the connection to the PC via Ethernet port, several EMA channels can be connected to the PC via Switch unit. This allows to create EMA multi-channel testing systems.



**OKO 22M-EMA software is a universal basic interface for the system setup, testing, viewing and analyzing the saved data irrespective of the purpose of the system, which comprises the integrated multi-channel OKO-22M-EMA flaw detector. Along with the basic software package, the delivery set can also include the numerical data and possibility of setting all channel parameters in a convenient format via Eth. UDP/IP for working in LabVIEW and other environments.**

**OUTER APPEARANCE OF OKO-22M-EMA PROGRAM INTERFACE**



- A) Detection of flat bottom hole with dia. 2 mm at a depth 136 mm (EMAT- 0° - 4 MHz, testing the 140 mm bar);
- B) Detection of groove with a depth 0.5 mm and length 10 mm (EMAT- 45° - 2 MHz, testing the 140 mm bar)

**APPLICATION OF EMA TESTING TECHNIQUE IN VARIOUS INDUSTRIES:**

Production sector, test object	Regulatory Documentation	Required number of channels	Operating frequency, MHz	Special requirements
Metallurgy, testing the flat rolled steel	EN10160, ASTM 578/A578M-96, A435A, ISO 12094	60 - 100	2 - 3	Test object temperature can reach to 650 °C
Metallurgy, testing the flat rolled steel bars	EN 10308, EN 10228-3, ASTM E - 2375, MS-STD - 2154	3 - 20	2 - 4	Operating gap is 1 mm, testing velocity is 2 m/s
Metallurgy, testing the slabs	—		0,5; 2; 4;	Operating gap is 0.3-1 mm, testing velocity is up to 2 m/s
Engineering, testing the pipe welded joint	API 5L, API 5 CT, EN 10246-17	12	2 - 4	Operating gap is 1 mm, velocity is up to 1 m/s
Engineering, testing the pipe body, thickness gauging	API 5L, API 5CT, EN 10246, ASTM E1816-96	56	2 - 4	Operating gap is 1 mm, velocity is up to 1 m/s



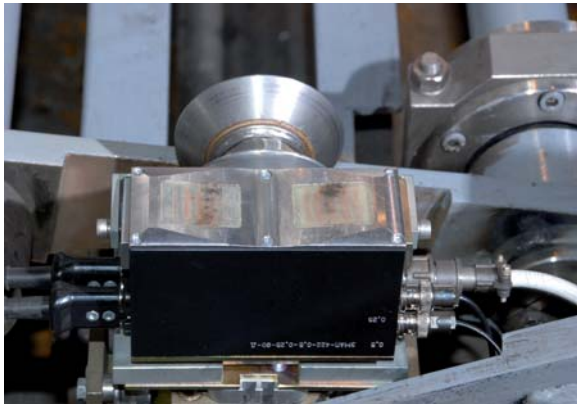
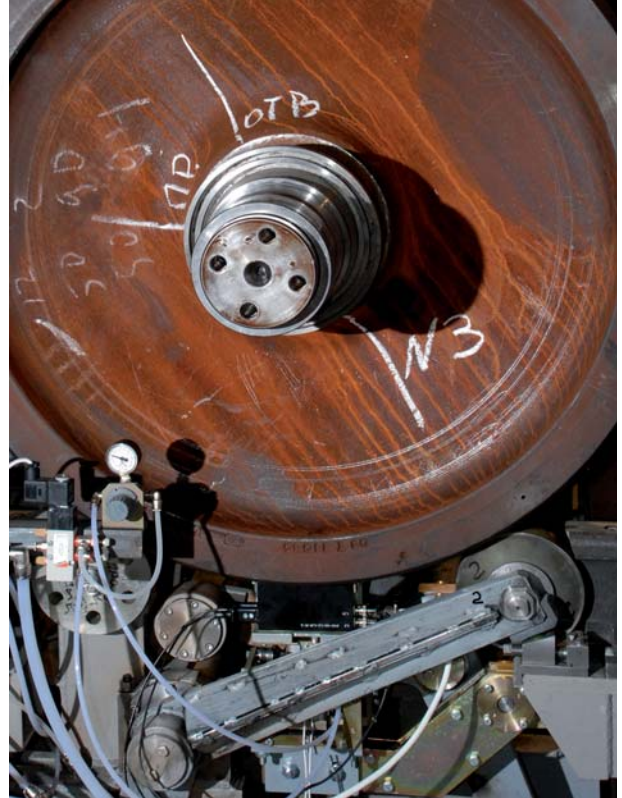
## APPLICATIONS

