

## MM-Info „Industry“

Info folder with branch specific information of chosen PolymerMetals  
for customers from the industry sector



**MultiMetall**  
the MetalExistenceCompany®

PolymerMetall® • MultiMetall® • Ceramium® • Molymetall® • Sealium® • XETEX®

MultiMetall is the manufacturer of PolymerMetall®.

For more than 40 years MultiMetall invests in polymer-metallic material technologies for the maintenance of metals and alloys.

In the fight with these special tasks our polymer-metallic materials are professionally equipped.

Tough hard, wear resistant and long-lived – even under more difficult conditions.

Successful on oily or under water lying repair areas.

Good to exceptionally good is the assessment as per certificate 301954. (Lloyds Register of Shipping)

Superiority due to mechanical physical data, which counteracts the constant load.

The continuous compressive strength under load can be more than 160 MPa.

A force of 245 MPa is necessary to reach the upper limit. (test report Fraunhofer Institut Germany)

Difficult to damage when attacked by chemicals e.g. acids, alkaline solutions, solvents, salts, gases etc.

PolymerMetall® has a high potential of research and development.

The equipment that lets metals live longer.

## MultiMetall

the MetalExistenceCompany®



PolymerMetall® for the repair of metallic devices

[www.polymermetal.com](http://www.polymermetal.com)

MultiMetall

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# PolymerMetall®

## Introduction

MultiMetall Germany invests for more than 40 years in polymer-metallic material technologies for the maintenance of metals and alloys. In plants and constructions often functional particularly important components are exposed to stresses like break, tear, corrosion, cavitation, chemical or thermal demands. Components treated with PolymerMetals can be preventatively protected against above mentioned stresses. Furthermore MultiMetall's cold repair technology facilitates a gentle material treatment and a durable repair of damaged parts.

Wherever technical security is concerned, PolymerMetals offer the required quality. Certificates from classification societies, test results from research laboratories as well as positive evaluations from customers worldwide verify that fact. Even at problematic surfaces, on oil, grease, fuel or under water, PolymerMetals are used. This technology is called „direct-MM-bonding“.

## PolymerMetals - Excellent properties

Engineers and technicians need to have a clear picture of the quality of the products available on the market to be able to choose the best product. Therefore we decided to list excellent properties of different MultiMetall-products in the following overview. Please make your own comparison and let the figures speak for themselves.

Compressive strength (DIN ISO 604):	211 MPa
Compressive strength after post-curing (DIN ISO 604):	245 MPa
Flexural strength (DIN 53452):	110 MPa
Hardness (DIN 50351):	55 Brinell
Modulus of elasticity at 20 °C (DIN EN ISO 6721-5):	15.600 MPa (2.262.000 psi)
Modulus of torsion at 20 °C (DIN EN ISO 6721-2):	5.900 MPa (855.500 psi)
Corrosion:	none
Electrochemical corrosion (DIN 50900):	none
Resist against internal pressure:	300 bar
Totally cured at temperatures up to:	minus 30 °C
Total curing time:	3 min
Repairs in high temperature range at metal temperatures up to:	300 °C
at water cooled metal surfaces up to:	550 °C
Repairs of all metals and alloys	
Application of oily, greasy or fuel contaminated metal surfaces	
Application under water or on wet metal surfaces	
Surface protection against erosion, abrasion, cavitation & corrosion	
Chemical resistance very high against acids, lyes & solvents	
Storage over 5 years without any loss of quality possible	

## Acceptance by classification societies

American Bureau of Shipping • China Classification Society • Det Norske Veritas • Germanischer Lloyd • Lloyd's Register of Shipping • Nippon Kaiji Kyokai • Russian Type Approval

## Availability

Technical data sheets are generally available in German or English language. PolymerMetals are only produced in Germany and delivered worldwide within short time by MultiMetall. In addition to that our products are internationally available from many MultiMetall-partners. Ask for further products from MultiMetall.

