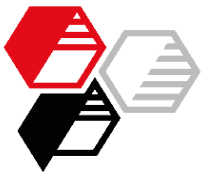




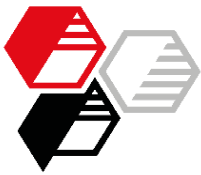
Antivibration mount NR

Author: Karin Müller



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- Experimental
- Results
 - Rheological properties
 - Mechanical properties
 - Hot air aging
 - Volume resistivity
 - Dynamic properties
 - Compound raw material cost indices
- Summary



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- Natural rubber is the polymer for antivibration mounts absolutely without requirements to high temperature stability
- Carbon black filling is usual practice
- Mineral fillers are usually hardly used in this range
- Is it possible to modify the characteristics positively with **Neuburg Siliceous Earth?**

Basic compound hardness range approx. 50 Shore A

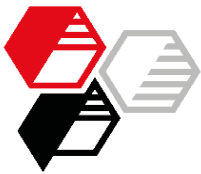


Fillers Selected

Characteristics

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	Particle size		Oil absorption [g/100g]	Specitic Surface area BET [m²/g]	Functionali- zation
	[µm]				
	d ₅₀	d ₉₇			
Sillitin Z 86	1.9	8	55	11	none
Aktisil MM	2.2	10	45	7	Mercapto
Aktisil PF 216	2.2	10	50	8	Tetrasulfane



Base Formulation

NR – 50 Shore A

CONTENT

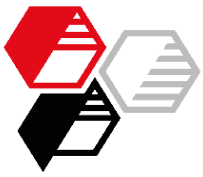
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	phr	
NR SMR 20	100.0	100.0
Stearic acid	1.0	1.0
Zinkoxyd aktiv	3.0	3.0
Sunthene 4240	5.0	5.0
Carbon black N 774	50.0	25.0
Neuburg Siliceous Earth	-	50.0
Vulkanox 4010 NA/LG	1.0	1.0
Vulkanox HS/LG	0.5	0.5
Perkacit TMTD	0.5	0.5
Santocure CBS	3.0	3.0
Sulfur	0.3	0.3
Total	164.3	189.3



Preparation and Curing of the Compound

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- **Preparation of the compound**

Open mill Ø 150 x 300 mm

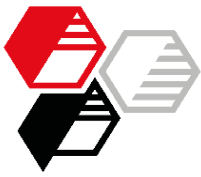
Batch weight: ca. 800 g

Temperature: 50 °C

Mixing cycle: approx. 25 min.

- **Curing**

Press, 170 °C, $t_{90} + 10 \%$ or 5 min.



Mooney Viscosity

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DIN 53 523 Part 3, ML 1+4 120 °C

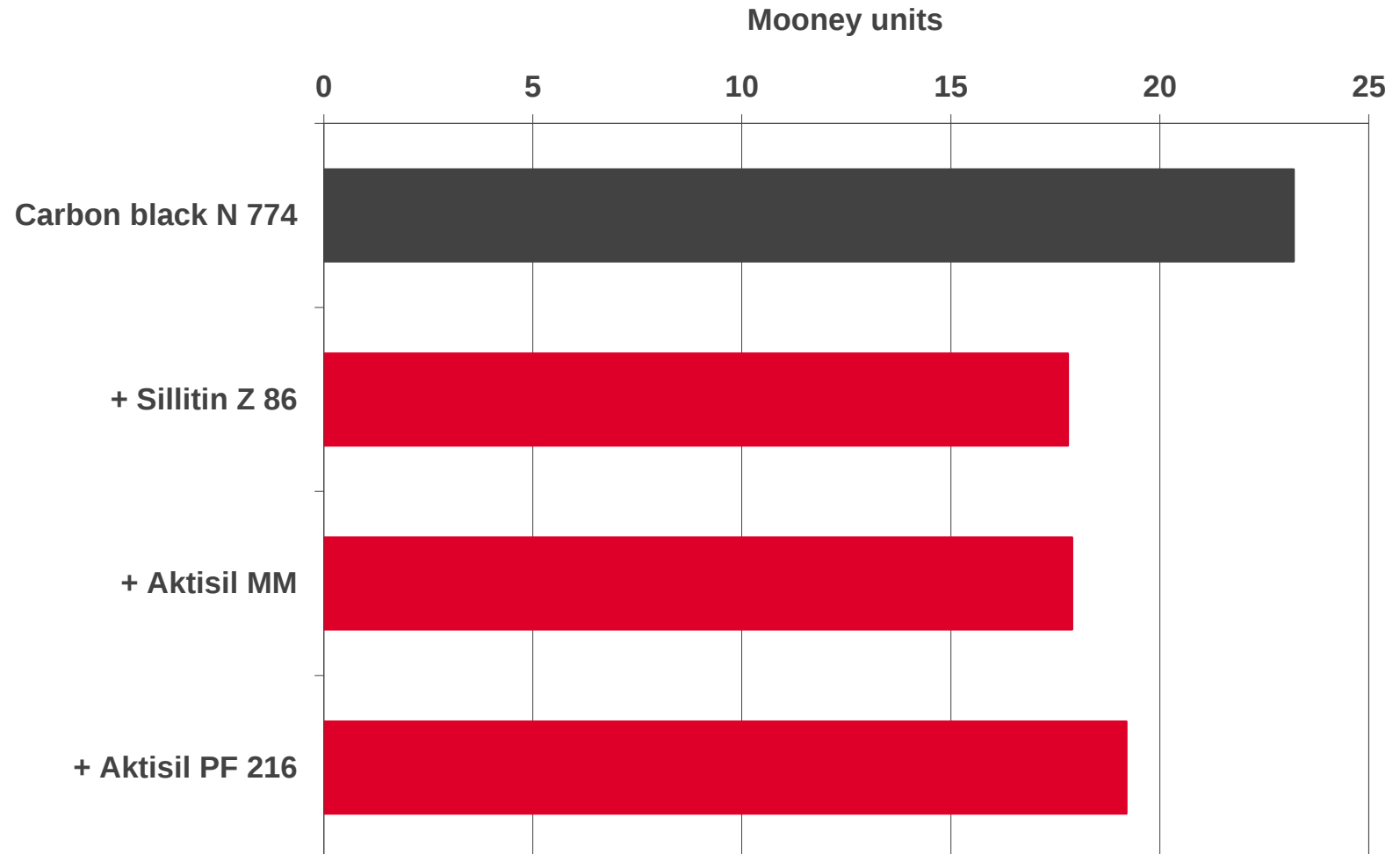
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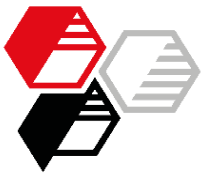
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Mooney Scorch

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DIN 53 523 Part 3, ML +5 120 °C

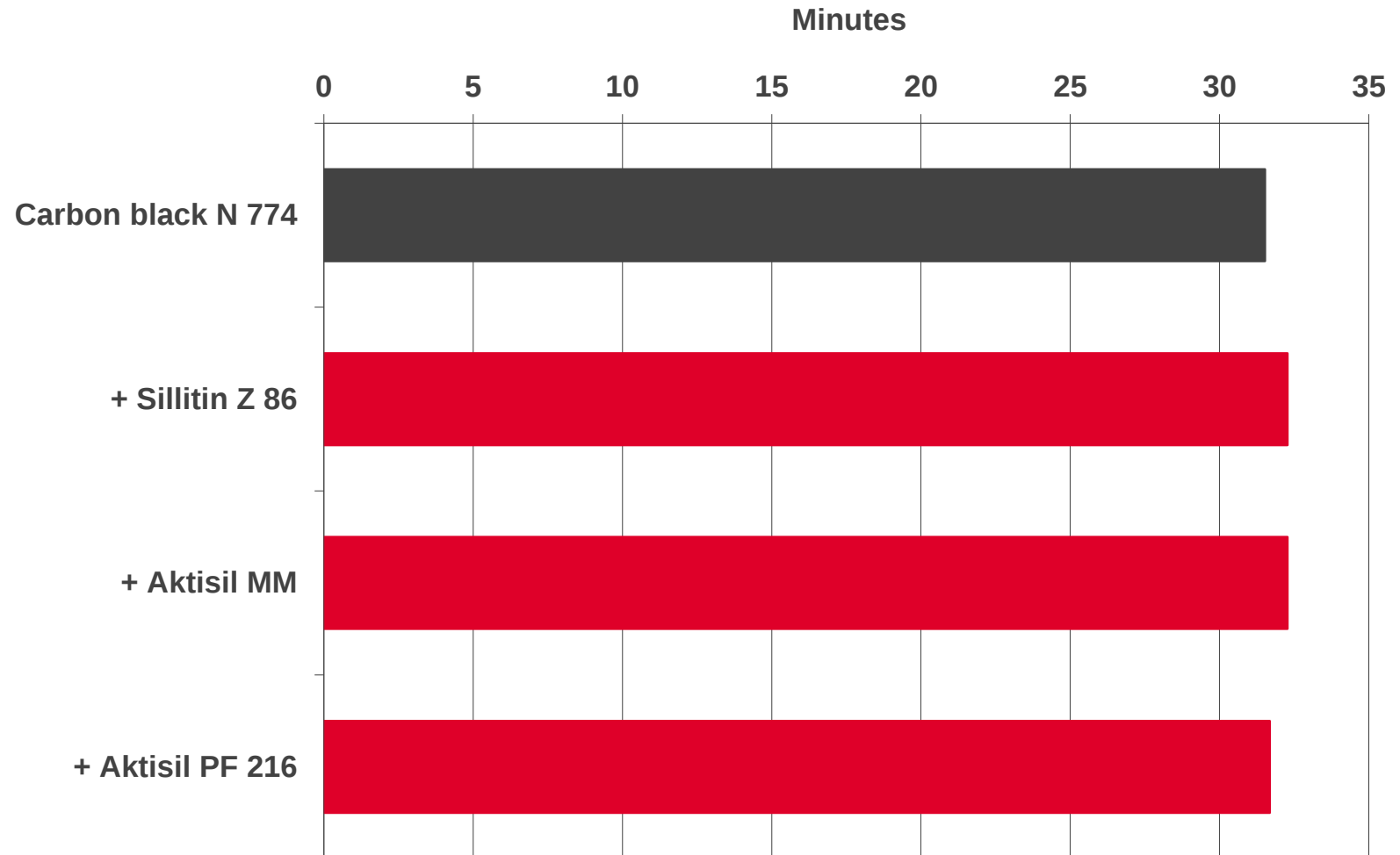
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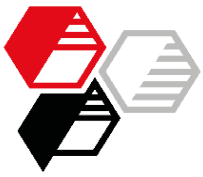
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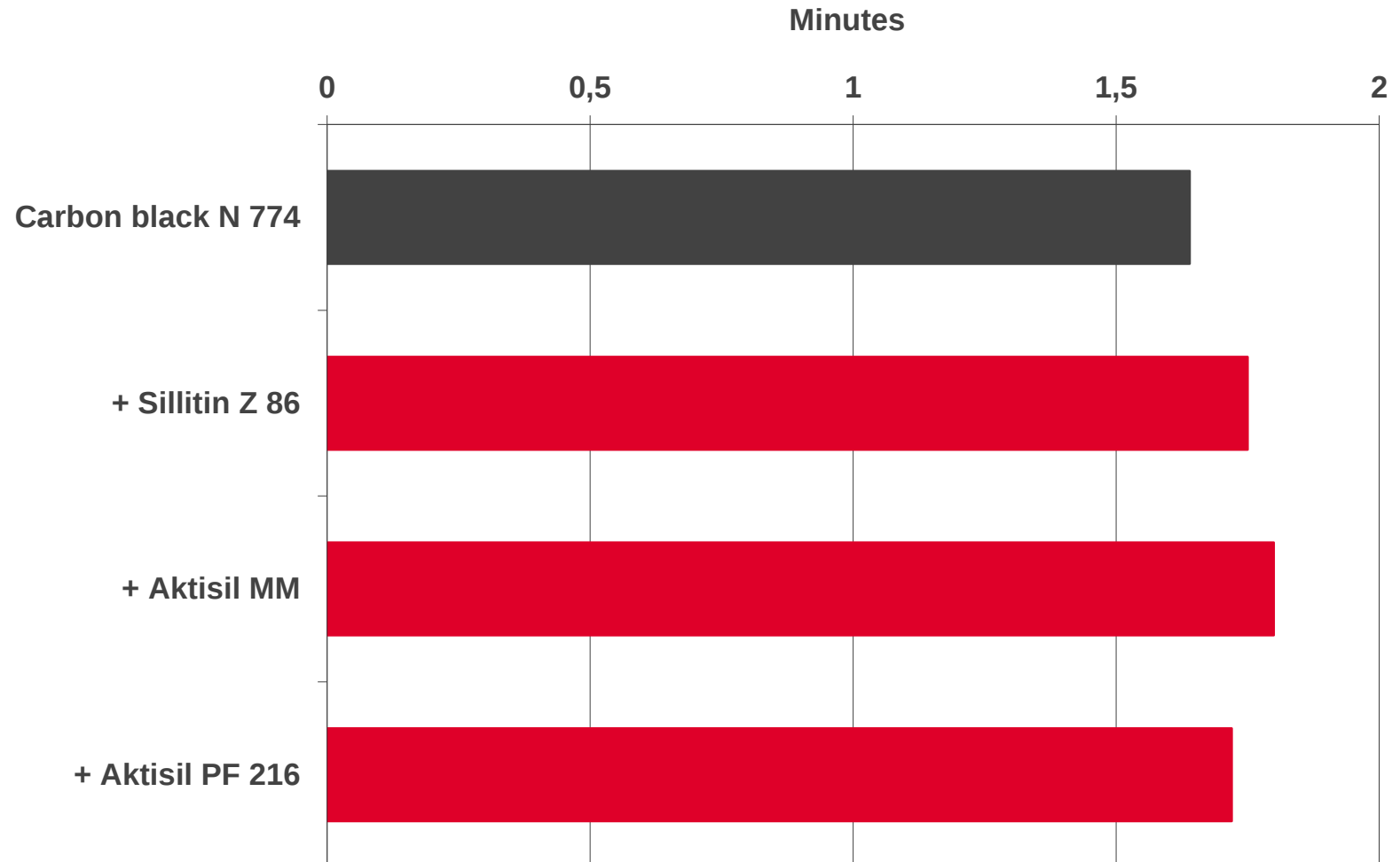


