PRECISION
EQUIPMENT
FOR
INVESTMENT
CASTING

modelmecanica sferica

modelmeccanica sferisad

COMPANIES IN PROGRESS

Professionalism
Technology
Quality
Service

The economic scene in the 21st century has seen a constant rise in demand for professionalism, technology, quality and service. By working in synergy with other companies with complementary skill sets, Modelmeccanica is able to answer the needs of our times in a positive manner.

Modelmeccanica-Sfericadisspecialised in the construction of equipment for the **investment casting of metals**.

Pending license for production, possession and sale of weapons materials.

Our **quality** is based on six cardinal points:

1 - 3D mathematical modelling is the basis of our working method

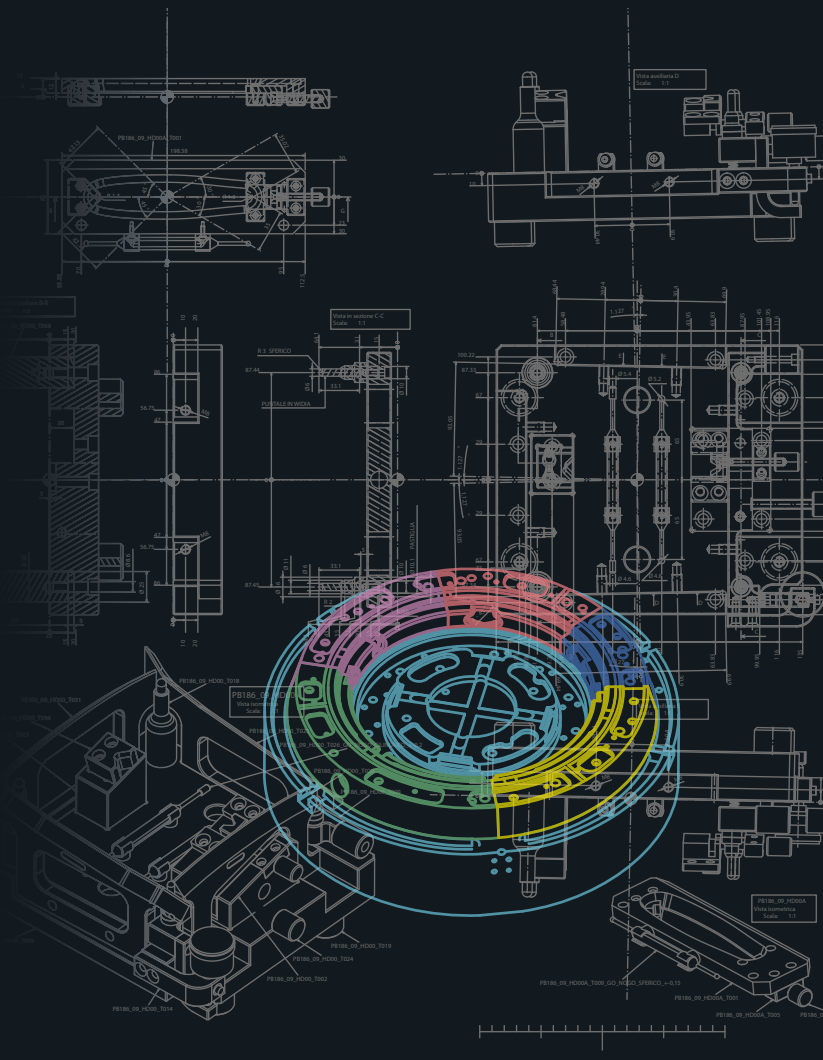
2 - Surfaces are processed with great care to obtain closed volumes and high precision, guaranteeing a quality process each and every time, even using external mathematics and always interfacing with the client

3 - Accurate control processes are applied according to specific procedures before, during and after the equipment is built and that drastically reduces the possibility of errors

4 - The construction of each detail is carried out with numerical control on 3/4/5 axis continuous machining systems, which allow for creating any 3D form

5 - The tools used are all controlled to guarantee joints without burs and a manufacturing tolerance of ±0.02mm

6 - Partial or total certification is carried out on the equipment as well as the production process

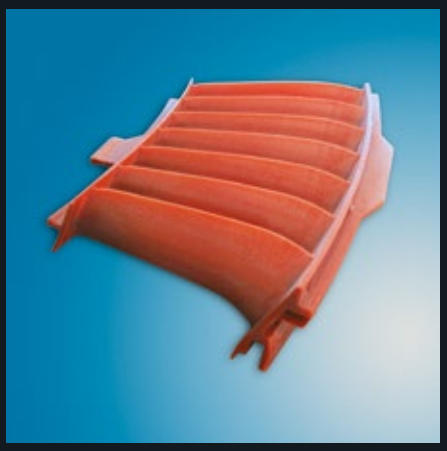


Some of the materials used for the construction of our equipment

MATERIALS	HARDNESS	TREATMENTS
ALLUMINIUM LEAGUE 7000	47 ÷ 54 Kg/mm²	Hard Anodizing with/or coating Teflon Tollerance ±0,03 mm
MOULD STEEL	100 ÷ 110 Kg/mm²	Ion Nitriding TIN coating
TEMPERED STEEL	70 ÷ 80 Kg/mm²	Vacuum Tempering TIN coating
SVERKER® 21		Vacum Tempering 62-64 HRC

