MIC-1500 telemetry system

Russian cutting-edge technologies for gas turbine testing

Mera

Complex systems &
reliable relationship

MIC-1500

MERA Group of companies is a developer and manufacturer of MIC-1500 multichannel telemetry system which is a unique innovation in Russian market.

Designers, system integrators, test and software engineers have developed MIC-1500 for four years from 2013 to 2017.

MIC-1500 has incorporated innovative solutions becoming further step in MERA Group technology progress.

Radiotelemetry systems

One of the key issues for national successful development is modern gas turbine technologies

Blade row testing is a compulsory requirement during design and construction of state-of-the-art gas turbine plants and engines

During testing of turbine and compressors blade rows it is compulsory to use radiotelemetry systems (RTS)

RTS are designed to measure strain, temperature, vibration on rotating parts of gas turbines and to transmit the data for registration and processing within recieving part located on stationary elements

There are only 4 manufacturers of RTS all over the world

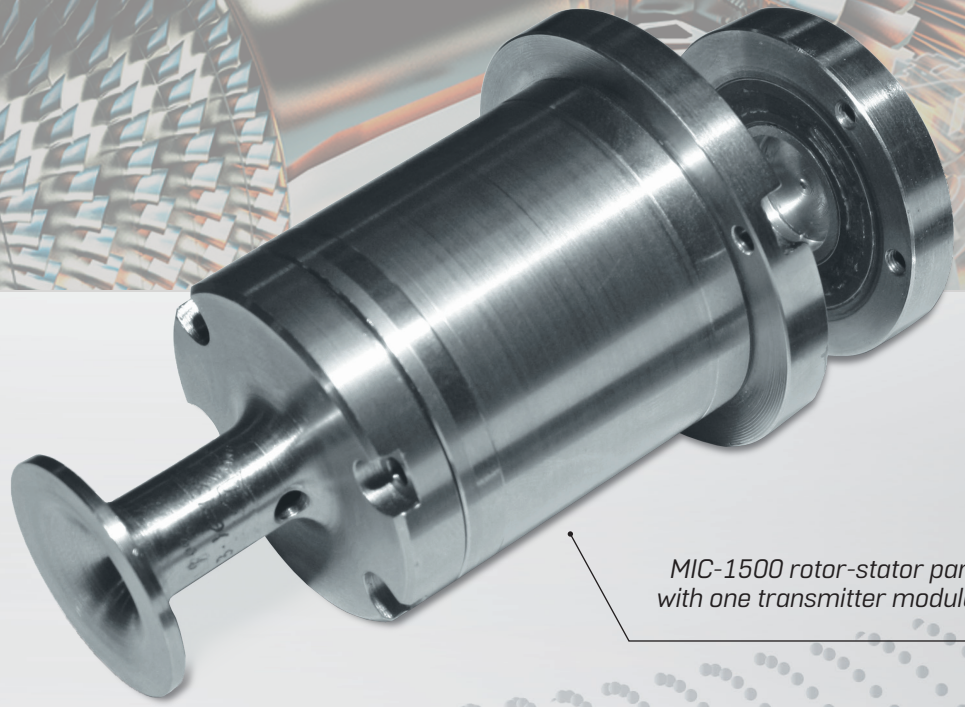
RTS design and manufacturing in Russia provides the capability for deep retrofitting of existing gas turbines and development of the new ones

MERA Ltd. is the only company in Russia which manufatures self-designed RTS which complies the modern level of testing technologies

Have created its own RTS MERA Ltd. made a sugnificant step in technology and competence development

We are sure that we can do more!

