



**DTM
TECHNOLOGIES**

**ENGINEERING AND PRODUCT
PORTFOLIO**

Ferrari *research center*



DESIGN AND TECHNOLOGIES FOR HIGH PERFORMANCE MECHANICS

DTM is a privately owned company founded in 1994 operating in many industrial sectors: aerospace, biomedical, marine and automotive. The company was born in the late '90 as spin-off of Ferrari SpA Space Division (former Ferrari Engineering). All the design and development activities are carried out in Modena premises and laboratories where are available many tools and facilities for design, manufacturing and testing.

DTM main core-business is the design, development and qualification of aerospace structures and GSE for satellites, launchers and ISS/sub-orbital flight experiments and infrastructures. DTM facilities include CAD, structural, thermal and CFD software tools, clean rooms, autoclave, tools and NDI/test equipments, TVCs, static and fatigue test jigs, shaker and acquisition systems.

MISSION

DTM offers mechanical design and analysis (structural, thermal, CFD) capabilities as well as testing and integration facilities.

This allows DTM to provide our customers with full turn-key project development meeting all requirements, on-time and on-budget. To guarantee the highest quality levels to our customers DTM has implemented since 2006 ISO 9001 quality management system and since 2013 EN 9100 (aerospace) quality management system.

DTM specialities include:

- Mechanical, fluidic and thermal design
- Composite parts design, development and testing
- Experimental and integration activities
- Testing, qualification and certification:
DTM is an industrial research Laboratory
of the Emilia-Romagna High Technology Network



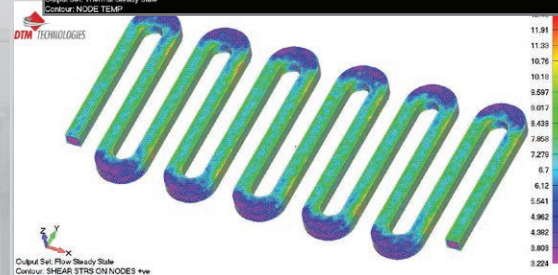
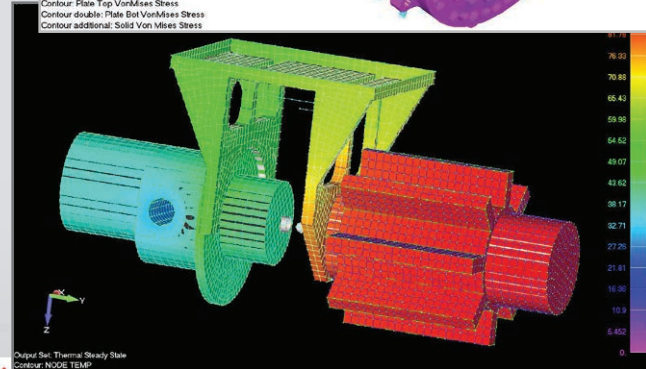
RETE ALTA TECNOLOGIA
EMILIA-ROMAGNA
HIGH TECHNOLOGY NETWORK



DESIGN AND ANALYSIS

DTM can develop full turn-key projects taking care for all design (drafting), structural and thermal verification activities or can work on specific design activities. Below are reported the main software tools available at DTM:

