

# KOEMMERLING

## NEWSLETTER

### *IG-Sealants and Gas Retention*

#### *Which is the best sealant combination ?*

The most important materials used for manufacturing insulating glass are the sealants. Their quality guarantees the long life time of the IG-units. The sealants must be resistant to low and high temperatures, UV-radiation, moisture and should ensure the gas tightness of the insulating glass.

#### *Using conventional metal or plastic spacers*

Under above mentioned conditions the ideal combination for conventional IG-units is butyl (PIB) as primary seal and polysulfide or polyurethane as secondary seal.

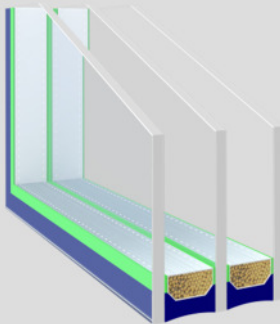
During assembly of the IGU the polyisobutylene fixes the spacer bar to the glass, during the lifetime of the IGU it seals the gap between inner and outer pane and retains the noble gas, which is filled in to enhance (optimize) the insulation. At the same time the butyl prevents the ingress of moisture because it has the lowest moisture vapor transmission rate of all known sealants.

Polysulfide or polyurethane are used as secondary seal to fix both glass panes and spacer profile mechanically together, to protect the primary seal and to act as an additional diffusion barrier.

In particular the polysulfide profile of characteristics has a high level without major disadvantages. Polysulfide is very tolerant against manufacturing mistakes and robust against mix ratio deviations.

A mix tolerance up to 20% for A- and B-component does not have a big impact on the final curing properties and does not affect the performance of the IG-unit. Neither component is sensitive to moisture and therefore can be handled and stored without any special requirements.

Due to the fact that polysulfide has very good resistance against moisture and noble gas diffusion, it can offset possible leaks in the polyisobutylene primary seal. This feature is very helpful especially as many IG-units are not perfectly manufactured.



Although silicone has best weathering properties and excellent adhesion to glass it is mostly the second choice, because of its high gas permeability compared to polysulfide or polyurethane. Silicone sealants allow a higher rate of moisture vapor and gas permeation than other materials (see Chart 1).

Besides imparting structural strength to the unit, the secondary seal is also responsible for offsetting moisture penetration or noble gas loss when the primary seal leaks. With polysulfide or polyurethane a thickness of 3-4 mm is sufficient. For silicone a sealant depth of minimum 4-6 mm is required to achieve similar safety reserves, which also makes it a more expensive option.

With Koemmerling materials the following gas loss rates with highest quality production can be achieved:

Sealant Combination	Gas loss rate (%/year) Reference value: < 1.0
GD 115 (PIB) / GD 116 (Polysulfide)	0.5 – 0.9
GD 115 (PIB) / GD 677 (Polyurethane)	0.5 – 0.9
GD 115 (PIB) / Isomelt (Hotmelt)	0.8 – 0.9

In practice, with silicone such low loss rates are difficult to achieve even with greater sealant depth unless the primary seal has been perfectly applied. Normally loss rates with silicone are between 1 and 3% a year which means they do not pass EN1279 -3. Loss rates of 0.8% and 0.9% can be achieved with GD115 and GD920 silicone which is certified to EN1279 but such results can only be achieved with high levels of workmanship.

Sealant	Gaspermeation (Argon) 3mm foil [ml/m <sup>2</sup> *d*bar]
Polyisobutylene (PIB)	5 – 15
Hotmelt (HM)	5 – 15
Polysulfide (PSR)	40 – 70
Polyurethane (PUR)	100 – 300
Silicon (Si)	2000 – 4000

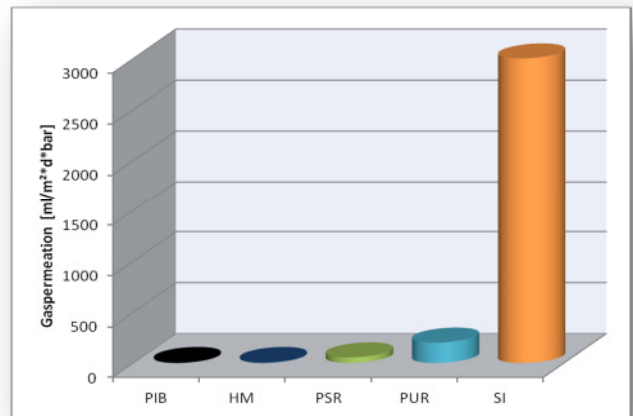


Chart 1 Relative gas diffusion rates of IG sealants

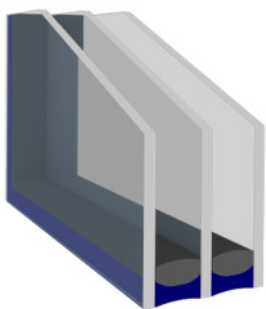


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**Using Thermoplastic Spacers instead of conventional metal or plastic spacers**

**Warm Edge System Koedispac 4SG and Silicone GD 920**

If silicone is to be used, it is best to use a reactive thermoplastic spacer Koedispac 4SG which forms a complete 6 mm barrier impervious to gas between the two glass panels. Conventional non-reactive TPS can be used with polysulfide but because of plasticiser combination issues should not be used with silicone secondary sealants.

Koedispac 4SG is a reactive hot melt warm edge system based on PIB which can be used with either silicone or polysulfide, both having excellent gas loss performance, less than 1.0 % and passing EN1279-3.

Koedispac 4SG substitutes the primary seal, the spacer bar and the desiccant in an IG-unit. Contrary to standard butyls it builds up a real chemical bond to glass and to the secondary sealant silicone which makes it ideal for structural glazing. This system gives a strong compound structure providing higher cohesion than standard spacer bar, which makes it ideal especially for usage in hotter climate zones.

Koedispac 4SG is applied fully automated which gives an absolutely closed edge seal around the perimeter, especially in the corner area by patented sloping connection. The automated application avoids manual errors and is of particular benefit in manufacture of big glass formats. This and the special designed properties for SG application ensure a very high moisture vapour and gas tightness throughout the whole life time of the insulating glass unit. Other alternative spacers systems on the market often exhibit inherent weaknesses due to mitre cutting in the corner area or expanding by bending.



Koedispac 4SG in combination with silicone or polysulfide meets the requirements of the EN 1279 part 2 and 3 (long-term stability and gas tightness).

