

## **Quadrant – So Much More than the Broadest Portfolio of Machinable Plastics**

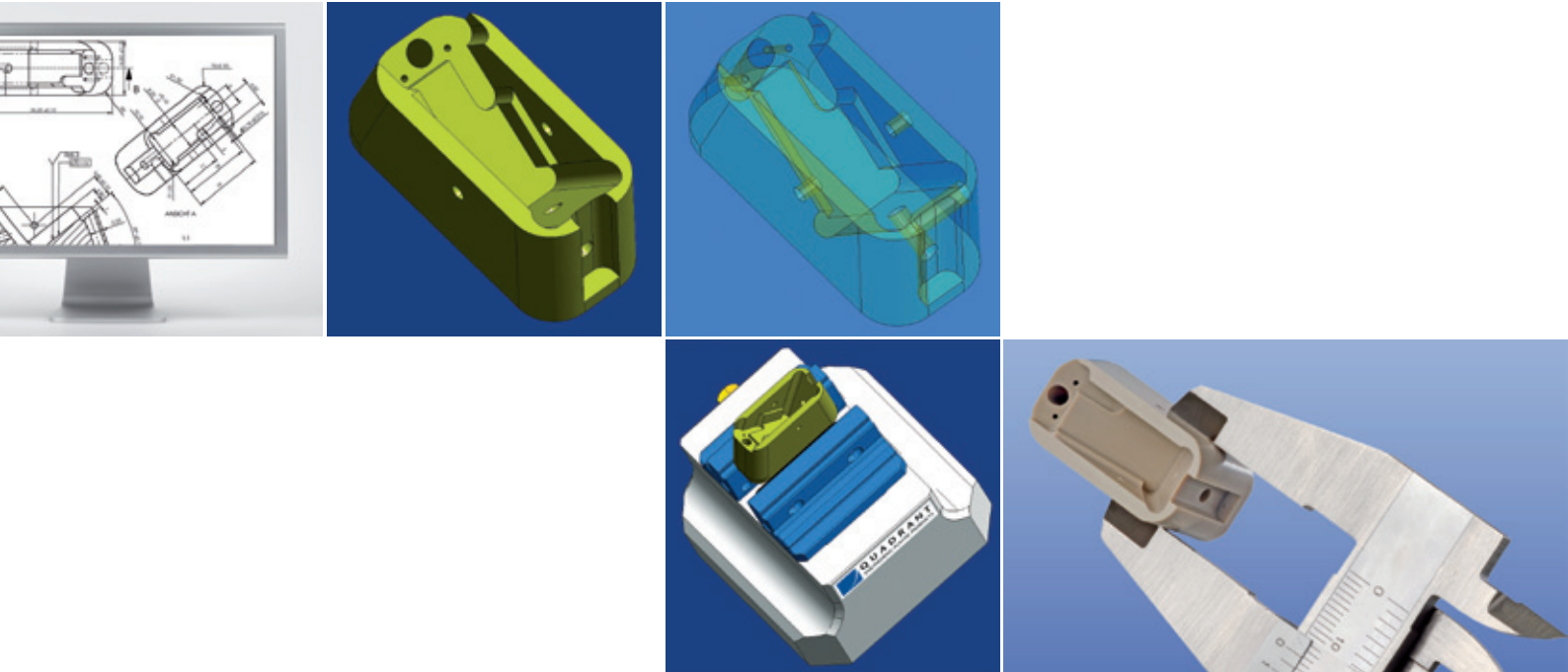
From material selection and supply - to finished part - to final assembly

You inspire ... we materialize®



*Quadrant is the world's largest manufacturer of machinable Engineering Plastics. We constantly develop new materials to meet the changing needs of industries around the world. Our investments in innovation have yielded the broadest product line in the industry.*

*Benefit from our capabilities and knowledge in producing high quality plastic parts machined with state-of-the-art technology.*



## Quadrant Values

### Service

From your initial question to the finished part, our experts are ready to help. We select and provide the best material for the application, develop your solution, create a prototype and produce the part in the required quantities. But we don't stop here: we can also assemble various parts components and different materials, handle special packaging & delivery requirements, conduct customer specific quality controls, and, if needed, support installation & maintenance - 360 degree service, all under one roof.