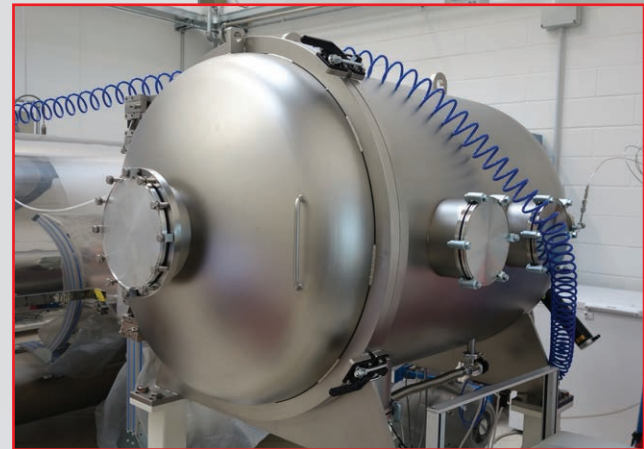
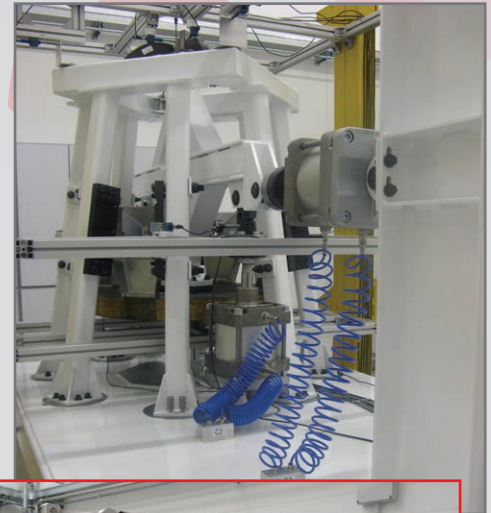
- 3D CAD systems for mechanical design
- Nastran solver and Femap pre-post processor for Finite Element Analysis
- TMG Thermal solver and advanced thermal module with CFD for thermal/fluid dynamic analysis
- Labview Development system for data acquisition and equipment control
- ESACRACK/ESALOAD/NASGRO: ESA fracture control engineering tools

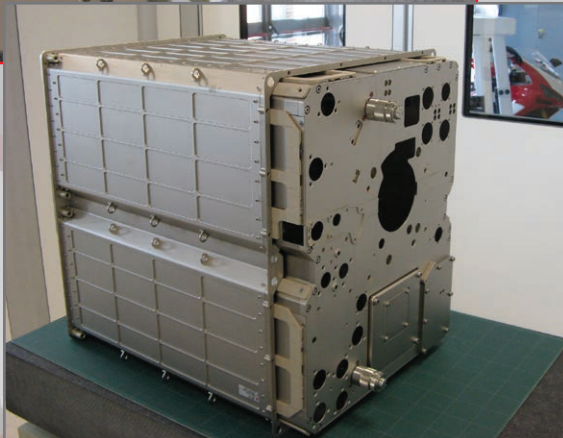


LABORATORY & FACILITIES

All the manufacturing, assembly, testing and integration activities of equipments/subsystems (as well as the production of customised parts) are performed in DTM laboratory (manufacturing through qualified outsourcers when required). It is available both a “gray” testing/integration area as well as an ISO6 clean room certified according to ISO 14644. The workshop is provided with an autoclave, milling machine, a lathe and several refining tools. Here is a list of the most important facilities and tools available at DTM integration plants:

- **Laboratory with clean area** (ISO14644 certified, ISO6 level - class 1000 according to FED STD 209E) for integration and test activities
- **Autoclave** for composite manufacturing
- **Testing equipments** to perform quasi static qualification or acceptance tests on aerospace structures or other high performance components
- **Support equipment** to fill and test pressurized components at pressure upto 300 bar with ultra high purity gas (gas purity 6.0 - 99.9999%)
- **Thermal vacuum chambers** for testing of components





having to be qualified in vacuum conditions (vacuum down to 1×10^{-6} mbar) and at different temperature levels ($-80^{\circ}\text{C}/+250^{\circ}\text{C}$ - cryogenic tests are also possible)

