

# Form and Foam Parts



# Trygonal Form and Foam Parts

- We are a sealing and plastic parts manufacturer
- We see ourselves as a partner to our customers
- We are independent, holistic and solution-oriented
- We are an international network company and we work world-wide
- We see our company culture like life: varied, complex and exciting
- We value greatly the individuality and the expertise of the staff
- We are committed to high professional ethics and integrity in all we do

All this creates a passionate, innovative and dynamic team to support your business.

We are an internationally active group of independent seal manufacturers and plastics processors. Our group manufactures all types of seals and plastic mouldings such as O-rings, rubber mouldings, rubber-metal compounds, foam mouldings, semi-finished products and machines for metal-cutting seal production. In addition, state-of-the-art production techniques are used.

We develop the component together with the customer. Based on the component application, it is determined whether the part must be foamed or cast. Polyurethanes offer a very large number of possible solutions. No matter whether it is a lightweight yet ultra-stable special foam, a casting component with excellent mechanical properties or a particularly tough integral foam, Trygonal will develop the right solution for you.

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#### PUR Foam types

- Soft foam – Visco-elastic foam
- Integral foam
- Hard foam
- Hard integral foam
- Casting resins

In different densities, degrees of hardness and colours

All processed polyurethanes can additionally be equipped with flame retardants, antistatic and many other special additives.

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#### Approvals

Flame protection, radiation protection and Food application

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#### Applications

Automotive, construction, mining, railways, power generation (power plants, solar energy and wind power), aircraft construction, semiconductors, mechanical engineering, medical technology and mobile hydraulics

## Introduction to polyurethane products

### Material

Polyalcohols and polyisocyanates are extracted from petroleum products. There are two types of product: Polyether and polyester.

The raw density (measured in kg/m<sup>3</sup>) of a PUR soft foam is specified as the minimum raw density depending on the application. In general, the higher the bulk density, the higher the performance characteristics.

The hardness, measured as compression hardness in kPa or indentation hardness, measured in N, can be set very low (soft) to very high (hard).

Casting resins or integral foams with closed and solid outer skin can also be measured in Shore A and D.

### Environmental/hygienic aspects/odour/recycling/waste disposal

PUR soft foams are physiologically harmless according to our state-of-the-art science and technology. They are odourless and easy to clean; disposal and recycling are possible.

### Manufacturing processes

We have various manufacturing processes available for the most diverse materials and part types.

- Low pressure dosing machines
- High pressure dosing machines

Liquid, reactive starting materials are used in this process. If polyols, isocyanates and blowing agents (usually water) are mixed, the polyol reacts with the isocyanate in a polyaddition to PUR (polyurethane foam) and the blowing agent forms gas inclusions (in the case of water, the blowing agent reacts with part of the isocyanate, releasing carbon dioxide). Additives and blowing agents are added to the polyol, so that usually two components are used.

The properties can be adjusted according to the selection of the starting material. Thus, the use of long-chain polyols produces soft to elastic foams, or short-chain polyols produce strongly cross-linked, hard foams.

For the production of moulded foam parts, the formulated mixture is transferred to a metal or plastic mould and the foaming process takes place. After opening the mould, the finished part can be removed. This process can also be used to produce complex 3D parts.

### Manufacturing tolerances

The hardness settings of the foam qualities have tolerances of up to 20%. For the other properties, minimum or maximum values are specified.

The parts from the mould shrink by approx. 1 percent.

### Special settings and variants

We can produce special material, colour and shape combinations according to your wishes.

These are, for example: electrically conductive, visco-elastic, acid- or heat-resistant materials.

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- Electrically conductive materials
  - Viscoelastic materials
  - Acid-resistant materials
  - Heat-resistant materials
  - Impact-resistant materials
  - Bulletproof materials
  - Radiation shielding
  - EMC
  - Tough materials
  - Extremely soft materials
  - Extremely hard materials
  - Abrasion-resistant materials
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## Further applications of polyurethane materials

### Surface protection (skinning/painting)

- The suitability of polyurethanes for coating all types of surfaces is determined by their service life and resistance to corrosion and weathering.
- Upholstery elements can also be supplied with skin.

### Adhesives

- Polyurethanes are so versatile that they are also available in the form of adhesives that securely bond very different materials such as wood, rubber, cardboard or glass.
- Furthermore, different PUR foams can be bonded together to form composites.