### Reliability & Cost Efficiency

Through the collaboration of our global network of Quadrant Technology Centres and the exchange of knowledge within our solutions development teams we design ideal and reliable solutions for you.

Our range of technological capabilities allows us to supply you everything from highly complex, precision parts, to more standard parts, small to large sizes - everything at an optimised cost/performance ratio.

### Quality & Safety

From compliance to ISO specifications to meeting "Total Productive Management" requirements – Quadrant sites and technologies have gained all the international certifications you expect from a supplier you can trust - now and in the future.

## Our Quality Commitment



### Certifications

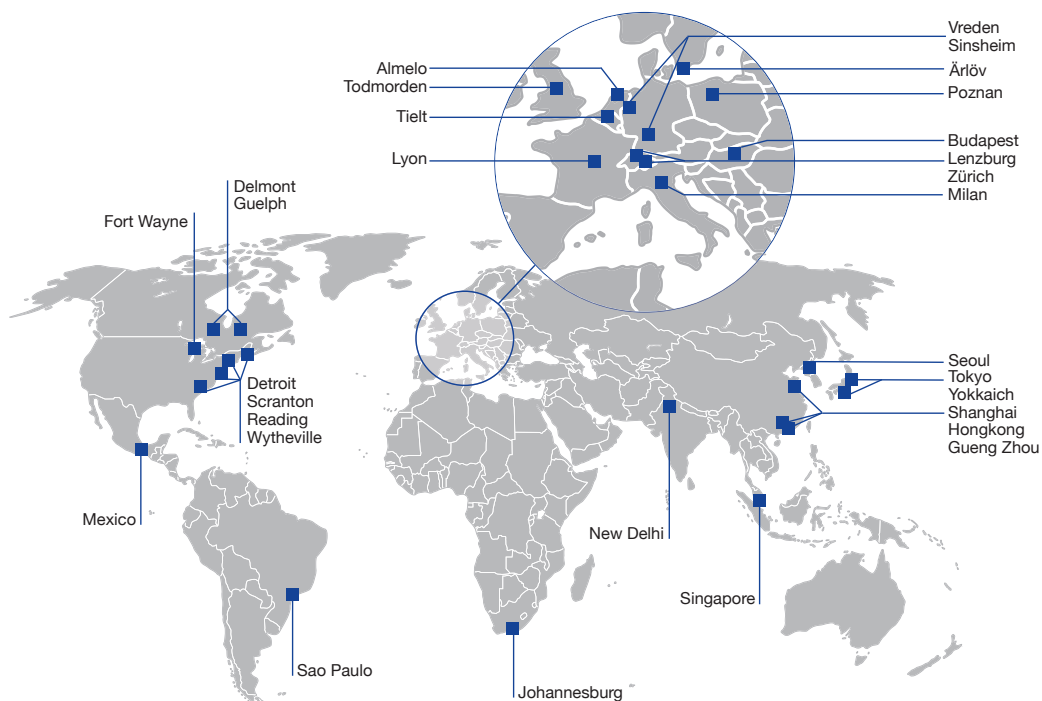
- All Quadrant Technology Centers (TC) are certified according to the European standard EN ISO 9001:2000.
- For the design and manufacture of medical applications, ISO 13485 certification can be confirmed.
- We offer 3D measuring systems that ensure exact quality monitoring and control of all dimensions.
- Quadrant has gained a vast number of customer specific certifications & approvals in sectors like railways, oil & gas, medical, and other demanding industrial applications.