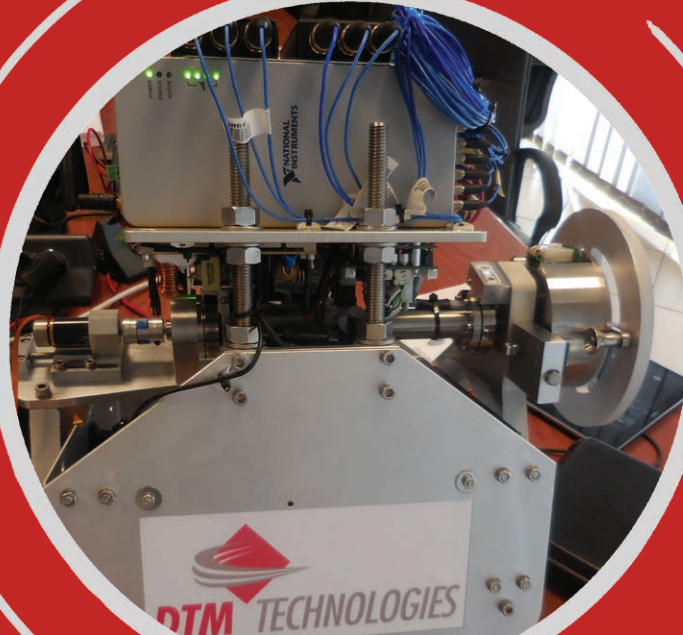
- **Helium leak detector** to perform leak tests
- **Instrumentation: data acquisition systems** (DAQ National Instruments 16/18 bits), electronic equipments
- **Sensors** (position, force, pressure, humidity, strain-gages, accelerometers...)
- **Autocollimator Edmund Optics** for precision measurements on mechanical and optical components
- **Particle counter Trotec** (5 channel)
- **Lathe**, milling-machine and other tools for integration activities
- **Shaker for dynamic vibration tests** C/O University of Modena and Reggio Emilia

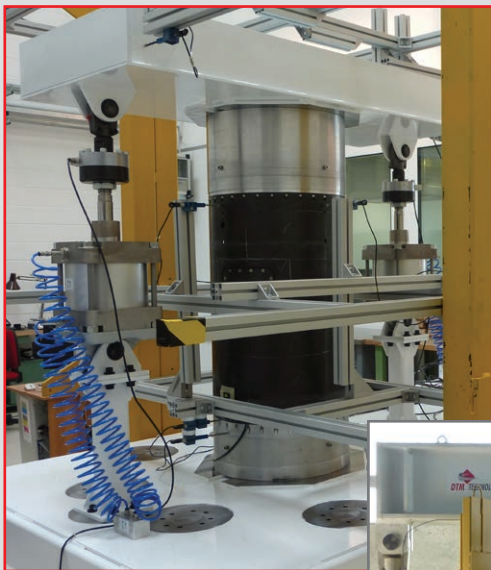
All the critical apparatus and sensors are periodically maintained and checked by certified companies according to EN 9100 aerospace standard.



ENGINEERING AND TESTING SERVICE

DTM offers engineering and testing services including the design of the full experimental (mechanical, electronic, fluidic) and acquisition equipments. Developments are mainly based on National Instruments acquisition systems and Labview for the software.





