



层出不穷的先进制造技术

编辑部



Riello Sistemi Group 涵盖重要的生产制造技术，为目标市场提供快速、广泛和直接服务。

作

为国际机床市场的领先欧洲公司的卓越典范，Riello Sistemi Group 优良的规划和有效资源管理胜过单纯的生产型企业。

依托融合有着近百年传统的先进技术方案，集团与其三个世界著名品牌——Mandelli Sistemi、Riello Sistemi 和 Tri-Way Manufacturing Technologies，正快速步入工业 4.0 和物联网时代。

集团每天潜心开发全新技术和流程，将其应用于集团加工中心、工业专机、特殊应用，并恪守为满足客户的需求提供最合适的完整解决方案工作理念。

持续改进

Mandelli 和 Riello 的机床凭借在功率、速度、灵活性和终身准确性等出色特点而始终深受青睐。过去十年间，除了更强大的定制技术解决方案，两家公司均致力于高附加值行业：在航空和能源领域，Mandelli Sistemi 擅长加工需要高性能车削和铣削操作的高硬度加工材料、复杂形状；在汽车和配件领域，Riello Sistemi 的高产量往往分成若干工件工位，而对加工灵活性的要求则必然需要极高的精度及快速重新安装能力。

Mandelli 加工中心

Mandelli Spark Ti 和 Spark 复合加工中心系列专业用于航空和能源领域，在这些领域，钛金属等材料和耐热超级合金（HRSA，例如 Inconel 718 和 Waspaloy）凭借出色的机械性能和耐受高操作温度而被广泛使用。对于需要低切割速度、低转速、高扭矩



的加工特点，在切割过程中机床会产生明显的振动，航空应用的这些特点对加工是非常不利。另一方面，形状复杂的航空发动机零件需要从立式车床操作快速切换到传统的立式机床操作，在单个机床中组合铣削和车削能够确保高生产效率和精度。

Mandelli 因此推出了革新的结构和软件。第一个构想是在粗加工阶段大量材料的切削

能力，高扭矩倾斜铣头（连续加工扭矩超过 1250 Nm），借助无背吸装置，能够提供高质量表面，震动减少达 75%。刀具冷却液内冷系统显著避免了刀具过早磨损，排屑器将废料充分排出、刚性角度头和延长头可以深入工件进行车削加工。在软件方面，Mandelli 最近开发出一个新软件包 iPum@ Suite 4.0，它基于机床周围的传感器和各种加工数据进行自动诊断和预测维护，实时监控全球任何加工中心，以提前



WHERE ADVANCED MANUFACTURING TECHNOLOGIES SPRING UP

Riello Sistemi Group, a primary European player in the international machine tool market, is an example of how good planning and efficient resource management lead beyond mere production.

With its forefront technological solutions blended with an almost centenary tradition, the Group, with its three world-wide renowned brands - Mandelli Sistemi, Riello Sistemi and Tri-Way Manufacturing Technologies, is moving fast in the line of the Industry 4.0 and IoT concepts.

New technologies and processes are developed and applied daily to the Group's machining centres, transfer machines and special applications as well as to its working philosophy, always completed by the study of the most suitable solutions to successfully fulfil the customers' requirements.

CONTINUOUS IMPROVEMENT

Both Mandelli's and Riello's machine tools have always been appreciated for their most outstanding characteristics such as power, speed, flexibility and lifetime precision. In the last decade, besides the ever stronger customization of technological solutions, both companies have focused their attention on the sectors with higher added value: Aerospace and Energy for Mandelli Sistemi, characterized by materials difficult to machine and complex shapes requiring high-performance turning and milling operations and Automotive and Fittings for Riello Sistemi where high output volumes often subdivided into several piece families and the consequent need for flexibility require

The offer by Riello Sistemi Group includes the main manufacturing technologies, completed by a quick, widespread and direct service in the reference markets

extreme precision and fast retooling at the same time.

MANDELLI MACHINING CENTERS

Mandelli Spark Ti line and the range of Spark Multitasking machining centres have been specifically studied for the Aerospace and Energy sectors where materials like titanium

and heat resistant Super Alloys (HRSA, such as Inconel 718 and Waspaloy) are largely used for their mechanical characteristics and resistance to high operating temperatures. The same features that make these materials ideal for aeronautics applications have negative effect in the cutting process, requiring the use of low cutting speeds, low spindle rpm and high torque and they can also generate critical vibrations in the machine structure. On the other hand, the complex shape of aero engine parts requires quick shifting from rotary tool operations to operations typical of a vertical lathe as combining milling and turning in a single setup is fundamental to guarantee high productivity and precision.

