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X-RAY TOMOGRAPHIE OF STEEL
FIBRE REINFORCED SHOTCRETE
(SFRS)

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X-RAY TOMOGRAPHIE

Steel Fibre Reinforced Shotcrete (SFRS)



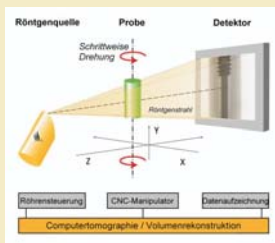
Sampling by core drilling in the Tunnel



SFRS drill core



X-Ray tomographie, ÖGI



Schematic diagram



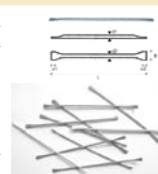
Voxel model



Steel fibre model

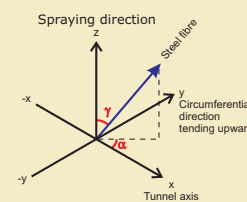
Technical specifications:

Diameter of steel wire	d	0,65 mm	± 0,04 mm
Diameter of fibre	d1	> 0,5 mm	
	d2	< 0,9 mm	
Length of fibre	L	35 mm	± 1,5 mm
Width of flat end	B	> 1,3 mm	
Length of flat end	e1, e2	1,5 mm	
L / d - Ratio		55	± 5
Tensile strength of steel wire	min.	1000 N/mm ²	

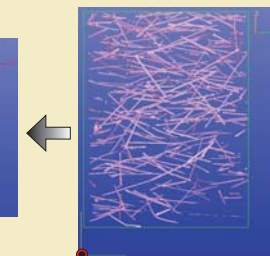
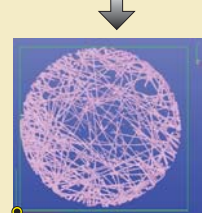


The composite material steel fibre reinforced shotcrete is applied widely in the geotechnics. The knowledge about the orientation of the steel fibres in the concrete is of decisive importance to model the mechanical behaviour.

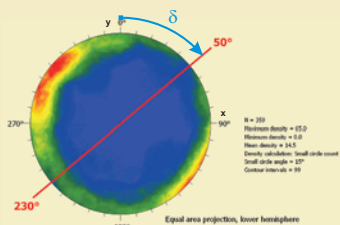
The sampling and the X-ray tomographie at the ÖGI up to the statistical evaluation of the steel fibre orientation is illustrated.



$$\tan \alpha = \frac{y_z}{x_z} \quad \cos \gamma = \frac{z \cdot \vec{v}}{|\vec{v}| \cdot |z|}$$



Orientation of the Steel Fibres, Mean value (87°) and Confidence interval



Schmidtt projection with density distribution of steel fibre density; low density at 50° and 230° (Stereo32)

	Angle α	Angle γ	Statistical parameters																				
BEFORE transformation			<table border="1"> <thead> <tr> <th>Variable</th> <th>Interval</th> <th>Mean</th> <th>Standard deviation</th> </tr> <tr> <td></td> <td>from to</td> <td>μ</td> <td>σ</td> </tr> <tr> <td></td> <td>(°) (°)</td> <td>(°)</td> <td>(°)</td> </tr> </thead> <tbody> <tr> <td>α</td> <td>-90 90</td> <td>-12</td> <td>48</td> </tr> <tr> <td>γ</td> <td>0 90</td> <td>77</td> <td>11</td> </tr> </tbody> </table>	Variable	Interval	Mean	Standard deviation		from to	μ	σ		(°) (°)	(°)	(°)	α	-90 90	-12	48	γ	0 90	77	11
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