RTS based on MIC-1500 are designed to measure and register strain and temperature of hard-to-access rotating parts of different systems via single strain-gauge transducers and thermocouples



MIC-1500 rotor-stator part with one transmitter module

Operation in hard conditions

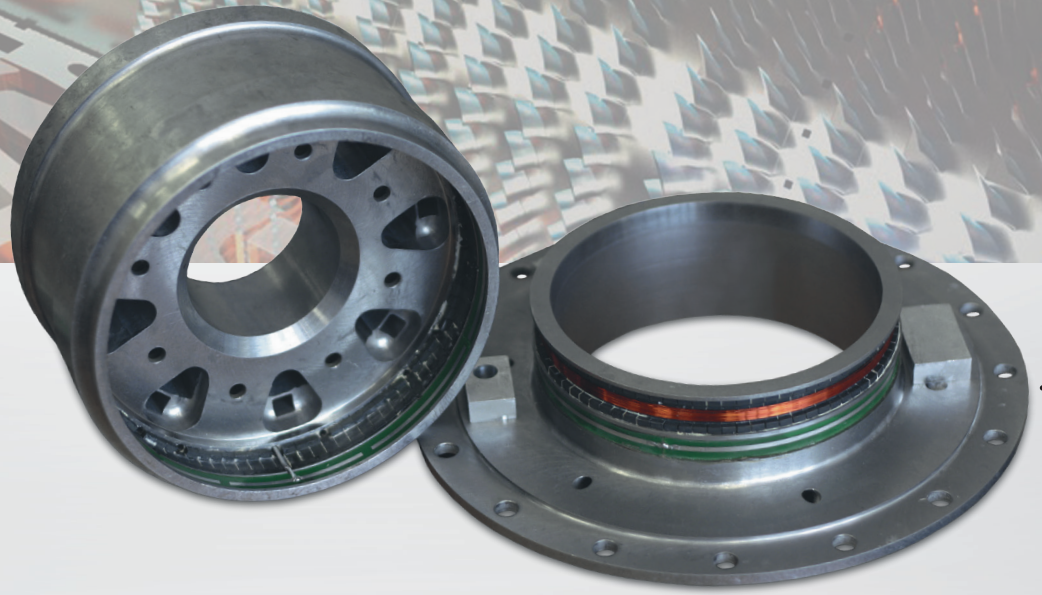
Miniature size
Light weight

Modern electronics

Special assembly technology and compounds

Weight-size parameters of MIC-1500 rotor-stator part are determined by specific measurement requirements and size of device under test