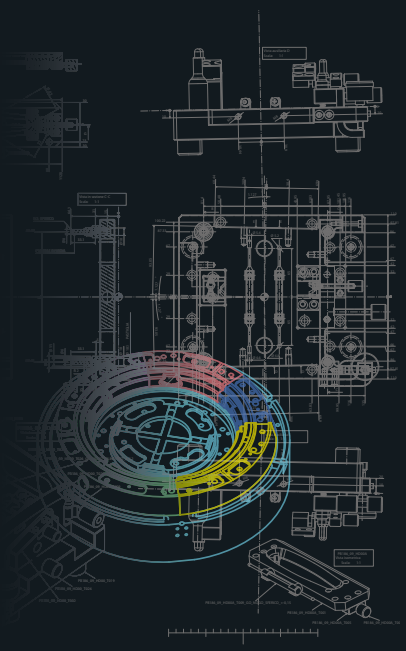
PRODUCTS TYPES RANGE

The types of products made by our equipment include:



AERONAUTICS

Single or multi-blade equipment with special ceramic inserts created with single-block high precision moulds (±0,02mm) in both steel and aluminium

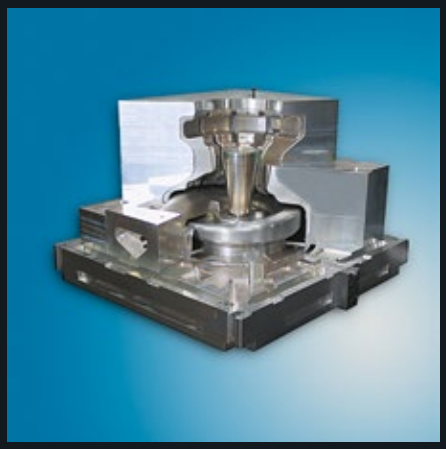


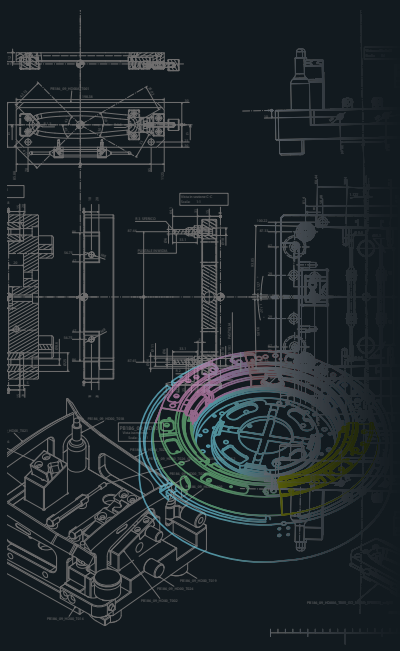
ENERGY

Single and double blades created with single-block moulds, multi-blade equipment created by attaching wax pieces with the relative gluing equipment.
Multi-blade propellers created by semi-automatic single-block moulds

AEROSPACE

Large-size moulds for creating volutes or conduits for the newest aerospace engines





ELECTRONICS

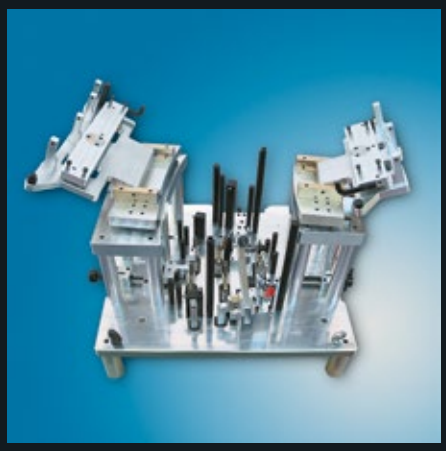
Equipment for building boxes to hold cards and electronic components

WE BUILD:

positioning gauges for casting with 3D machine control, procontrol gauges for the control of casting with electronic sensors and a master switch....

