German institute for civil enigineering

Deutsches Institut für Bautechnik

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Zulassungs- und Genehmigungsstelle für Bauprodukte und Bauarten

General technical approval / general type approval

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Z-3.82-2042

Validity:

from: **January 15, 2023**

to: **January 15, 2028**

Applicant:

DIAMANT Polymer GmbH
Marie-Bernays-Ring 3a
41199 Moenchengladbach

Subject of approval:

Metal Polymer "MM1018P" and "MM1018FL"

Vom Deutschen Institut für Bautechnick nicht geprüfte Übersetzung der deutschen Originalfassung – Translation not approved by the German institute for civil enigineering

The subject of approval mentioned above is herewith generally approved in the field of construction.
This general technical approval consists of nine pages and an annex.
This general technical approval replaces the general technical approval No. Z-3.82-2042 of January 15, 2018.
The approval went public for the first time on January 15, 2013.

I GENERAL PROVISIONS

1 With this decision, the usability or applicability of the subject matter of the regulation in the sense of the state building regulations is proven.

2 This notice does not replace the permits, approvals and certificates required by law for the implementation of construction projects.

3 This notice is issued without prejudice to the rights of third parties, in particular private property rights.

4 Copies of this decision are to be made available to the user of the subject of the regulation, irrespective of further regulations in the "Special Provisions". In addition, the user or user of the subject matter of the regulation must be informed that this notification must be available at the point of use or application. Copies must also be made available to the authorities involved on request.

5 This decision may only be reproduced in its entirety. A publication of excerpts requires the approval of the German Institute for Building Technology. Texts and drawings of advertising literature must not contradict this decision, translations must contain the note "Translation of the German original version not checked by the Deutsches Institut für Bautechnik".

6 This decision is revocable. The provisions can be supplemented and changed later, especially if new technical knowledge requires this.

7 This decision relates to the information and documents submitted by the applicant. A change to these basics is not covered by this notification and must be disclosed to the Deutsches Institut für Bautechnik without delay.

II SPECIAL PROVISIONS

1 Subject of the regulation and area of use or application

1.1 This notice applies to the manufacture and use of the metal polymer "MM1018". Metal Polymer "MM1018" is a filled, 2-component reaction resin system (epoxy resin) with a pasty ("MM1018P") or liquid ("MM1018FL") consistency.

1.2 The metal polymer "MM1018" is used for full-surface and non-positive compensation or filling of inaccuracies and bumps between metal elements such as head plates, bridge bearings, crane runways and rail guides and steel components.

1.3 Metal Polymer "MM1018" is applicable for gap sizes from 0.25 to 10 mm. If the gap is more than 10 mm, we recommend inserting steel lining plates to reduce the maximum gap width to less than 10 mm.

2 Provisions for the construction product

2.1 Properties and composition General

2.1.1

The metal polymer "MM1018" is a filled, 2-component reaction resin system (epoxy resin). The composition is deposited with the Deutsches Institut für Bautechnik.

The material characteristics or compositions not specified in this approval notice for the metal polymer "MM1018P" and "MM1018FL" must correspond to the information deposited with the Deutsches Institut für Bautechnik.

2.1.2 Infrared spectroscopy (IR)

The infrared spectrograms of the resin and hardener components must correspond to the infrared spectrograms deposited with the Deutsches Institut für Bautechnik. The spectroscopy procedure is described in Appendix 1, A.1.

2.1.3 Thermogravimetric Analysis

The thermogravimetric diagrams of the resin and hardener components must correspond to the diagrams deposited with the Deutsches Institut für Bautechnik. The procedure for carrying out the analysis is described in Appendix 1, A.2.

2.1.4 Characteristics of the starting materials / grain size distribution

The characteristic values of the starting materials are compiled in the following table or deposited with the German Institute for Building Technology.

Index	"MM1018P"	"MM1018FL"
Density of the resin component	2.986 g/dm³ ±5%	3.002 g/dm³ ±5%
Density of the hardener component	1.998 g/dm³ ±5%	0.997 g/dm³ ±1%
filler content	79 wt% ±5 wt%	77% by mass ±5% by mass

The grain size distribution of the filler, recorded using laser granulometry, must correspond to the grain size distribution deposited with the German Institute for Building Technology.