Antenna system is customizable



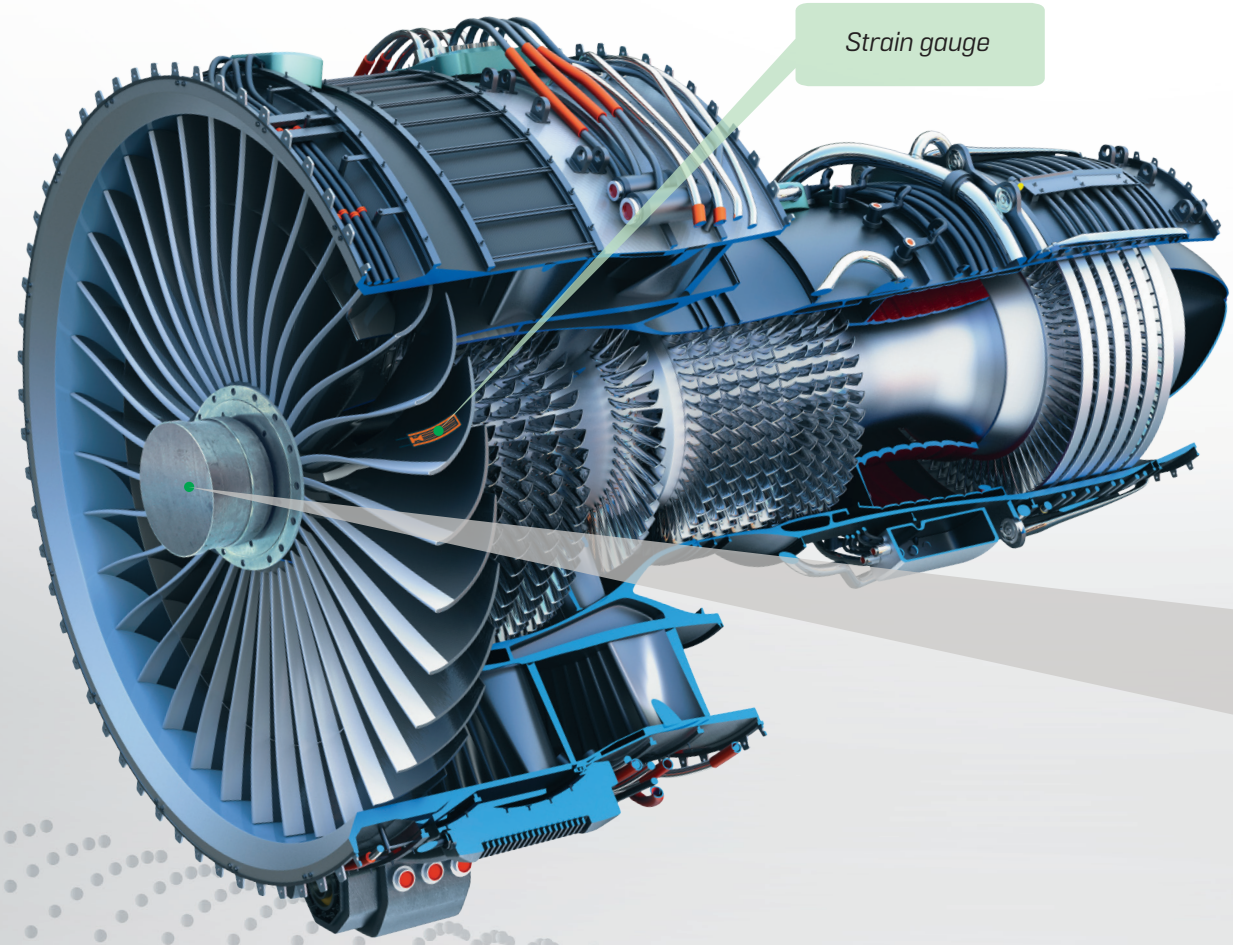
MIC-1500 rotor-stator part for 8 transmitter modules