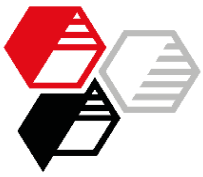
Conversion Time t_5

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DIN 53 529-A3, Göttfert Elastograph, 170 °C

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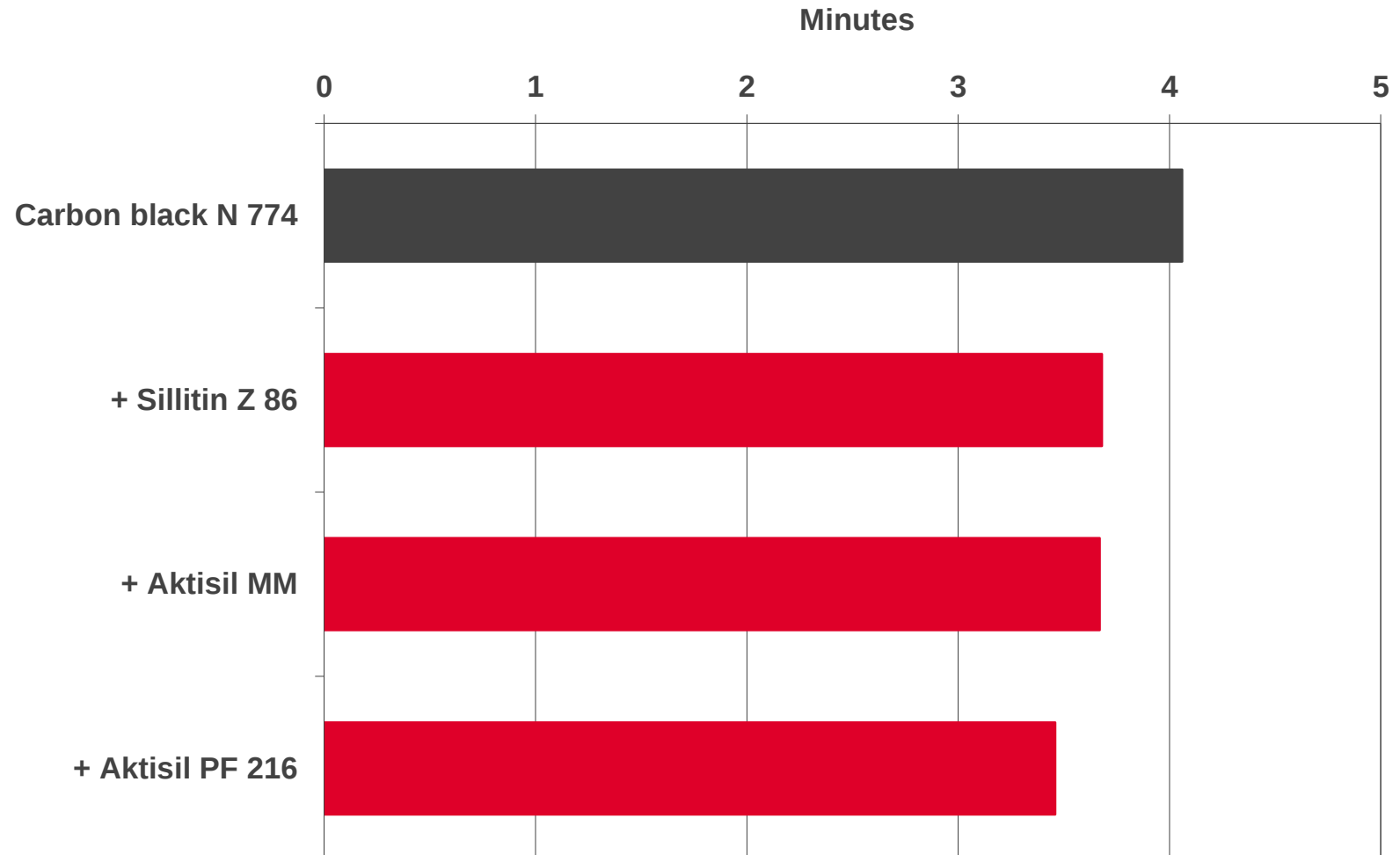


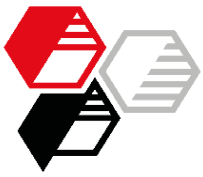
Conversion Time t_{90}

HOFFMANN
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DIN 53 529-A3, Göttfert Elastograph, 170 °C

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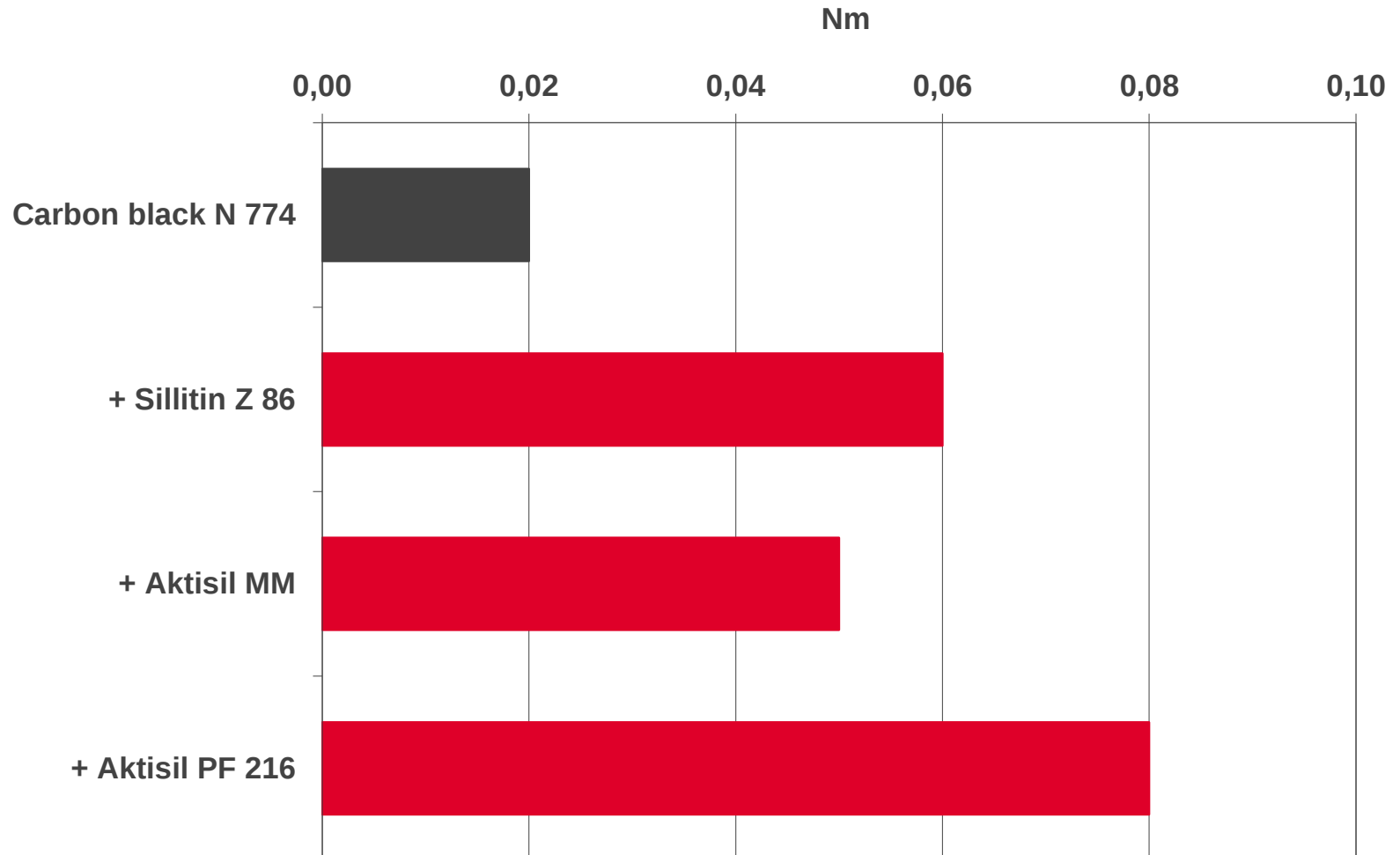


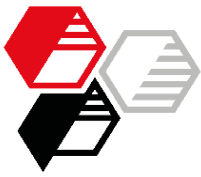
Reversion $M_{\max} - M_{\text{end}}$ after 15 min.