### Total Productive Management (TPM)

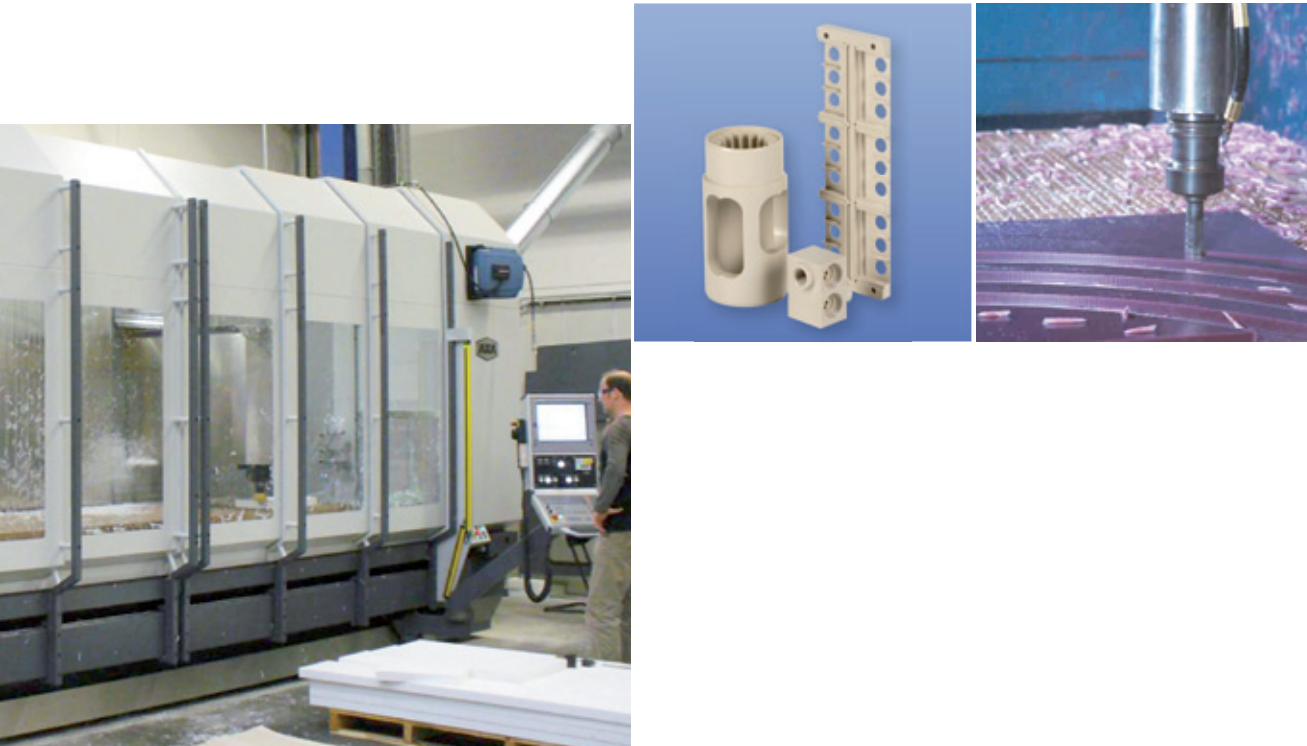
We are certified according to the TPM concept and standards. TPM aims at increasing productivity and improving equipment efficiency.

## Our Service Commitment

With our unrivalled products, technical expertise and global presence we can commit to deliver the optimal solution for you, wherever you are.



## Our Machining Capabilities



### Milling

- CNC driven machines, 3 - 5 axis to produce complex geometries
- Standard series and large parts, up to 5 axis: maximum length up to 6.300 mm, width up to 1.300 mm, height up to 1.000 mm
- Fully integrated 3D machining software, files such as .stp or .iges are supported

### Turning

- Multi axis CNC technology
- Driven tools: a combination of turning and milling
- Large series (bar feeder technology): up to a diameter of 130 mm
- Maximum: diameter 1.500 mm and length 500 mm (smaller diameter -> increased length)
- Minimum: below 10 x 10 mm limited feasibility
- Speciality: sliding head machine for long and thin parts

### Precision Machining

- Measurements up to 50 mm with a tolerance field of 0.05 mm
- Measurements greater than 50 mm, tolerance field of 0.1 % of dimension
- Even tighter tolerances of e.g. up to 0.01 mm can be machined

## Our Machining Capabilities

### Machining of Profiles

State-of-the-art production machinery and long-term technology know-how is the key to high quality production of profiles and guide rails.

