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Strahlmittel abrasives Stahlfasern steel fibres

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PP Fibres for Tunnelling

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PP Fibres for Tunnelling

- Kind of fibres
- Mode of action
- Fields of applications
- Integration
- Standards

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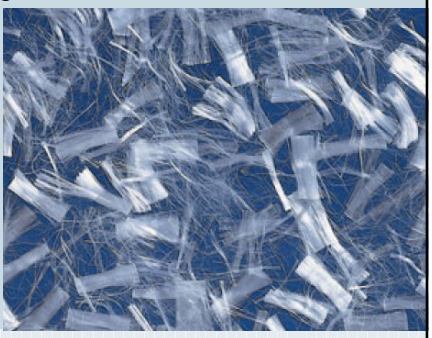
Kind of Fibres

Multifilament
PP Fibres



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Polypropylene Fibres

	possible	common in tunnels
Length	3-24 mm	3-6 mm
Diameter	18-42 μm	18-32 μm

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Modes of Action

PP Fibres:
- Structural fire protection
- Reduction of shrinkage cracks

Steel fibres:
- Increase of Post-Crack-Behaviour
- Increase of equivalent tensile strength
- Replacement of shear reinforcement
- Replacement of nominal reinforcement

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Approvals

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Modes of Action

Melting point of PP fibres: 140-150 °C

Melting leaves a large net of tiny hollow channels and intersections.
Water which is bonded in the cement can evaporate as steam.

No vapour pressure will be build up.

The concrete will not be destroyed.

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Modes of Action

Diameter [µm]	Fibres [Mio/kg]*	2 kg/m³	1.5 kg/m³	1.0 kg/m³
18	723	1.447	1.085	723
32	229	458	343	229
42	133	265	199	133

* 6mm length

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Modes of Action

If amount of fibres is fixed according to specification, e.g. 2 kg/m³

a thicker fibre might be chosen

→ Influence on wet concrete properties
Pumpability

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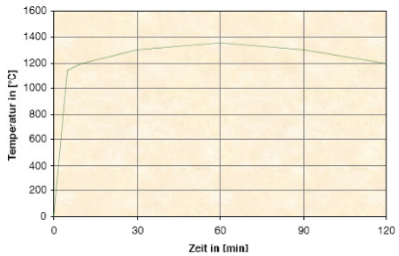
Modes of Action

„RWS-Brandkurve“



Zeit [min]	Temperatur [°C]
0	0
5	1144
10	1200
30	1300
60	1350
90	1300
120	1200

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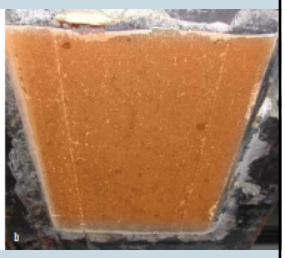
Modes of Action



no fibres | 1.5 kg/m³ PM 3/18

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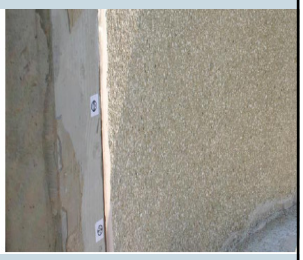
Modes of Action



plain concrete 2 kg/m³ PM 6/18

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Modes of Action

no fibres 2 kg/m³ PM 6/18

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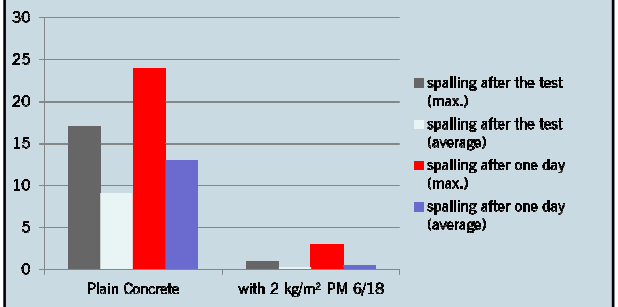
Modes of Action



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Fields of Application

Cast-in-place concrete

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Fields of Application

Cast-in-place concrete

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Fields of Application

Tubbings

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Fields of Application

Shotcrete

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Integration of PP fibres

Conveyor belt KH 500

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Integration of PP fibres

Along with the aggregates

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Integration of PP fibres

Automatic batching
(mobile plants)

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Integration of PP fibres

Automatic batching
„Incite“

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Strahlmittel abrasives Stahlfasern steel fibres

Integration of PP fibres

Automatic batching
„Incite“

Daten für Kunststofffaserdosierung:

Type	D (mm)	L (mm)	B (mm)	H1 (mm)	H2 (mm)	Motor (W)	Strom (A)	Ge-wicht (kg)	Kapazität (kg/min*)	Füllmenge (Liter**)
MD75	600	700	75	1020	1100	720	1,2	250	10-30	40-70
MD250	1000	1200	200	1350	1580	2200	4,4	680	15-75	160-300
MD400	1800	2300	350	1260	1600	3000	6,0	1100	40-150	600-1200
MD500SX	2000	2400	420	1590	1900	3920	8,2	1380	40 - 200	900-2000

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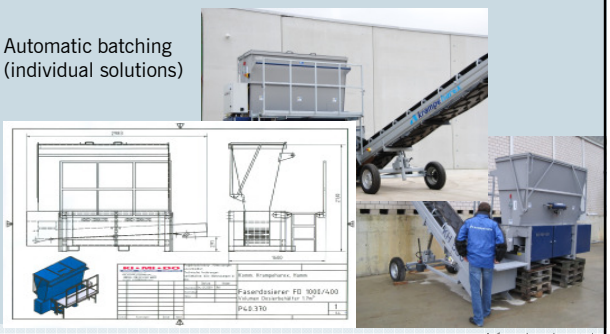
Integration of PP fibres

Automatic batching
(individual solutions)



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Standards

Austrian Guideline:

Enhanced fire protection with concrete for underground constructions (7/2005)

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„Spalling of concrete can most effectively prevented by using fine polypropylene fibres“

- Standard fire test
- Accordance of the fibres
- Tests of fresh concrete
- Tests of hard concrete

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Testresults

Average depth of spalling < 1.0 cm
Maximum depth of spalling < 4.0 cm

After cooling depth of spalling may increase by 1-3 cm

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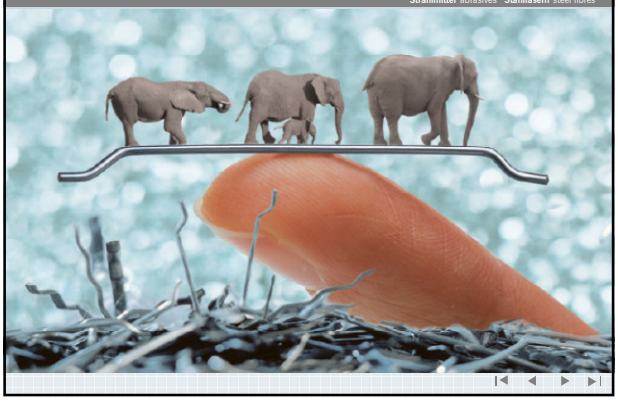
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