POSITIONING GAUGES FOR 3D MACHINES

Positioning pins in hard metal and supports in steel



PROCONTROL GAUGES FOR CONTROLLING CASTING

Positioning pins in hard metal. Spheroid-guided motion. Master in nitrided steel or anodized aluminium

Dedicated tooling and special equipment is available at the request of our clients:

TOOLING AND EQUIPMENT

Positioning pins studied according to tolerance balance. Possibility of adjusting reference values

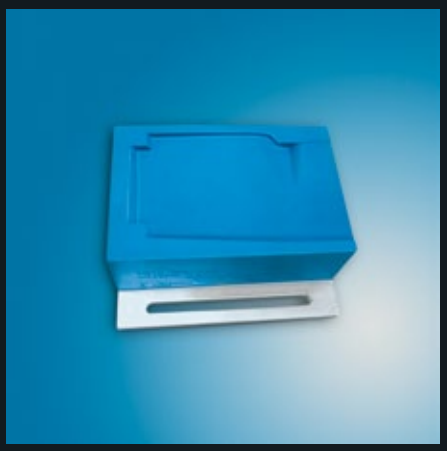
...equipment for the production of ceramic cores and related tools for shaping, melting and size control

CERAMIC MOULD

1. Automatic mould in tempered, nitrided and certified steel 100-110 Kg
2. Automatic mould in steel with hardened fittings

GREEN SETTER

Material: Resin

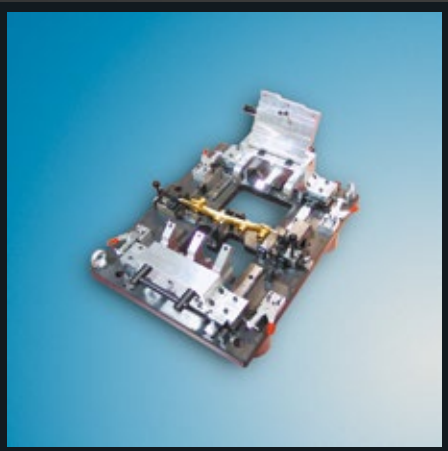


PREDEFORMATION GUAGE

A gauge for maintaining or correcting ceramics

CERAMIC CONTROL GAUGE WITH MASTER

Positioning pins in hard metal, tempered core-print seats, control blades, control blade profiles with go-nogo nitride, movement with spheroid-guided motion, master in nitrided steel and a tin covering.
Certified equipment



PROTOTYPING

Always interested in new technologies and offering increasingly more complete investment casting services, we are able to offer prototype models in wax-infiltrated castform. This material has been tested by the largest American and European precision casters because the material exits the ceramic mould better, leaving hardly any residues.
By using a 2500 Plus sintering laser we are able to produce details on a piece with the maximum size of a paralleliped measuring 330x380x450 mm. For pieces with larger dimensions it is possible to glue the parts of a previously sectioned piece together.
With the mathematical model, this process allows for having one or a small series of wax prototypes that can help develop the final product in a short amount of time.
The level of size precision on a piece created through the sintering process with wax infiltration is quite variable and it is affected by many factors: the size, the shape, the mass and the thinness of the piece. The process has a standard tolerance of ±0.3% on sizes larger than 100 mm and a surface roughness of 6µ to 9µ (on injection cast prototypes).
The sintering puts a layer of 0.1 mm grain powder down in layers measuring 0.15 mm in thickness. On inclined surfaces the roughness is greater than it is on vertical surfaces.

With experience we have been able to improve tolerance levels and obtain the following results:

- On widths from 1 mm to 5 mm, a ±0.1mm tolerance; on diameters over 100 mm, a ±0.25% tolerance; on sintering heights over 100 mm, a ±0.5mm tolerance;
- On diameters less than 300 mm we obtain concentricity and roundness equalling ±0.5mm.

These tolerance levels are indicative of the levels we obtain on the parts we build.
Given the fact that it is impossible to control the process, we cannot guarantee the repeatability of size on a series of similar pieces, however it will remain within the tolerance levels indicated above. A preliminary discussion with the client is necessary in all cases to better define the size and use requirements of the sintering requested.

Sintering classifications:

CLASS A: Prototypes that do not have size requirements and which are for strictly technological use: tests for metallurgic casting, defining casting connections, verifying shrinkage.

CLASS B: Prototypes for functional testing and processing. In this case, the quotas needing special attention and any tooling modification during processing, must be established carefully. In this case, the piece will be consigned with control certification.

Surface roughness:

1st LEVEL: Surface roughness created by the process (9µ on investment casting);

2nd LEVEL: Polishing the parts that can be accessed easily (6µ on investment casting);

3rd LEVEL: Polishing the entire piece (6µ on investment casting), except for those areas that are not accessible

To better formulate bids, it is preferable to receive a mathematical model of the piece that requires sintering. The sintering process is able to simulate an item in a realistic amount of time. It is very important that the mathematical file is of good quality or that it is a closed volume. We are able to import all types of files, but we suggest to all of our clients that they consult our software chart to see if their files are compatible with our systems. All of this allows us to provide better quality products and to reduce managing costs. On request we make models of parts to be sintered such as casting batch connections, we insert special ceramic cores or we can make possible modifications to machine allowances for the investment casting process.