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Göttfert Elastograph, 170 °C

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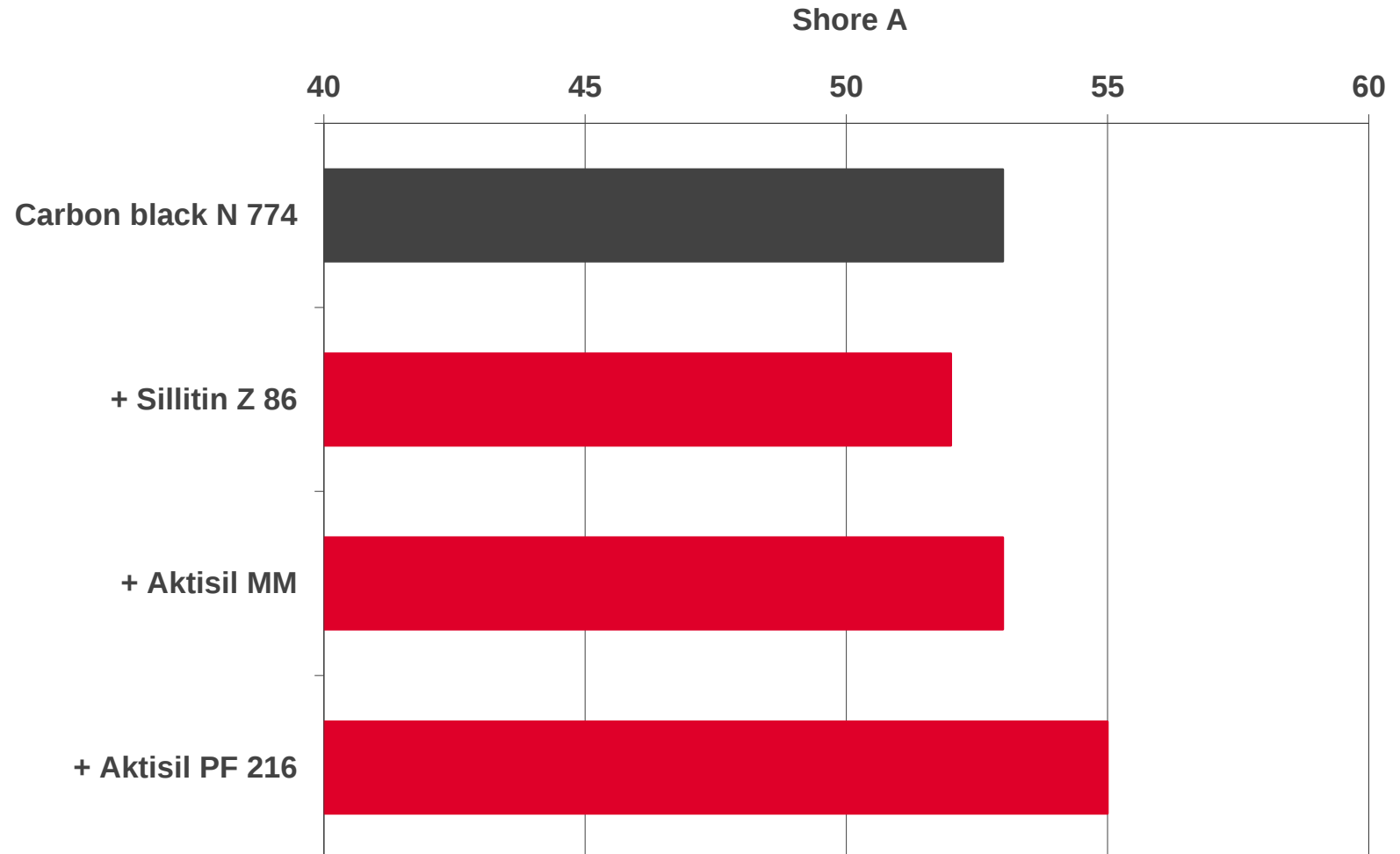


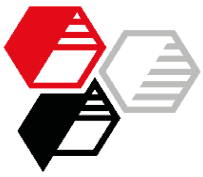


Hardness

DIN 53 505-A, piled S2

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Tensile Strength

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DIN 53 504, S2

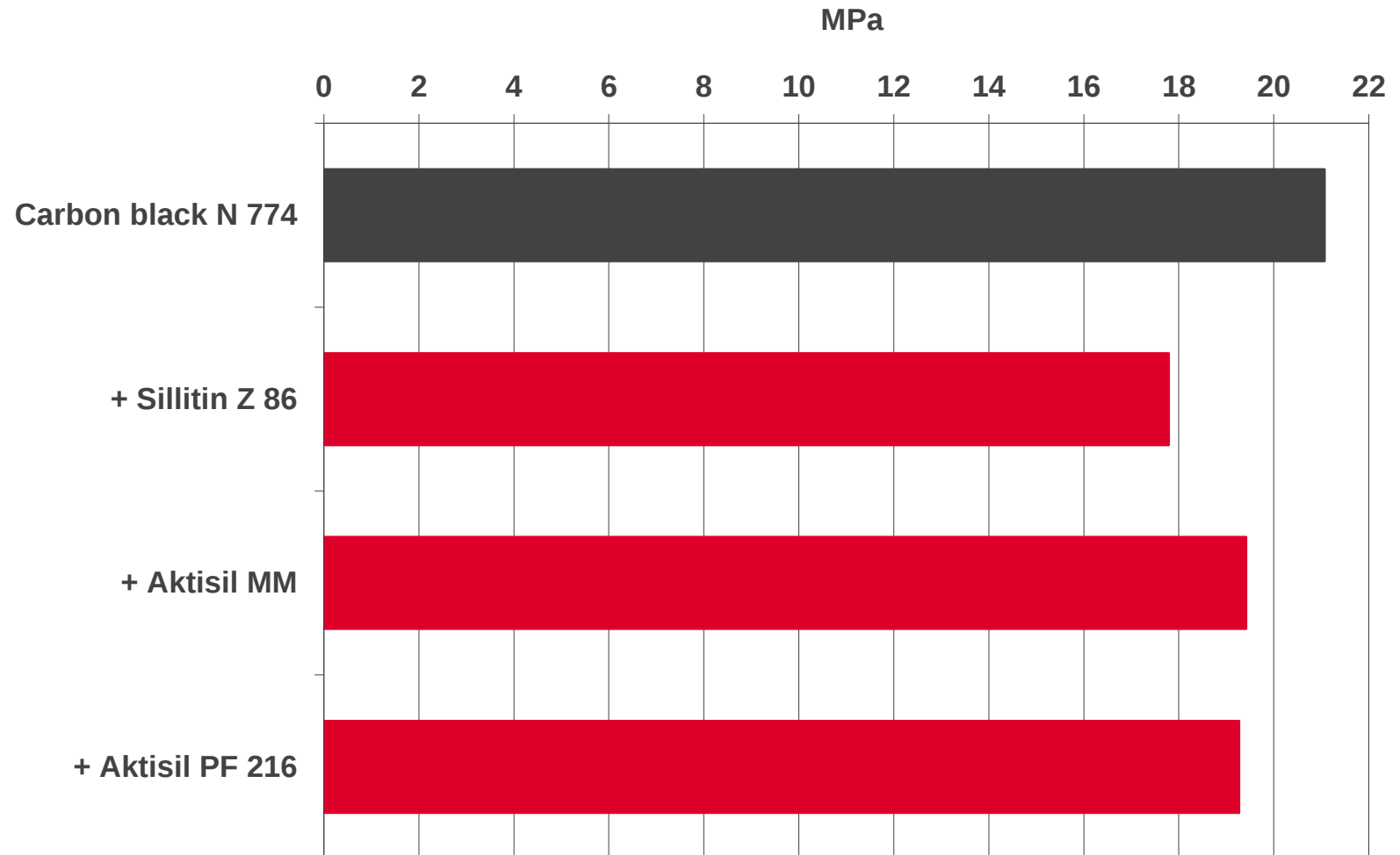
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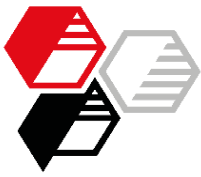
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Elongation at Break

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DIN 53 504, S2

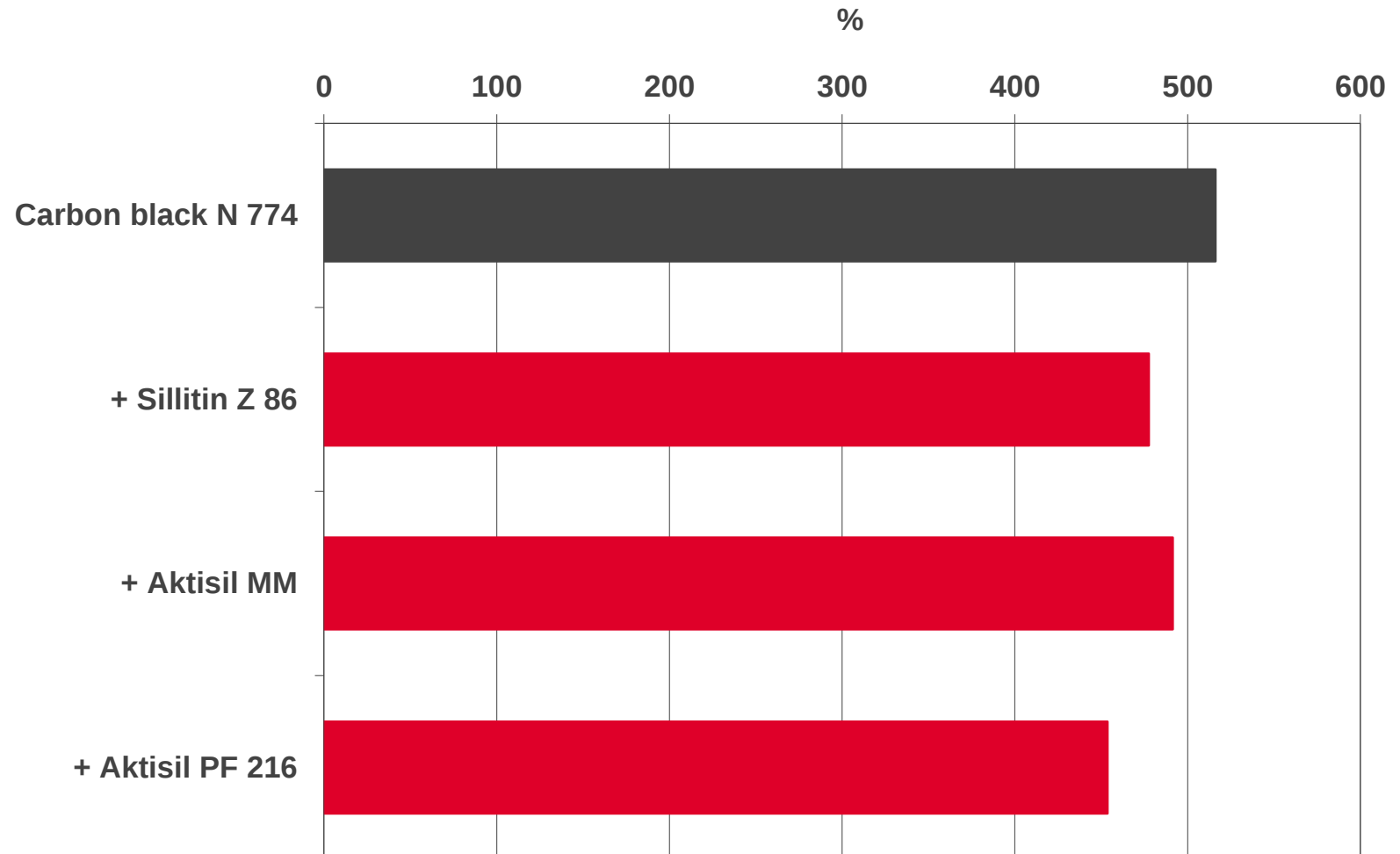
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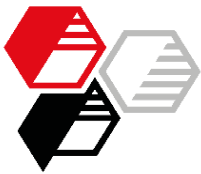
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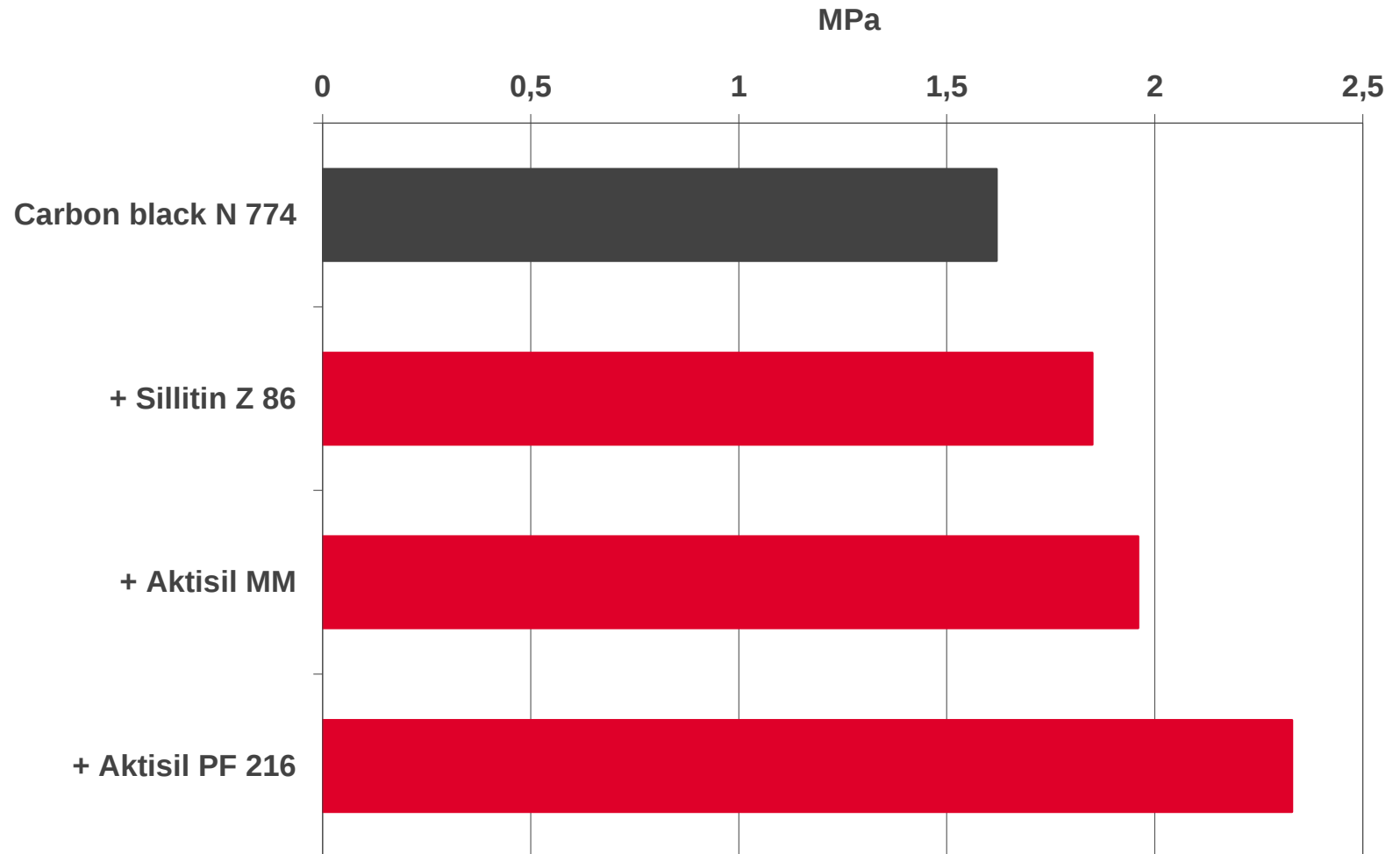