2.1.5 Viscosity

The viscosity of metal polymer "MM1018P" is 600 Pa·s ±15% and that of metal polymer "MM1018FL" is 11,000 mPa·s ±15%. The procedure for determining the viscosity is described in Appendix 1, A.3.

2.1.6 Pot life

The pot life (temperature increase by 15 K; measured according to DIN EN ISO 9514[1]) of metal polymer "MM1018P" at 21 °C is 20 min ±20 %.

The pot life (temperature increase by 15 K; measured according to DIN EN ISO 9514[1]) of metal polymer "MM1018FL" at 21 °C is 89 min ±20 %.

2.1.7 Glass transition temperature

According to DIN EN 12614[2] at the age of 7 days after storage in a climate of 21 °C/60 % r. F. Certain glass transition temperatures of metal polymer "MM1018P" or metal polymer "MM1018FL" must be at least 60 °C.

2.1.8 Compressive strength

2.1.8.1 The metal polymer "MM1018" shows typical compressive strengths at the age of 7 (28) days, according to the table below.

Test Element	Storage		Pressure resistance in N/mm²	
			"MM1018P"	**"MM1018FL"**
standing prism* 35 x 35 x 140mm³	Temp. 21/60	7d	92	108
		28d Temp. 21/60	97	110
thin disks** 100 x 100 x 10mm³		7d	110	161
standing prism* 35 x 35 x 140mm³	6 d temp 21/60 + 1 day at 50 °C		116	105
thin disks** 100 x 100 x 10mm³			133	152
* : tested according to DIN EN 12190[3], ** : Procedure see Appendix 1, A.4				

2.1.8.2 The metal polymer "MM1018" has relative compressive strength development depending of the storage temperature, tested according to DIN EN 12190[3] on prisms 35 x 35 x 140 mm³ according to the following table.

Age when tested	Relative pressure resistance (related to 7 days at 21 °C)					
	"MM1018P"			**"MM1018FL"**		
	temperature					
	5°C	21°C	30°C	5°C	21°C	30°C
6 h						88%
16 h		79%	89%		94%	109%
24 h		80%	82%		97%	103%
2d		91%			100%	
7d	96%	100%	111%	86%	100%	113%
28d	108%	105%	116%	92%	102%	118%

[1] DIN EN ISO 9514:2019-10 Paints and coatings - Determination of the working life of multi-component coating systems - Preparation and conditioning of specimens and guidance for testing (ISO 9514:2019); German version EN ISO 9514:2019

[2] DIN EN 12614:2005-01 Products and systems for the protection and repair of concrete structures - Test methods - Determination of the glass transition temperature of polymers

[3] DIN EN 12190:1998-12 Products and systems for the protection and repair of concrete structures - Test methods - Determination of the compressive strength of repair mortars; German version EN 12190:1998

2.1.8.3 The metal polymer "MM1018P" must have a compressive strength of at least 70 N/mm² when aged 7 days tested on prisms 35 x 35 x 140 mm³ after storage in a climate of 21 °C/60 % r. F. have.

The metal polymer "MM1018FL" must have a compressive strength of at least 85 N/mm² at the age of 7 days tested on prisms 35 x 35 x 140 mm³ after storage in a climate of 21 °C/60 % r. F. have.

2.1.9 Modulus of elasticity

The metal polymer "MM1018" has at the age of 7 days tested according to DIN EN 13412, method 2, on prisms 35 x 35 x 140 mm³ (load level 1/3 of the 7 d pressure resitance) demontrates an elasticity module according to the table below.

Storage	Elasticity module in N/mm²	
	"MM1018P"	**"MM1018FL"**
7d temp. 21/60	10,000	10,000
6 d temp 21/60 + 1 day at 50 °C	7,000	7,000

2.1.10 Creepage

The metal polymer "MM1018P" shows when tested according to DIN EN 13584[4] determines a creep coefficient φ on prisms 35 x 35 x 140 mm³ after 182 days of continuous compressive loading, which was applied at the age of 7 days (load level 25% of the 7 d compressive strength). $_{182,\ 7d}$= (ε_{total}- $\varepsilon_{electrical}$- ε_s) / $\varepsilon_{electrical}$ from 2.9 to.

With a prism of the same cross-sectional dimensions, in which 9 layers of "MM1018P" each 10 mm thick were arranged between 1 mm thick steel sheets, a $\varphi_{182,\ 7d}$ determined from 2.1.

