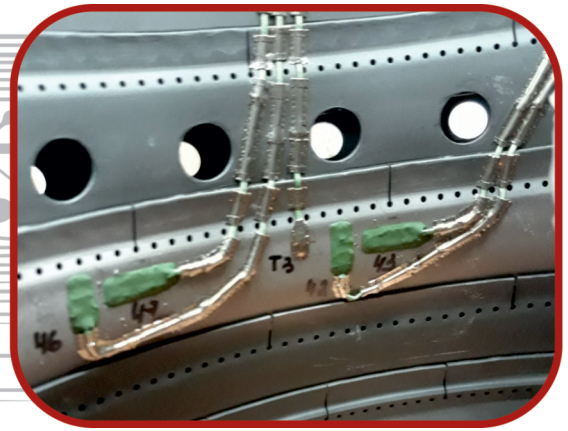

Remedial works due to cracks propagation on the walls of the combustion chamber. HPM nickel-chromium wire strain gages were installed using VPG HG-1 cement.
Elongation cable routes are protected with spot-welded heat-resistant foil. In total, 60 strain gages were used for dynamic test of the combustion chamber.

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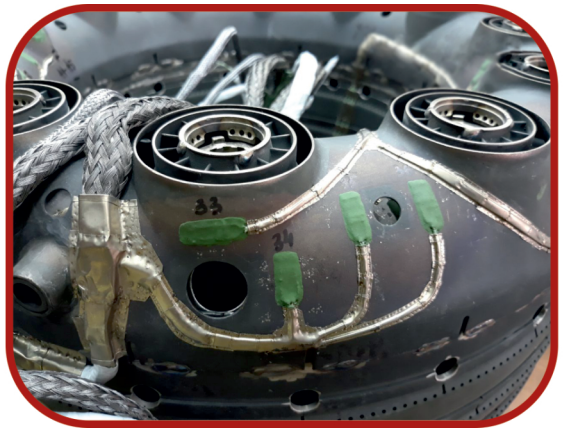

Test to determine the cause of burnouts around fuel injectors. 50 HPM nickel-chromium wire strain gages were installed using ZEMIC GT-900-H cement. Dynamic test was performed at normal engine working cycle for 5 hours.
Strain test was preceded by TSP-M02 thermal indicator paint application to clarify the temperature in different zones of the combustion chamber.

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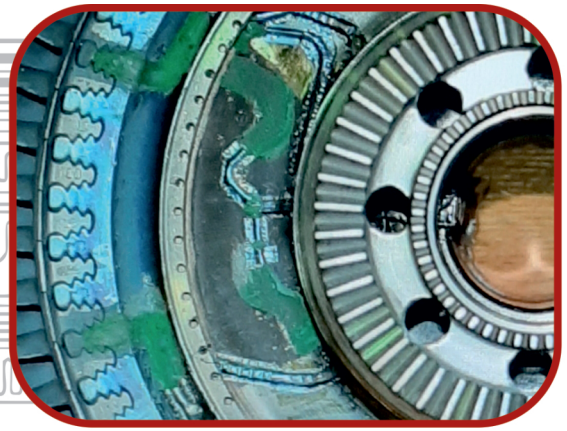
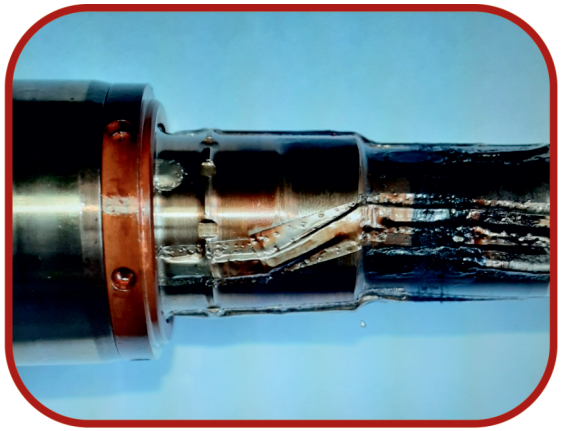
Certification works for the free turbine blades at 60,000 rpm.
An 8-channel telemetry system was used, implementing 8 strain gages installed in critical points of the blades. Dynamic test is carried out throughout entire engine test program (around 6 hours).

HPM
High Precision measurements



Certification works for the turbine compressor disk at 60,000 rpm.
An 8-channel telemetry system was used, connecting 8 strain gages installed by 2-wire scheme on the turbine disc. Dynamic test is carried out throughout entire engine test program (around 6 hours).



Test to investigate the load on the free turbine shaft. 8 HPM nickel-chromium wire strain gages were installed on the shaft with GT-900-H ceramic cement and connected through TMS-BV-8 telemetry system. Dynamic test was performed for 6 hours throughout all working cycles of the engine. This was the third part of certification tests, also comprising test of turbine disk and blades.

Strain test of fuel injectors installed in the combustion chamber flame tube.
Two HPM 3 mm nickel-chromium wire strain gages were installed on each igniter with ceramic cement VPG HG-1. Temperature was controlled using custom-made chromel-alumel thermocouple with core diameter of 0.3 mm.