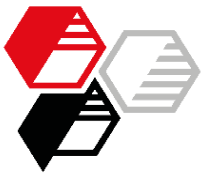


Modulus 100 %

DIN 53 504, S2

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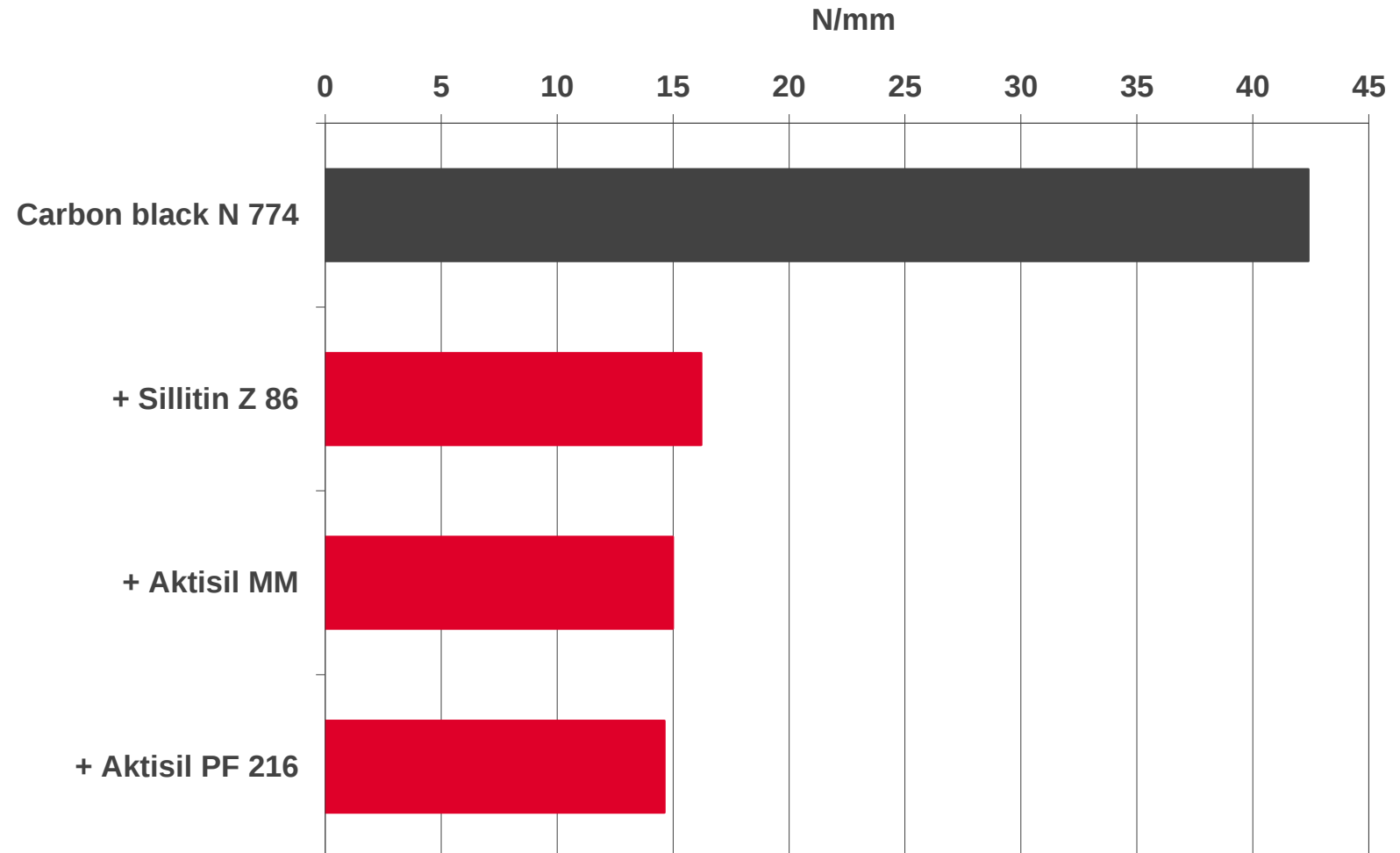


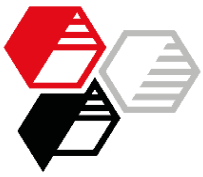
Tear Resistance

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DIN 53 515-A, Graves, 500 mm/min.

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Compression Set

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ISO 815-B, 70 h / 70 °C

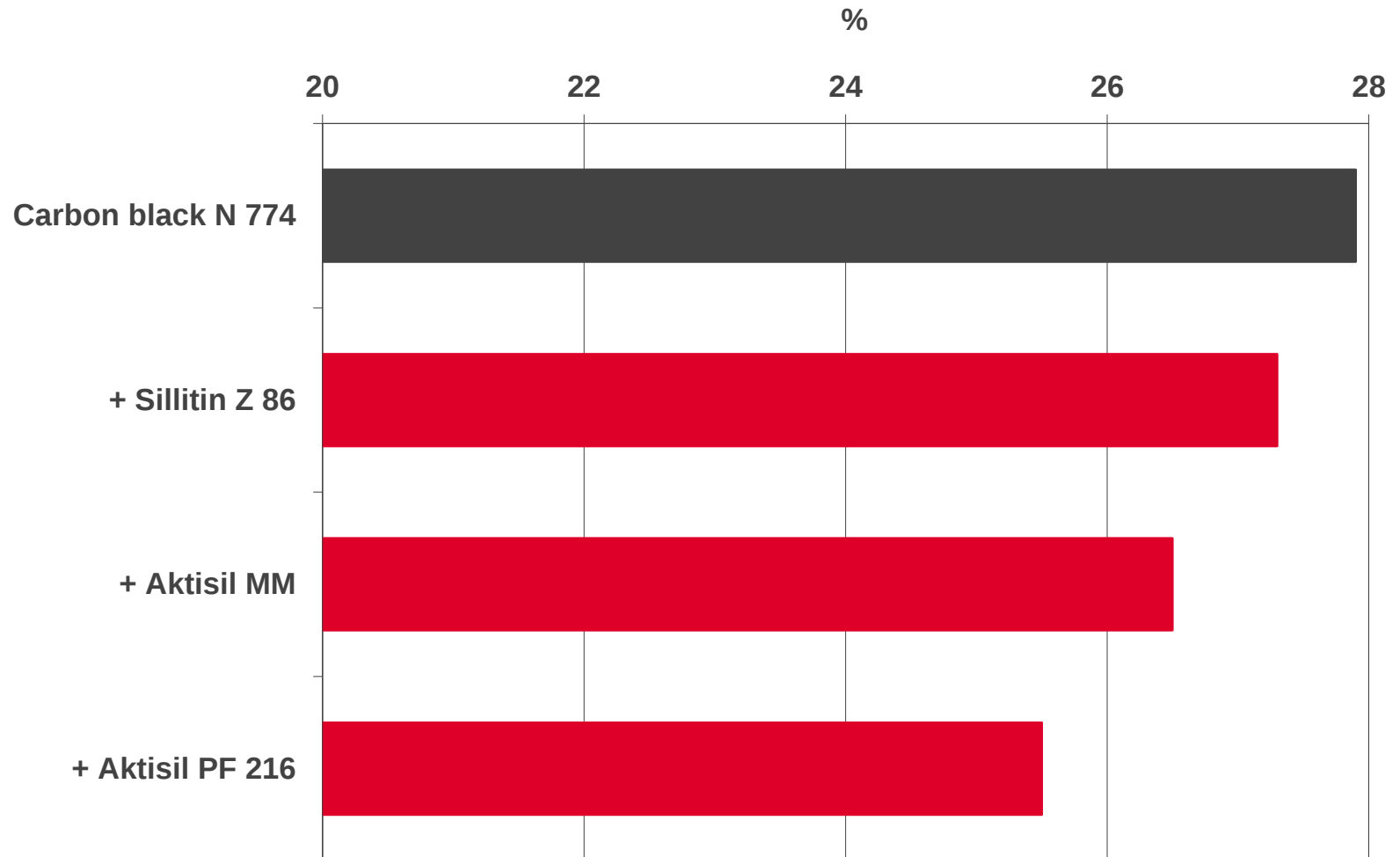
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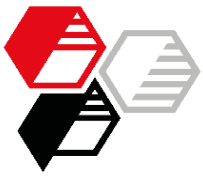
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Compression Set