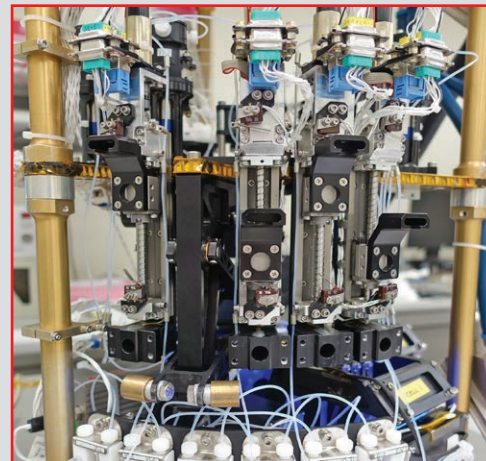
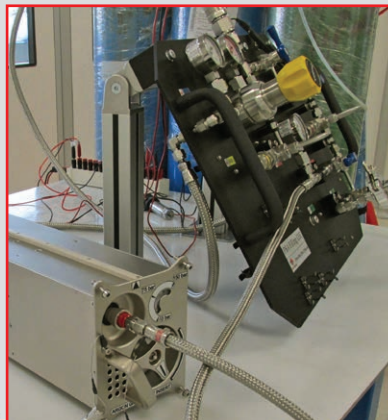
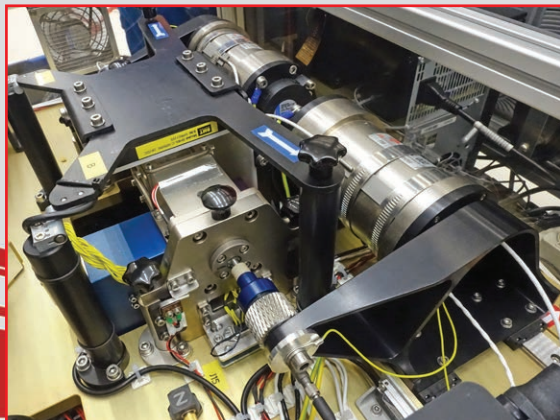
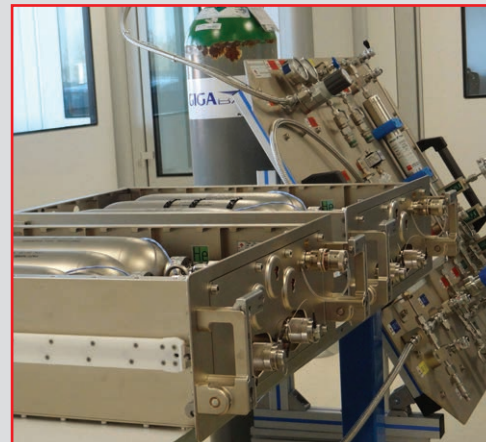
TEST FACILITIES FOR LAUNCHERS AND SATELLITE SUB-SYSTEMS



DTM designs and develops custom test jigs to qualify flight structures like the Tank Support Structure of Sentinel 1 (Thales Alenia Space Rome), Vega Interstage 2/3 and composite outer structures of sub-orbital launchers (Swedish Space Corporation)

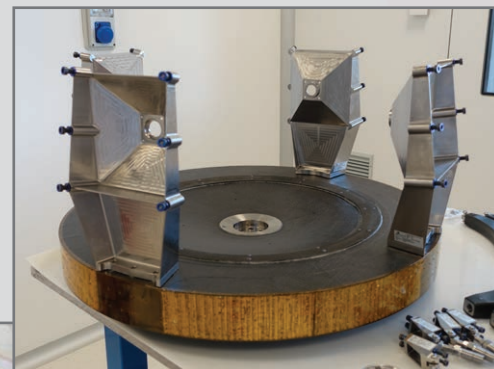
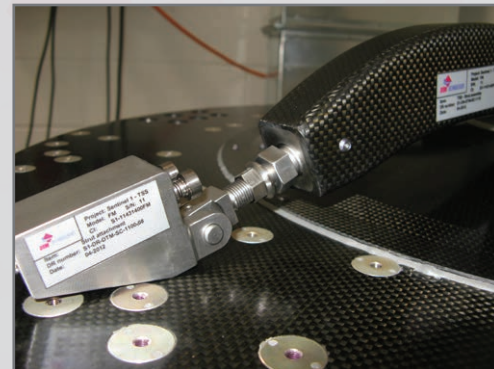
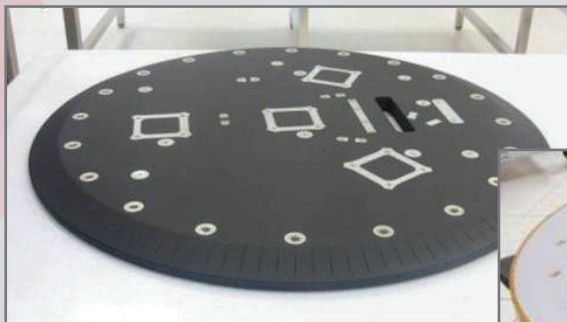
ISS AND MICRO- GRAVITY FACILITIES

DTM has a strong heritage for design and development of microgravity facilities and experiments for ISS, sub-orbital and parabolic flights. DTM designed the Gas supply modules for MSL/ EML (Airbus Defence and Space) and PK4 (OHB - Kayser Threde). For EML facility (Airbus Defence and Space prime contractor) DTM was in charge of the thermal design (air and water cooling) of the full facility as well as the realization of all the active and passive components (e.g. coldplates, heat exchangers). DTM is also developing the VIPGRAN-ISS facility for the European Space Agency.