Mandelli has thus introduced structural and SW innovations. The first ones are conceived to generate an outstanding stock removal in roughing: a range of high-torque tilting heads (more than 1250 Nm in continuous operation), providing as well top quality surface finishing thanks to backlash-free kinematics, process damping devices that reduce vibrations by 75%, a notable coolant delivery to the tool to avoid precocious wear and provide an adequate chip removal as well as rigid angular transmission heads and head extensions for deep internal

预测任何错误报警，当确定异常工作情况时，设备产生一个维护保养信号提示需要进行干预。

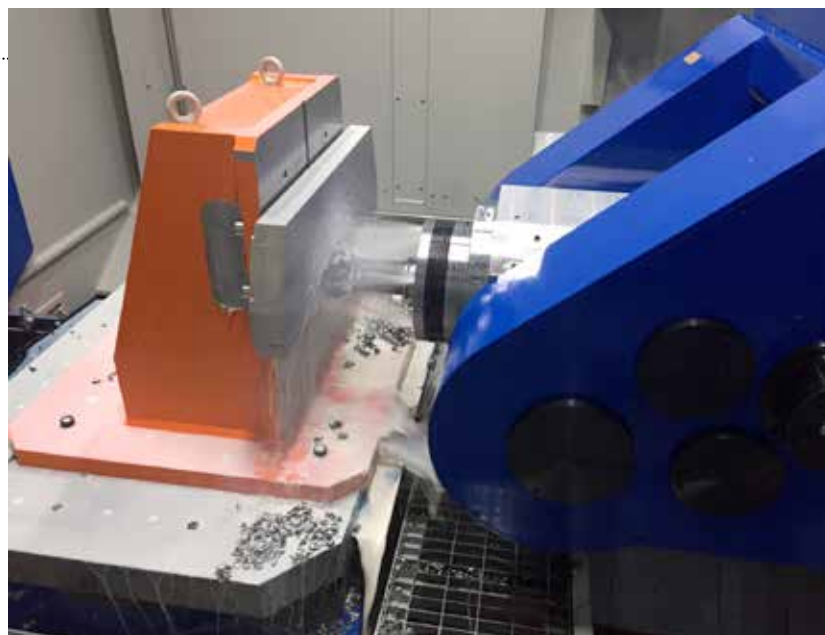
Riello 工业专机

Riello Sistemi 将高性能解决方案运用到汽车零件等大批量生产市场中。

Riello Sistemi 的柔性单元装置和旋转台机床（传统、杆式和柔性）专为加工黄铜、铝和不锈钢等各类材料设计，为特殊应用和

极为苛刻的要求提供高度量身定制的解决方案。

配有杆式专机的传统水平轴工业专机配有 14 个工作站、不同的工件系列、超短周期时间和高性价比，允许机床基于杆长和直



径的六角形和/或圆形杆式装载机，可加工不同的尺寸和刚度。

而不同型号的柔性 TFL 和 VFX 工业专机融合传统专机所有特点以及旋转夹具的灵活性。通过在加工过程中旋转零件，柔性专机易于重装、使用灵活，500 mm 侧面立方体的工作区，能加工同一类型但

尺寸不同的零件。全新推出的 TFL 400 重新定义了工业专机的生产概念，填补市场空白，集高生产能力和加工中心的灵活性于一身。TFL 专机采用 21 个带 2-3 轴的独立模块——单个工位或配有 3 个 HSK63 工位的旋转换刀装置，配备旋转夹具、自定心旋转夹盘，以及机床侧的平旋盘：它们是完美匹配加工中心生产线的装置，而且加工成本更具竞争力。

借助名为“Riello User Interface 3D (RUI 3D)”的全新操作界面，Riello 机床可随时切换到工业 4.0。RUI 3D 采用 3D 技术，完全由内部开发，易于使用，易监测更多需要维护的零件。RUI 3D 可实时连接供应商，为某些应用而开发，适合自动传送给

➡ turning operations. On the software side Mandelli has recently developed a new package called iPum@ Suite 4.0 for self-diagnosis and predictive maintenance which, on the basis of the sensors positioned around the machine tool and the large amount of data processed, any machining center around the world can be monitored in real time so as to forecast any possible failure well in advance and plan an intervention with a sufficient margin signalling the need for maintenance only when anomalous working conditions are identified.

RIELLO ROTARY TRANSFER MACHINES

A similar approach with high performance solutions is applied by Riello Sistemi to high-volume production markets such as automotive applications.

Specifically dedicated to machine several types of materials, from brass and aluminium up to the various types of stainless steel, Riello Sistemi's flexible cells and rotary table machines – traditional, bar and flexible ones, supply highly tailor-made solutions for special applications and very demanding customizations.

Up to 14 stations, different piece families, short cycle times and low piece/cost ratio represent the main characteristics of traditional horizontal-axis transfers with bar loader allowing the machine to house hexagonal and/or round bar loaders of different sizes and rigidity according to the bar length and diameter.