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ISO 815-B, 70 h / 100 °C

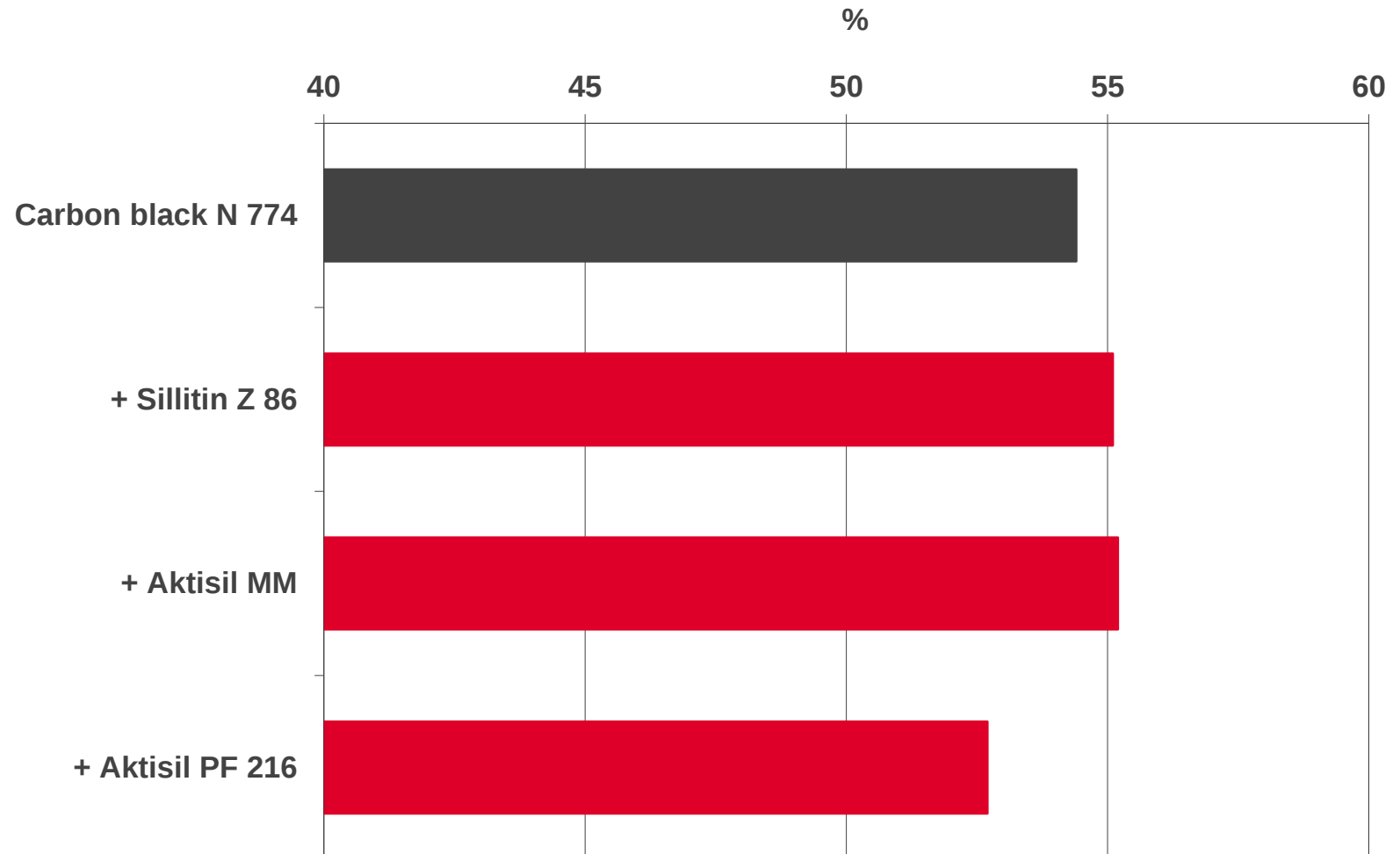
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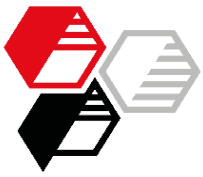
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Hot Air Aging Tensile Strength

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168 h / 70 °C

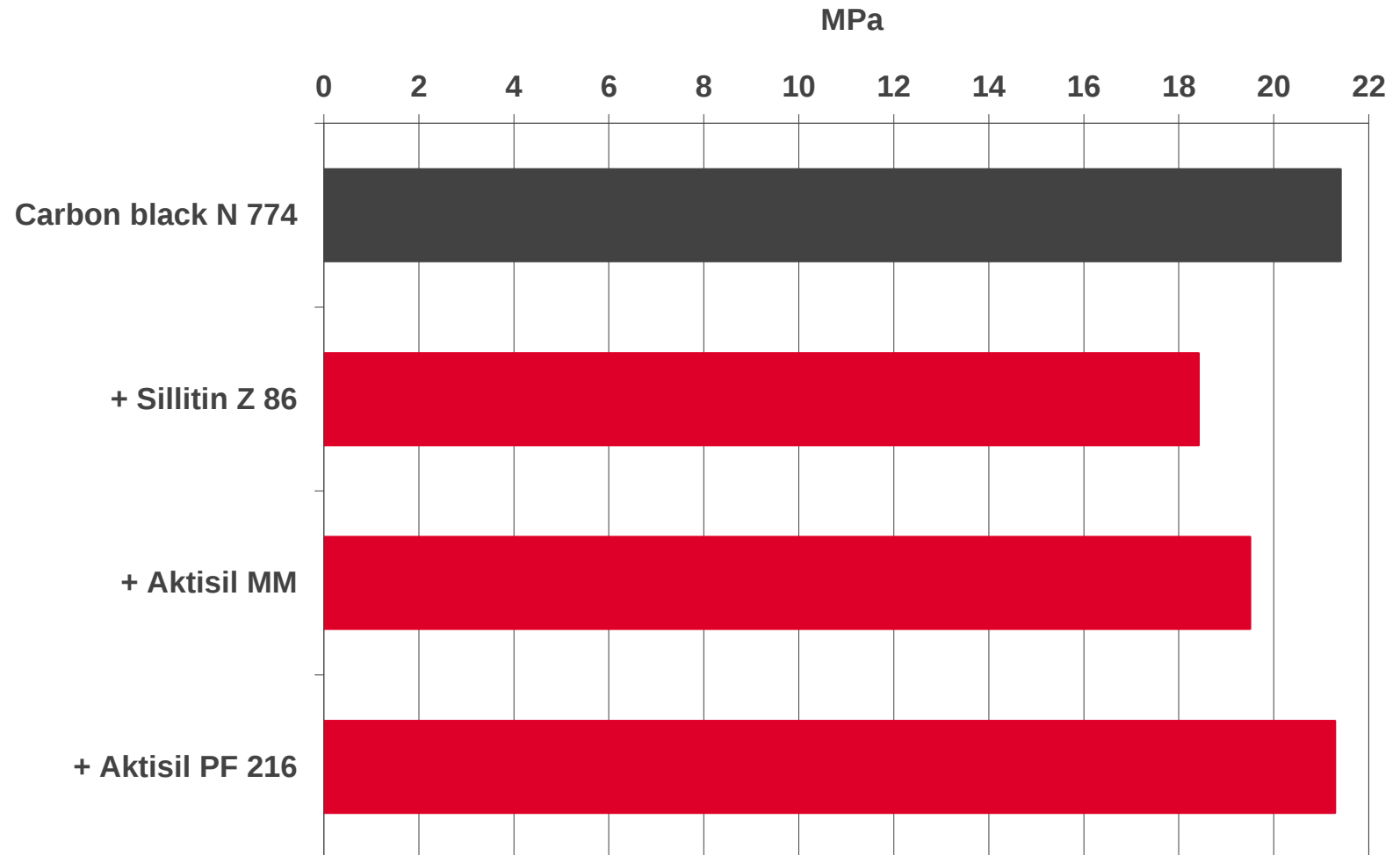
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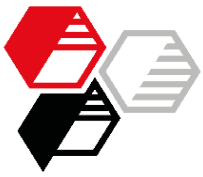
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Hot Air Aging Elongation at Break

HOFFMANN
MINERAL®

168 h / 70 °C

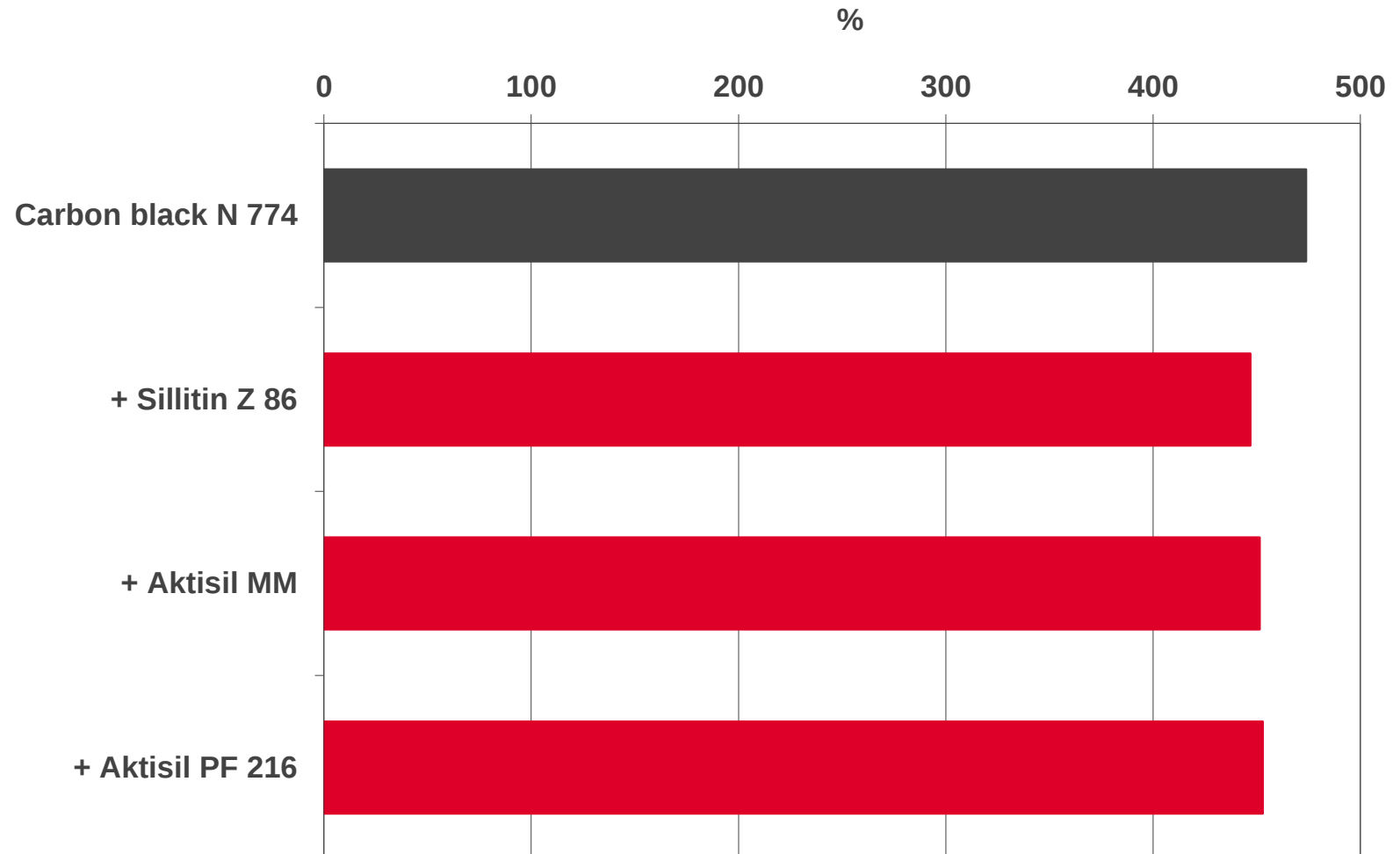
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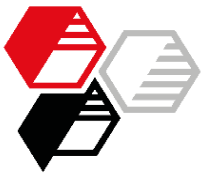
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Hot Air Aging Change of Tensile Strength