## Repair of components with PolymerMetals

air sleeves • axles • bearing housings • bearing seating • boiler • bridge bearings • compensators • compressors • condensers / capacitors • conveyor belts • cooling tubes • cyclone • cylinder barrels • cylinder sleeves • engine blocks • engines • exhaust pipelines • exhaust pipes • exhaust turbines • gaskets • gearbox housings • guide rails • heat exchangers • housings for gas inlet and outlet • hulls • hydraulic cylinders • hydraulic oil pipes • hydraulic pistons • impellers • kort nozzles • oil coolers • oil pipelines / oil feed pipes • oil tanks • petrol pipelines / petrol feed pipes • petrol tanks • plain bearings • plungers • propellers • pumps • rudder bearings • seals • shaft plates • shafts • slab frames • spline shafts • steam pipelines / steam feed pipes • tappet guides • transformers • turbine housings • turbochargers • V-grooves / keyways • valve housings • valves • vibration dampers • water coolers • water pipes • water tanks

## Trademarks

MultiMetall®  
PolymerMetal® • Ceramium®  
Molymetall® • Sealium® • XETEX®

## Reference list (Extract of German customers)

ABB AG • AG der Dillinger Hüttenwerke • AIDA Cruises • Alstom Power Service GmbH • Atlas Copco Energas GmbH • Blohm + Voss Industrietechnik GmbH • Bombardier Transportation GmbH • BVG Berliner Verkehrsbetriebe • Carl Büttner Ship Management • Continental AG Automotive Systems • Daimler AG • DB AG • Deutsche BP AG • Deutz AG • E.ON AG • ENSO Energie Sachsen Ost AG • Erdgas Südsachsen GmbH • Europipe GmbH • Evonik Power Saar GmbH • German Tanker Shipping GmbH & Co. Ship Owners & Tanker Operators • HeidelbergCement AG • Henschel Industrietechnik GmbH • HKM Hüttenwerke Krupp Mannesmann GmbH • Holborn Europa Raffinerie GmbH • IVECO Motors FPT Deutschland • K + S KALI GmbH • KKW Krümmel • KKW Brokdorf • KS Aluminium-Technologie GmbH • KSB AG • LEW Lechwerke AG • LH Luitpoldhütte AG • MAN Diesel SE • Metalock Industrie Service GmbH • MTU Friedrichshafen GmbH • N-ERGIE AG • Norddeutsche Reedereien H. Schuldt GmbH & Co KG • PCK Raffinerie GmbH • Peiner Umformtechnik GmbH • Pirelli Kabel & Systeme GmbH & Co.KG • Porsche AG • Ruhrpumpen GmbH • RWE AG • Saarstahl AG • Salzgitter AG • Shell Deutschland Oil GmbH • Siemens AG Power Generation • Stadtwerke München • Stadtwerke Trier • ThyssenKrupp Industrieservice GmbH • ThyssenKrupp Marine Systems Blohm & Voss Repair GmbH • ThyssenKrupp Steel Europe AG • Vattenfall Europe AG • ZF Friedrichshafen AG

# MultiMetall

the MetalExistenceCompany®



## Overview product range

### **MM-metal SS-steelceramic**

MM-metal SS-steelceramic is the PolymerMetal with the widest range of application for repairs and maintenance of all metals and alloys. MM-metal SS-steelceramic offers a very high quality at mechanical repairs of damaged components (e.g. caused by crack, corrosion, abrasion, impact or chemical stress).

Machinability: SiC-grinding plates, Diamond tools

### **MM-metal SQ**

Characteristic for this PolymerMetal are the easy processing and extreme short curing time. The variable mixing ratio offers application consistencies from pasty to liquid. MM-metal SQ can be used at ambient temperatures up to minus 30 °C.

Machinability: standard tools

### **MM-metal SS-steel 382**

MM-metal SS-steel 382 is a PolymerMetal and construction material. The high performance material MM-metal SS-steel 382 delivers the best technical data under mechanical and physical stress.

Machinability: standard tools

### **MM-metal SS**

PolymerMetals of the SS-basis possess very high quality standards for the reconstitution of metallic components. These PolymerMetals are available with the alloy materials steel, aluminium, copper and bronze.

Machinability: standard tools

### **MM-metal oL-steelceramic**

MM-metal oL-steelceramic is a PolymerMetal tested and certified for the repair of oily, greasy or fuel contaminated metals and alloys in case of stress due to cracks, corrosion, abrasion, impact or chemicals. MM-metal oL-steelceramic can also be used to seal oil, grease or fuel pouring from leaks at systems under pressure.