### Seals

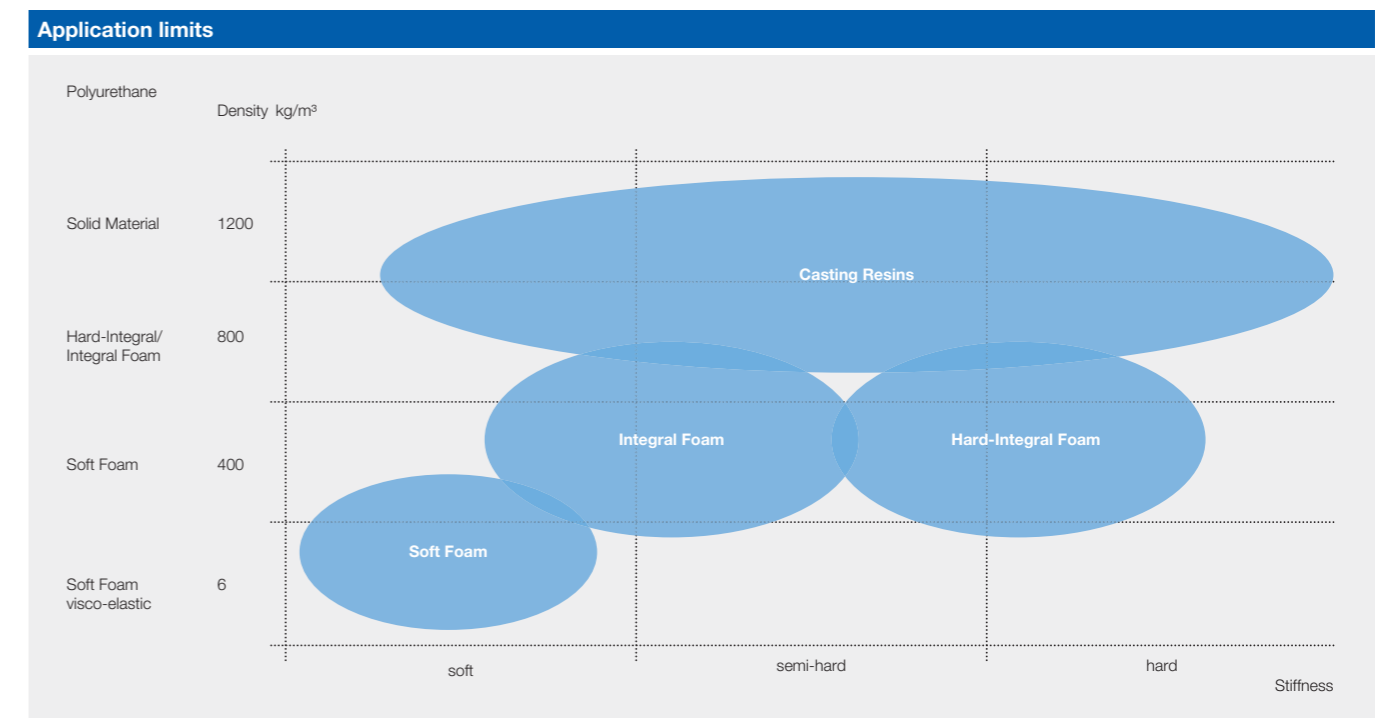
- Polyurethane seals prevent liquids or gases from penetrating or escaping through gaps and crevices. There is a wide variety of seal types on the market today.
- Trygonal offers you over 140 individual profile types, which we can adapt to your application.

### Application limits and possibilities

The figure below shows the materials manufactured, offered and processed by Trygonal. The figure shows the PUR foam application limits as well as the corresponding volume weight and stiffness of the respective foam type.

In contrast to other manufacturers Trygonal can also offer many derived materials with different properties and therefore a wide range of elastomers.

On the following pages the main characteristics, the physical, chemical and ecological properties as well as their application in sealing technology are shown.