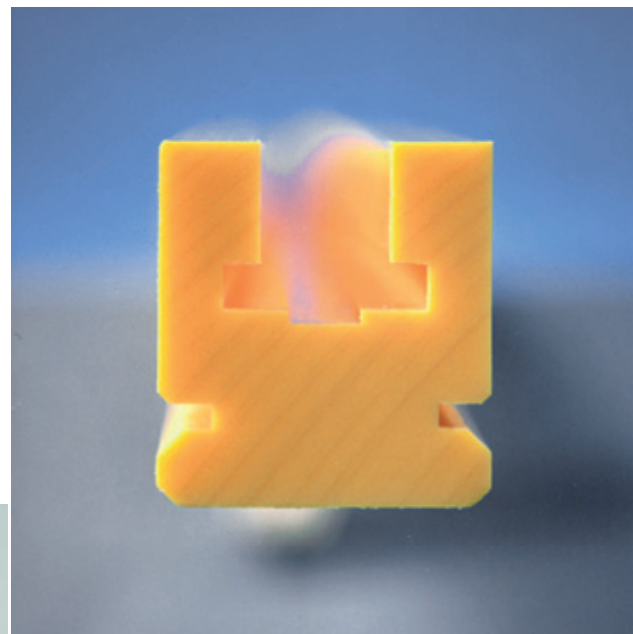
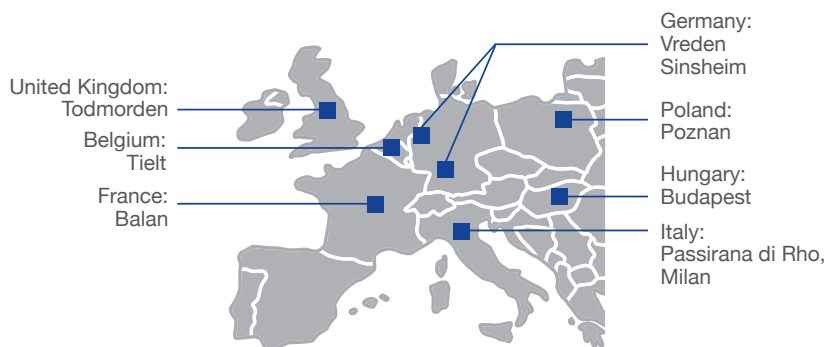
Our machining capabilities for the conveying sector:

- Any individual colour
- Any individual length (from 0.5 to 10 m; standard up to 6 m, individual up to 10 m on request)
- Any profile up to a cross-section of 240 mm x 140 mm
- Wide range of standard and proprietary materials available, like TIVAR® CleanStat, TIVAR® DrySlide or TIVAR® H.O.T. or any other UV-resistant, static dissipative, food contact compliant material. Please refer to our Polyethylene Delivery Programme.
- Flexible production planning provides short lead times

Machining processes also for smaller demands:

- Optimal production process for special geometries and small volumes (no tool costs compared to extrusion)
- Suitable for tightest tolerances
- More flexibility concerning lead times and quantity

### Next to You - The Quadrant Technology Centers





## Our Special Technologies



### Laboratories

Quadrants guarantee of quality starts with the raw materials. The manufacturers of plastic resins provide data for each type of material. However engineering plastic materials are only as good as the manner in which they are processed and all Quadrant materials are tested and certified in house, using our own laboratories and technicians. This ensures that each grade of material conforms to our published data sheet so that parts made from Quadrant materials have the same material properties, consistent with each batch.

### Clean Room & Cleaning Capabilities

The production and packaging of highly sensitive products for the medical and semiconductor industry is processed in our clean room facilities. Cleaning baths are available for special cleaning regulations. The finished parts will be supplied in sealed packaging.

### Assemblies - Bonding - Welding

We can deliver assemblies consisting of various plastics or even steel or rubber parts which can be assembled conventionally or by bonding or welding.

### Special De-burring Techniques

Special techniques allow us to remove burrs and swarf, also from inside complex parts, to reduce the risk of failure of the components.

### Annealing - Hot Water Treatment (Conditioning)

We are able to anneal and/or condition the machined parts. This can help significantly to avoid any warpage or dimensional change of components in use.

### Pressing & Sintering

The press & sinter process - also called direct forming - can help you to significantly reduce cost, especially if you need parts with complex geometries and large series. Low tooling costs help to make this technology even more attractive for cost savings.