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MINERAL®

168 h / 70 °C

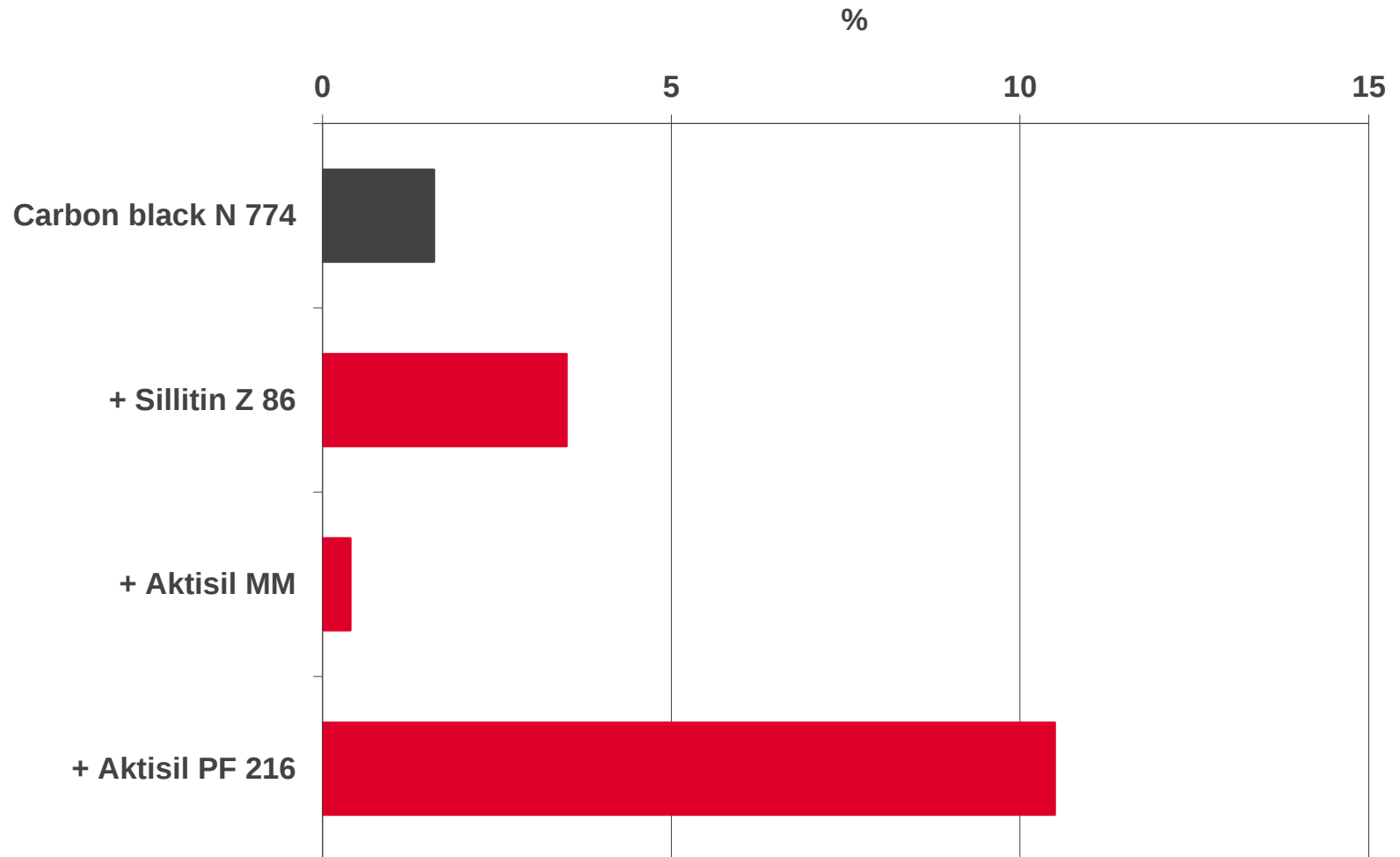
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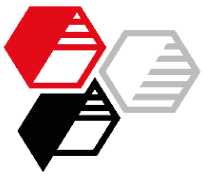
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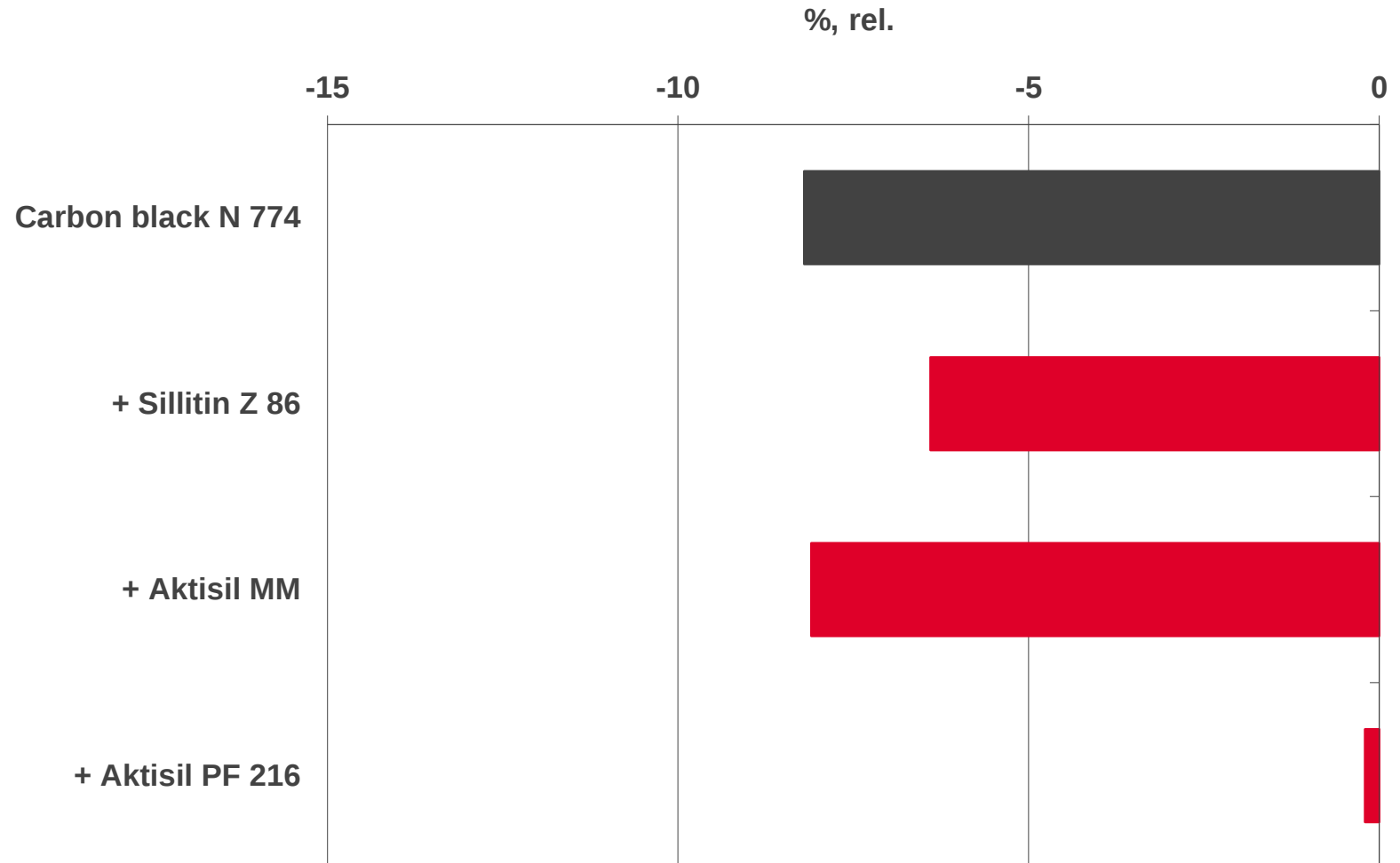


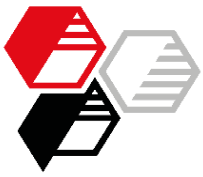
Hot Air Aging Change of Elongation at B.

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168 h / 70 °C

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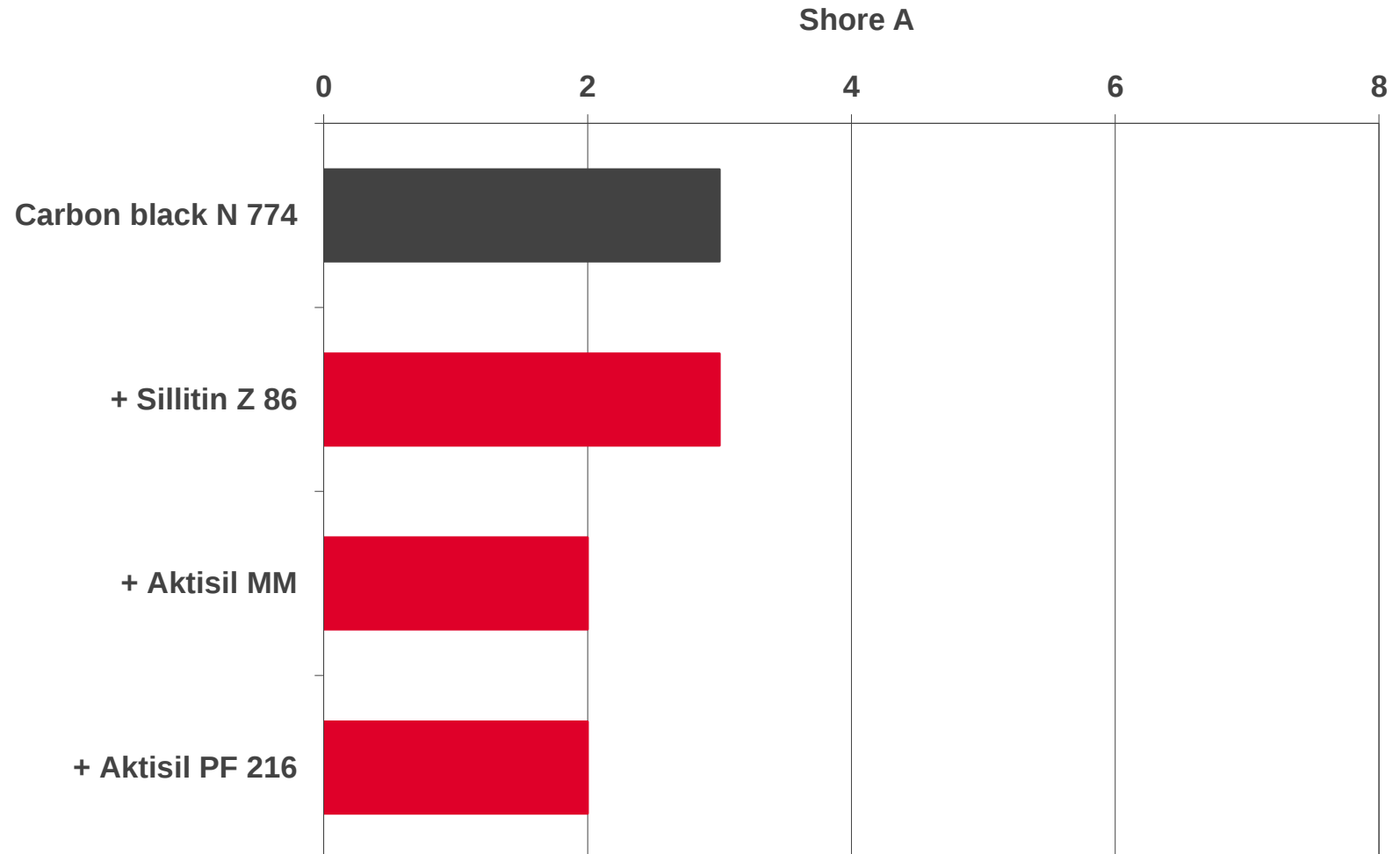