Machinability: SiC-grinding plates, Diamond tools

### **MM-metal UW**

MM-metal UW is a PolymerMetal with extreme short curing time. It is certified for repairs under water or on wet metal surfaces. Possible application areas of MM-metal UW are the repair of under water components or the sealing of leaks. MM-metal UW can also be used to seal water pouring from leaks at systems under pressure.

Machinability: SiC-grinding plates, Diamond tools

### **Ceramium®**

Ceramium offers maximum wear resistance against continuous material loss on metallic surfaces. With tough hard layers, Ceramium protects against erosion, abrasion, cavitation or corrosion in case of dry or wet or chemical stress.

Machinability: SiC-grinding plates, Diamond tools

### **Ceramium® CH**

Ceramium CH is a wear resistant Polymer-Ceramic with excellent resistance against chemicals. These include inorganic (mineral) and organic (carboxylic) acids - also in concentrated form – as well as halogenated and aromatic hydrocarbons, ester, ketone, alcohols, bases and oxidising salt solutions.

Machinability: SiC-grinding plates, Diamond tools

### **XETEX® BD**

XETEX BD is a cold-setting two-component construction adhesive on basis of epoxy resin / ceramic, which has been developed for high-strength bonding. The application is the joining of materials (e.g. metals, ceramics and plastics) with very high strength at high mechanical, static and dynamic loads.

### **VP 10-017**

VP 10-017 is a tough elastic PolymerCeramic with high impact and cavitation resistance. This extremely smooth surface protection provides a good resistance against chemicals and has a high mechanical-physical load capacity.

### **VP 10-500**

VP 10-500 is a PolymerMetal for repair and maintenance of metals in the high temperature range. It is a hot-hardening material which does have a clearly higher temperature resistance than cold-hardening polymer materials. A high chemical resistance especially against sulphuric acid is given.

Machinability: SiC-grinding plates, Diamond tools

### **Molymetall®**

Molymetall is a PolymerMetal with a very low coefficient of friction and self-lubricating properties. The emergency running properties against solid dry friction such as sliding wear and stick-slip are excellent. After curing, Molymetall can be processed to a finished measure up to the  $\mu$ -area.

Machinability: standard tools

### **Sealium®**

Mostly Sealium is used as sealant and sealing of metallic casting materials. Furthermore alloys and thermal coated components can be treated with Sealium. As a one-component material with extremely high capillary activity, Sealium penetrates micro-porosities or hairline cracks and reacts in the structure of the metallic material.

### **MM-metal S**

PolymerMetals of the S-basis are used for removing bubbles in cast parts, for quick repairs and for visual improvements. MM-metal is available with high metal filling particular for the cast materials steel, iron, aluminium, copper and bronze.

Machinability: standard tools

### **MM-Elastomer**

MM-Elastomer is a material with rubber-like characteristics. Using MM-Elastomer elastic connections can be created or components repaired which are e.g. subject to abrasion. The range of MM-Elastomer goes from Shore A hardness 40 to 95.

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XETEX® • the MetalExistenceCompany®  
are registered trademarks of MultiMetall

# Technical Report PolymerMetal®

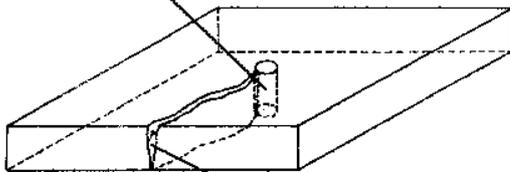
## TEC-# 016

### Sample applications

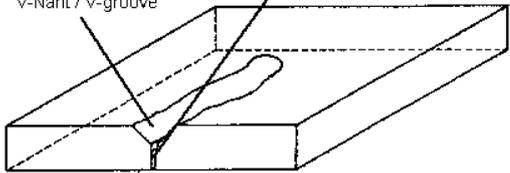
### Used products

### PolymerMetals

Rissende ausgebohrt / crack end drilled out



V-Naht / V-groove



Riss / Crack

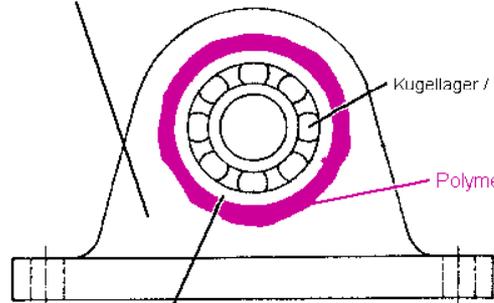
appliziertes PolymerMetal /  
applied PolymerMetal