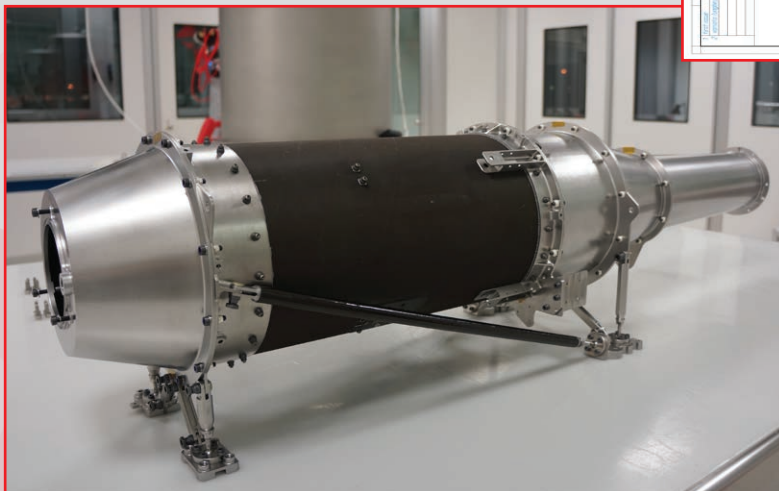
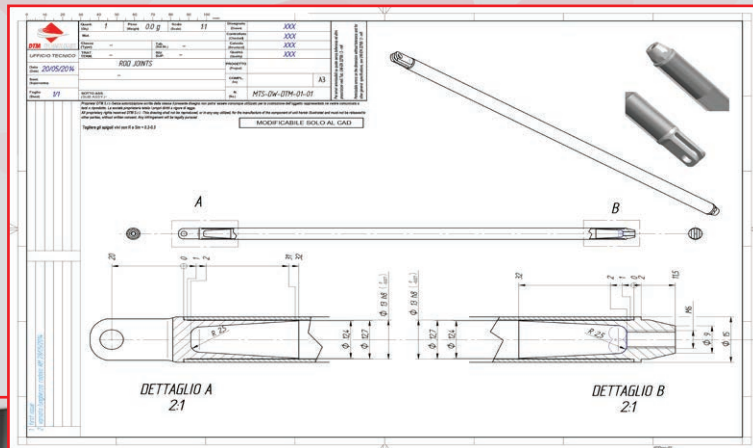
SATELLITE STRUCTURES

DTM is qualified for the realization of composite or metallic sandwich panels like the Exomars sandwich panels developed for Thales Alenia Space Rome. DTM also performed the detailed design and optimization, structural verification, manufacturing assembly integration and testing of the tank support structure of the Sentinel 1 satellite. For OHB Italia DTM has been in charge for the development of the composite primary and secondary structures of the Prisma Satellite (ASI program)



SATELLITE INSTRUMENTS

For Thales Alenia Space Turin DTM has realized the mechanical structure for the Metis Telescope including qualification for composite parts (Bepi Colombo Mission). DTM was also involved in co-engineering phase together with TAS which allowed to exploit DTM know-how in designing composite parts.