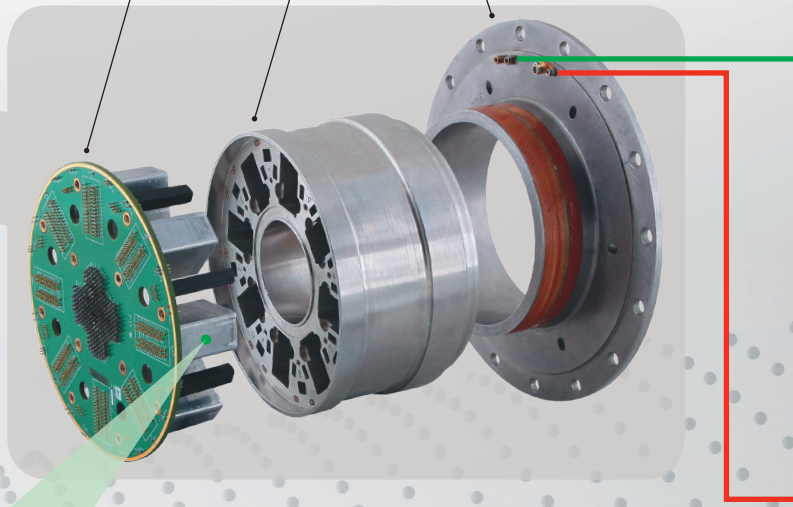
High level PCB assembly

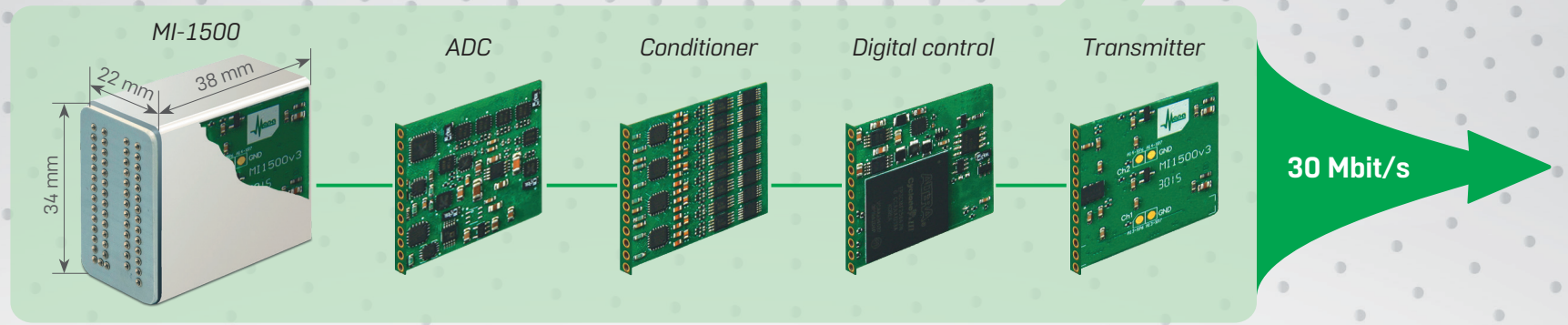
Scalability: 8 to 64 strain gauge channels, 10 to 80 temperature channels

High data transfer rate of HF channel

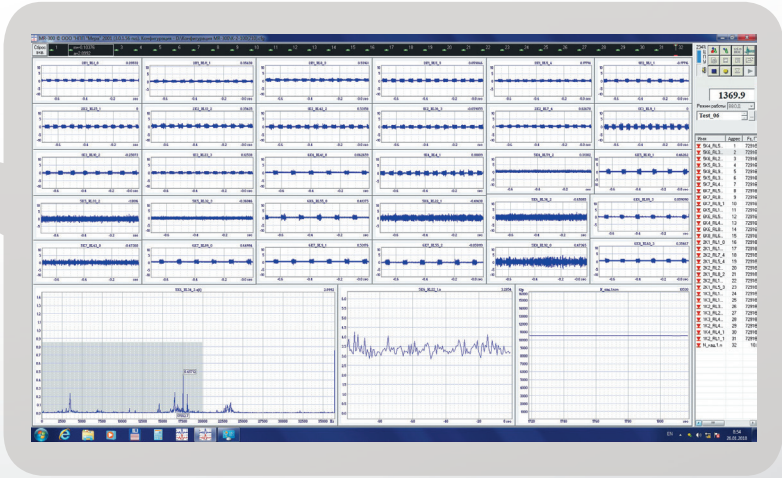
Multilevel software


Strain gauge


Backplane with installed 8 transmitter modules MI-1500 and 8 power supply modules MBP
Antenna rotor
Antenna stator