Reparaturstelle nach Bearbeitung /  
Repair site after machining



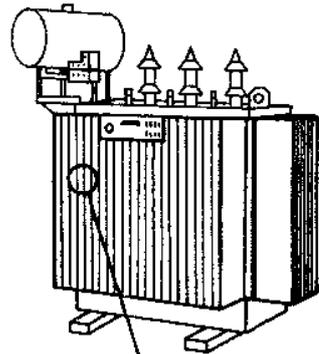
Lagerblock / pillow block



Kugellager / Ball bearing

PolymerMetal

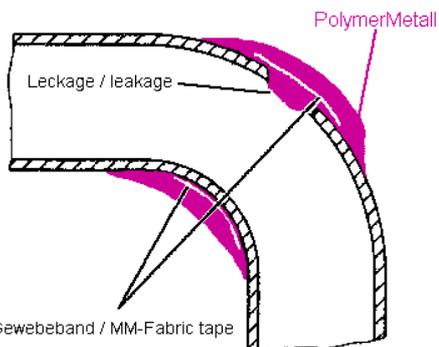
MM-Trennmittel / MM-Release agent



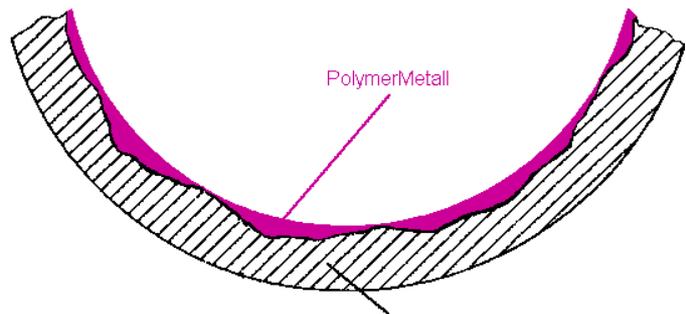
PolymerMetal



Leckage mit Flüssigkeitsaustritt /  
leakage with liquid pouring out



MM-Gewebeband / MM-Fabric tape



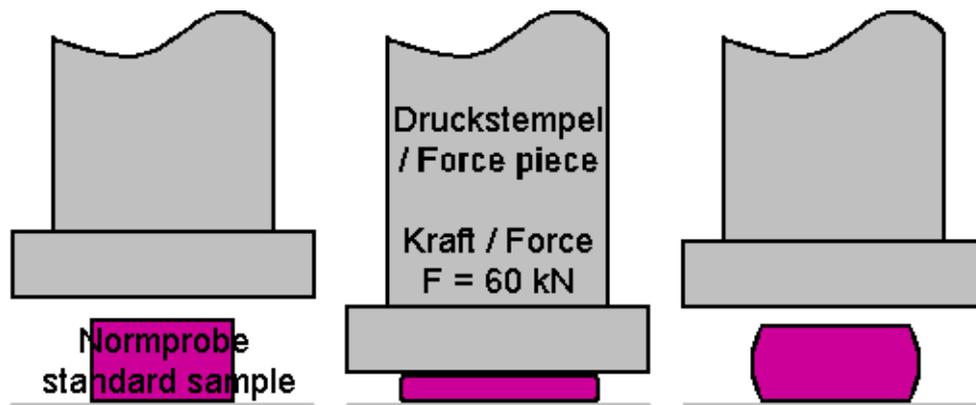
verschlissenes Pumpengehäuse / worn pump casing

**TEC-# 015**

Compression strain test

**Used products**

MM-Elastomer



**Description**

As you can learn from this test, MM-Elastomer disposes high impact strength, hardness and low distortion rest despite of this high use. Furthermore no cracks or excavations could be found after the test. MM-Elastomer is especially suitable for the production of shock and vibration absorbers, cyclone coatings and for the repair of pumps, containers, seals and conveyor belts.