### INTEGRATED INLINE SOLUTIONS

#### MACHINE BUILDING. TESTING OF WHEEL PAIRS AND ROLLERS

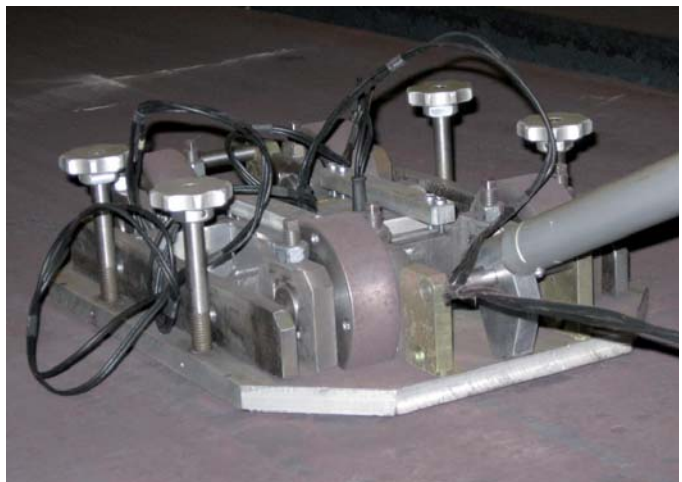
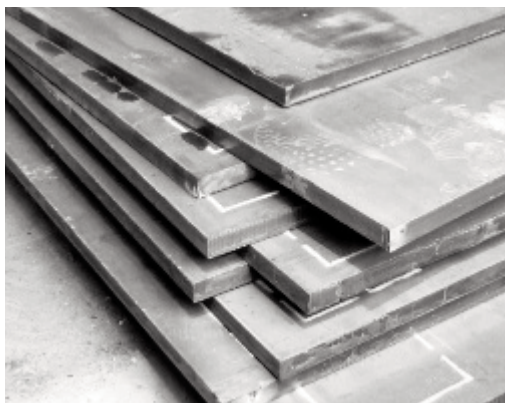
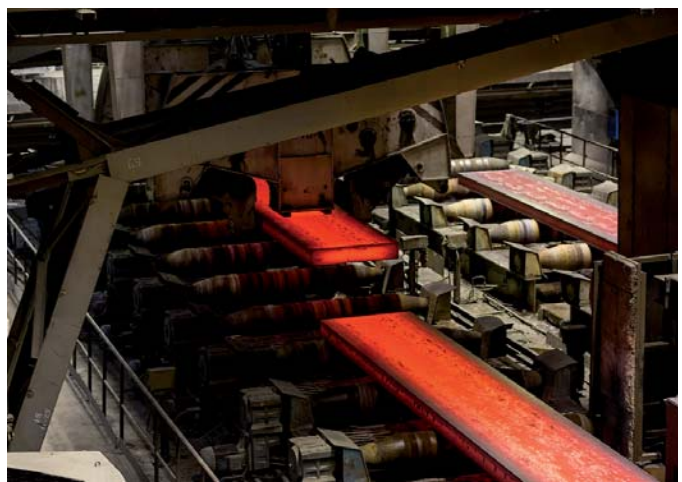
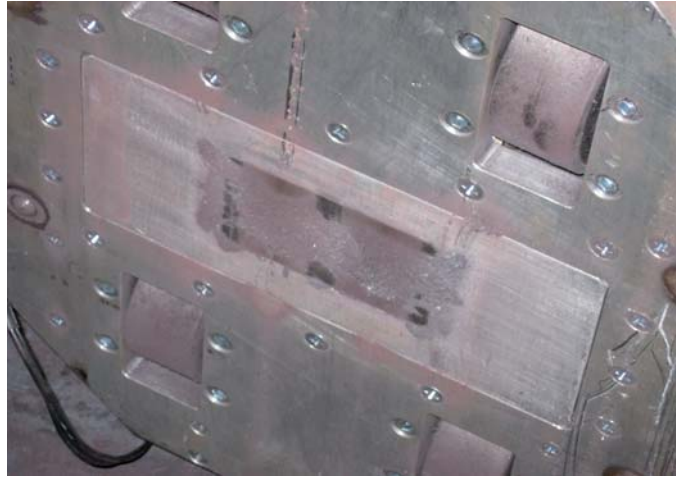
The list below covers the most common and specific NDT applications that require specific instrumentation.