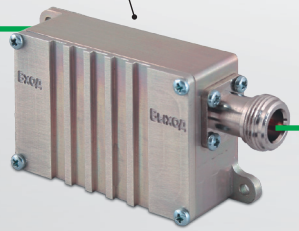

MI-1500
22 mm
38 mm
34 mm
ADC
Conditioner
Digital control
Transmitter
30 Mbit/s

Software for real-time registration and processing



Data acquisition station

HF amplifier



Measurement crate

MR-2507 module for data recieving and processing

Total data volume for 8 modules MR-2507 is 150-240 Mbit/s

Power supply

Matched termination

Power amplifier

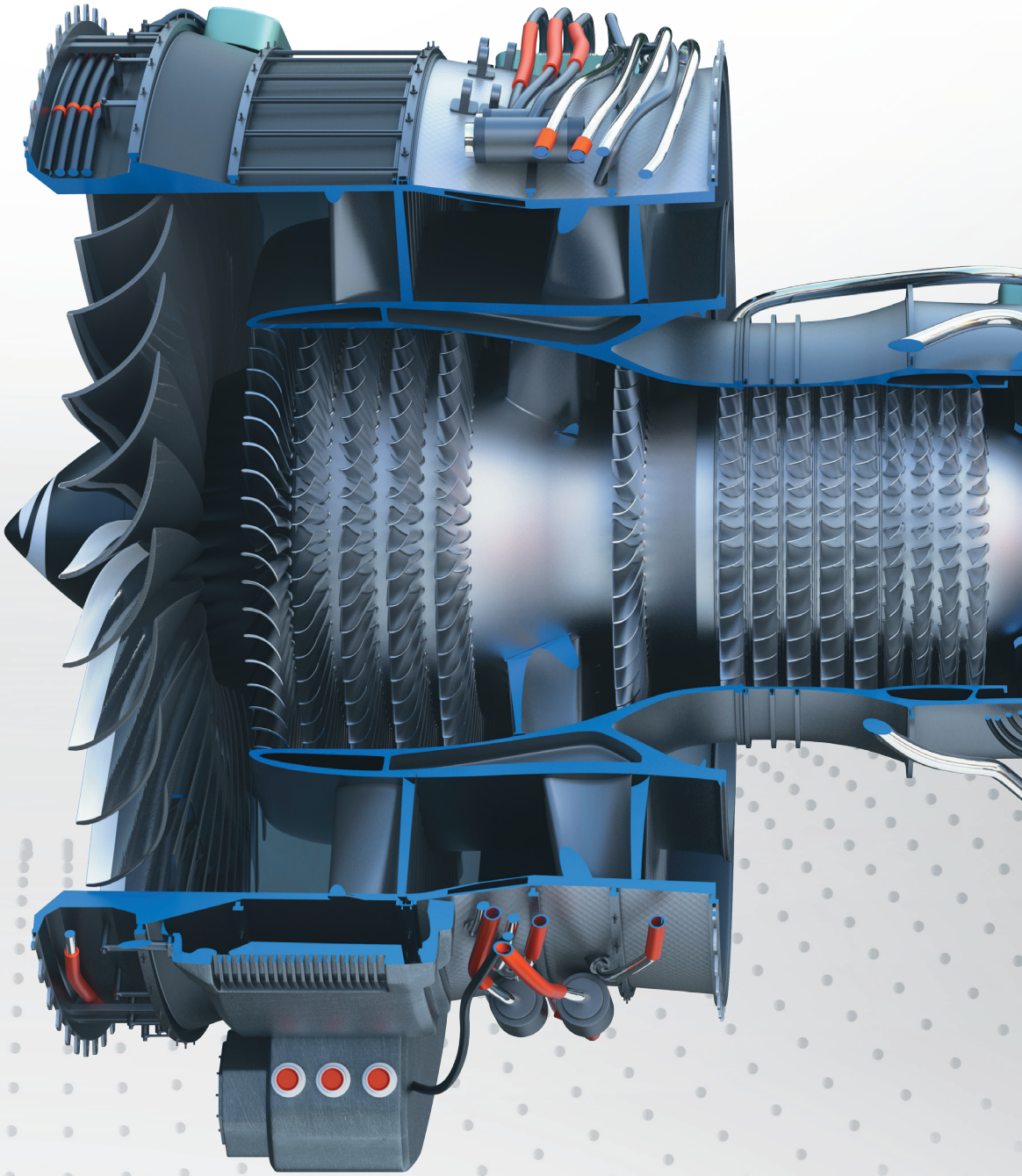
Carefully adjusted construction and circuit design solutions implemented in MIC-1500 has made possible the creation of high precision and robust measurement system equal to analogs from leading foreign manucaturers