Wax-infiltrated sintering for investment casting (Ø270[+ flange]x295)

Sintered with a minimum thickness equal to 4.2 mm (size: 600x200x220)

We are also able to supply prototyped parts in nylon for small lots or functional testing

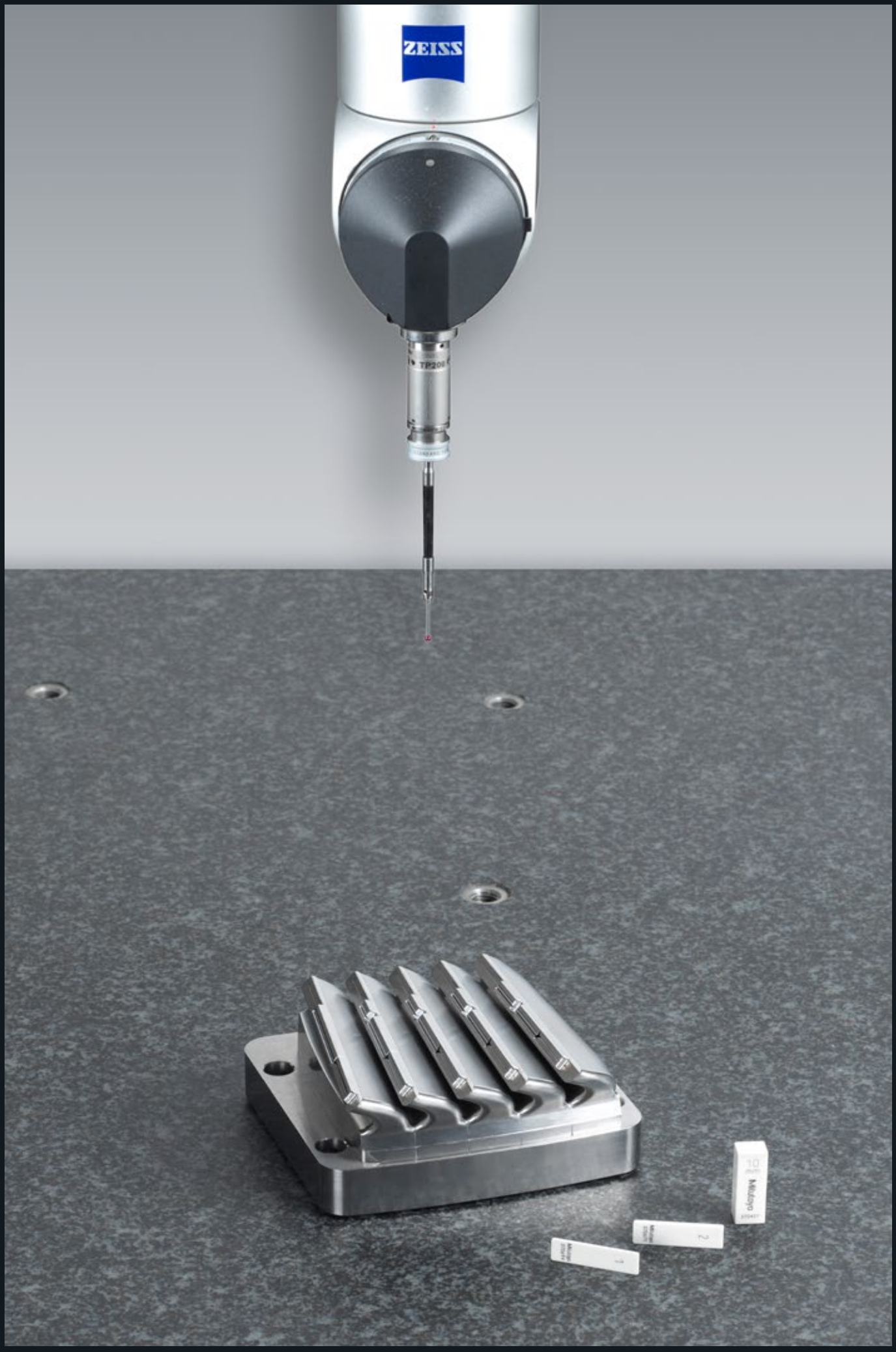
Nylon parts for assembly

We make milled models and prototypes with 3/4/5 axis C.N.C. machining, in aluminium, resin and steel: for wind tunnels, naval testing laboratories, design etc.

MIM TECHNOLOGY

We also work in the sector of powder sintering with MIM (Metal Injection Moulding) with the construction of automatic mass-production moulding machines

EQUIPMENT FOR INJECTING POLYSTYRENE OR LURAN FOR INVESTMENT CASTING


ZEISS
TP200

CAD/CAE/CAM SYSTEMS

The CAD/CAM/CAE systems that we use are CATIA V4/V5 by Dassault System and NX by Siemens.
We exclusively use CAM generated tool paths.
We carry out 3/4/5/6 axis continuous machining processes, VDA, STEP, PARASOLID, SAB and more.

