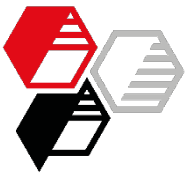


Silfit Z 91

in conventional and non-conductive car body seals

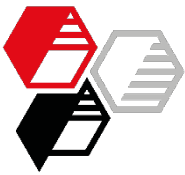
Author: Nicole Holzmayr



Content

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- Introduction
- Experimental
- Results
 - General Properties
 - Extrusion Properties
 - Die Plating
- Summary



INTRODUCTION

EXPERIMENTAL

RESULTS

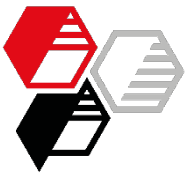
SUMMARY

Car body seals can be separated into two sections:

conventional and non-conductive (electrically insulating)

Mineral fillers are used in car body seals because of their following effects:

conventional	→ esthetic effects on the extrudate surface
non-conductive	→ replacement of carbon black to decrease electrical conductivity
	→ optimization of processing and mechanical properties



Objective

INTRODUCTION

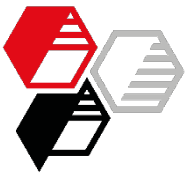
EXPERIMENTAL

RESULTS

SUMMARY

Effect of calcined **Silfit Z 91** in comparison to Sillitin and a calcined clay with regard to

- compound properties
- extrusion properties
- deposits in the extrusion process (die plating)



Base Formulation

Car Body Seal

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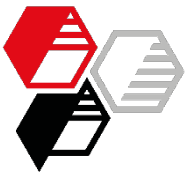
INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

	conventional	non-conductive
Keltan 8340 A	100.00	100.00
Zinkoxyd aktiv	5.00	5.00
Stearic Acid	1.00	1.00
PEG 3000	2.00	2.00
Calcium oxide	5.50	5.50
Corax N 550/30	110.00	60.00
Mineral filler	50.00	155.00
Sunpar 2280	65.00	65.00
Rhenogran DPG-80	0.50	0.50
Rhenogran MBTS-80	1.30	1.30
Rhenogran ZBEC-70	2.00	2.00
Rhenogran S-80	0.75	0.75
Rhenogran CLD-80	1.00	1.00
Rhenogran TP-50	2.00	2.00
Vulkalent E/C	0.50	0.50
Rhenogran CBS-80	0.50	0.50
Total	347.05	402.05



Fillers, Characteristics

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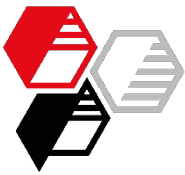
INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

		Calcined Clay	Neuburg Siliceous Earth		
		Polestar 200 R	Sillitin Z 86	Sillitin P 87	Silfit Z 91
Particle Size d ₅₀	[μm]	3.6	1.4	1.1	2.0
Particel Size d ₉₇	[μm]	19	6.9	4.3	10
Oil Absorption	[g/100g]	60	48	53	59
Specific surface area (BET)	[m ² /g]	6.5	11	12	7.6
Calcination		yes	none	none	yes



Preparation and Curing of the Compound

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INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

- **Mixing**

Open mill Ø 150 x 300 mm

Batch volume: approx. 700 cm³

Temperature: 50 °C

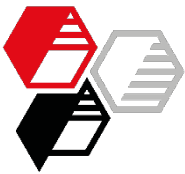
Mixing time: approx. 15 min.

- **Curing**

Press, 180 °C

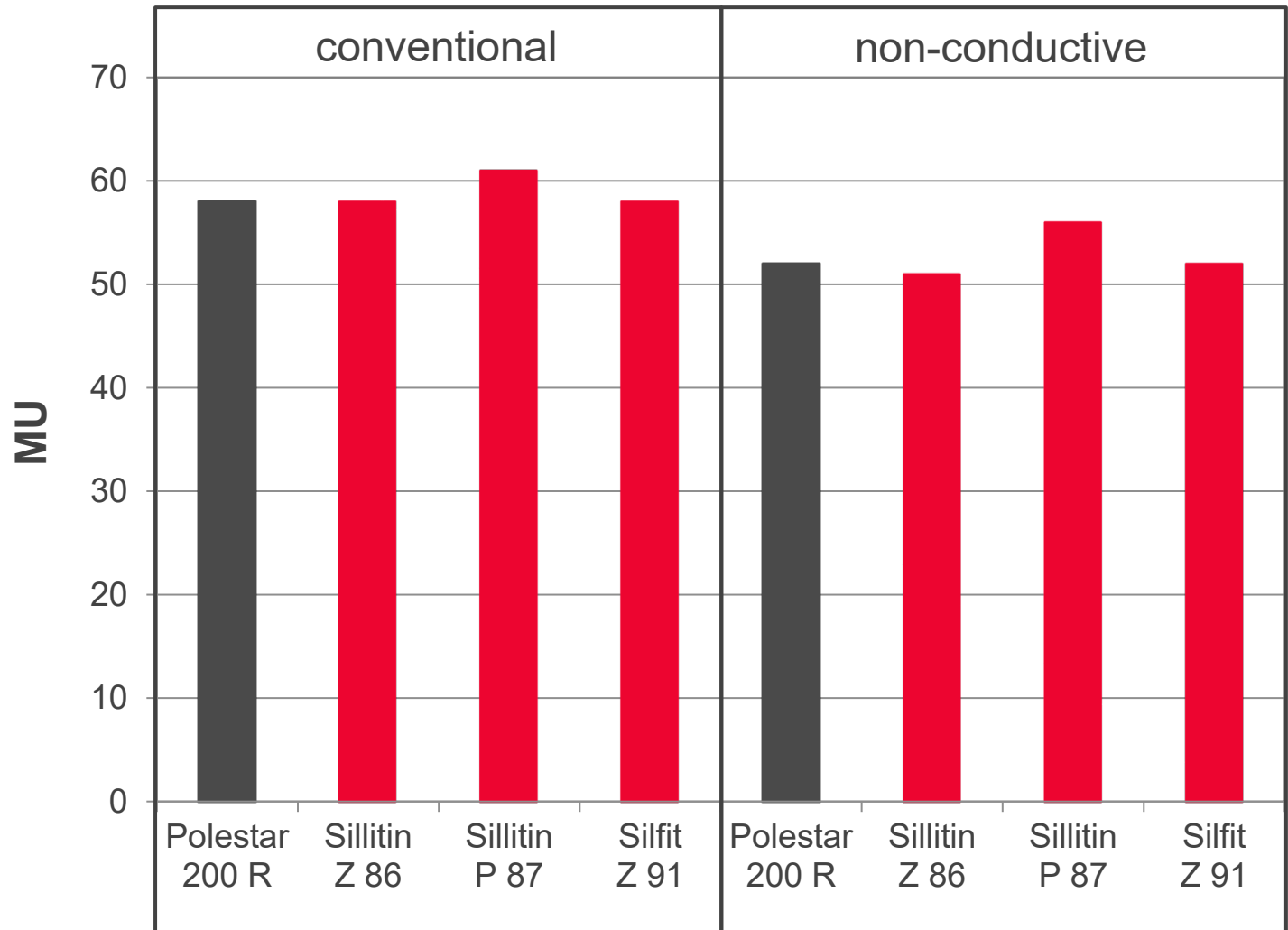
2 mm sheet: 6 min.

