Processing Guidlines - Badaflex TPE-S SEBS and SBS Compounds

General Information

This information brochure is intended to give hints and advices to skilled processor about the processing of Badaflex TPE-S compounds based on SEBS or SBS. Due to the huge variety of articles and in the configuration of machine and tooling, this information brochure can only give general advice.

In case of more specific questions, Bada's Application Technicians remain at your disposal:

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Advice for the safe handling and processing of Badaflex TPE-S Compounds can be found in the appropriate material safety data sheet.

Process Support on site – our special service

We would be pleased to support you on site if you have any questions or problems with the processing of new sample materials or in ongoing series applications. We offer our processing support service for this purpose. Together with you we look for the cause to find a solution for you. If you would like to find out more, just contact us at ProcessSupport@bada.de.

Nomenclature

Badaflex TPE-S grades are thermoplastic elastomer compounds based on the Styrene copolymers SEBS and SBS. There are grades available both for injection moulding and extrusion applications.

The Badaflex TPE-S product family consists of a large variety of different grades and modifications.
In general, the nomenclature is bulit up like this:

Badaflex TPE-S XX YYYY [optional designations] colour [optional colour identification number]

Here, XX indicates the Shore hardness (70A means Shore 70A, 40D accordingly Shore 40D).
The number YYYY is a consecutive, four-digit identification number of the grade; no conclusion related material properties can be drawn out of this number.

The further designations bear the following meanings:

LD	low density (low filler content)
2K	adhesion modification for 2 component overmoulding
EL	electrically condustive or dissipative
LM	capable for applications with food contact
FR	flame retardant
FR HF	flame retardant without the use of halogens
UV	stabilisation against ultraviolet light

In special cases, there are some more designations not mentioned above. They are described individually in the technical datasheet.

Colours are identified by an internal Bada colour code. Again, this is an ordinal numeration. There is no

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relation to RAL numbers, neither to other colour standards.

In general, Badaflex TPE-S compounds are equipped with processing and mould release agents as well as a basic stabilisation against UV irradtiation and oxidation.

Storage

Badaflex TPE-S can be delivered in different packagings. Common packaging is transparent plastic bags, big bags or octabins.

The shelf life of the TPE granules is 12 months from delivery if storage instructions are observed and the product is stored in the unopened original Badaflex TPE packaging. Store in dry conditions at room temperature (15–30 °C) away from heat sources and direct sunlight!
Contact with nitrogen oxides must be avoided during storage!

Especially the very soft grades (shore hardness < 40A), or the adhesion modified grades (2K- grades) may clump together although anti-blocking additives are used in the manufacturing process of the Badaflex TPE-S grades. The shelf life of these TPE granules is 6 months from delivery if storage instructions are observed and the product is stored in the unopened original Badaflex TPE packaging.

The material should not be stacked with other material on the top.
The pressure applied by loading increases the risk of clumping clearly.

Although there is no acute risk in storing Badaflex TPE-S compounds, all sources of ignition and open flames shall be avoided for safety reasons.

Predrying

Usually, predrying is not required, provided the material has obviously not become wet.

Predrying might be advisable for material which has been stored for almost a year or more, for flame retardant grades (FR), electrically conductive grades (EL), or adhesion modified grades (2K).

Drying temperatures should be 60 – 70 °C, the drying time is 2 to 4 hours.

Machine Configuration

Badaflex TPE-S grades can be processed on all modern, state of the art injection moulding machines.
The injetion moulding machine should be equipped with at least 3 individual cylinder heating zones, as well as flange and nozzle tempering.

The machine should be equipped with an universal screw / 3- zone- screw. The L / D ratio should be at least 20, the compression ratio should be 1.5 to 3, preferrably 2 to 2.5. The use of a non- returning valve is mandatory.

Open nozzles as well as needle valves can be used. The open nozzles are advantageous because of the robustness and the favourable flow conditions. Neddle valves avoid the suction of air on decompression / screw retraction.

A well balanced relation between cylinder / screw size and shot weight has to be ensured.

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Too large screws / cylinders are risky beacuse of long residual times of the material in the cylinder. This can lead to thermal decomposition of the material in the cylinder.

Tool and Gating Configuration

Regarding the huge variety of possible configurations, it is not possible to give a recommendation concerning tool layout and gate dimensioning.
Basic precondition for successfully processing Badaflex TPE-S compounds is a well balanced relation between machine size and shot weight.