The metal polymer "MM1018FL" shows when tested according to DIN EN 13584[4] determines a creep coefficient φ on prisms 35 x 35 x 140 mm³ after 182 days of continuous compressive loading, which was applied at the age of 7 days (load level 25% of the 7 d compressive strength). $_{182,\ 7d}$= (ε_{total}- $\varepsilon_{electrical}$- ε_s) / $\varepsilon_{electrical}$ from 1.6 to.

With a prism of the same cross-sectional dimensions, in which 9 layers of "MM1018FL" each 10 mm thick were arranged between 1 mm thick steel sheets, a $\varphi_{182,\ 7d}$ determined from 1.1.

2.1.11 Coefficient of thermal expansion

The thermal expansion coefficient at the age of 7 days determined on prisms 35 x 35 x 140 mm³ is:

temperature range	**"MM1018P"**	**"MM1018FL"**
- 20 to 20°C	24 x 10^{-6} 1/K	24 x 10^{-6} 1/K
20 to 60 °C	54 x 10^{-6} 1/K	44 x 10^{-6} 1/K

4 DIN EN 13584:2003-11 Products and systems for the protection and repair of concrete structures - Test methods - Determination of the creep of concrete replacement systems in compression tests; German version EN 13584:2003

2.2 Manufacturing, packaging, transport, storage and labeling

2.2.1 Manufacturing

The metal polymer "MM1018" is manufactured from the components deposited according to Section 2.1.1 in the Mnchengladbach plant of DIAMANT Polymer GmbH.

The applicant shall keep records of when Metal Polymer "MM1018" was manufactured and shipped.

2.2.2 Storage and transportation

2.2.2.1 The metal polymer "MM1018" is to be stored in the manufacturing plant in suitable containers which are clearly marked:

Metal Polymer "MM1018P" or "MM1018FL"

according to general building authority approval no. Z-3.82-2042

2.2.2.2 The metal polymer "MM1018" is supplied in ready-to-use pack sizes. The product should be stored in its original, unopened containers in a dry, cool and frost-free place (5 °C to 20 °C). Higher temperatures reduce the storage time, which is otherwise up to 2 years. The product must be protected from direct sunlight.

2.2.3 Labelling

2.2.3.1 General

The container of the construction product and the delivery note for the construction product must be marked by the manufacturer with the conformity mark (Ü mark) according to the conformity mark regulations of the countries. Labeling may only take place if the requirements according to Section 2.3 are met.

2.2.3.2 Container labels

The following information must be clearly legible, permanent and highlighted by a frame on the containers of the metal polymer "MM1018":

Type and designation of the construction product:	"MM1018P" or "MM1018FL"
Type:	"Component A" or "Component B"
Manufacturing plant:	DIAMANT Polymer GmbH, Moenchengladbach
Mark of conformity with approval no.:	Z-3.82-2042
Date of manufacture and Batch number:	.....
Exp:	.....
Target filling volume in kg:	.....

2.2.3.3 Delivery Notes

The delivery notes must contain the following information:

Type and designation of the

Construction material name and description	"MM1018P" or "MM1018FL"
Approval no.:	Z-3.82-2042
Batch number[5]:	.....
Delivery volume (mass):	.....

5 The batch number may not be stated on the delivery note if the construction product is not delivered directly to the place of use, but via the building materials trade, for example.

2.3 Confirmation of Conformity

2.3.1 General

The confirmation of the conformity of the construction product with the provisions of this general technical approval must be provided for each manufacturing plant with a certificate of conformity based on factory production control and regular third-party monitoring, including an initial inspection of the construction product in accordance with the following provisions.

The manufacturer of the construction product must involve a recognized certification body and a recognized monitoring body for issuing the certificate of conformity and for external monitoring, including the product tests to be carried out.

The declaration that a certificate of conformity has been issued must be given by the manufacturer by labeling the construction products with the mark of conformity (Ü mark) with reference to the intended use.

The certification body must provide the Deutsches Institut für Bautechnik with a copy of the certificate of conformity it has issued and a copy of the initial test report.

2.3.2 Factory production control

A factory production control must be set up and carried out in each manufacturing plant. Factory production control means the continuous monitoring of production to be carried out by the manufacturer to ensure that the construction products manufactured by him comply with the provisions of this general building inspectorate approval.

