



MM1018



GENERAL BUILDING
APPROVAL MM1018

The Liquid-Shim®

100% form-fit and force-fit gap compensation
in steel and bridge construction

DIAMANT 
POLYMER SOLUTIONS



www.diamant-polymer.de/en

DIAMANT POLYMER GMBH

MM1018 – The Liquid-Shim®



- 100% force-fit gap compensation
- Reliable levelling of unevenness
- Full connection guaranteed
- Replaces milling and machining
- Better than conventional lining or comb plates
- Approved, tested and in use worldwide

DIAMANT MM1018 – The Liquid-Shim® is the clever solution for full-surface joining of surfaces in steel construction. Tolerances, gaps and gaps in the assembly of steel components are the order of the day and often cannot be avoided. So what can be done to guarantee the statically necessary specification of full-surface support? Mechanical machining of the flange surface, e.g. by face milling, is often impractical, expensive and reduces the cross-section of the component. Conventional lining and comb plates are inexpensive, but usually offer only selective support and do not provide a reliable solution, especially under dynamic load.

DIAMANT Polymer provides a simple and cost-effective solution for 100% gap compensation with The Liquid-Shim® **MM1018**. Also for prestressed connections. The tested and building authority approved 2-component metal polymer adapts to any gap geometry and provides a full-surface connection to the surfaces. The product can be used preventively as a paste-like compound before joining the surfaces. Alternatively injectable version is also possible.

Your advantages

1. TIME SAVING

The Liquid-Shim® always fits. You avoid long waiting times, time-consuming adjustments and processing times are eliminated.

2. COST SAVING

Simple dosage. In total, less expensive than conventional lining plates.

3. SECURITY

By abZ, DIBt-Berlin




Properties of the Liquid Shim® MM1018


- **100% FRICTION-LOCKED**
MM1018 is flowable before curing, adapts to the gap and fills it completely without air pockets.
 - without air pockets.
- **WITHOUT MECHANICAL PROCESSING**
There is no need for time-consuming processing on site. **MM1018** can be simply applied as a pasty variant or injected or poured as a liquid variant.
- **NON CONDUCTIVE**
MM1018 is electronically insulating, so there is no risk of contra-corrosion.
- **GOOD ADHESION, HIGH COEFFICIENT OF FRICTION**
MM1018 enables shear force transfer via the connection joint. The static friction coefficient determined according to Eurocode DIN EN 10190-2 Annex G is e0.4.
- **HIGH COMPRESSIVE STRENGTH**
with tested strength values of up to 160 N/mm² (23.20b psi) one of the strongest systems on the market.
- **FATIGUE RESISTANCE LIKE STEEL**
MM1018 has been successfully tested to 10 million load cycles.
- **NO VOLATILE COMPONENTS, EXTREMELY LOW MATERIAL SHRINKAGE**
MM1018 is dimensionally stable and seals the gap reliably and permanently. Measured linear shrinkage <0.00035 mm/mm.
- **CREEP, LOSS OF PRELOAD**
MM1018 is an approved construction product and may be used explicitly for prestressed connections. The loss of prestressing force after 50 years determined in the creep test according to DIN EN 1090-2 Annex G is <13 (24h curing, retightening after 3 days).
- **RELIABLE CORROSION PROTECTION**
MM1018 adheres reliably to the substrate and prevents the penetration of moisture into the crevice space, crevice corrosion therefore has no chance!

Product overview


The Liquid Shim® **MM1018** is available in different variants:




#1866
MM1018 FL Liquid



#1436
MM1018 P Putty



#2492
MM1018 SMART S



ONLINE-SHOP

In our online shop you will find all our **MM1018** products and an extensive range of accessories - everything you need for a successful application.

Recommended, approved, established

With over 1,000 applications worldwide, DIAMANT **MM1018** is considered the number 1 for force-fit gap compensation and is the first product of its kind to have the general building authority approval of the **German Institute for Building Technology (DIBt)**.

MM1018 has been approved for many years by **Deutsche Bahn (DB Netze)** as well as by the **Waterways and Shipping Administration (WSV)** for many years and is named in various installation regulations. The use of DIAMANT MM1018 is also described and recommended for the use of bridge bearings by the **Association of Manufacturers of Roadway Crossings and Bearings for the Construction Industry (VHFL)**.