Composite rod with titanium inserts
whose design has been proposed by
DTM and implemented by TAS -
Left: Metis OM in DTM clean room

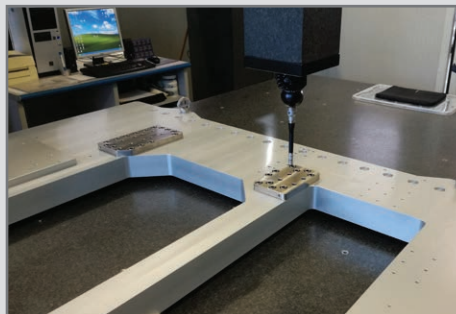
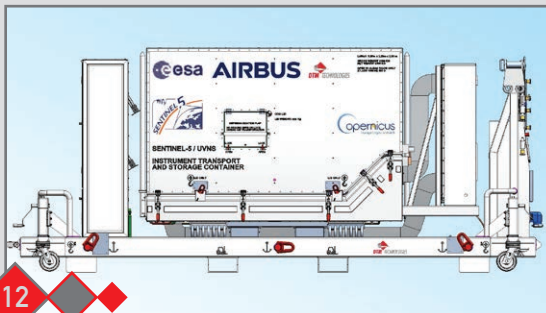
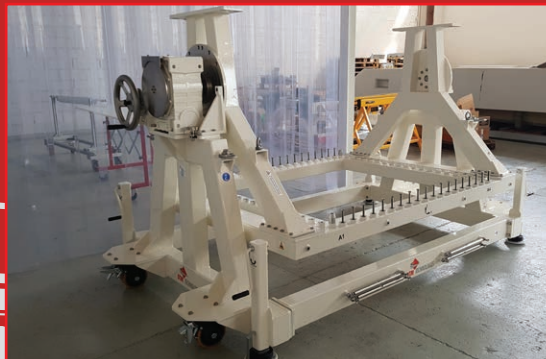
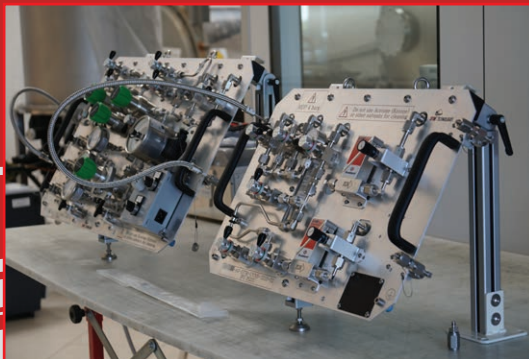
SPACE PRODUCTS

DTM designs and develops heat exchangers for ISS and space vehicles. Pictures show performance and functional tests of the heat exchangers for the Orion Multi Purpose Crew Vehicle (prime Thales Alenia Space). DTM also develops custom flight components for challenging application like the filling valve developed for Exomars Ultra Clean Zone Analytical Laboratory Drawer.



MECHANICAL GROUND SUPPORT EQUIPMENTS

DTM designs and develops mechanical ground support equipments (M-GSE) for instruments and satellites handling, integration, purging and transportation. For Airbus Defence and Space DTM developed the mechanical GSE for the Sentinel 5 instrument: integration stand, trolley, handling adapters, protection covers, purging unit, hoisting devices and transportation container.

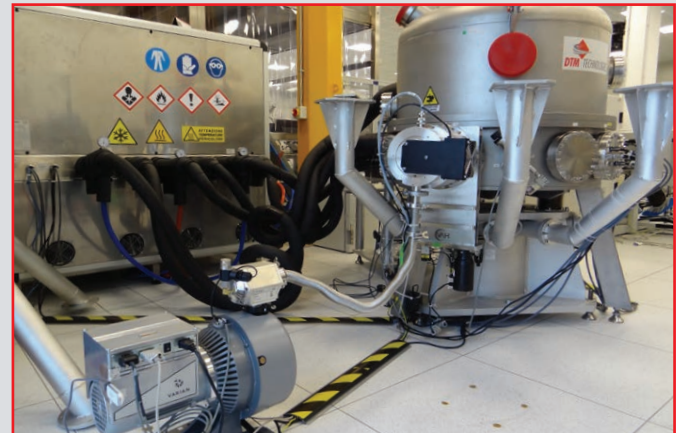
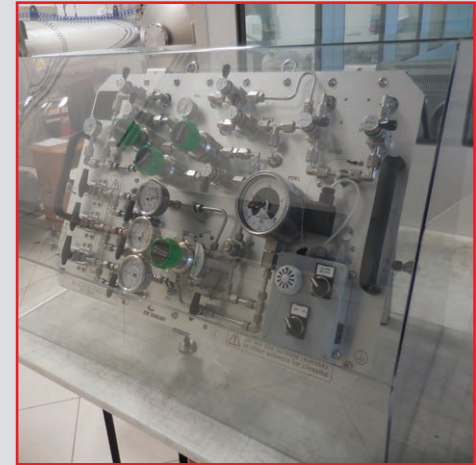