The factory production control should include at least the measures listed below.

- Description and verification of the starting material and components (incoming goods inspection) for each batch:
  - Density and epoxide equivalent of the resin component, density and amine number of the hardener component, grain size distribution of the filler components with works certificate "2.2" or inspection certificate "3.1" according to DIN EN 10204[6],
  - Density and viscosity of the raw materials,
  - Determination of Shore D hardness and pot life[7] the resin with a reference hardener or the hardener with a reference resin
- Control and tests to be carried out during manufacture
- Verifications and tests to be carried out on the finished construction product:
  - Color of resin component and hardener component, each batch
  - Density of resin component and hardener component, each lot
  - dispersion[8] of resin component and hardener component, each batch
  - Viscosity of resin component and hardener component, each lot
  - color of the mixture of resin component and hardener component, each batch,

6 DIN EN 10204:2005-01 Metallic products - Types of inspection certificates; German version EN 10204:2004

7 The pot life is determined on a 100g batch. The time taken for the material to harden physically is measured. The pot life is reached as soon as the viscosity of the material changes noticeably

8 The dispersion is checked by taking a material sample from the mixer and drawing it onto a rubber plate. It is drawn up with a flat spatula and provides information on whether the powder conglomerates have been completely dispersed. The result is an even material film with a uniform color.

- Viscosity of the mixture immediately after the end of mixing in climate 21/60, every 10th resin and hardener batch,
- Pot life according to DIN EN ISO 9514₁at 21 °C, every 10th resin and hardener batch and
- Compressive strength after 7 days in climate 21/60, every 10th batch of resin and hardener.

The results of the factory production control must be recorded and evaluated. The records must contain at least the following information:

- Designation of the construction product or the starting material and the components
- Type of control or audit
- Date of manufacture and testing of the construction product or the starting material or components
- Outcome of controls and tests and, where applicable, comparison with requirements

- Signature of the person responsible for the factory production control

The records are to be kept for at least five years and submitted to the monitoring body responsible for external monitoring. They are to be presented to the German Institute for Building Technology and the competent supreme building control authority on request.

If the test result is unsatisfactory, the manufacturer must immediately take the necessary measures to rectify the defect. Construction products that do not meet the requirements are to be handled in such a way that confusion with conforming ones is ruled out. Once the defect has been remedied, the test in question must be repeated immediately - insofar as this is technically possible and necessary to prove that the defect has been rectified.

2.3.3 Third-party monitoring

In each manufacturing plant, the factory production control must be checked regularly by external monitoring, but at least twice a year.

As part of the external monitoring, an initial test of the construction product must be carried out, samples must be taken and tested and samples can also be taken for spot checks. The sampling and testing are the responsibility of the recognized monitoring body.

As part of external monitoring, the following properties must be checked or tests carried out at least once a year:

- density of resin and hardener components,
- Thermogravimetric analysis on resin and hardener,
- filler content,
- viscosity of the mixture immediately after the end of mixing at 21 °C,
- glass transition temperature,
- Pot life at 21 °C and
- Compressive strength after 7 days in climate 21/60.

The results of the certification and external monitoring must be kept for at least five years. They must be submitted by the certification body or the monitoring body to the Deutsches Institut für Bautechnik and the competent supreme building control authority on request.

3 Provisions for planning, dimensioning and execution

3.1 Planning and dimensioning

3.1.1 Metal Polymer "MM1018" is applicable for gap sizes from 0.25 to 10 mm. If the gap is more than 10 mm, we recommend inserting steel lining plates to reduce the maximum gap width to less than 10 mm.

3.1.2 The metal polymer "MM1018" can be processed in the temperature range from 5 °C to 40 °C, whereby the following criteria must be met:

- Material temperature 5 °C to 30 °C
- Component temperature 5 °C to 40 °C

3.1.3 The service temperature range of the cured metal polymer is -20 °C to 50 °C.

3.1.4 The modulus of elasticity of the hardened metal polymer can be assumed to be 7 kN/mm² at temperatures of up to 50 °C.

3.1.5 The compressive strength of the hardened metal polymer at temperatures of up to 50 °C on thin panes (100 x 100 x 10 mm³) is at least 90 N/mm² for "MM1018P" and at least 120 N/mm² for "MM1018FL".