Sustainable, monitored, REACH-compliant

Our products are REACH-compliant and meet current standards. **MM1018** bears the Ü mark as an externally monitored product. DIAMANT is ISO 9001 and ISO 14001 certified.



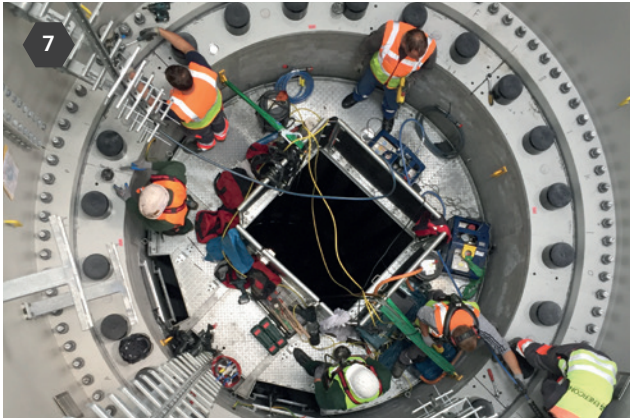
DIAMANT assembly and application service

Service! Exactly where you need it - and exactly when you need it: Targeted, strong solutions, effective. The installation and application service of **DIAMANT** Polymer supports users directly on site.

- User-accompanying advice and assistance
- Assembly by excellently trained DIAMANT specialist personnel
- Guarantee of professional Product processing
- Problem solving on site
- Detailed documentation of the work carried out
- Quality assurance of the assembly work through inspections and with acceptance protocol
- Fair billing according to expenditure and consumption
- Working for you worldwide



Reference projects with MM1018

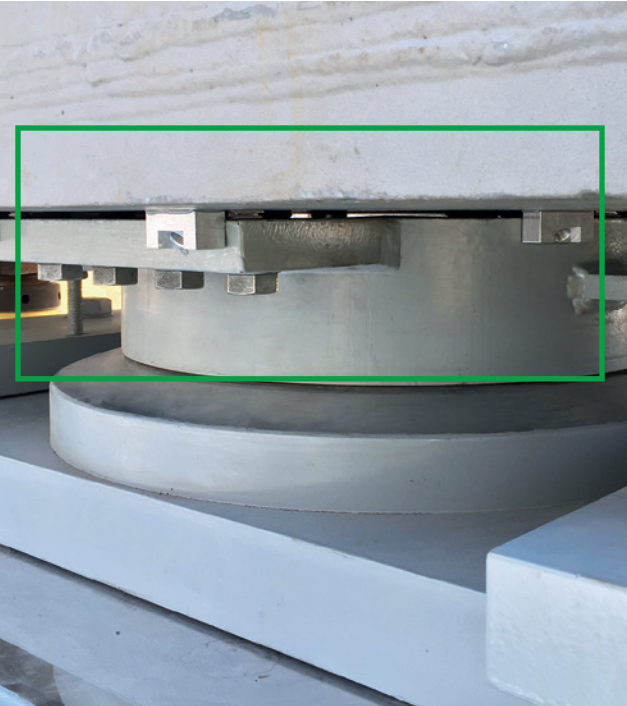


(1) Mandovi River Railway Bridge, Goa/India, (2) Osman-Gazi-Bridge, Izmit/Turkiye, (3) Lignite-fired power plant Neurath, Grevenbroich/Germany, (4) Ariane Rocket launching site, Kourou/Fraench Guiana, (5) Bogibeel Bridge, Assam/India, (6) Steelworks Dillinger Huette, Germany, (7) Wind farm Gardelegen, Germany (8) Yavuz-Sultan-Selim-Bridge, Istanbul/Turkiye

