

# Insulation and sheath materials

## General information about the material Polyurethane (PUR)

### Polyurethan (PUR) - Thermoplastic Elastomere

Polyurethane has become increasingly important in the cable industry over the past years. This material shows at certain temperatures mechanical characteristics similar to rubber. The combination of thermoplastic and elastic characteristics has led to the description TPE thermoplastic elastomere. Here at SAB Bröckskes GmbH & Co. KG, we use PUR on a Polyether base as sheath material. In addition to standard Polyurethane, thanks to constant development between SAB Bröckske and the plastic industry, the following types of PUR are also available:

- PUR semi-mat (low adhesion)
- PUR mat (rough surface, low adhesion)
- PUR flame protected
- PUR halogen-free and flame protected

### Mechanical characteristics

The insulation materials of the cables are usually not subject to high mechanical stress. Sheaths, on the other hand are heavily used. This is especially true for flexible control and connection cables which are often pulled over sharp corners and rough surfaces. This can lead to cuts which are accentuated when the cable is stretched during flexible use. Compressive stress caused by squashing and impacting from tools and machines can also occur. The most important mechanical characteristics of PUR are:

- high tensile strength
- high tear resistance
- notch resistance
- abrasion resistance
- alternate bending resistance
- flexibility at low temperatures
- impact resistance

### Chemical characteristics

The chemical resistance depends upon many factors such as chemical type, reaction time, temperature, volume, concentration and of course the type of Polyurethane used. In comparison with many other materials, such as rubber or PVC, PUR has a better resistance against chemical reaction. The outstanding chemical characteristics are:

- very good resistance against mineral oils
- good resistance during storage in water
- good resistance against alcohol-free benzine
- good resistance against many solvents

The danger of decomposition through microbes exists with Polyurethane on a Polyester base after prolonged exposure to dampness and warmth. The Polyurethane on a Polyether base used by SAB is resistant to microbic decomposition. Etherpolyurethane and Esterpolyurethane can be differentiated by the saponification value (VZ).

- Etherpolyurethane (resistant) - VZ  $\leq$  200
- Esterpolyurethane (non-resistant) - VZ  $\geq$  350

After prolonged exposure to warm water or tropical climates, Polyurethane on a Polyester base will undergo a chemical reaction. The result is a weakening of mechanical strength. S Polyurethane on a Polyether base is relatively more resistant to hydrological break-down. Etherpolyurethane is weather and ozone resistant in all climates. Discolouration by sunlight is possible, but this will not affect performance.

### Exemplary application fields of PUR insulated cables

For control devices, for example machine tools, assembly lines, conveyor systems and production lines, machine and plant construction, conveyor technique (among others hoisting platforms and transport systems), automobile industry, handling and automation technique, iron, steel and chemical industry, electric tool construction (for example lawn mowers, edge cutters, hedge trimmers), in brick and cement works, electric hand-held equipment (for example drilling machines, angle grinders and other electric tools), industrial painter's shops, water treatment systems, automobile and coal, iron and steel industry, ...