Compression set specimen: 8 min.



Mooney Viscosity

DIN 53 523 Part 3, ML 1+4, 120 °C



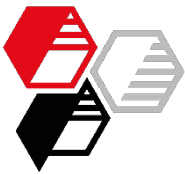
INTRODUCTION

EXPERIMENTAL

RESULTS

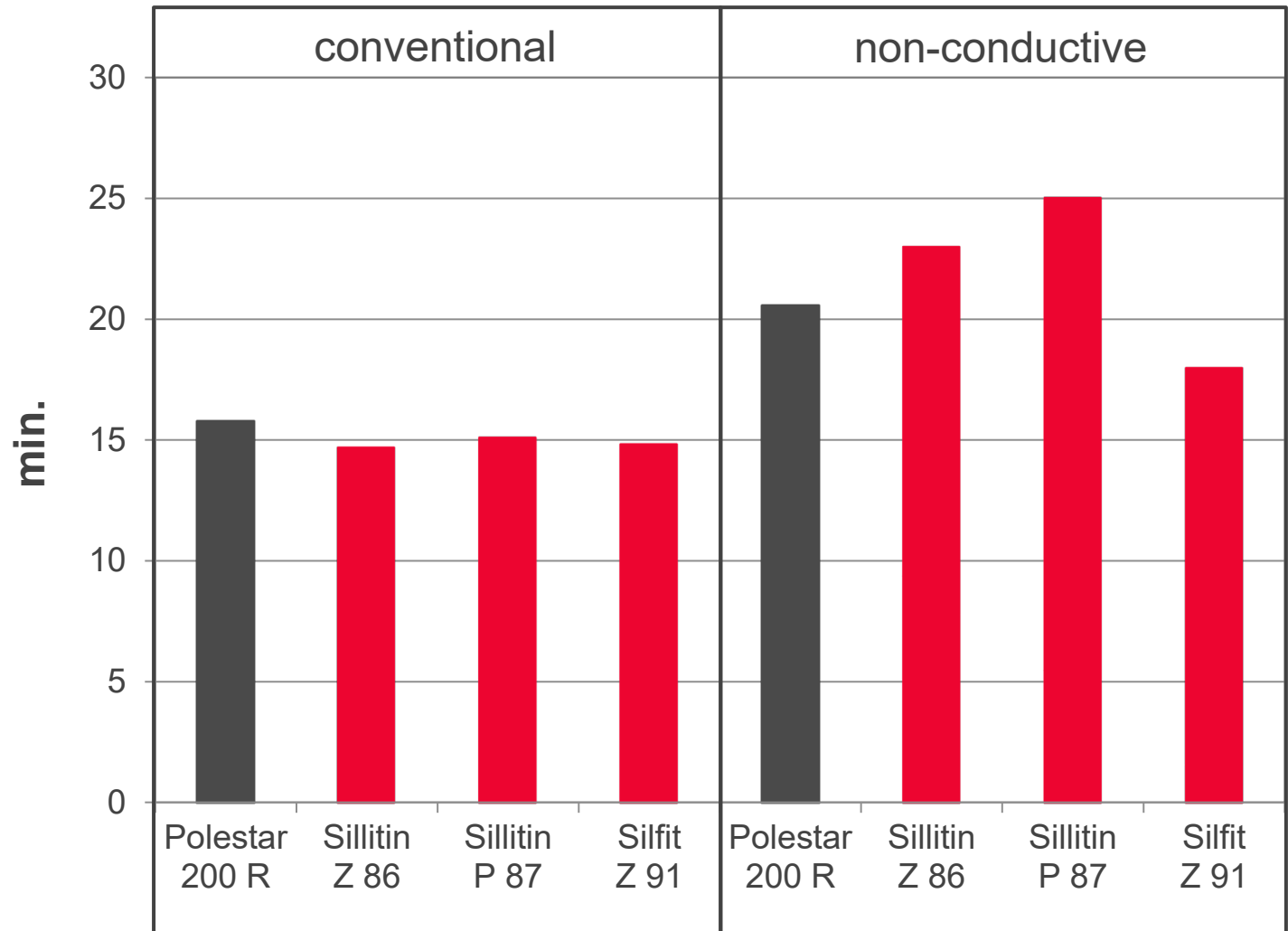
• General Properties

SUMMARY



Mooney Scorch Time

DIN 53 523 Part 4, ML +5, 120 °C



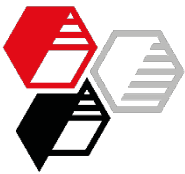