FLUIDIC GROUND SUPPORT

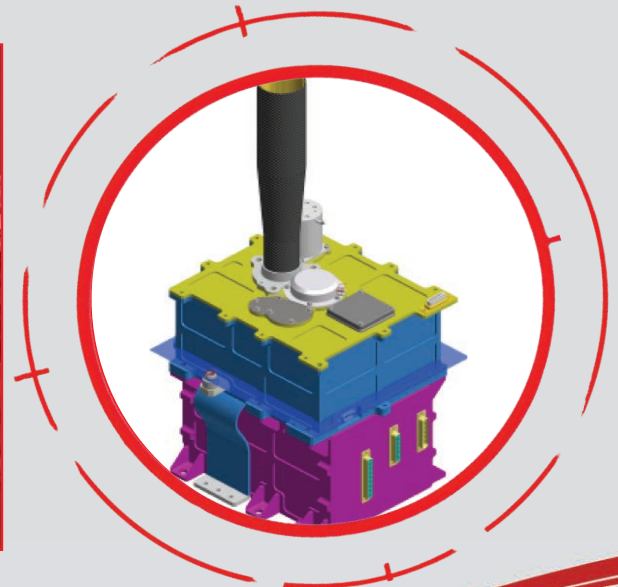
DTM designed and developed fluidic GSE to support flight hardware operations and tests. We are capable to design extra high purity GSE requiring biological, molecular and particle contamination control like the F-GSE built for the Exomars ultra high purity GSE of the Analytical Laboratory drawer developed by Thales Alenia SpaceTurin.

DTM also designed and developed custom Thermal vacuum chambers like the one built to qualify ISA spring accelerometer for Bepi Colombo mission (Thales Alenia Space Milano) and fluidic GSE for satellite instrument purging.



COMPOSITE COMPONENTS

DTM has a strong know-how in designing, developing and testing composite structures for space and non space sectors. Also thanks to facilities available in our laboratory like autoclave and NDI equipments, we can design and realize custom products meeting challenging requirements including all the materials and process qualification tests.



With reference to special developments DTM studied and realized for INFN-Pisa (IXPE project) a carbon fibre collimator with gold coating.

RESEARCH & DEVELOPMENT: BIOMEDICAL APPARATUS

DTM has been requested to transfer the technological achievements of the company into new research projects, for the benefit of the whole community. For ASI, DTM developed a surgical device, to improve the rehabilitation of patients suffering for arts problems, consequent to osteoporosis or traumatic injuries. This is based on CFRP technology: the main advantages over the conventional products are the mass reduction, the properly tuned rigidity, perfectly tailored over the patient's needs, the X ray transparency, and the possibility to monitor the stress and strain level, in real time, thanks to a miniaturised electronic apparatus, fully embedded into the CFRP structure.



Ferretti - Riva76

DTM is also active in design and development in other industrial sectors like the marine field. For Ferretti Group DTM designed and manufactured the Convertible Top for the Riva 76 Bahamas.

Ferretti Group's new Riva76 Bahamas, shown here with its "roof" (Convertible Top) which is opening in order to reach its forward position, allowing an open configuration of the yacht. The Convertible Top, a Ferretti Group's patent, is designed and manufactured by DTM.



CTop for the Riva76 during assembly at DTM, with a close-up of the large carbon fibre rollbar, designed to overcome a very high first natural frequency value.



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