Measuring module-transmitter MI-1500 ready to be mounted in rotor

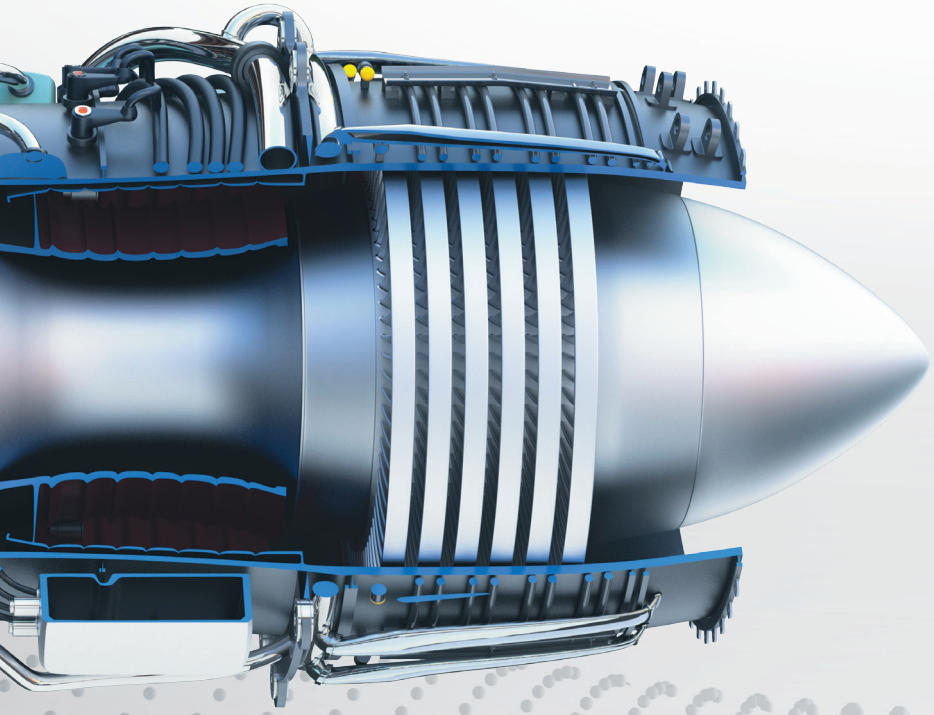
- Frequency: 1,2 ... 1,8 GHz
- Bit rate: 30 Mbit/s
- Size: less than 38x34x22 mm
- Weight: less than 65 gr

Operation conditions

- Operation temperature: - 40 ... + 125 °C
- Rotation frequency: up to 18 000 rpm
- Vibration: up to 150 g



Connection of additional group of strain gauge sensors allows to increase number of channels up to 128



- Channel q-ty:
  - Strain – 8 .. 64 (single strain gauge)
  - Thermo – 10 .. 80 (thermocouples K-type)
- Bandwidth (-0,5 dB): 10 Hz .. 50 kHz
- Tolerance:
  - Strain – 0,5%
  - Thermo – 0,2%
- Built-in shunt calibration resistors
- Overloading: up to 40 000g
-
-

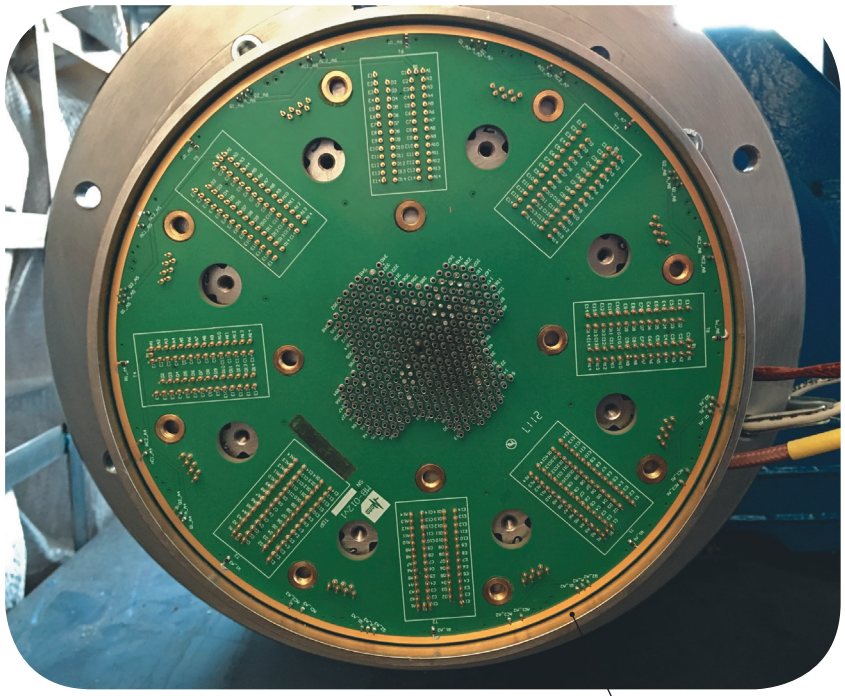
2 – 2,2 times cheaper than foreign analogues