INTRODUCTION

EXPERIMENTAL

RESULTS

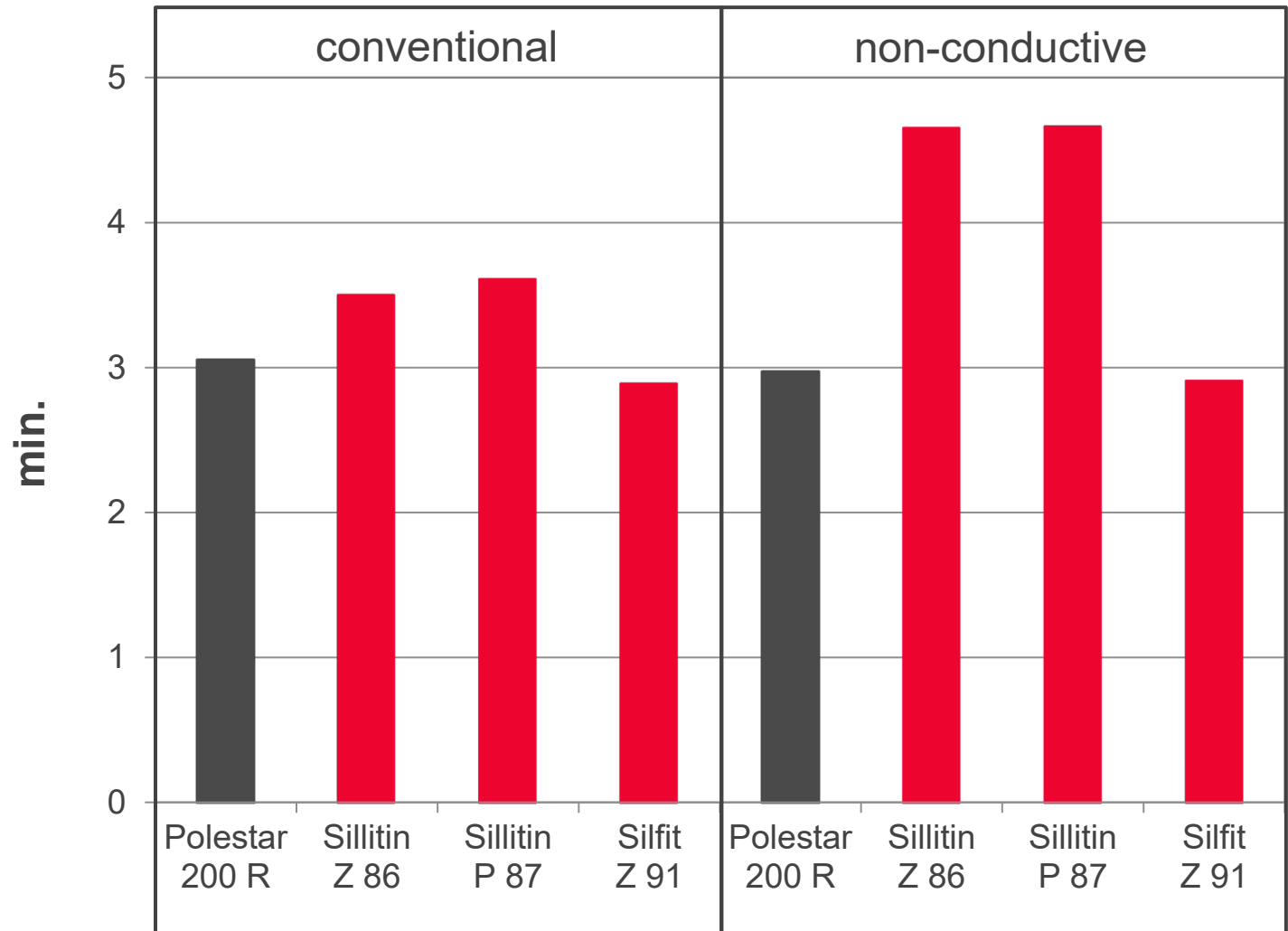
• General Properties

SUMMARY



Conversion Time t_{90}

DIN 53 529-A3, 180 °C, 0,2° deflection – Göttfert Elastograph



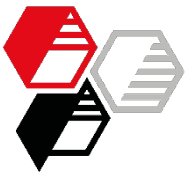
INTRODUCTION

EXPERIMENTAL

RESULTS

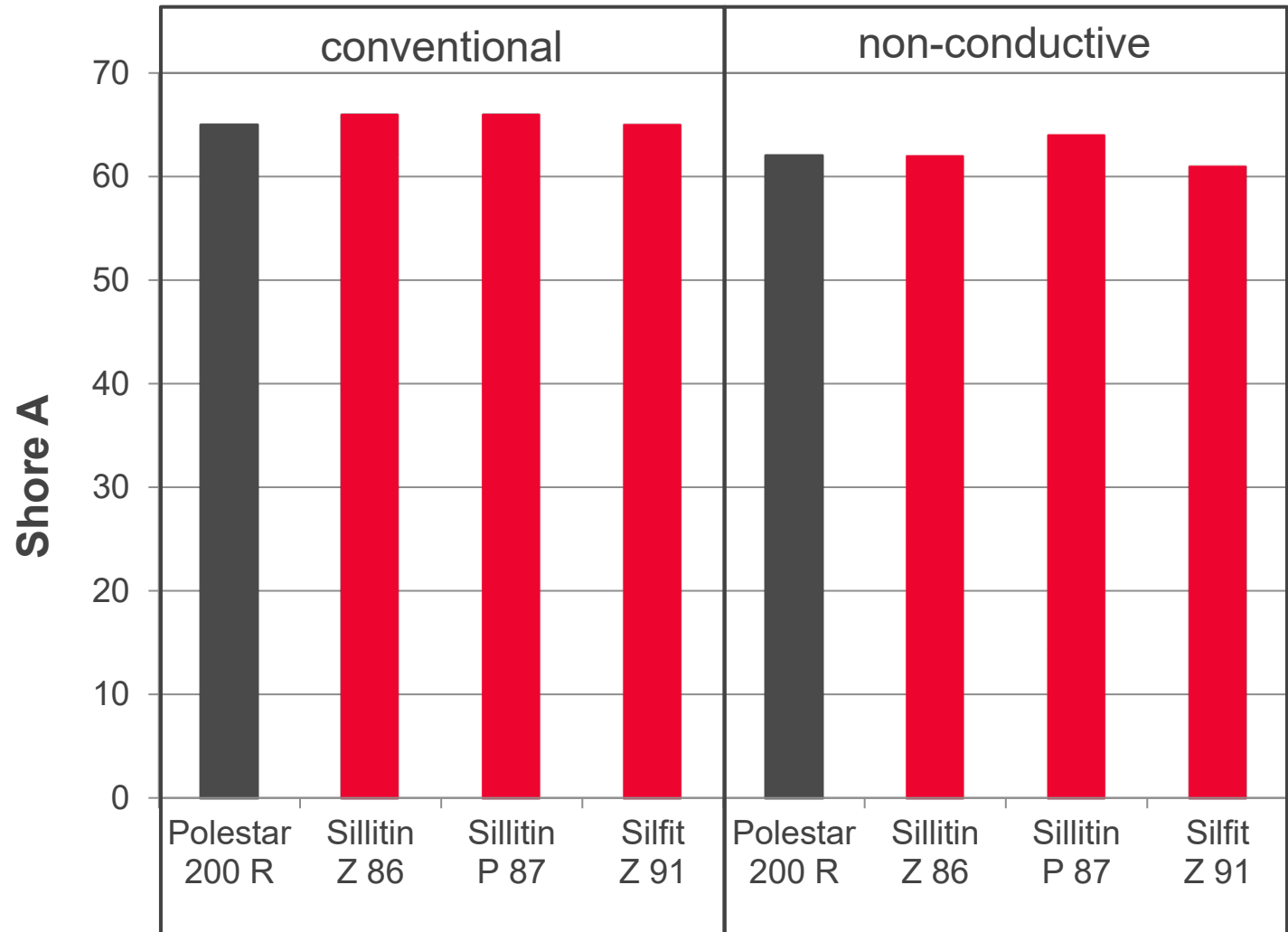