You may send your mathematical models to our e-mail address or, for the maximum SAFETY and PRIVACY, our company is equipped with a SERVER WITH SSL (Secure Socket Layer) PROTOCOL, to provide every client with personal and private access.

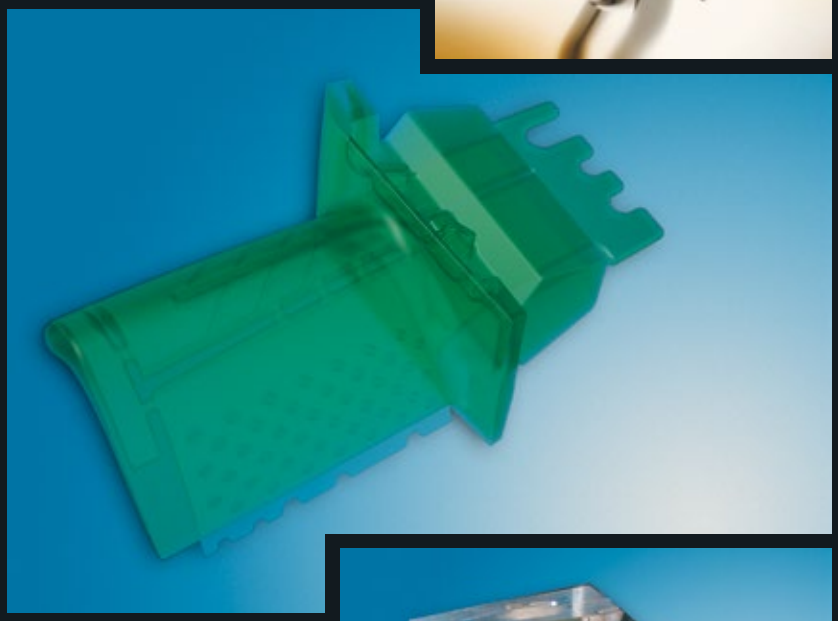
Software

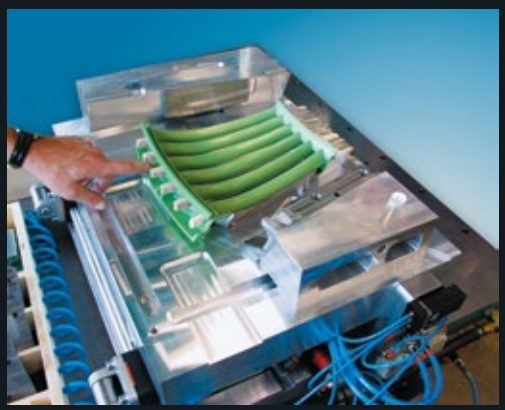
CAD
CATIA V4/V5 Dassault System
SIEMENS NX
WORKPLAN - WORKXPLORE 3D

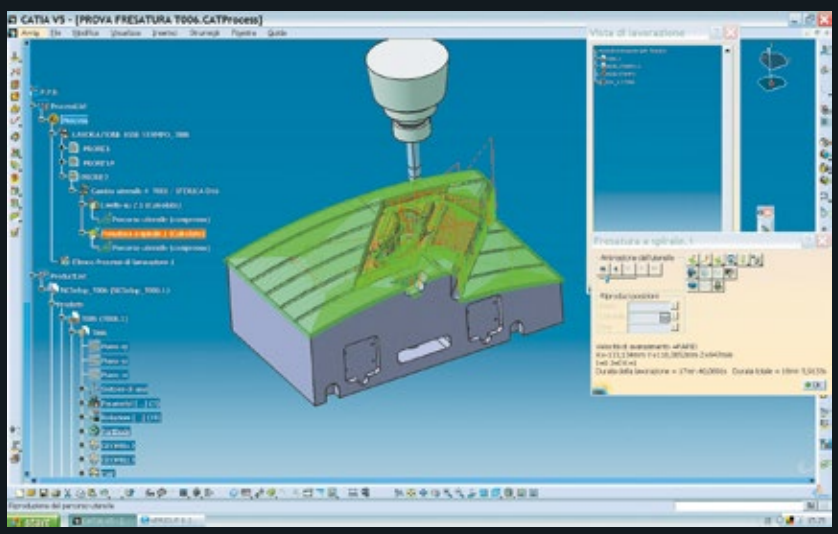
CAM
CAM CATIA 3/4/5/6 axes
CGTech VERICUT
PowerMill 3/4/5/6 axes and FeatureCAM

SUPPORTS
CD-ROM
DVD-ROM
BLU - RAY

DATA FORMAT
CATEXP V4
CATIA V5/V6
UNIGRAPHICS/NX
SOLID EDGE
IGES
VDA
STEP 203/214
PARASOLID
STL
DXF/DWG,CGM
SAB
Elisium
DirectTranslator
CATIA<->NX







MAKINO D800Z AND D500
AIMED AT THE AEROSPACE SUPPLY INDUSTRY

The **D800Z** is designed for high-performance job shops providing precision large part 5-axis machining for the die/mold and aerospace markets.
Like D500 machines, the D800Z offers easy access to the spindle and table, a highly rigid structure for responsive cutting, outstanding surface finishes and optional automation devices. Workpieces of up to 1,000mm in diameter and 1,200kg in weight can be machined in five axes, with great efficiency and fewer operations for reduced production time.