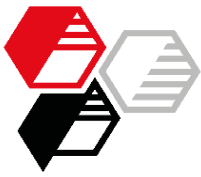
Hot Air Aging Change of Hardness

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168 h / 70 °C

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Volume Resistivity

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DIN IEC 93, 100 V

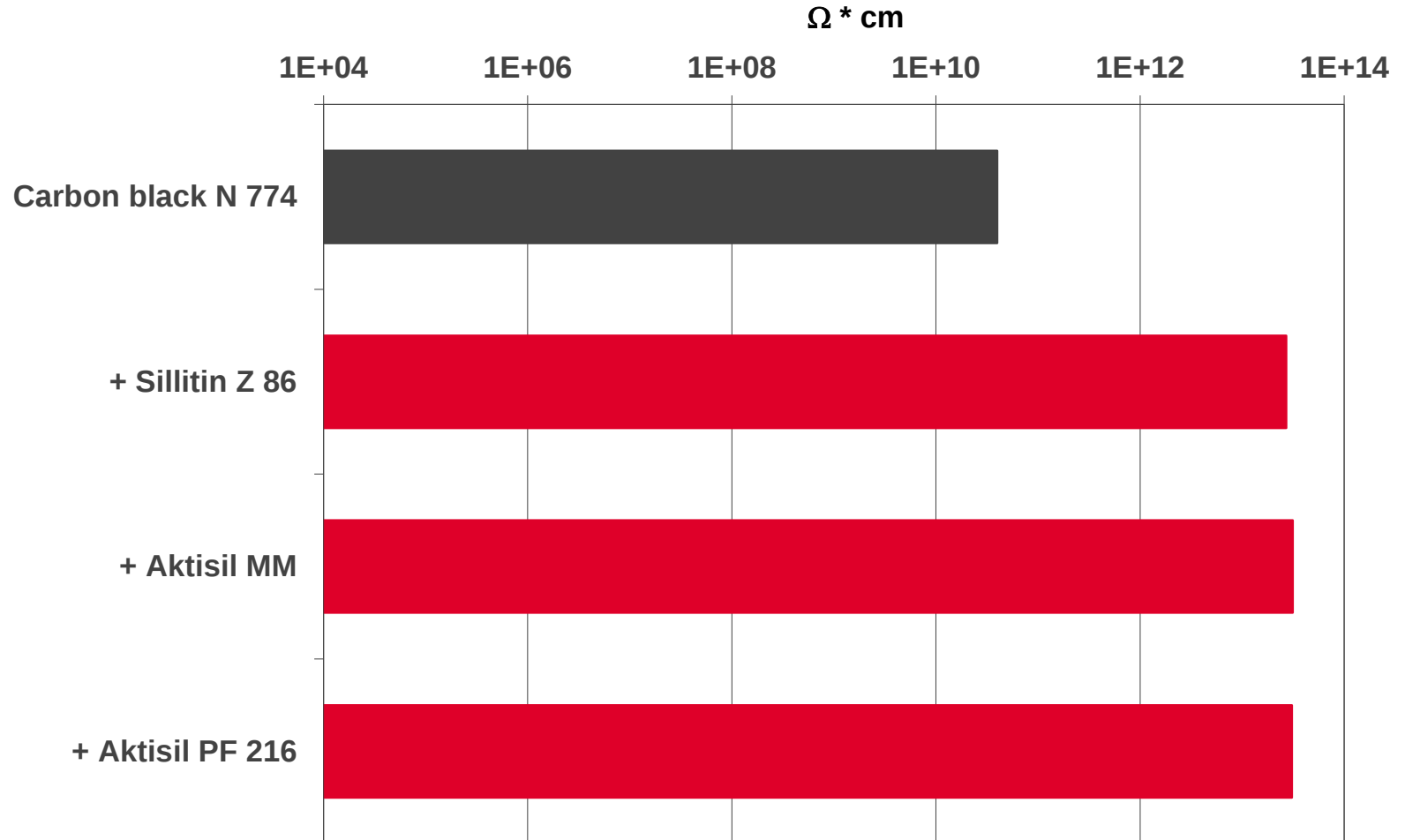
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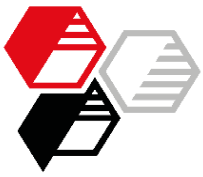
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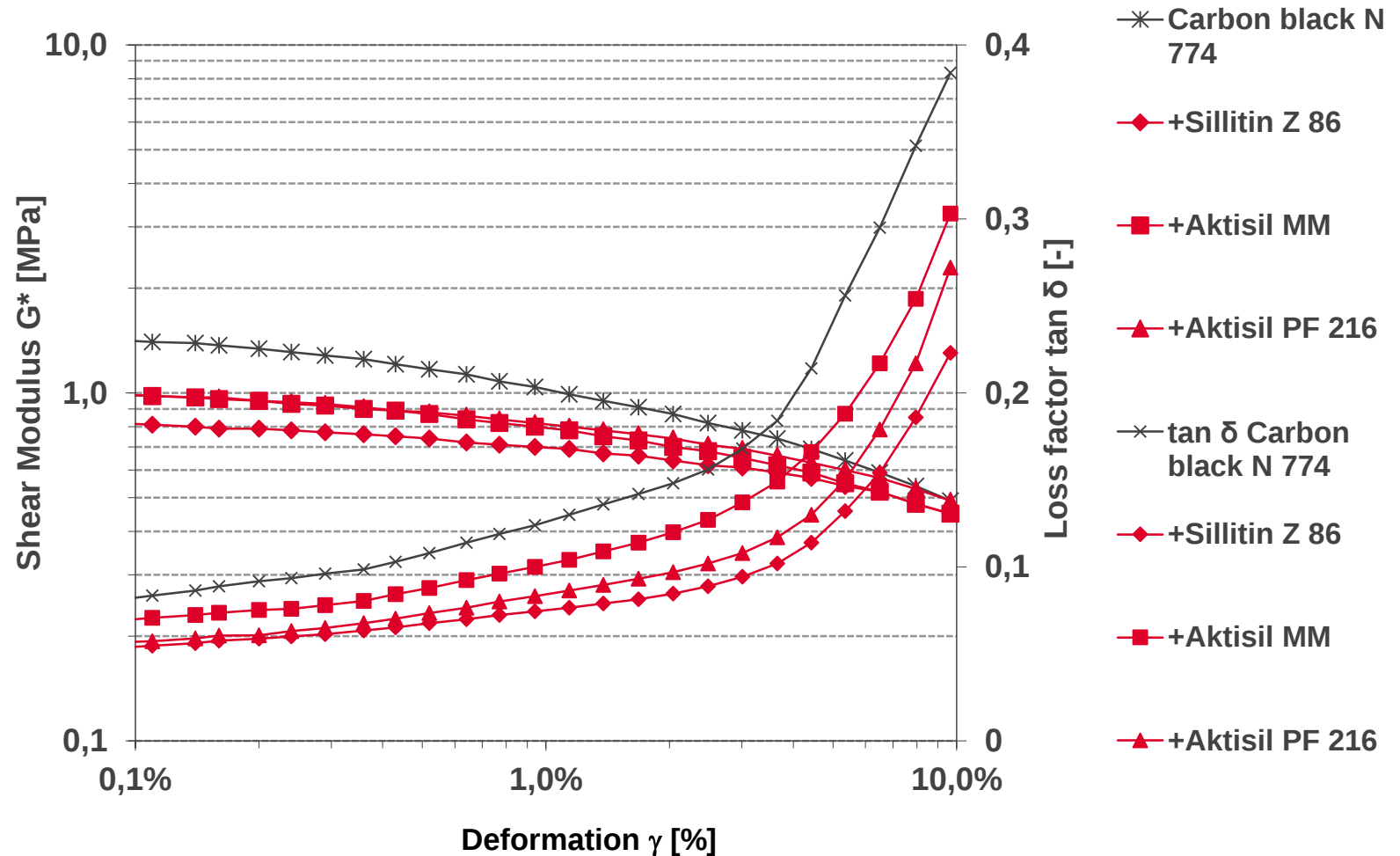


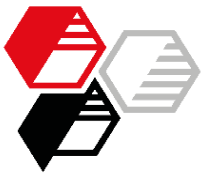


Amplitude Sweep at 23 °C

Plate / Plate – Rheometer, Frequency $\omega = 1/\text{s}$ ($f = 0.16 \text{ Hz}$)

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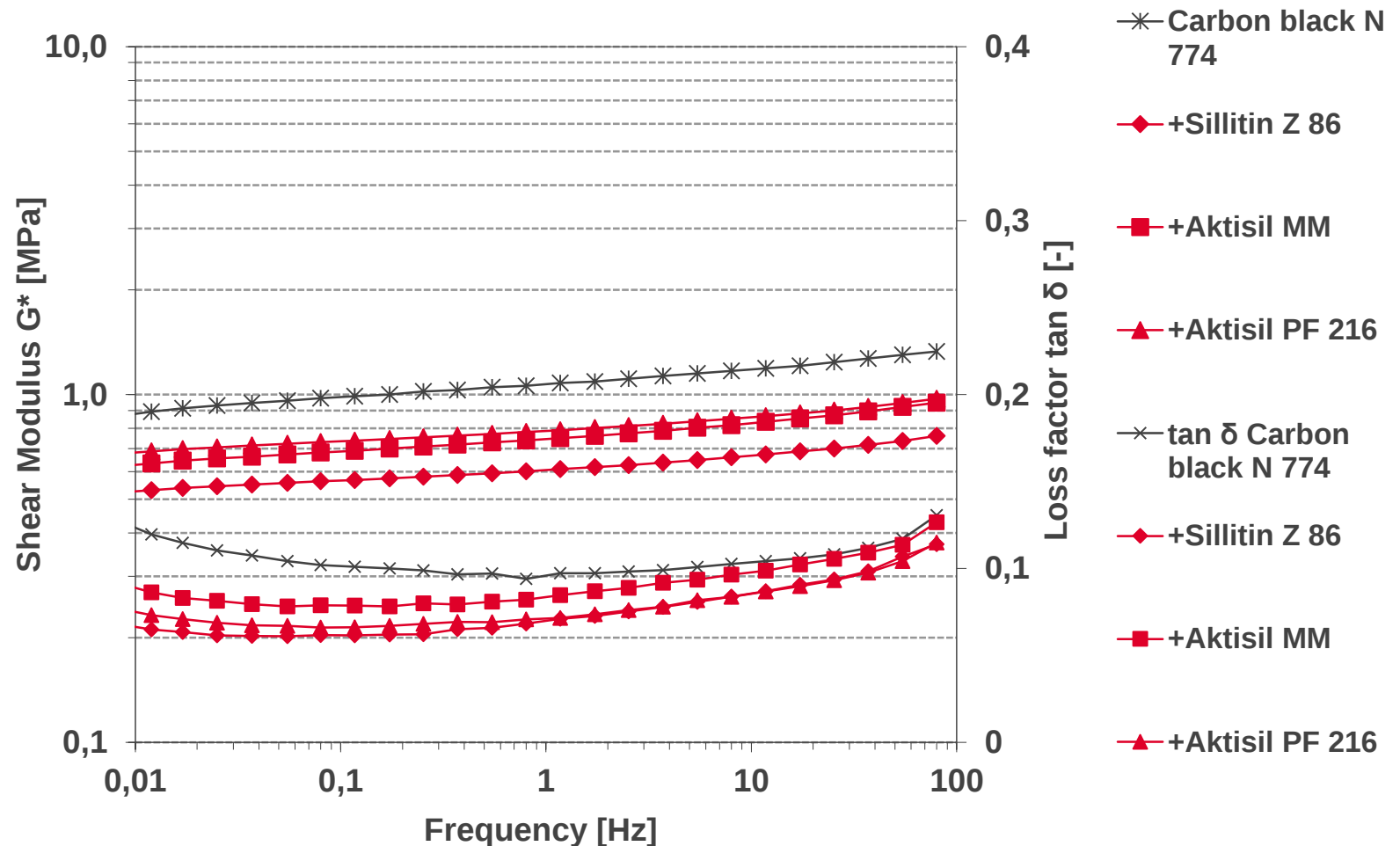