3.1.6 Fatigue-relevant loads may only be applied after the metal polymer has completely hardened.

3.2 Execution

3.2.1 It is recommended to have the application carried out by trained specialists. The technical data sheet must be observed.

3.2.2 Metal Polymer "MM1018" is applicable for gap sizes from 0.25 to 10 mm. If the gap is more than 10 mm, we recommend inserting steel lining plates to reduce the maximum gap width to less than 10 mm.

3.2.3 The metal polymer "MM1018" can be processed in the temperature range from 5 °C to 40 °C, whereby the following criteria must be met:

- Material temperature 5 °C to 30 °C
- Component temperature 5 °C to 40 °C

3.2.4 The hardener component B of the container must be completely added to the resin component A. A portioning of the components into smaller quantities is not permitted.

3.2.5 The metal polymer must be stirred in the original container with an electric mixer according to the specifications of the technical data sheet.

3.2.6 The processing time in the container decreases as the temperature rises. The table below gives reference values for the time the material has to be processed after mixing.

Material-temperature	Processing time	
	"MM1018P"	**"MM1018FL"**
10°C	30 min	60 min
20°C	15 min	30 min
30°C	10 min	15 min

3.2.7 Fatigue-relevant loads may only be applied after the metal polymer has completely hardened.

Dr.-Ing. Wilhelm Hintzen
Head of Department

Notarized
Kulle

The properties mentioned in Section 2.1 were determined using the following procedures:

A.1 Infrared spectroscopy

The infrared spectroscopy was carried out according to DIN EN 1767:1999[A1] performed with a Fourier transform infrared spectrometer. The filled components were extracted with hexane. The IR spectrum was created on the capillary film produced between potassium bromide discs, if necessary after the hexane had evaporated. 500 scans were carried out each time. The resolution was 4 cm^{-1}.

A.2 Thermogravimetric Analysis

The thermogravimetric analysis was carried out according to DIN EN ISO 11358-1:2022[A2]with a weight of 44.84 mg (resin component "MM 1018 P") or 51.22 mg (resin component "MM 1018 FL") or 62.13 mg (hardener component "MM 1018 P") or 31.13 mg (hardener component "MM 1018 FL") in an argon atmosphere with an open crucible with a heating rate of 10 K/min and an accuracy of the thermal balance: 0, 1 µg performed. The TGA curves are based on the moving averages over 8 seconds.

A.3 Viscosity

The dynamic viscosity was determined according to DIN EN ISO 3219-1:2021[A3]and DIN EN ISO 3219-2:2021[A4]determined with a cylinder rotation viscometer and the plate-plate system at 21 and 30 °C. The viscometer was started about 2 minutes after the end of mixing with the following settings: uniform increase in the shear rate from 0 to 1.1 1/s (21 °C, "MM 1018 P") or 25 1/s (21 °C, "MM 1018 FL") or 4.0 1/s (30 °C, "MM 1018 P") or 124 1/s (30 °C, "MM 1018 FL") in 180 s.

A.4 Compressive strength on thin panes

The samples were produced by pressing the mixed material between two glass plates moistened with release agent to a thickness of 10 mm and cutting it to 100 x 100 mm^2 after 3 days. In the compression test, which was carried out with a piston feed rate of around 1 mm/min at (21±2) °C and (60±10) % relative humidity, the samples were placed between 5 cm thick, hardened steel plates 100 x 100 mm^2, whose surfaces had been ground. The experiments with the 50 °C samples were terminated around 6 minutes after removal from the heating cabinet.

A1	DIN EN 1767:1999-09	Products and systems for the protection and repair of concrete structures - Test methods - Infrared analysis
A2	DIN EN ISO 11358-1:2022-07	Plastics - Thermogravimetry (TG) of polymers - General principles (ISO 11358-1:2022); German version EN ISO 11358-1:2022
A3	DIN EN ISO 3219-1:2021-08	Rheology - Part 1: Terms and symbols for rotational and oscillatory rheometry (ISO 3219-1:2021); German and English version EN ISO 3219-1:2021
A4	DIN EN ISO 3219-2:2021-08	Rheology - Part 2: General principles of rotational and oscillatory rheometry (ISO 3219-2:2021); German version EN ISO 3219-2:2021

Metal Polymer "MM1018P" and "MM1018FL"	Attachment 1
Procedures for determining the characteristic values	