The large part 5-axis machining capabilities of the D800Z can be utilized in five-face milling mode to minimize setup, maximizing access to complex, multisided parts and reducing cycle times, or to address the demanding angular, blending, matching, fine-surface finishes and 3-D accuracy requirements of die-and-mold components.

The **D500** is aimed at the aerospace supply industry, premium job shops and die-and-mould manufacturers. The customers targeted in the aerospace supply industry are manufacturers of jet engine components such as blisks, impellers and blades (200-500 mm). The premium job shops targeted are manufacturers geometrically complex parts and prototypes for the medical, photonics and semiconductor industries. In the die and mould industry the applications will be primarily involve index machining (2- and 3-axis) with a special focus on deep cores/cavities and providing fast acceleration and precision in simultaneous 5-axis machining, even for heavy workpieces.

Application benefits

Customers in the aerospace supply industry will benefit from reduced blade machining times thanks to the high acceleration and deceleration performance of the rotary table. This is particularly beneficial in blisk and impeller machining where leading-/trailing-edge reverse motion speed is the key. Premium job shops are faced with frequent model changes, tight reprogramming times as well as numerous positioning and indexing operations and on-machine manual inspection times. Their requirements are for a machine that is easy to program for one-off prototypes and offers high positioning accuracy, good visibility from an operating eye view and an easily accessible working chamber. The D500 meets these requirements. It delivers high positioning accuracy thanks to the short distance between the A-axis pivot point and workpiece location. The operating station directly faces the A-axis and the walk-in splashguard enables the operator to enter the machining chamber more easily. What's more, the pallet changer is positioned directly opposite the operator's station, a design that does not affect the ease of working even in automatic operation. Last but not least, die-and-mould manufacturers will benefit from the minimisation of level differences at seams in index machining and the ability to move heavy workpieces and enjoy fast acceleration in simultaneous 5-axis machining. Significant reductions in rough machining times, improved tool life and enhanced surface finished are to be expected.

Outstanding feature

Technically speaking, the outstanding feature of the D500 is its three ultrahigh torque direct-drive (DD) motors, one at each end of the cradle (tilting Aaxis) and one for the rotary table (rotating C-axis). These DD motors bring the benefits of fast acceleration and high-speed rotation, enabling the A-C axes to fully follow the linear X-Y-Z axes, even with a maximum table load of 350 kg. By positioning DD motors on both sides of the tilting axes, the Makino design engineers have prevented torsion on the tilting axis and optimised the distribution of torque. The trunnions supporting the cradle are designed with a fully coaxial layout and have a split structure that allows assembly adjustments, which substantially improves machining accuracy.

Thermal control

The issue of thermal control is critical to a machining centre's accuracy over time. Here, Makino has come up with a number of smart solutions to the heat problem. Both the spindle and feed axis are temperature controlled while key cast-iron components, e.g. the column and bed, are insulated against ambient heat. Moreover, Makino's unique spindle coolant system and cooling oil encircling the DD motors prevent a heat-induced loss of accuracy. The D500 comes with a number of spindle variations. The high-speed spindle is a 20,000-rpm HSK-A63.

High level of automation

Since the issue of automation in parts machining is increasingly critical, the D500 is designed to be readily compatible with a pallet changer, pallet magazine.

Specifications: Makino D800Z

Travels:	
X-axis	1,200 mm
Y-axis	1,100 mm
Z-axis	650 mm
B-axis	180° (-180° to 0°)
C-axis	360°
Spindle:	20,000 RPM
Rapid Traverse:	36,000 mm/min
Cutting Feedrate:	36,000 mm/min
Maximum Payload:	1,200 kg
ATC Capacity:	155 tools
High pressure coolant through the spindle:	70 bar

Specifications: Makino D500

Travels:	
X-axis	550 mm
Y-axis	1,000 mm
Z-axis	500 mm
A-axis	150° (+30°/-120°)
C-axis	360°
Table:	Table size Æ 500 mm
	Maximum loading weight 350 kg
	Max workpiece dim. Æ 650 mm x H 500 mm
Feed rate:	Rapid traverse:X-axis 48,000 mm/min
	Y- and Z-axis 50,000 mm/min
	A- and C-axis 50 rpm
Cutting traverse:	X-axis 1-32,000 mm/min
	Y- and Z-axis 1-40,000 mm/min
	A- and C-axis 50 rpm
Tool changer:	60 tools Machine 1 (2010) and
	155 tools Machine 2 (september 2015)