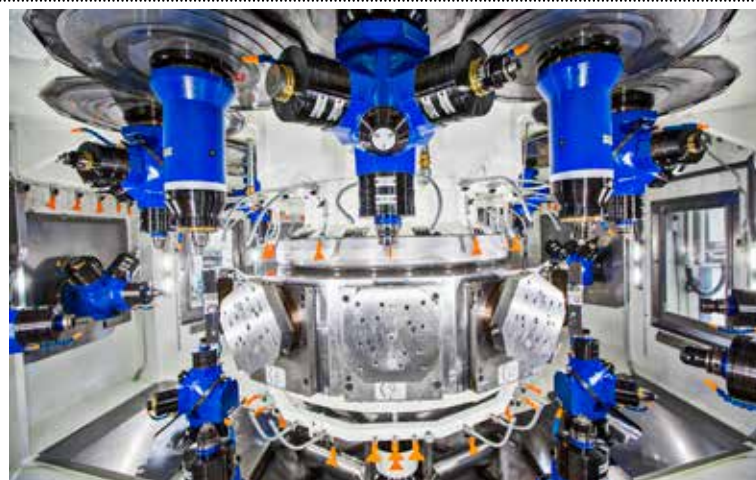
The Flexible TFL and VFX transfers instead, in their various models, combine all the peculiarities of the traditional transfers with the flexibility provided by the rotating clamping fixtures. Through the rotation of the part during the machining process, the flexible transfer becomes flexible and easy-to-retool, capable of machining parts with different sizes but belonging to the same family as well as totally different pieces, with a working area that typically corresponds to a 500 mm-side cube. The new-born TFL 400 redefines the concept of TRANSFER production, filling up a gap in the market and combining the advantages of high volume production with the flexibility of machining centers. Featuring 21 independent modules with 2-3 axes – single-tool or equipped with revolver tool change with 3 HSK63 positions – TFL models are equipped with rotary clamps, rotary self-centring chucks, and even facing heads on the tool side: they are indeed produc- ➡

车间操作员、客户生产经理和高管的进行机床效率的分析。

生产管理

精益制造意味着生产效率。不断广泛拓展的精益方法论诞生于以批量生产为准则的汽

车行业，已被和 Riello Sistemi Group 多数业务流程所采用。依据多个级别上的精益方法论、



全面深入所有部门并基于 KPI 流程和 5S 理论尽可能处理特殊问题。因此需要一开始监控整个生产过程，确保获得有效结果。

Riello Sistemi Group 遍布全球

作为世界领先公司，Riello Sistemi Group 面向全球为客户提供最佳方案。

集团在毗邻底特律的美国汽车大区中间设立了分公司——Tri-Way Manufacturing Technologies，主要生产汽车组件，为美国市场的基准合作伙伴和远东分公司提供销售、服务和改造。利雅路（上海）机床有限公司是集团在全球增长的大环境下应中国市场需求而生。该公司立足销售和服务，帮助集团巩固旗下各品牌在东亚的地位，并成为“1 级汽车供应商”到重要航空发动机制造商等技术最先进领域的重要客户。

➡ tion cells perfectly equalling lines of machining centres yet with much more competitive machining costs.

Riello machines are Industry 4.0 ready thanks to their new Operator Interface called "Riello User Interface 3D" (RUI 3D). Entirely developed inside according to the 3D technology, RUI 3D is easy to use and the parts more in need of maintenance are easy to monitor. Getting connected to the supplier in real time, RUI 3D has been developed to include some applications for the analysis of the machine efficiency that can be automatically transmitted to the operators in the workshop as well as to the customer's production managers and first level executives.

PRODUCTION MANAGEMENT

Lean Manufacturing, that is production efficiency. Born in the automotive sector, where mass operations were the rule, the Lean methodology in its more extended evolution has been adopted by most business processes and by Riello Sistemi Group as well.

Working according to lean methodologies across multiple levels, dealing with a specific problem with a full immersion of all the

departments involved to solve it as best as it can be, process mapping and assessment according to KPIs and implemented on the basis of the 5S methodology.

As a consequence, the entire production process is monitored from the very beginning to guarantee effective results.

RIELLO SISTEMI GROUP IN THE WORLD

Being a primary player means offering the best possible solutions and customer care around the world.

This is the reason why the Group has a branch situated in the middle of the American automotive district close to Detroit, that is Tri-Way Manufacturing Technologies, specialized in the production of plants for car components and reference partner for sale, service and retrofitting in the American market and a branch in the far East. Riello Sistemi Shanghai is in fact the Group's answer to the Chinese market needs which are globally rising. A sale and service structure contributes to consolidating the image of the Group brands in South Asia and acquiring important customers in the most technologically advanced sectors ranging from "Tier 1 automotive" to the major aeroengine manufacturers.