• General Properties

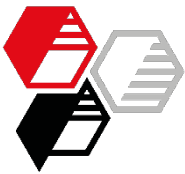
SUMMARY



Hardness

DIN 53 505-A, piled-up S2 dumbbells

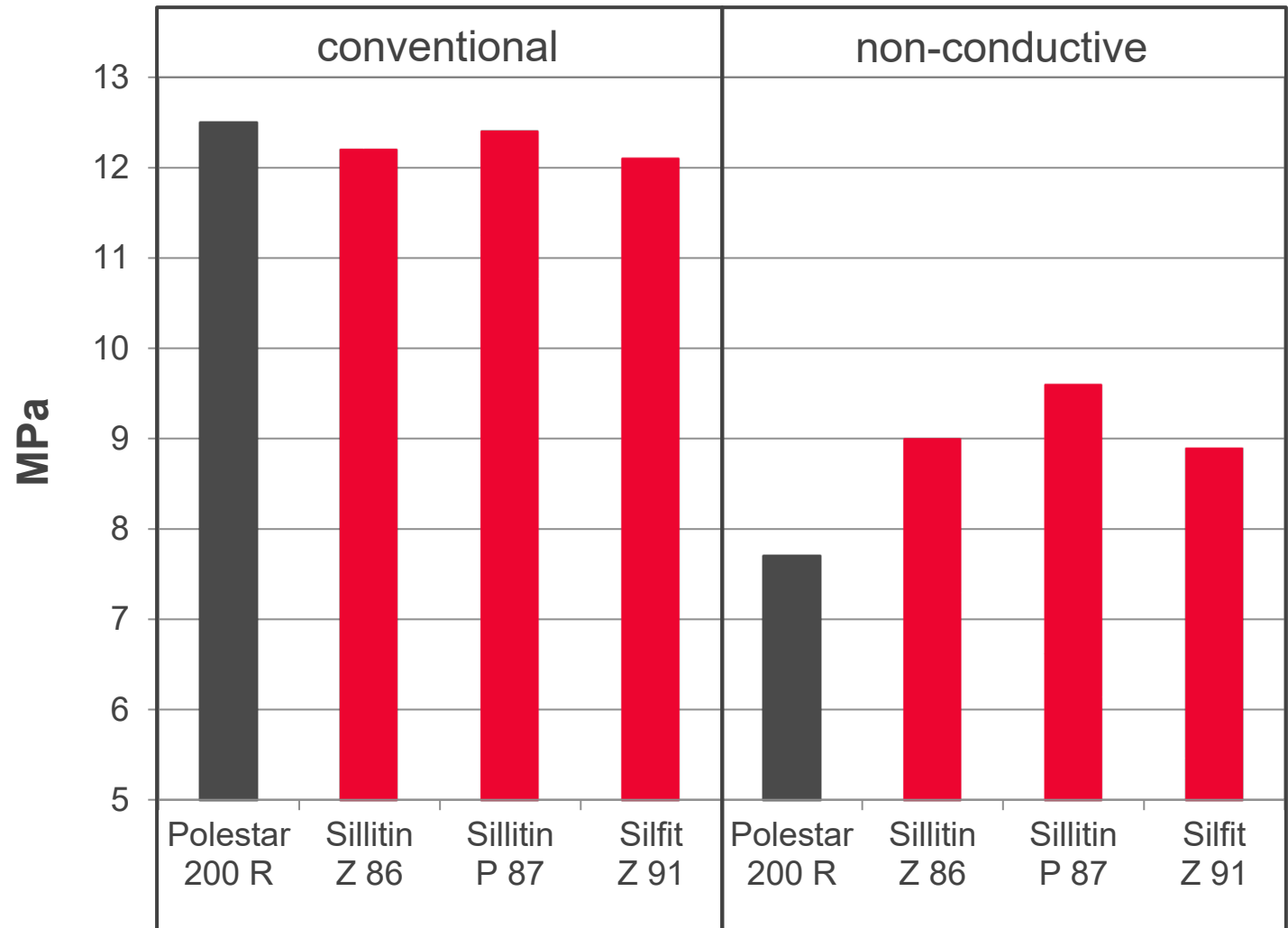


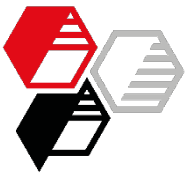


Tensile Strength

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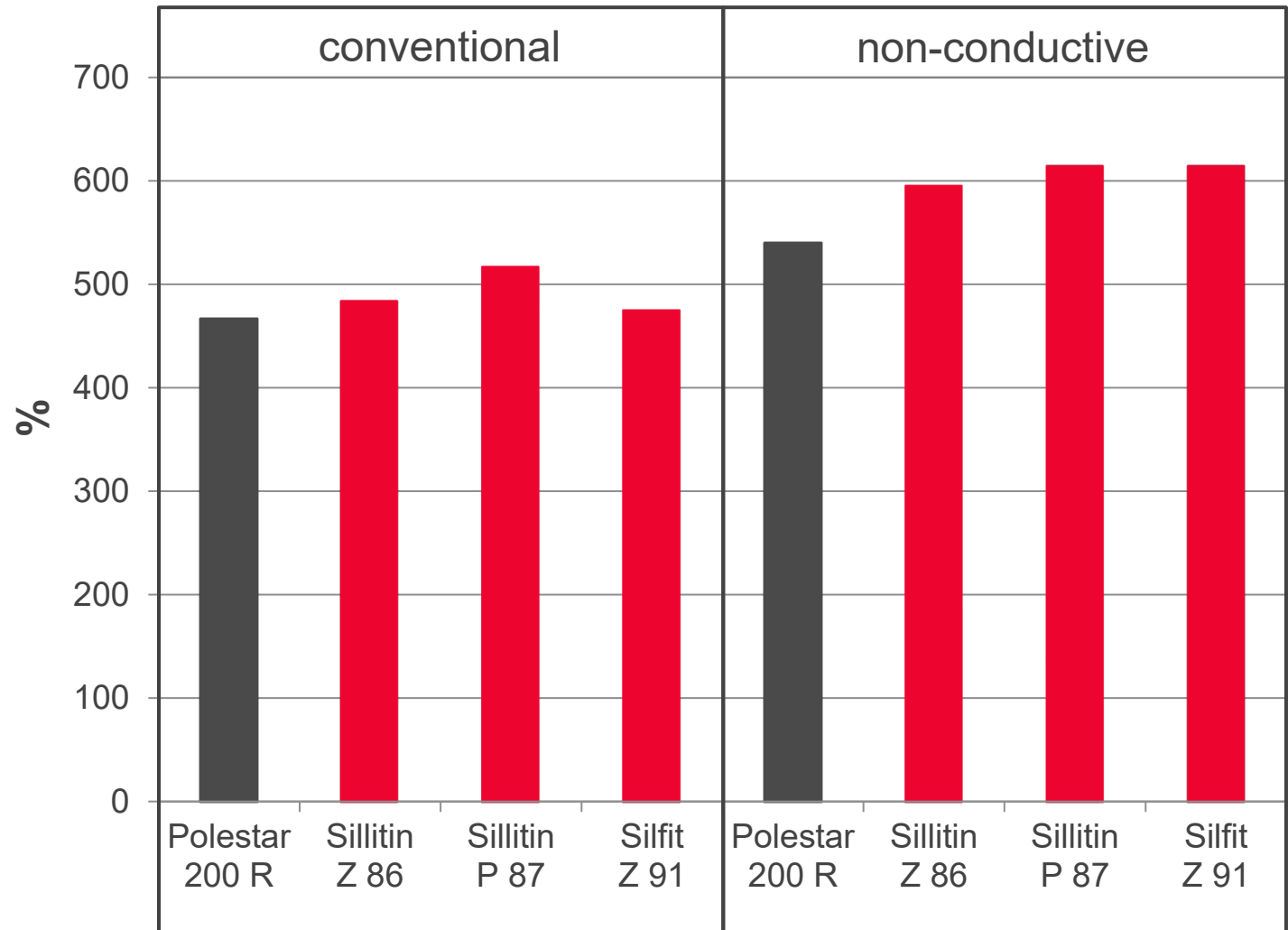
DIN 53 504, S2