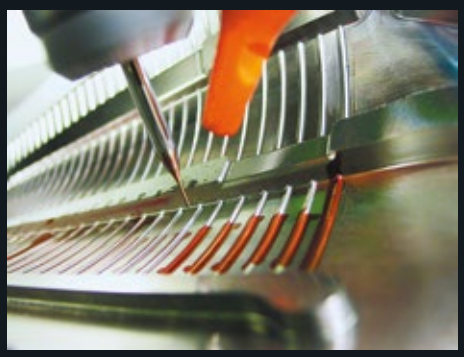
MACHINES AND CAD SOFTWARE

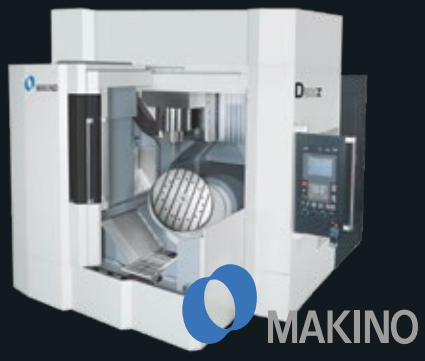
OFFICE

- CATIA Vr. 5 - Dassault System
- CATIA Vr. 6 - Dassault System
- NX - Siemens
- VERICUT - CGTech
  (simulates CNC machining)
- PowerMill and FeatureCam *
- WORKPLAN for project management to ERP *

MACHINES

- 1 c.n.c. MAKINO D800Z with working spindle (20,000 rpm) 5 axis - HSK-A63 (x=1200, y=1100, z=650)
- 2 c.n.c. MAKINO D500 with working spindle (20,000 rpm) 5 axis - HSK-A63 (x=550, y=1000, z=500)
- 3 c.n.c. C.B. Ferrari A13 (x=650, y=320, z=320); 2 F43-E (x=920, y=420, z=350)
- 1 c.n.c. C.B. Ferrari with working spindle (18,000 rpm) 3 axis - A17 (x=1050, y=520, z=420)
- 3 c.n.c. C.B. Ferrari with working spindle (20,000 rpm) 4 axis
  A15 (x=850; y=420; z=420); B15 (x=850; y=420; z=420); B18 (x=1400; y=520 z=420)
- 1 c.n.c. C.B. Ferrari with working spindle (20,000 rpm) 5 axis B18 (x=1400; y=520; z=420)
- 1 EDM die sinking Charmilles Technologie ROBOFORM 55P (x=600; y=400; z=450)
- 1 wire EDM Charmilles Technologie ROBOFIL 330F (400x300)



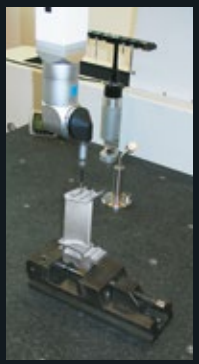


PROTOTYPE ROOM

3 SLS
3D systems

METRICAL ROOM

ZEISS SPECTRUM



Periodic ZEIIS quality control certification

ISO 9001

SQS

Certificate

SQS herewith certifies that the company named below has a management system which meets the requirements of the standard specified below.

modelmeccanica sfericad

Modelmeccanica sfericad S.r.l.
Via Cherubini, 2
21010 Germignaga (VA)
Italy

Scope of certification

Site of Via Cherubini, 2
21010 Germignaga (VA)
Italy

Field of activity

Planning, 3d modeling and die construction, equips for investment casting process. Prototypes and patterns. Dimensional control services