High-productivity testing of roll surfaces for the presence of surface and sub-surface flaws is performed due to creeping surface waves in the Pitch-Catch mode. High sensitivity of testing is ensured by Rayleigh waves emission in the frequency range from 0.2 to 1 MHz.



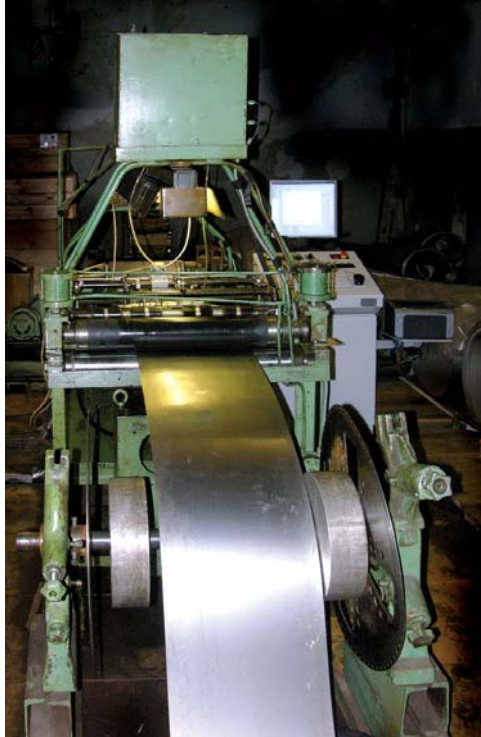
**METALLURGY.  
TESTING OF SLABS  
AND ROLLED PRODUCTS  
WITH ROUGH SURFACE**

Due to the minimum impact of surface quality on the sensitivity of ultrasonic testing while using the EMA technology, the systems for non-destructive mechanized and automated testing of slabs, plates and bar sections can be designed on the basis of OKO 22M-EMA. The possibility to combine up to 100 channels into one network ensures the performance of high-productivity ultrasonic dry testing in a production flow. The advantage of EMA is testing of objects with high surface temperature.