Elongation at Break

DIN 53 504, S2



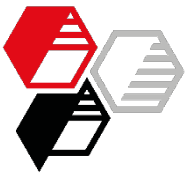
INTRODUCTION

EXPERIMENTAL

RESULTS

• General Properties

SUMMARY

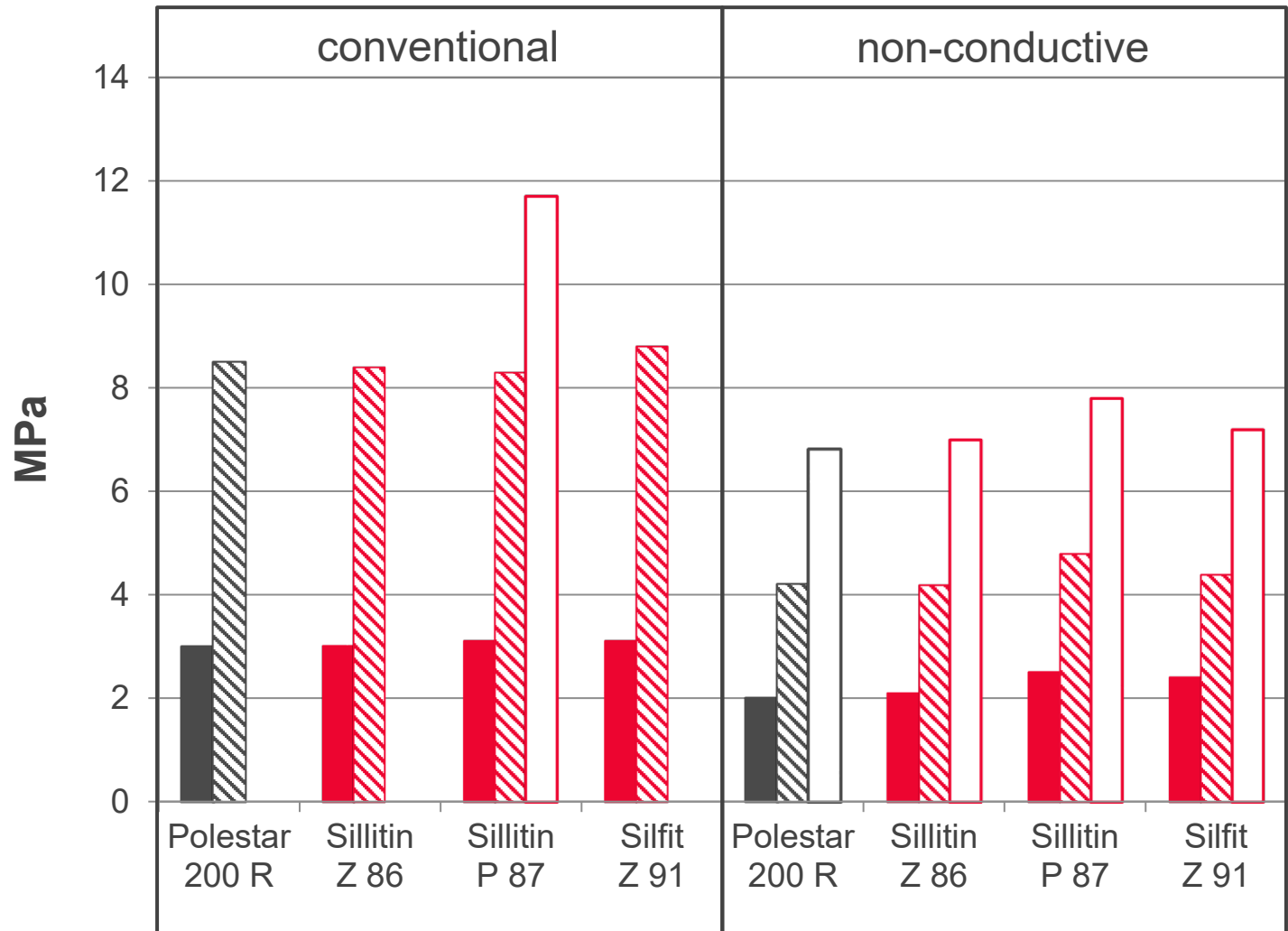


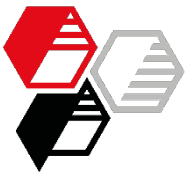
Moduli

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DIN 53 504, S2

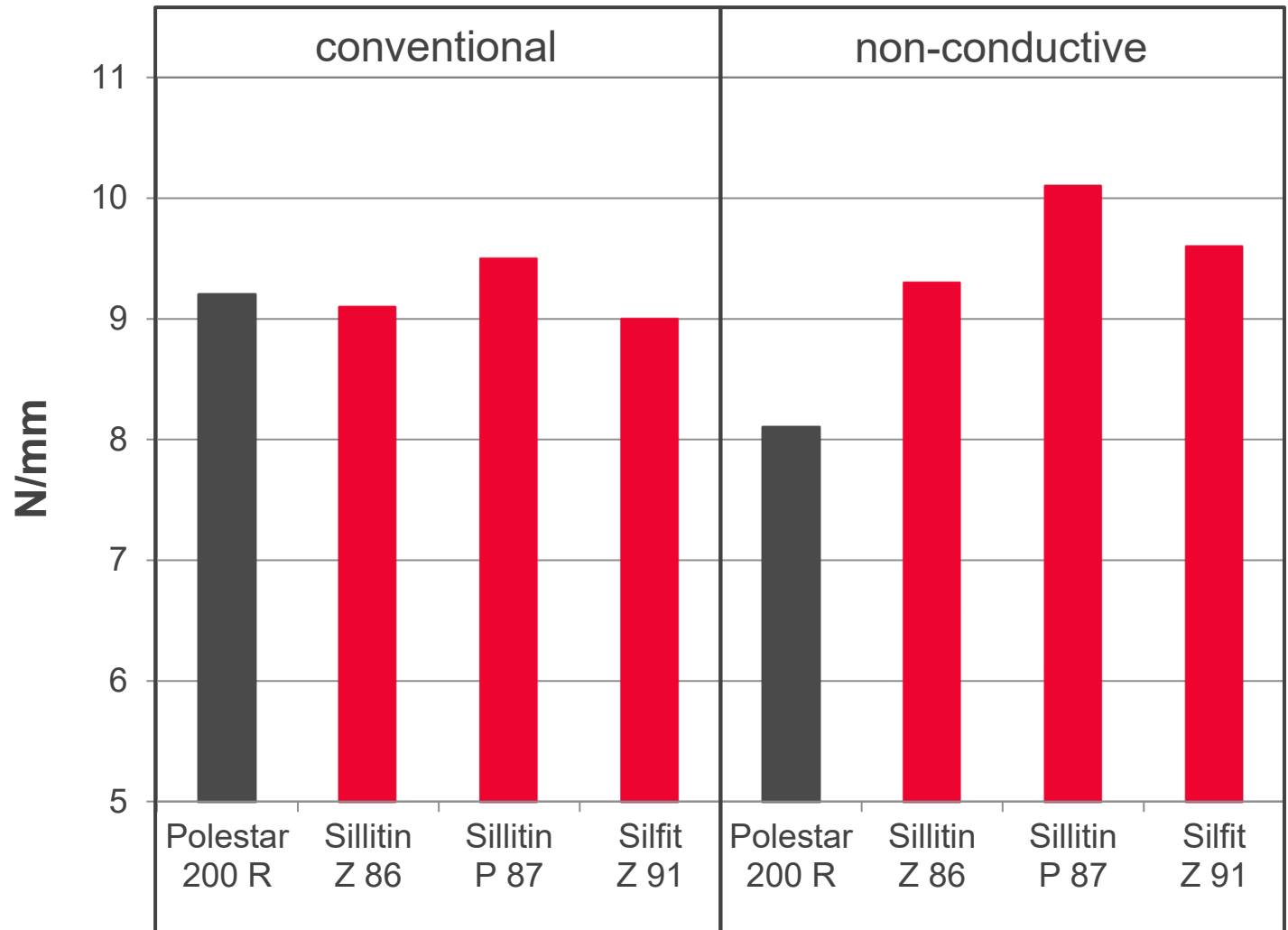
■ 100 % ▨ 300 % □ 500 %

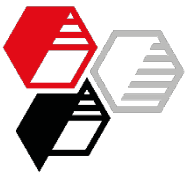




Tear Resistance

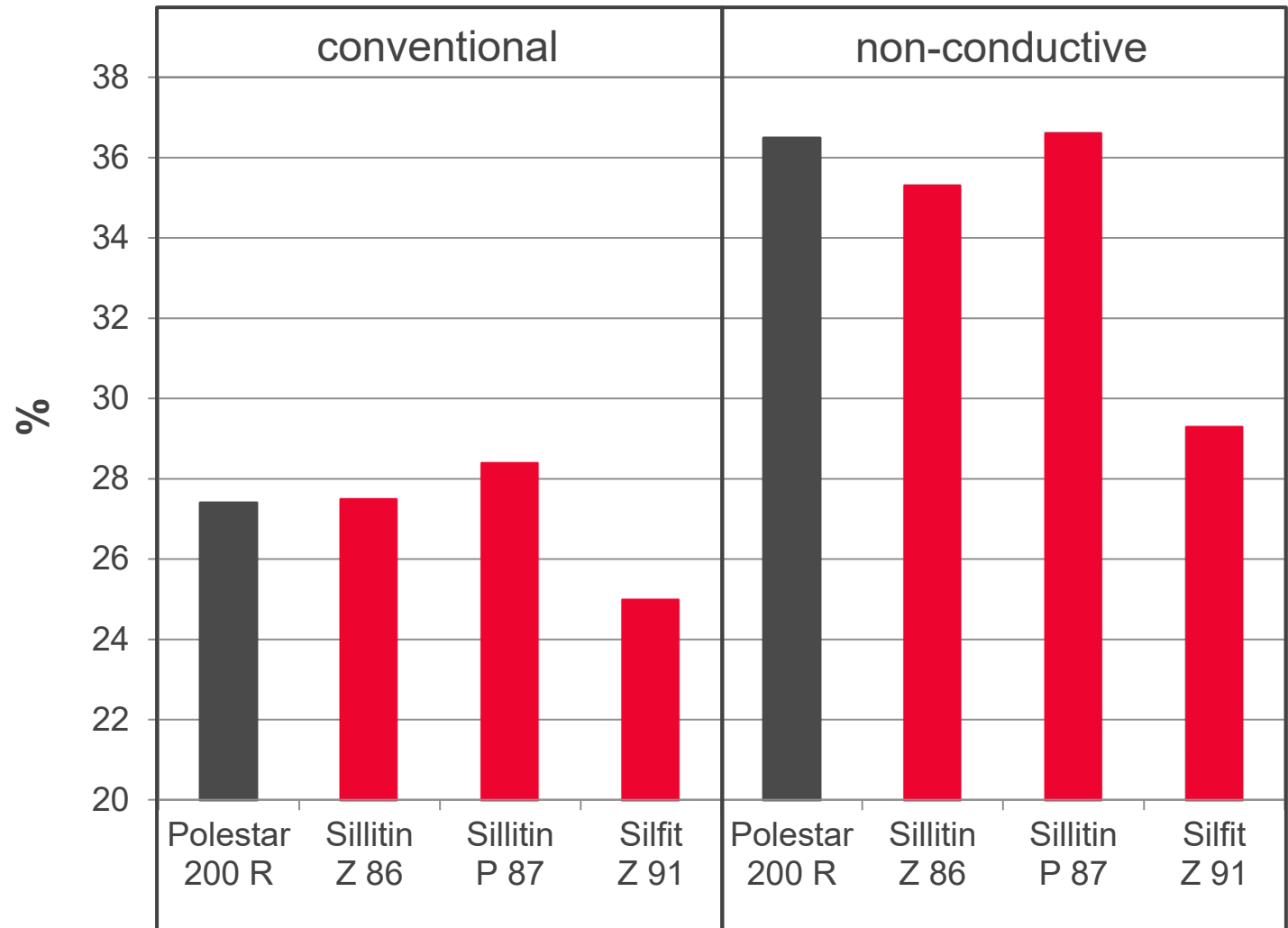