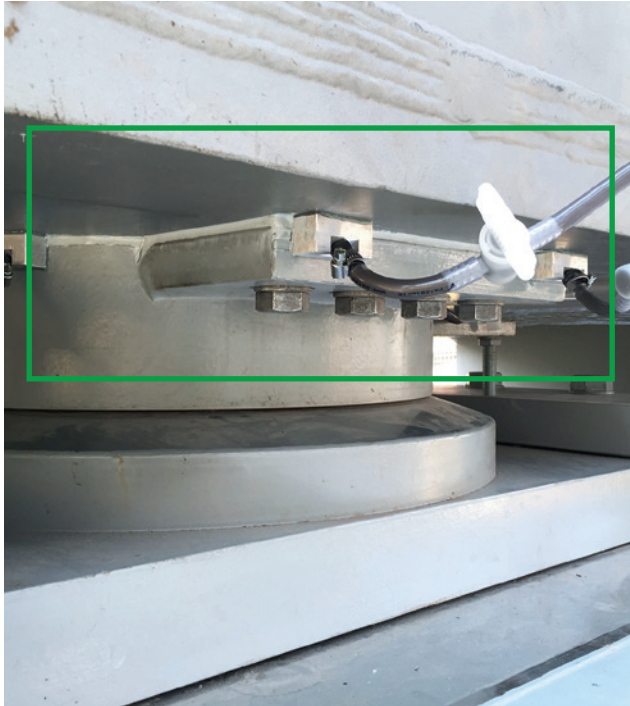
BEFORE/AFTER APPLICATIONS

Gap compensation in steel and bridge construction with MM1018

BEFORE:



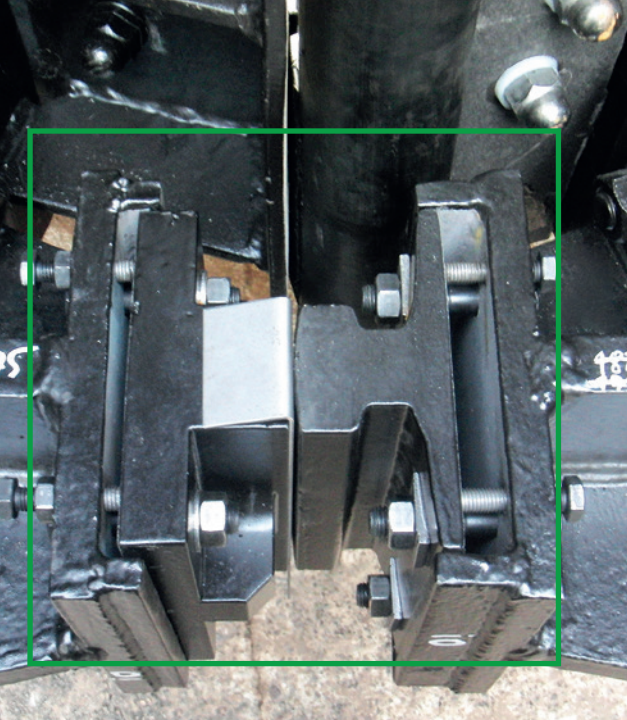
AFTER:



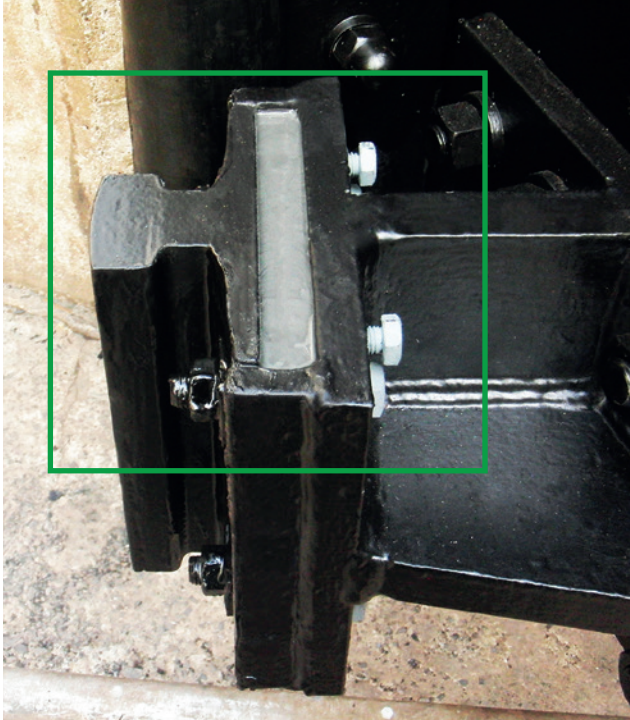
Gap compensation at bridge bearing, Yavuz Sultan Selim Bridge, Istanbul, Turkiye

Gap compensation in hydraulic steel structures with MM1018

BEFORE:



AFTER:



Gap compensation at lock gate, caulking nail

OUR SERVICE

DIAMANT assembly and application service

Service

Our installation and application service supports users directly on site. From direct planning with you, through the application of the products, to the completion of the work, our qualified employees are there to help and advise you. Are you already using our products? No problem - to ensure quality, our expert construction supervision is at your disposal.