# Polyurethane Systems – Overview

Automobile:  
FMVSS 302

Rail vehicle construction:  
DIN 5510 (S3, SR2, ST2), EU TL 45545

Aircraft construction:  
ABD 0031, FAR 25.853

Furniture industry:  
California 117 Section A Part 1

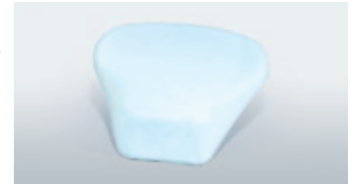
Construction sector:  
DIN 4102 B2

Leisure industry:  
M2, UNI 9175/87 (= CSE 4/83);  
Class 1.1M, BS 5852 crib 5

Electrical Industry:  
UL 94 V0



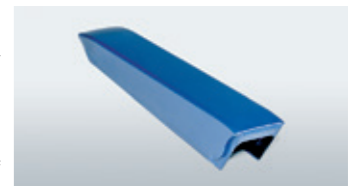
Type	Description	Volumetric weight, grams/litre volume	Flame protection					Applications
<b>Soft Foam</b>								
PUR soft 050	Soft Foam	RG 050	•	•	•	•		Office furniture industry, cushions, supports, neck rolls etc.
PUR soft 100	Soft Foam	RG 100	•	•	•	•		Upholstery industry, couches, seats, furniture etc.
PUR soft 150	Soft Foam	RG 150	•	•	•	•		"High-end" Foam system
PUR soft 200	Soft Foam	RG 200	•	•	•	•		Industry, machine insulation, protective functions, upholstery elements, rollers, etc.
PUR soft PP150	Soft Foam	RG 150	•	•	•	•		Antivibration elements, shock absorbers
PUR soft PP250	Soft Foam	RG 250	•	•	•	•		Sound insulation, personal protection
PUR soft 125F	Soft Foam, flame-resistant	RG 125	•	•	•	•		Public Transportation



Note:  
Soft Foam hardness can be controlled during manufacturing.



Type	Description	Hardness, Shore A	Flame protection					Applications
<b>Integral Foam</b>								
PUR skin 1565	Integral Foam	15-65	•	•	•	•	•	Furniture industry, handles, steering wheels, castors, seats etc.
PUR skin 3585	Integral Foam	35-85	•	•	•	•	•	Buffers, machine functional parts, armrests, steering wheels, handles, etc.
PUR skin 6098	Integral Foam	60-98	•	•	•	•	•	Spoilers, claddings etc.
PUR skin 3585F	Integral Foam, flame-resistant	35-85	•	•	•	•	•	Foam sheets for armrests



Note:  
Integral Foam Shore A is a multivariable system - specific customer-specific properties can be produced: visco-elastic, controllable skin thickness, etc. Fillers of various types can also be added.



Type	Description	Volumetric weight, grams/litre volume	Flame protection					Applications
<b>Rigid Foam</b>								
PUR rigid 0050	Insulating Rigid Foam (0.03 W/mk)	RG 050						Insulations, pipelines, refrigerators, slides, boilers, etc.
PUR rigid 0250	Hartschaum	RG 250						Insulation moulded parts, facade insulation, tunnel construction, parts for fittings
PUR rigid 0500	Hartschaum	RG 500						No insulations
PUR rigid 0750	Hartschaum	RG 750						No insulations
PUR rigid 0900	Hartschaum	RG 900						Special applications (backrests etc.)



Note:  
Rigid Foam offers the usual parameters. Special settings can be made to meet special requirements. Flame protection equipment feasible.

For technical questions and product designs, our team of experts is at your disposal at any time.

# Polyurethane Systems – Overview

Automobile: FMVSS 302	Rail vehicle construction: DIN 5510 (S3, SR2, ST2), EU TL 45545	Aircraft construction: ABD 0031, FAR 25.853	Furniture industry: California 117 Section A Part 1	Construction sector: DIN 4102 B2	Leisure industry: M2, UNI 9175/87 (= CSE 4/89); Class 1.1M, BS 5852 crib 5	Electrical Industry: UL 94 V0
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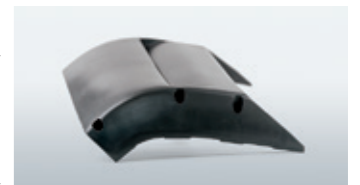
Type	Description	Volumetric weight, grams/litre volume	Flame protection				Applications
<b>Hard-Integral Foam</b>							
PUR tek 0400S	Hard-Integral Foam, self-isolating	RG 400	•		•		• More favourable shuttering parts etc.
PUR tek 0700S	Hard-Integral Foam, self-isolating	RG 700	•		•		• Most common equipment and machine casing, good quality
PUR tek 0500	Hard-Integral Foam	RG 500	•		•		• Surface can be painted subsequently
PUR tek 0850	Hard-Integral Foam	RG 850	•		•		• Sophisticated components, backrests, chairs etc.



Note:  
Hard integral foams are used for visible parts.  
They can be produced in all colours and shapes.



Type	Description	Hardness, Shore A	Flame protection				Applications
<b>Casting resins</b>							
PUR resin 1565	Casting elastomer	15-65 A					• Soft moulded parts, rollers, handles, cranks, arm rests etc.
PUR resin 5085	Casting elastomer	50-85 A					• Rollers, abrasion protection, seals
PUR resin 6598	Casting elastomer	65-98 A					• Coatings and rollers, housings, shock absorbers, bullet traps, etc.
PUR resin 4070D	Casting duromers	40-70 D					• Formwork, technical moulded parts for the machine industry
PUR resin 5585D	Casting duromers	55-85 D					• Electronics industry, for high loads



Note:  
Casting resins offer an almost infinite variety of adjustment possibilities such as mechanics, current conduction resistance, hardness, rebound, flame retardancy and much more.