Warranty: 3 years

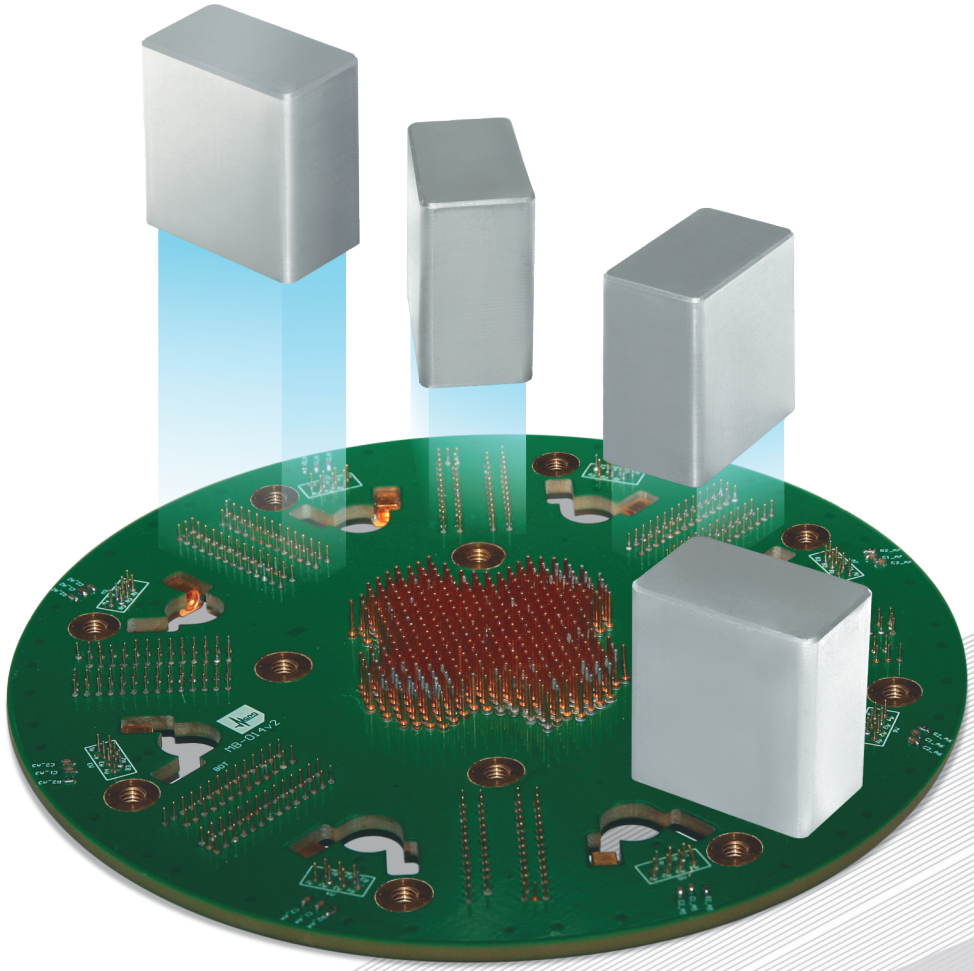
Scalability and variability

Due to modular design types and number of measurement channels can be adjusted individualy for each object-under-test in accordance to specific conditions and customer requirements

Universal modules-transmitters MI-1500 in number of 1 ... 8 are mounted in specially designed rotor-housings