**METALLURGY.  
TESTING OF STEEL  
STRIPS DURING  
PRODUCTION**



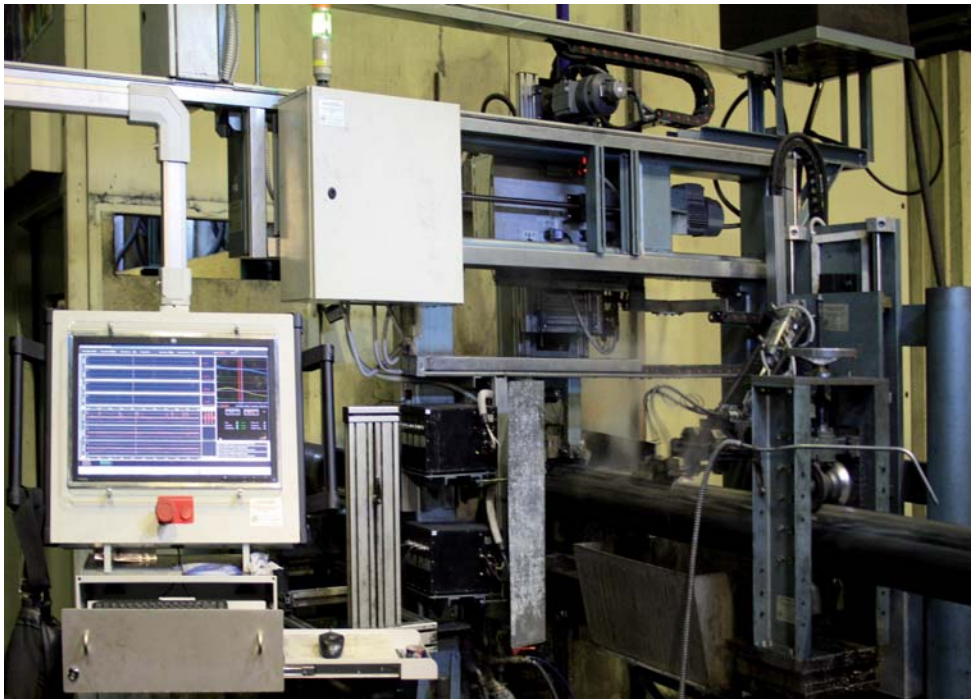
**OKO-22M-EMA** system provides for high-speed automated testing of thin steel strips for the presence of internal and surface flaws, such as laminations, laps, inclusions, by ultrasonic non-contact method using a pair of special-purpose angle beam EMA probes, which induce Lamb waves in an object under test. **OKO-22M-EMA** ensures the stable detection of flaws, which, in terms of their reflectivity, are equivalent to the reference reflector of through-hole drilling type with the diameter of 0.8 mm.



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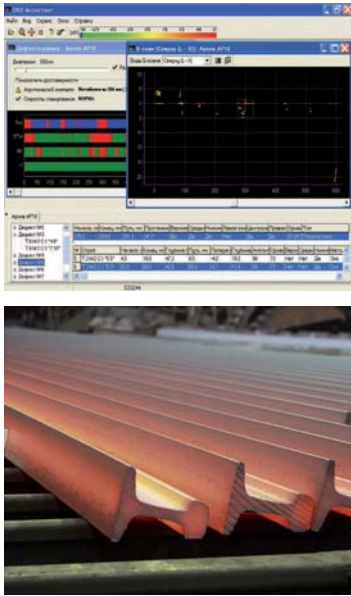
**METALLURGY.  
IN-LINE ULTRASONIC TESTING  
OF ERW PIPES ON WELDING  
MILL DURING PRODUCTION**

**OKO-22M-EMA** electronics provides for inspection of ERW pipes larger than 60 mm in diameter immediately after welding, along with a superior return on investment by minimizing scrap rates while meeting all the quality codes. The System can be installed directly after a welder to provide immediate feedback on the quality of the weld without quenching. It also provides for a complete volumetric inspection of the weld according to the most stringent API standards.



**METALLURGY.  
ULTRASONIC TESTING  
OF RAILS ON MILL DURING  
PRODUCTION**

During acceptance testing of rails manufactured in accordance with GOST P 51685, EN13674:1 2011 and TU 0921\_231\_01124323, **OKO 22M-EMA** provides EMA dry ultrasonic testing of rails.