It is advisable to incorporate the experience in moulding SEBS compounds which is present at the tool maker and at the processors into the tool design. Furthermore, the generally accepted rules for the design of moulded articles and injection moulding tools can be applied.

Individual means of tempering, especially –if feasible – for mosing slides and cores should be considered, in particular when the geometries are complex.

A lot of the most common sprue and gating systems can be used for processing of Badaflex TPE-S.

Concerning the material, hot runner systems often apply a high thermal stress to the material. The risk of thermal decomposition of the material is present. In particular, long residual times, for examples during interruptions in material processing, are risky.

Special attention should be turned to the venting. especially when processing flame retardant grades. Ejectors with increased clearance are a good means to improve venting locally. Venting is of very high efficiency at the ends of the flow lines or in the area of welding lines. Due to the good flowability of the material, there is always the risk of blocking of the venting.

Paricular care has to be spent for the reasonable positioning and the design of the ejectors. The ejectors can penetrate the material. The compressibility of the material can lead to dimensional expansion normal to the ejection direction.

A more jagged tool surface can be advantageous in some cases, because the material can not adhere that much to the tool surface,

Processing – General Advice for Processing Parameters in Injection Moulding

Dosing should be accomplished at low screw rotation speed and low back pressure. The cooling time should be used completely. The least material quantity should be dosed which allows a stable process with sufficient melt cushion. Low residual times ot the melt in the cylinder are favourable.

According to experience, injection speed should be in the middle or the top range and should be lowered towards the end of the injection step in order to prevent buners (diesel effect).
Increasing the injection speed, ort he sheare rate, respectively, makes the material flowing more easily. Too high injection speed can result in overfilling the cavity or to the formation of burrs.

In general, short holding times and low holding pressure (down to zero holding time / holding pressure) are preferred.

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The clamping force should be set to values as small as possible. This is not only good for conserving machine and tool, but improves venting in the parting line – but too low clamping forces can lead to burrs.

Special Hints for Overmoulding

Processing Badaflex TPE-S in overmoulding technology, the adhesion of Badaflex can be improved by having higer holding pressure levels. Furthermore, higher temperatures are good for improving the adhesion. This is especially true fort he hard component (subtsrate), too. For this reason, a hot surface from a freshly moulded hard component (transfer technology) is preferred compared to a cold surface when using insert technology.

The substrate surface has to be clean and free from grease, oil, release agents, and so on. Lubricants directly added at the injection moulding machine should not be used at all, neither fopr the hard nor fort he soft component.

Typical Injection Moulding Parameters

The following typical values can be used for an initial process parameter setup:

Badaflex TPE-S grades	**general**	**2K (adhesion modified)**
Heating zones	140 – 220 °C	140 – 230 °C
Nozzle	170 – 220 °C	220 – 230 °C
Hot runner	max. 250 °C	max. 250 °C
Melt temperature	170 – 220 °C	220 – 230 °C
Tool surface temoerature	30 – 60 °C	30 – 60 °C
Back pressure	low to medium	low to medium
Injection pressure	60 – 120 MPa	60 – 120 MPa
Injection speed	fast	fast
Holding pressure	Zero to low	medium
Cooling time	long	long

More information can be found in the technical datasheets.

This values are typical values. They can vary in a large range due to mould and machine setup.

Application-specific processing instructions to reduce carbon emissions

When testing the carbon emissions according to VW PV 3341, for example, the carbon emissions from components can be minimized during processing by adhering to the following parameters.

Mechanical load:
• Minimize shear during melt preparation, i.e., screw speed and Dynamic pressure as low as possible (use cooling time)
• Keep injection shear low, i.e., injection speed as low as possible, nozzle and gate cross-sections as large as possible, sharp-edged transitions avoid

Thermal stress:
• Keep cylinder and, if applicable, hot runner temperatures as low as possible but still high enough that the mechanical shear is as low as possible.

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• Residence time of the melt in the overall system of cylinder, nozzle and, if applicable, hot runner as short as hold possible.

Use of Regrind

In general, the use of regrind is possible. It has to be considered that moisture, dust and other impurities as well as the repeated thermal stress may have a negative influence on the mechanical properties.
In coloured grades, the colour can change.
Processing regrind with flame retardant grades (FR, FR HF) is not recommended. The flame retardant properties can be massively deteriorated by the use of regrind.
As a rule, there content of regrind shall be significantly below 20%.
It is the duty of the processor to verify wheter the processing of regrind is in accordance with the requirements and the specification, or not.