Normative base

ISO 9001:2015 — Quality Management System

Scope(s) 15, 17, 35

Validity 09.02.2018–08.02.2021
Issue 09.02.2018

Reg. no. 35736

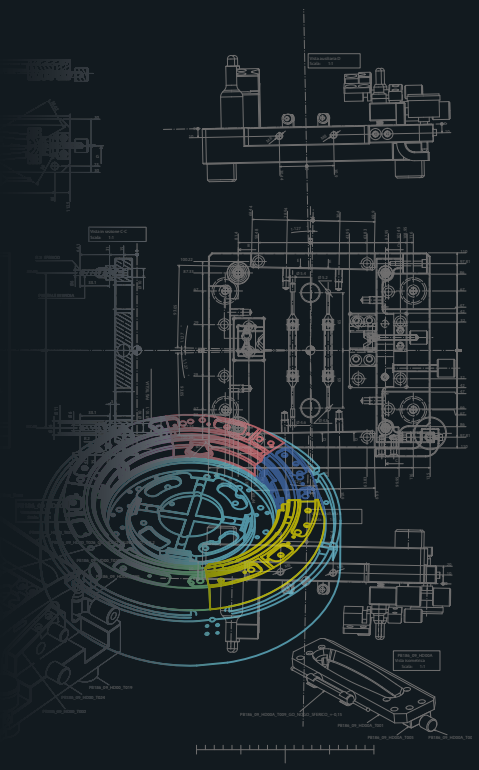
X. Edelmann, President SQS

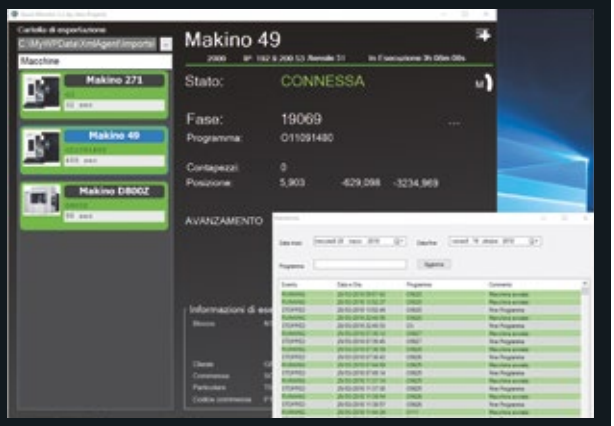
F. Müller, CEO SQS

sqs.ch

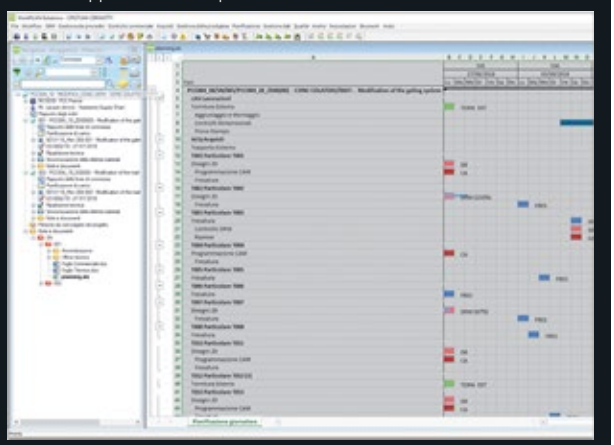
Swiss Association for Quality and Management Systems SQS
Bernstrasse 103, 3052 Zollikofen, Switzerland

Swiss Made





∗ Office application example: PowerMill and FeatureCam



∗ Office application example: Workplan for project management to ERP

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

SQS has issued an IQNet recognized certificate that the organization:

Modelmeccanica sfericad S.r.l.
Via Cherubini, 2
21010 Germignaga (VA)
Italy

for the following scope and type of activities

Site of Via Cherubini, 2
21010 Germignaga (VA)
Italy

Planning, 3d modeling and die construction, equips for investment casting process. Prototypes and patterns. Dimensional control services

which fulfils the requirements of the following standard(s):

ISO 9001:2015 / Quality Management System

for the validity date, please refer to the original certificate issued by SQS*

This attestation is directly linked to the IQNet Partner's original certificate and shall not be used as a stand-alone document

Scope No(s): 15, 17, 35
Issued on: 2018-02-09
Validity date: 2021-02-08
Registration Number: ***CH-35736***

Alex Stoichitoiu
President of IQNet

Felix Müller
CEO SQS

SQS

IQNet Partners**:
AENOR Spain AFNOR Certification France APCER Portugal CCC Cyprus CISQ Italy
CQC China CQM China CQS Czech Republic Cro Cert Croatia DQS Holding GmbH Germany FCAV Brazil
FONDONORMA Venezuela ICONTEC Colombia Inspecta Sertifiointi Oy Finland INTECO Costa Rica
IRAM Argentina JQA Japan KFQ Korea MIRTEC Greece MSZT Hungary Nemko AS Norway NSAI Ireland
NYCE-SIGE México PCBC Poland Quality Austria Austria RR Russia SII Israel SIQ Slovenia
SIRIM QAS International Malaysia SQS Switzerland SRAC Romania TEST St Petersburg Russia TSE Turkey YUQS Serbia
IQNet is represented in the USA by: AFNOR Certification, CISQ, DQS Holding GmbH and NSAI Inc.

* The list of IQNet partners is valid at the time of issue of this certificate. Updated information is available under www.iqnet-certification.com

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• ARLOTTA Giampiero
Production manager

HOW TO REACH US

We are situated in the north of Italy, on the Lombardy shore of Lake Maggiore, some 5 km from the Swiss border; Malpensa 2000 airport is approximately 50 km from our head office, while Lugano-Agno airport, in Switzerland, just under 20 km away.

Lat 45° 59' 1" N
Lon 8° 44' 30" E

AP0701-1_GB

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