Your situation

Your own qualified personnel are more than busy due to pending tasks or do not have the necessary expertise to process chemical products professionally? You would like to use our products without risking downtimes and construction delays due to improper application? Through our qualified team we can offer you the following:

Our service offer

Planning

Execution

Closing

- Qualified and personal consulting
- Tendering/Awarding
- Procedure planning

- Delivery worldwide
- Assembly by excellently trained DIAMANT specialists
- Problem solving at your site

- Guarantee of professional product processing
- Documentation of the work performed
- Fair and precise billing according to time and consumption



Your benefit

With the proper and professional application of our DIAMANT products by our qualified DIAMANT Service Team we help you to save materials and resources, to react quickly to occurring problems and to be able to solve them. You do not have to worry about the coordination of different service providers. With us, you get the complete package, including the solution, with the highest quality standards. This allows you to prevent possible follow-up costs and to realize an optimization of material and personnel resources.

Motivation

With our unique products, individually tailored to your application, we will work with you to find the best possible solution to solve your problem in a cost-saving and timely manner. If we have aroused your interest or if you have any further questions, please do not hesitate to contact us. **Phone +49 2166-9836-0**

Service overview

| | Pure Product delivery | Product + Supervisor | Product + Assembly service | Product + Engineer |
|--|--------------------------|-------------------------|-------------------------------|-----------------------|
| Product liability | ✓ | ✓ | ✓ | ✓ |
| Technical advice by phone and e-mail | ✓ | ✓ | ✓ | ✓ |
| Technical advice on the construction site | ✗ | ✓ | ✓ | ✓ |
| Product demonstration on the construction site | ✗ | ✓ | ✓ | ✓ |
| Full process description | ✗ | ✗ | ✓ | ✓ |
| QA and acceptance protocol | ✗ | ✗ | ✓ | ✓ |
| Application liability | ✗ | ✗ | ✓ | ✓ |
| Warranty up to 50 years | ✗ | ✗ | ✓ | ✓ |
| Detailed technical expertise on site | ✗ | ✗ | ✗ | ✓ |

General technical approval / general type approval

Eine vom Bund und den Ländern gemeinsam
getragene Anstalt des öffentlichen Rechts

Zulassungs- und Genehmigungsstelle
für Bauprodukte und Bauarten

Date:

11/28/2022

Reference:

I 44-1.3.82-28/22

Approval number:

Z-3.82-2042

Applicant:

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

Validity:

from: **January 15, 2023**

to: **January 15, 2028**

Subject of approval:

Metal Polymer "MM1018P" and "MM1018FL"

Vom Deutschen Institut für Bautechnik nicht geprüfte
Übersetzung der deutschen Originalfassung - Translation
not approved by the German institute for civil engineering

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.

DIBt

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/dm ³ ±5% | 3.002 g/dm ³ ±5% |
| Density of the hardener component | 1.998 g/dm ³ ±5% | 0.997 g/dm ³ ±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 9514₁) 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 9514₁) of metal polymer "MM1018FL" at 21 °C is 89 min ±20 %.

2.1.7 Glass transition temperature

According to DIN EN 12614₂ 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 12190₃,
** : 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 12190₃ 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 resistance) demonstrates an elasticity module according to the table below.

| Storage | Elasticity module in N/mm ² | |
|------------------------------------|--|------------|
| | "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 13584⁴ 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).
 $\varphi_{182, 7d} = (E_{total} - E_{electrical} - E_s) / E_{electrical}$ 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 13584⁴ 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).
 $\varphi_{182, 7d} = (E_{total} - E_{electrical} - E_s) / E_{electrical}$ 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 /K | 24 x 10 ⁻⁶ /K |
| 20 to 60 °C | 54 x 10 ⁻⁶ /K | 44 x 10 ⁻⁶ /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 Mönchengladbach 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, Mönchengladbach |
| 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 10204⁶,
 - Density and viscosity of the raw materials,
 - Determination of Shore D hardness and pot life⁷ 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
 - dispersion⁸ 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 9514¹ at 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 mm² 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 mm², whose surfaces had been ground. The experiments with the 50 °C samples were terminated around 6 minutes after removal from the heating cabinet.

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| 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"

Procedures for determining the characteristic values

Attachment 1



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