**TRANSDUCERS SPECIFICATIONS**



Figure 4  
EMA Transducers

Catalog number	Frequency, MHz	Probe angle, °	Working surface size, mm	Connector type	Connector position
EMAT0.5-0	0.5	0	20 x 20	2Lemo00/BNC	cable
EMAT0.5-90	0.5	90	20 x 20	2Lemo00/BNC	cable
EMAT1-0	1.0	0	20 x 20	2Lemo00/BNC	cable
EMAT1-45	1.0	45	20 x 20	2Lemo00/BNC	cable
EMAT1-90	1.0	90	20 x 20	2Lemo00/BNC	cable
EMAT2-0	2.0	0	20 x 20	2Lemo00/BNC	cable
EMAT2-45	2.0	45	20 x 20	2Lemo00/BNC	cable
EMAT2-90	2.0	90	20 x 20	2Lemo00/BNC	cable
EMAT4-0	4.0	0	20 x 20	2Lemo00/BNC	cable
EMAT4-45	4.0	45	20 x 20	2Lemo00/BNC	cable
EMAT4-90	4.0	90	20 x 20	2Lemo00/BNC	cable
EMAT5-0	5.0	0	20 x 20	2Lemo00/BNC	cable
EMAT5-45	5.0	45	20 x 20	2Lemo00/BNC	cable
EMAT6-0	6.0	0	20 x 20	2Lemo00/BNC	cable
EMAT8-0	8.0	0	20 x 20	2Lemo00/BNC	cable

\* Working surface size and dimensions of EMA probes can be performed at the customer's request. Available high temperature EMAT modification.

## OKO-22M EMA MAIN SPECIFICATIONS

PARAMETER	VALUE	TYPE OF EQUIPMENT	
		OKO-22M-EMA V.2	OKO-22M-EMA PRO
<b>PULSER</b>			
• Initial pulse filling frequency (Up to 8 MHz available as an extra option. Selection of a frequency filling is determined by the testing task.);	0.5, 1, 2, 3, 4, 5, 6 MHz;	+	+
• Type of initial pulse	Toneburst Waveform;	+	+
• Number of periods	2 – 6;	+	+
• Pulser amplitude	up to 4000 Vpp;	+	+
• Pulse energy	depends on a filling frequency;	+	+
• Pulse repetition frequency (PRF)	from 50 to 2000 Hz.	up to 1000	2000
<b>RECEIVER</b>			
• Gain adjustment:	– 28 dB to 68 dB (gain step 0.1, 0.5, 1, 2 dB);	+	+
• Filter (Selection of the filter frequency is determined by the testing task.);	0.5, 1, 2, 3, 4, 5, 6, MHz; _	+	+
• Delay	from 0 to 1000 mm in steel (sound velocity 3230 m/s);	+	
• Range	from 1 to 1000 mm in steel (sound velocity 3230 m/s);	+	
• Number of averages	2 / 4 / 8 / 16 / 32;	+	+
• Data presentation	A-Scan; B-Scan; C-Scan;	+	+
<b>TCG</b>			
• Depth	entire gain range;	+	+
• Number of points	not less than 20;	+	+
• Minimum time step between TCG points	up to 1 μs;	+	+
• Maximum slope	not less than 46 dB/μs;	+	+
<b>GATES</b>			
• Two independent gates per channel Amplitude and time measurements		+	+
• Two acceptance levels per gate		+	+
<b>A/D CONVERTER</b>			
• 10 bit, 80 MHz		+	+
<b>PORTS (for communication with PC and various peripheral devices)</b>			
• Ethernet (for communication with PC);		+	+
<b>CONNECTORS</b>			
• 2 lemo00 connectors for connecting the EMAT to the receiver of EMA channel;		+	+
• 1 BNC connectors (one connector for the first pulser, second connector for the second pulser);		+	+
• 1 lemo connector for one axis Encoder connection;		+	+
• 1 Ethernet connector for transmitting the data to PC;		+	+
• 1 Trigger connector is used either for synchronization between EMA channels, or for EMA channel metrological verification.	+	+	
<b>IP LEVEL</b>			
• Ingress Protection Rating		IP65	IP44



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