MIC-1500 during mounting (view from backplane sight)



Rotor part with built-in antenna system for 8 transmitters

Stator with built-in antenna system for 8 transmitters

Backplane

Measurement and transmitting modules MI-1500
Power supply modules MBP-1500

MI-1500 main technical parameters

Strain gauge channels	
Number, pc.	8
Max. sampling rate, not less, Hz	105 468
Measurement frequency range, Hz	100 ... 40 000
Time shift between channels of single transmitter, not less, μs	±0,1
Amplitude frequency responce flatness, not more, dB	±0,5
Software switchable measurement range, mV	±3, ±7, ±15, ±30, ±60
Supply current, mA	8,0
External sensor type	single strain gauge sensor
Strain-gauge nominal resistance range, Ohm	50 ... 550
Shunt switching frequency, kHz	1,22
Resistance value of software-switchable calibration shunt, kOhm	60,4 150,0
ADC resolution, bit	24
Transmitted data width, not less, bit	12
Limit of basic systematic error referred to full-scale value, %	±0,5
Additional channel error caused by deviation of module temperature from normal conditions , not more, %10 deg. C	±0,1
Signal generation (saw-type, square-type)	+
Control of dynamic shunt on/off for each channels	+
Control of signal generation on/off for each channel	+
Strain gauge sensor power supply	individual
Channel calibration by shunt resistor	+

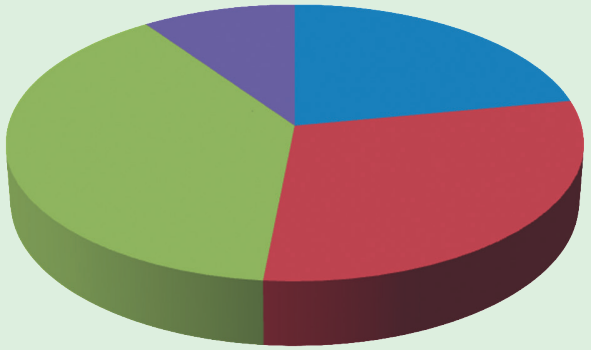
Temperature channels	
Number, pc.	10 (thermocouples) 1 (could junction temp.)
Max. sampling rate, not less, Hz	100
Supply current (for cold junction), mA	2,45
Measurement range, mV	-4,9 ... +66
ADC capacity, bit	16
Transmitted data width, not less, bit	16
Input resistance of thermocouple measurement channel, not less, kOhm	200
Limit of basic systematic error referred to full-scale value, %	±0,2
Additional channel error caused by deviation of module temperature from normal conditions, not more, %10 deg. C	±0,1
Cold junction temperature compensation by external sensor	+
External cold junction temperature sensor	+
External sensor type	thermocouple, Pt100-type sensor for cold junction
Automatic compensation of ADC zero offset	+
Type of channel input	differential
Measurement and transmitting module MI-1500	
Number of HF-transmitter channles, pc.	2
HF-transmitter bandwidth, not less, MHz	150,0
Max.power of transmitter channels, not more, dBm	2,0
Error of module temperature measurement by built-in sensor, not more, deg. C	± 2,0

We help creating technologies of future

MERA Group of companies

Moscow region

For many years MERA is proudly recognized as the trustworthy supplier of turnkey test facilities and test automation systems for the aviation industry. We are perfectly able to apply modern automation methods and a mastery of advanced testing technologies. That is why we are a competence center in the field of aviation equipment testing and we are leaders in the supply of various measuring and control systems.



More than 220 employee

- System integration department
- Design center
- Production plant
- Other

120 implemented projects per year
For 25 years 2100 projects have been implemented

More than 250 customers
More than 30 - permanent

MERA is included in Board of Chief Contructors of Vostochny-C space port

Partnership with JSC United Engine Corporation

MERA Group of companies
build. 13, 2, Kolpakova str., Mytishchi, Russia,
141002 Phone: +7 495 783 71 59
Fax: +7 495 745 98 93
info@nppmera.ru
www.nppmera.ru