## Our Special Technologies

### Near Net Shape

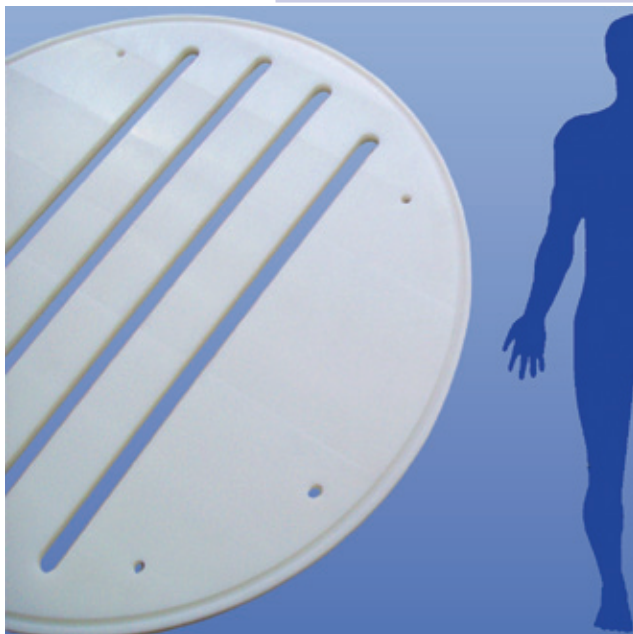
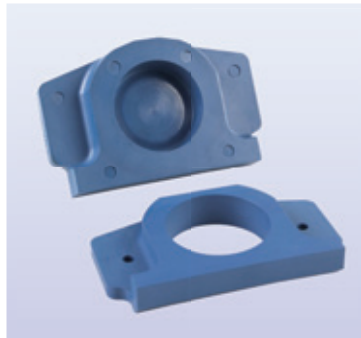
Using our compression or injection molding technologies, we first form the rough size of your parts. In a second step the parts will be machined down to the required tolerances. This process ensures optimised material and machining cost (especially important with expensive materials), and is applied for parts series with very specific tolerances.

### Machine Welding

Plastic parts cannot always be made in one piece, especially large pieces or special designs require alternative production methods. Design and tooling considerations sometimes make it more economical and/or advantageous to produce a part in two or more pieces. We can offer welding of panels, sheets at a maximum width of 4 meters.

### Gun Drilling

Gun drilling is an ideal technology to create long and deep drill holes, with smooth surfaces and small tolerances in technical parts. Gun drills are straight fluted drills; cooling liquid can flow through the drill's hollow body to the cutting head. A depth to diameter ratio of more than 300:1 is achievable.



## Ertalon® and Nylatron® Material Grades From Custom Casting to Near Net Shape to Final Machined Part

### The Production of Custom Cast Parts or Nylon Castings Offers many Advantages over Conventional Parts Production Technologies

- Capability to manufacture small or medium quantity production series
- Capability to manufacture large parts
- Elimination or reduction of machining operations
- Improved product performance
- Scrap reduction

### Compared to Machining Stock Shapes

- Special formulations are possible
- Material savings up to 40% possible
- Costly machining time is avoided
- Better mechanical properties can be achieved
- Customer logos and special marking possible

### Compared to Injection Molding

- Heavier products (max. 800 kgs/piece) possible
- Lower tool investments
- Variations in wall thickness and heavy cross-sections possible





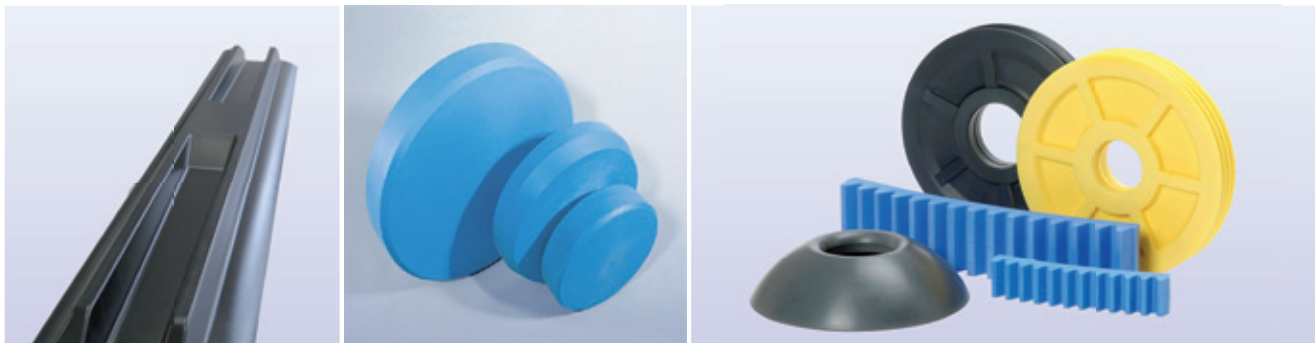
## Typical Applications

### Standard Custom Casting

- Monocast® cable sheaves and pulleys
- Monocast® pile driver caps
- Monocast® outrigger pads
- Nylatrack® track plates
- Elevator buckets
- Vibrating bowls