DIN ISO 34-1, trouser specimen

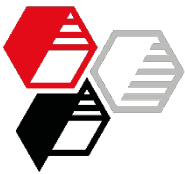




Compression Set

DIN ISO 815-1 B, cooling method A, 24 h / 100°C, 25 % deflection

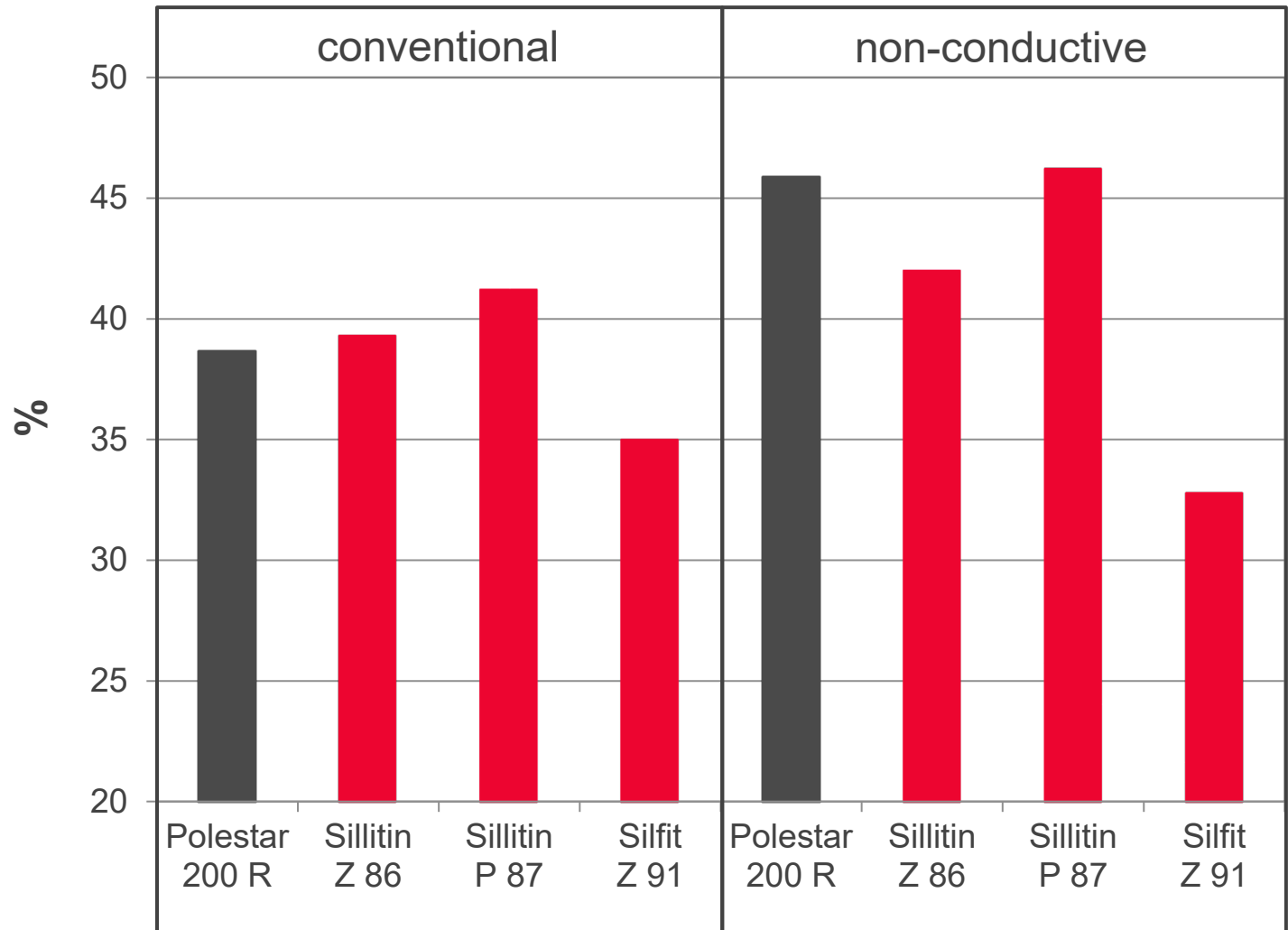


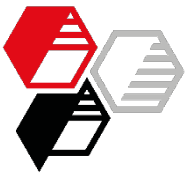


Compression Set

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VW PV 3307, 100 h / 70°C, 50 % defl., cooling 3 h, relaxation 5 s

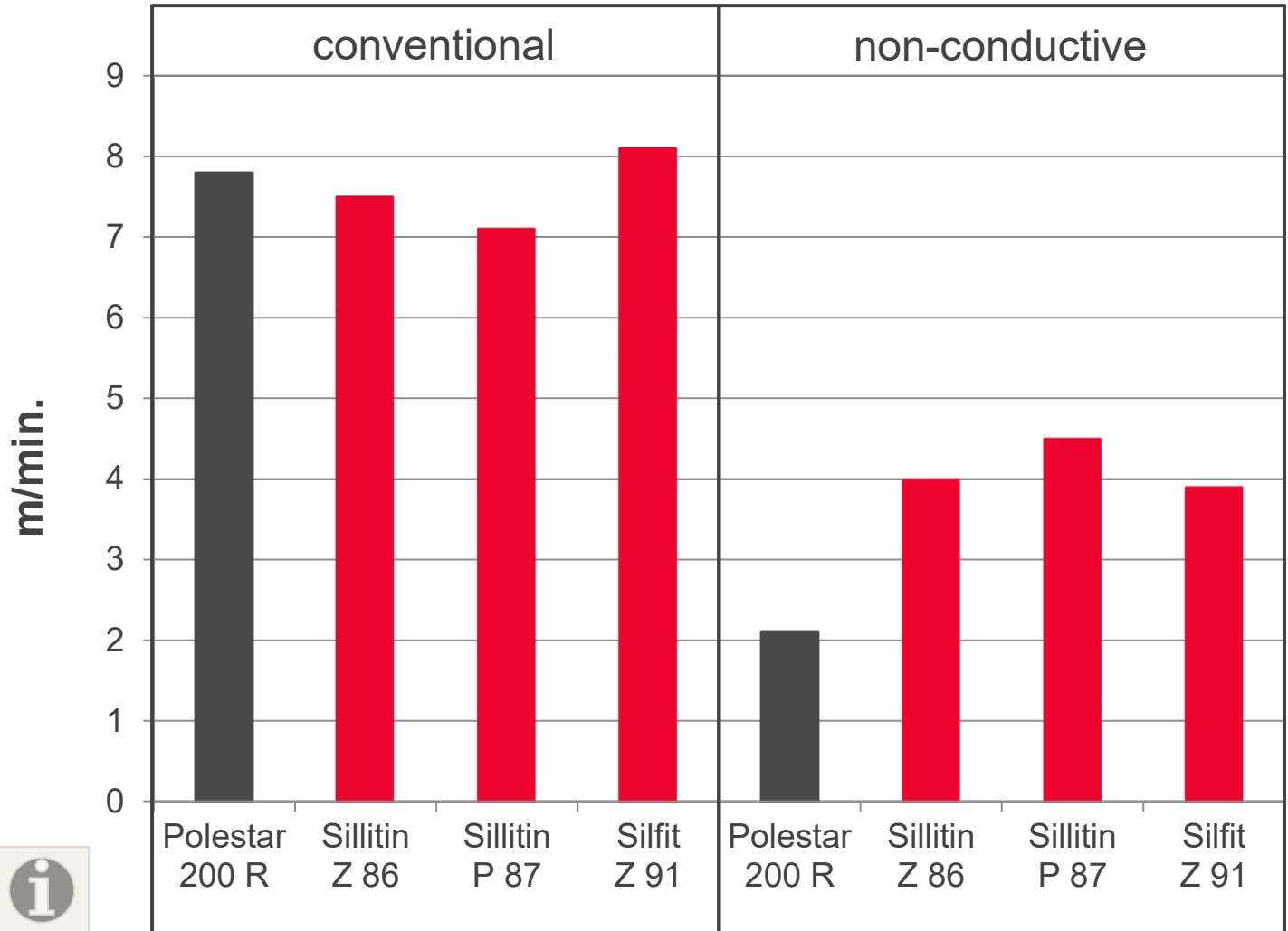


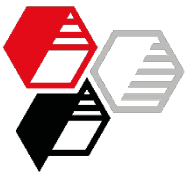


Garvey Extrusion Haul-off Speed

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ASTM D 2230, rating 4 4 4 4





Deposits in the Extrusion Process

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INTRODUCTION

EXPERIMENTAL

RESULTS

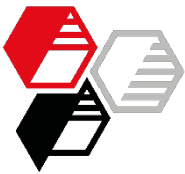
SUMMARY

Mould fouling or die plating caused by fillers can be observed in extrusion processes as well as in flow channels and at the die orifice of extruders.