For technical questions and product designs, our team of experts is at your disposal at any time.

PUR Foam types	
<b>Soft Foam</b>	Open-cell foam: The walls between the individual cells are open and can therefore absorb liquids
<b>Integral Foam</b>	Integral foams have a closed thick outer skin and an open-cell core
<b>Rigid Foam</b>	Open-cell hard foam, liquids can be absorbed
<b>Hard-Integral Foam</b>	Hard, closed outer skin, liquids are not absorbed
<b>Casting resins</b>	For elastic to hard-elastic parts, moulds or toolings
<b>RG</b>	Volumetric weight e.g. RG 35 -35 kg/m³ or 35gr/dm³
<b>Shore A</b>	Specified for soft elastomers measured with a needle with blunted tip
<b>Shore D</b>	Specified for hard elastomers measured with a needle running at a 30° angle

# Applications



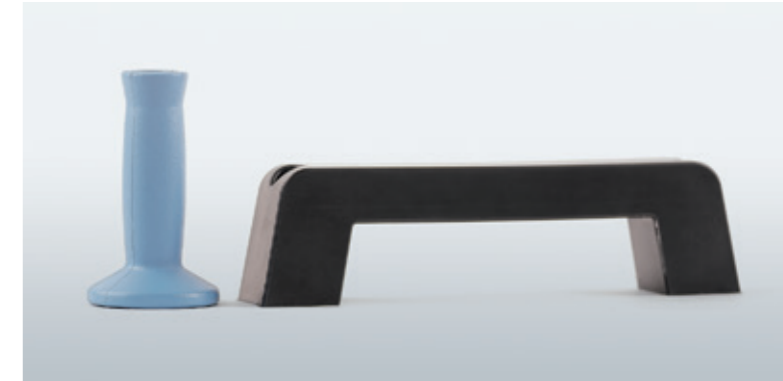
**Seats**  
 Seat, back and head cushions for railways and public transport  
 Manufactured according to railway standard EN 45545 Norm  
 For high demands and long service life  
 Upholstery for the furniture industry – Loungers and chairs  
 Mattresses and arm rests

**Medical technology**  
 Insulations  
 Heat and sound insulation  
 Loungers, seats and supports  
 Special seals



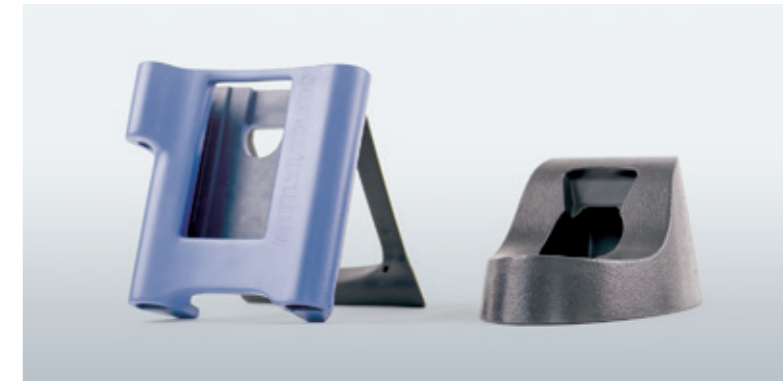
**Arm rests**  
 Arm rests for trains and buses  
 Handles, knobs  
 Steering wheels  
 Bolsters  
 Fairings/Covers

**Automotive**  
 Seat and back parts  
 Handles and sun visors  
 Covers  
 Spoiler  
 Arm rests



**Edge protector**  
 Covers  
 Gaiters  
 Bins  
 Hazard strip  
 Knee and chin protection

**Industry**  
 Cases  
 Boardings  
 Castors and wheels  
 Supports and supports  
 Gaskets and seals



**Impact protection**  
 Buffers for mountain railways  
 Bumpers for cleaning vehicles  
 Covers  
 Side claddings  
 Stoppers

**Sports and Leisure**  
 Components for rides, like:  
 seat and back rests, safety bars  
 Components for mountain railways and chair lifts, such as:  
 seat units, side panels, handles, stoppers



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Seals

Customised and Large Sealing Solutions

O-rings and Static Sealing Profiles

Materials and Semi-Finished Products

Machines, Software and Tools

Plastic Turned and Milled Parts,  
3D Printer Parts

Rubber Parts and Membranes

Rubber-Metal and Rubber-Plastic  
Components

Vibration Technology and Gripper Rails

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