### Special Custom Casting

- Rope guides
- Water filter units
- Stabilising fins
- Body for drilling unit
- Ventilator hoods



## Casting Technologies

### Atmospheric Pressure Casting (APC)

APC is used to produce parts without externally applied pressure. The process is suitable for low to medium volume runs or even parts that may have intricate design details. APC cast nylon is used for structural parts, it allows for larger cross sections and minimises flow-induced stress. Compared to injection moulding, this results in improved dimensional stability during use, with parts less likely to distort or change shape. Cast weight up to 800 kgs is possible.

### Low Pressure Casting (LPC)

LPC allows the production of big parts with thinner sections and a more complicated shape, in addition to parts similar to those made by APC. Economical production runs are 100-300 pieces.

### Reaction Injection Molding (RIM)

RIM is a low pressure casting technology where specific additives are mixed with the base material. It shows very specific properties after „injection“ in the mould and the polymerisation of the material. RIM casting is a perfect production technology for a wide range of products with different shapes and qualities.

## Injection Molding Technology

Economical or technical aspects of certain parts solutions might call for alternatives to machining as the manufacturing technology. Often, injection molding offers the desired options, and also here, Quadrant's Creative Molding Systems (CMS) team can help.

Which factors speak for injection molding versus machining from an extruded or compression molded material?

In the majority of cases, the production quantity is the deciding argument. Injection molding is most economical and efficient for large series of components.

Beyond the question on the required quantity of parts, the selected material and the parts tolerances are key to understand before determining the manufacturing technology. Most polymers can be used in the injection molding process, this includes all thermoplastics.

Quadrant CMS can also manufacture parts made of unique Quadrant EPP materials, such as Duratron® PAI, Techtron® PPS and Techtron HPV PPS, Ertalyte® and Ertalyte TX by injection molding. Combining two or more polymer materials (2-component molding, 3-component molding), combining plastic and metal materials (insert molding), as well as new to develop special compounds is naturally also part of our expertise and offering.

Considering this, Quadrant CMS focuses on so called "function critical systems", components with a highly complex interface with the rest of the end product, or modules with a strong influence on user perception with regard to the component's functionality.





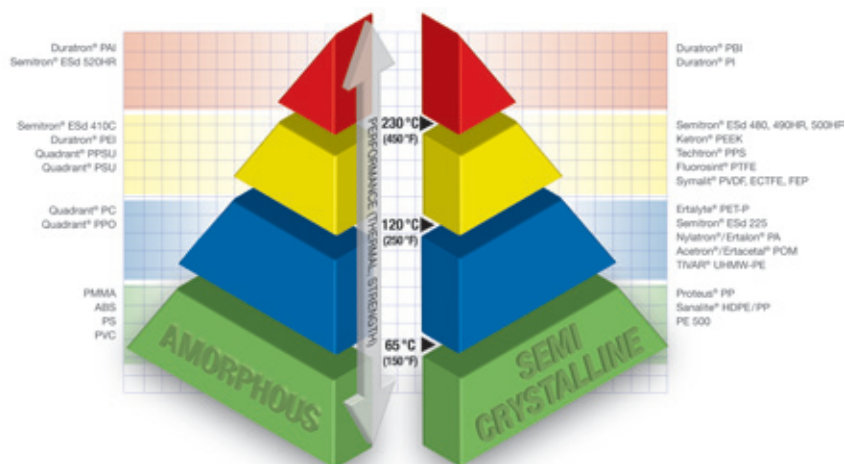
#### Service and Key Technologies:

- Product design and engineering
- Highly automated production
- Clean Room certified Class 100,000 (ISO 8)
- 2K and 3K molding
- Smart tooling to reduce the burden of tooling costs at lower series productions



Injection molded solutions are predominantly used for applications in the automotive, medical, food & beverage, machine construction and electrical & electronics industries. Common applications are airbag housings, safety belts, blood sample analysis cuvettes, power tool covers, pump parts, although examples can also be found in other markets.





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