Among other parameters, the choice of the right filler plays a major role.

This is shown in the following on the basis of a special test formulation.

The test set-up with a measuring device applied on the extruder was used to detect the affinity to cause deposits respectively the tendency of causing die plating.



Measuring Device

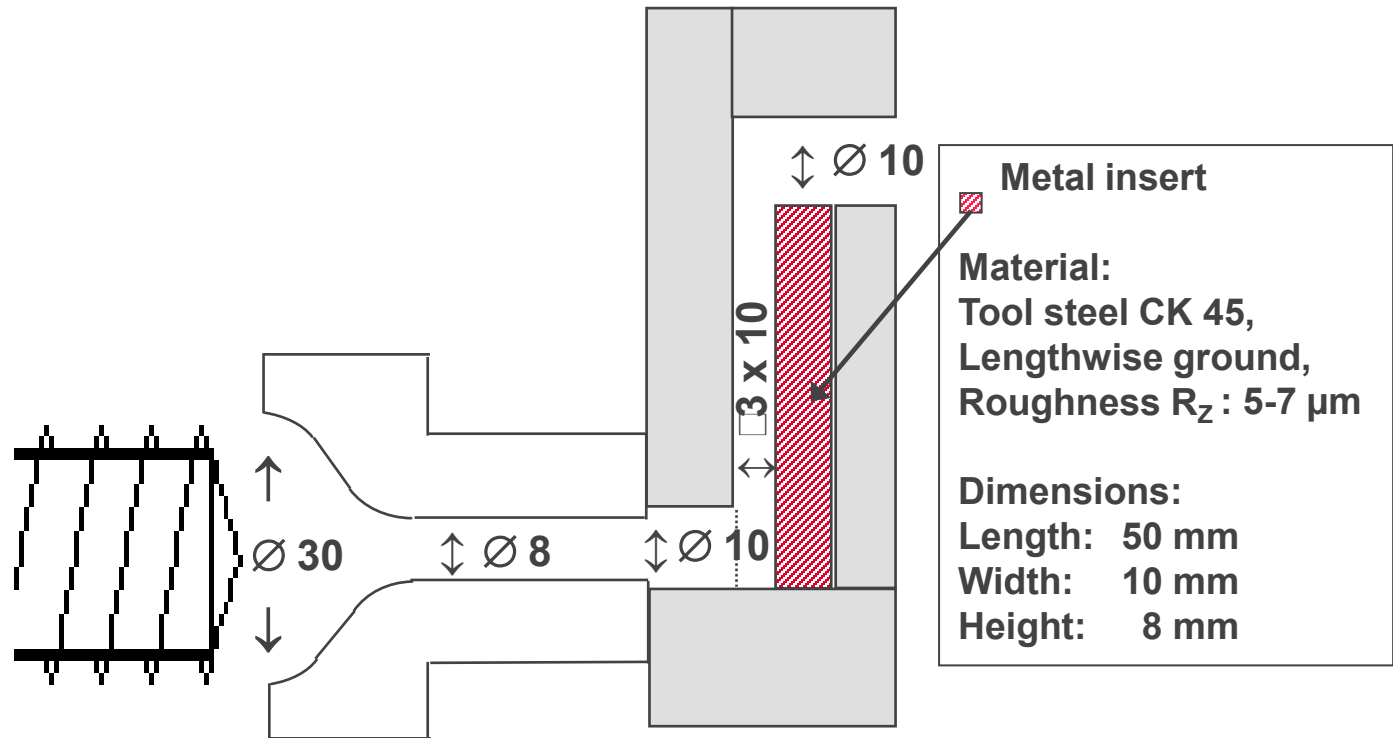
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INTRODUCTION

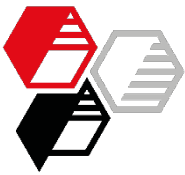
EXPERIMENTAL

RESULTS

SUMMARY



all dimensions in mm



Experimental Parameters

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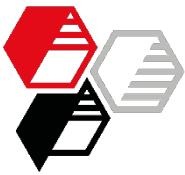
INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

Extruder		Schwabenthan Polytest 30 R
Screw diameter	mm	30
Process length	mm	450
Temperature set point head / zone 1 / zone 2	°C	60 / 60 / 60
Cooling (zone 1 and 2)		¼ turn open
Screw speed	rpm	100
Measuring channel l x w x h	mm	50 x 10 x 3
Metal insert material		Tool steel CK 45, lengthwise ground
Metal insert roughness R_z (across the flow direction)	µm	5-7
Feed strips	mm	30 x 6



Base Formulation Die Plating

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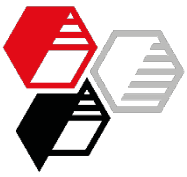
INTRODUCTION

EXPERIMENTAL

RESULTS

SUMMARY

	$\triangle$ conventional		$\triangle$ non-conductive	
Vistalon 8600	100	100	100	100
Sunpar 2280	75	75	75	75
Corax N 550/30	90	90	60	60
Sillitin Z 86	50		110	
Silfit Z 91		50		110



Deposits on the Metal Insert

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INTRODUCTION

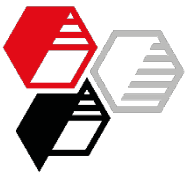
EXPERIMENTAL

RESULTS

• Plating

SUMMARY

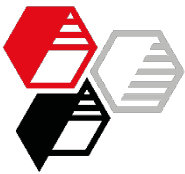
	≡ conventional		≡ non-conductive	
	Sillitin Z 86	Silfit Z 91	Sillitin Z 86	Silfit Z 91
				
extruded amount [kg]	5	5	5	5
throughput [g/min.]	546	570	616	600



Conclusion

The calcined **Silfit Z 91** shows the following positive effects:

- quick cure
- general properties within Sillitin Z 86 and Sillitin P 87
- general properties comparable to calcined clay in conventional car body seals with slightly improved compression set
- higher tensile strength, higher tear resistance and much better compression set than calcined clay in non-conductive car body seals
- extrusion properties within Sillitin Z 86 and Sillitin P 87
- higher extrusion output than with calcined clay in non-conductive car body seals
- prevention of filler caused deposits in the orifice die (plating) during extrusion



We supply material for good ideas!

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