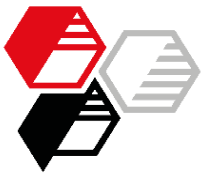


Frequency Sweep at 23 °C

Plate / Plate – Rheometer, Deformation $\gamma = 0,3 \%$

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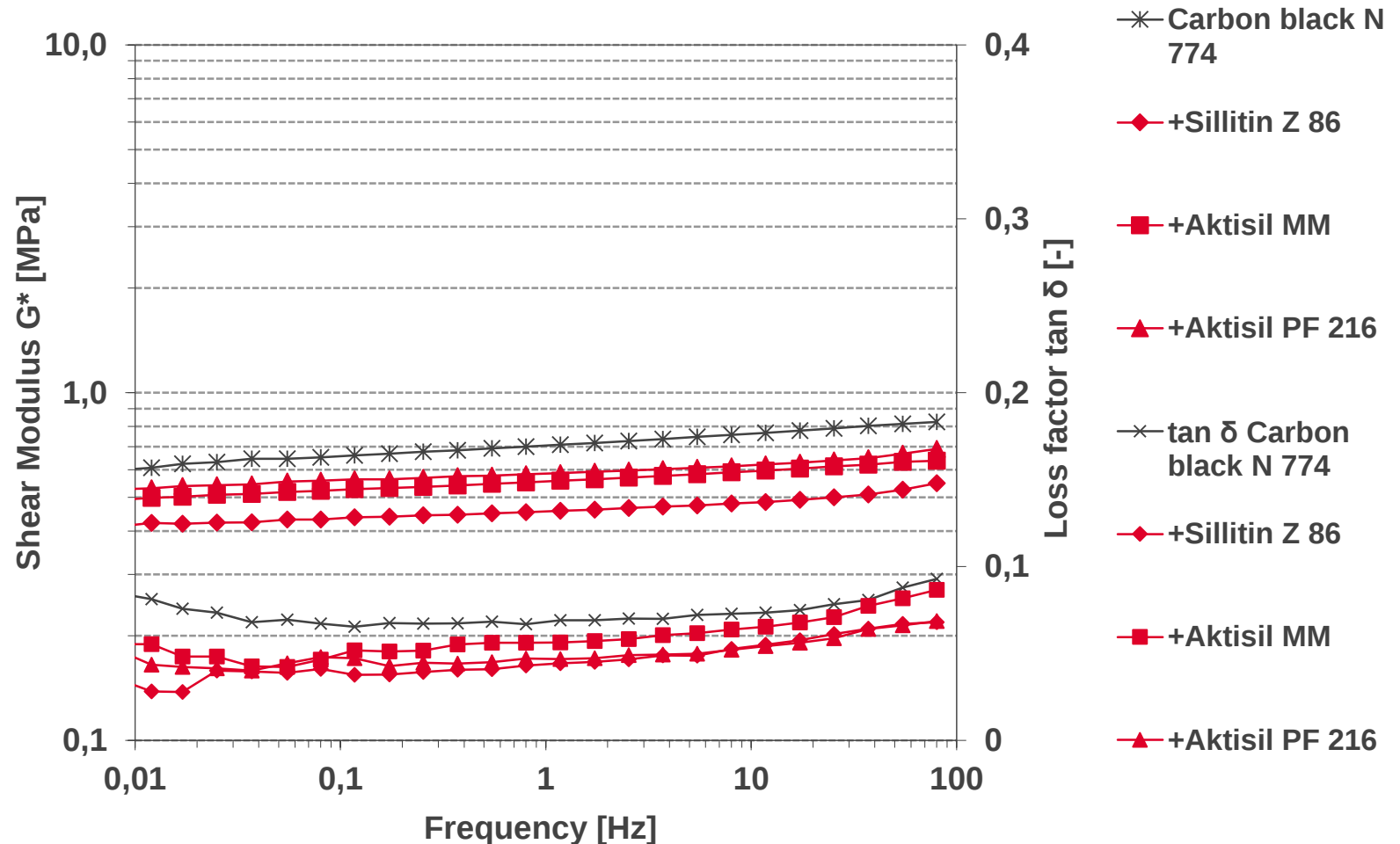


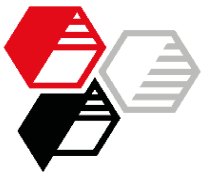


Frequency Sweep at 100 °C

Plate / Plate – Rheometer, Deformation $\gamma = 0,3 \%$

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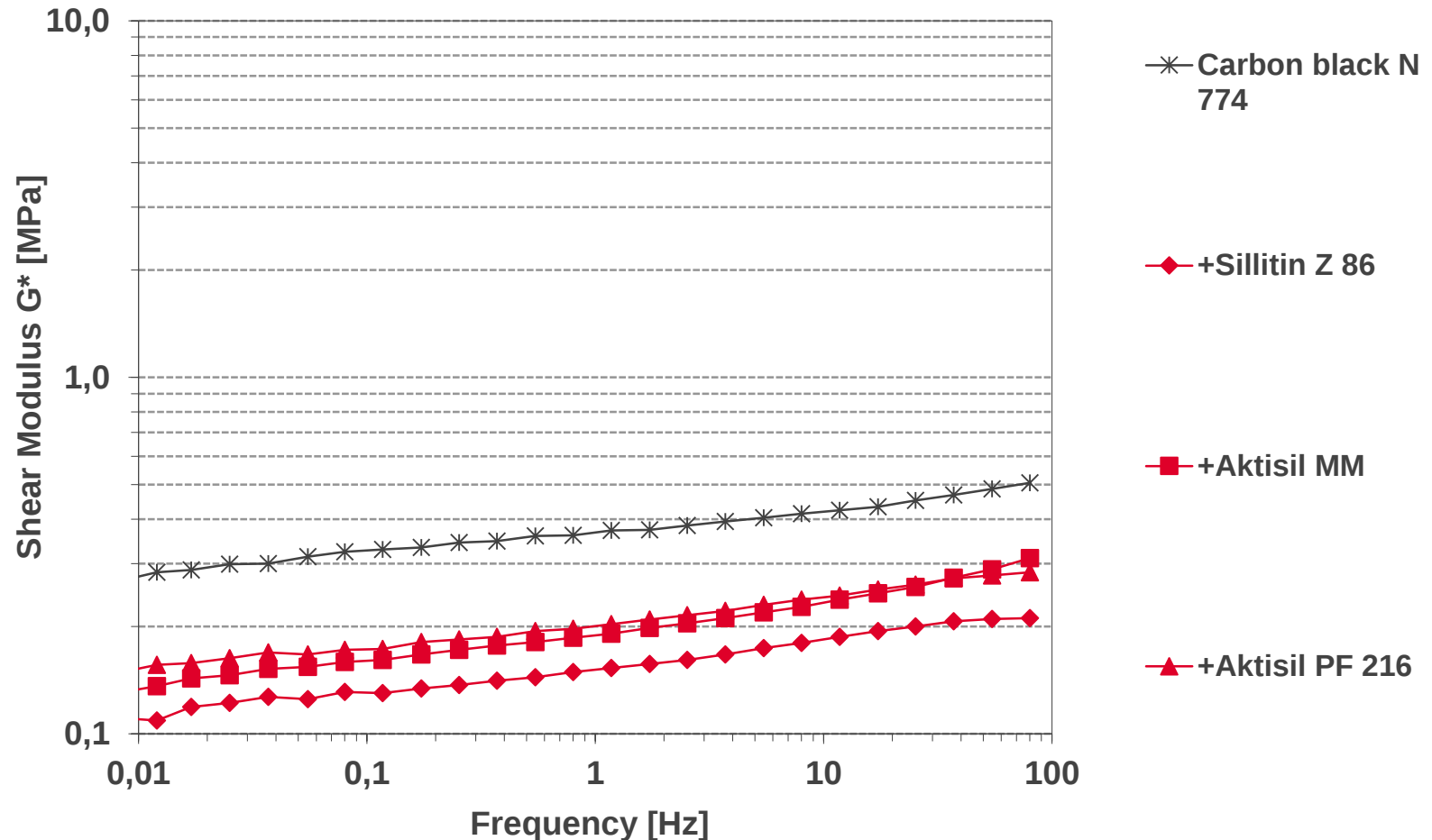


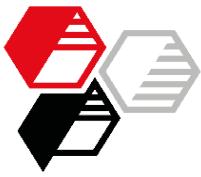
Change of Shear Modulus in Frequency Sweep 23 °C vs. 100 °C

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Plate / Plate – Rheometer, Deformation $\gamma = 0,3 \%$

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Dynamic Stiffening

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Quotient of Shear Modulus G^* 80 Hz/0,008 Hz

Plate / Plate – Rheometer, Deformation $\gamma = 0,3 \%$

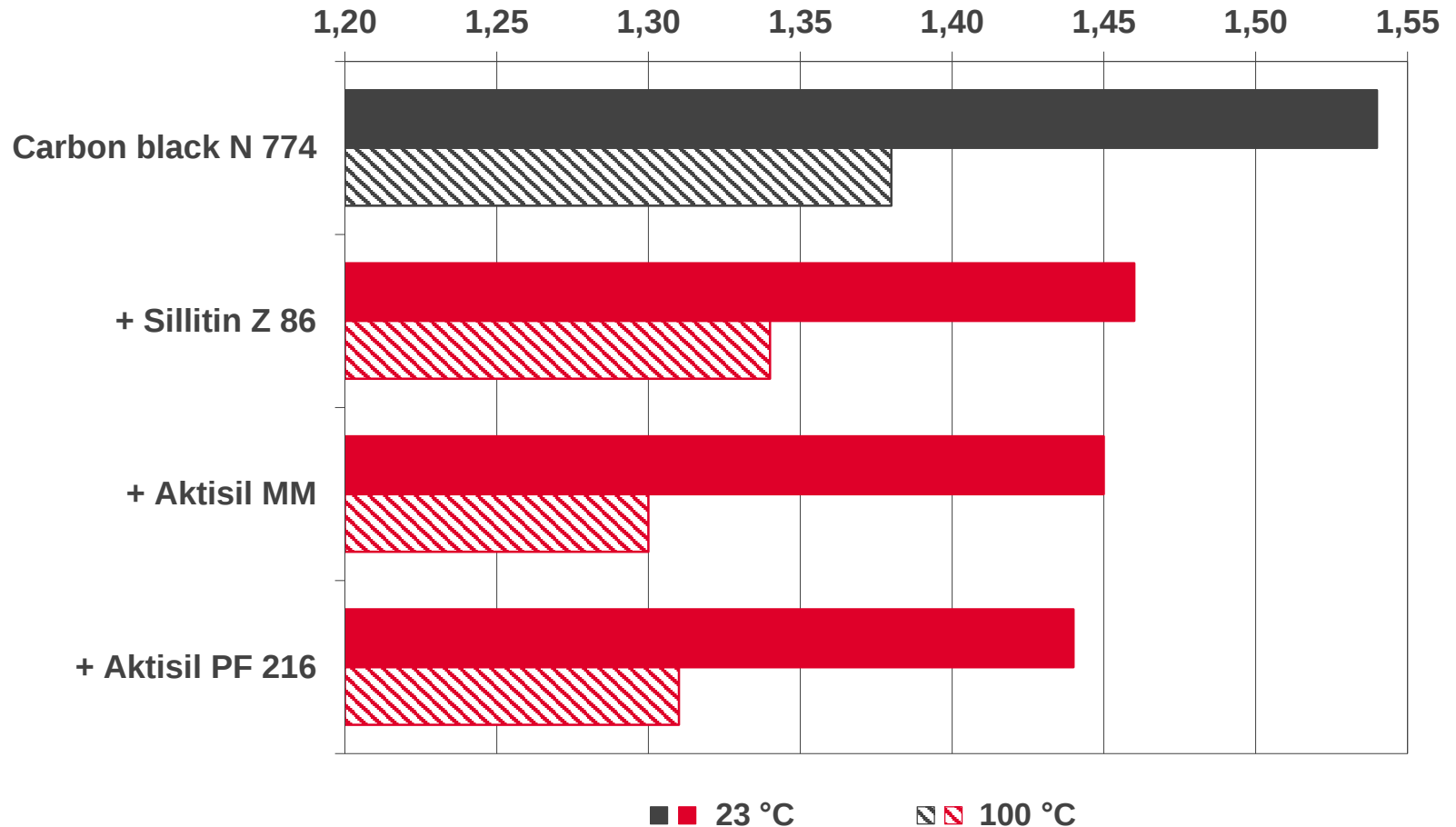
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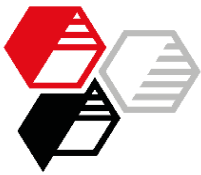
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Neuburg Siliceous Earth offers benefits with respect to:

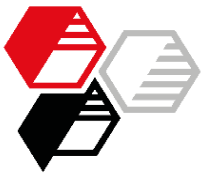
- Mooney viscosity
- Compression set, especially with Aktisil PF 216
- Electrical insulation properties
- Temperature dependence of the dynamical properties
- Dynamic stiffening

Optimization Potential is seen with regard to:

- Reversion
- Tear resistance

As a cost-saving grade, **Sillitin Z 86** is the material of choice.

Technically, the best results are obtained with **Aktisil MM and Aktisil PF 216**.



We supply material for good ideas!

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