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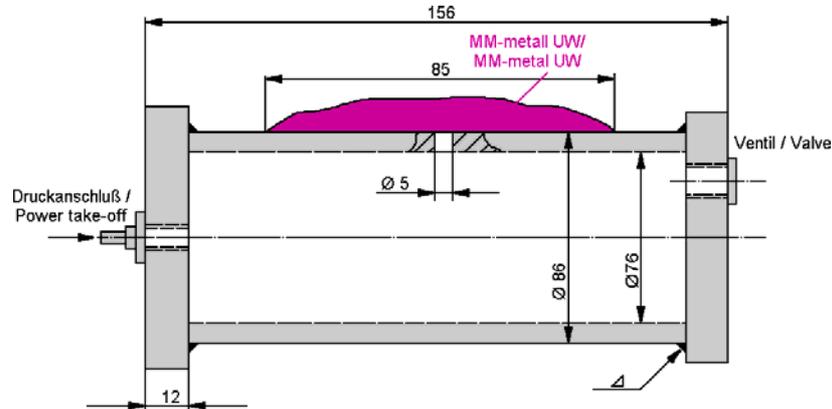
## Technical Report PolymerMetal®

### TEC-# 012

Pressure tightness test of MM-metal UW

### Used products

MM-metal UW



### Testing method:

The pressure tightness has been tested at repaired leakages at MAN-testing bodies with MM-metal UW. This test has been carried out according to the test reports of Lloyd's Register of Shipping.

### Results:

The following data are from a repair under water with MM-metal UW and Hardener UW9:

<u>Pressure</u>	<u>Data</u>
50 bar	pressure tight
100 bar	pressure tight
120 bar	after 10 min small leakage

The following data were achieved at a repair on a wet metal surface with a first layer of MM-metal UW with Hardener UW3 and a final coating with MM-metal UW and Hardener UW9:

<u>Pressure</u>	<u>Data</u>
100 bar	pressure tight
150 bar	pressure tight
200 bar	after 15 min small leakage

### Conclusion:

MM-metal UW can be used in many cases, where an application under water or on wet surfaces is required. The total curing time at 20 °C is between 10 - 60 minutes and a processing is possible up to an ambient temperature of 0 °C. Because of the a.m. technical data MM-metal UW can be used e.g. to seal leakages at water pipings, which need to resist strong pressure.

## MultiMetall

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The product information and instructions provided in this leaflet were prepared to the best of our knowledge and serve information purposes only. We recommend that appropriate tests are carried out prior to application in order to ensure that the products and methods fulfil the purpose desired by the user. In this procedure, the given data may serve as a basis. Application and processing of the products lie outside our possible control and are therefore the sole responsibility of the user.



## Technical Report PolymerMetal®

### TEC-# 007

The corrosion-chemical behaviour of PolymerMetals in combination with casting material (contact corrosion)

### Used products

MM-metal SS-steelceramic / MM-metal SQ / MM-metal SS-steel 382 / MM-metal SS-steel / MM-metal oL-steelceramic / MM-metal UW / Ceramium® / MM-metal S-steel

### Introduction

PolymerMetals are used for repairs of metallic constructions which were damaged by physical loads like tear, impact, erosion, abrasion, corrosion and cavitation or by chemical load.

Questions of customers concerning the contact corrosion of our PolymerMetals lead us to do tests.

The following report shows how the test has been carried out and what results have been obtained. Tests have been made with seven different PolymerMetals in artificial sea water (laboratory test) as well as in aggressive marshy soil. The PolymerMetals used were potentially equivalent or potentially superior to the base material (cast iron).

### Place of repair

Moorland in the North of Germany and laboratory

### Preparation of test samples

56 plates measuring 150 x 95 x 25 mm and 95 x 47 mm have been cut off cast iron. The surface of 23 plates has been treated mechanically. 2-3 bore holes of different diameters were installed in order to create different proportions between cast iron and PolymerMetals.

### General information

An ordinary salt spray test proved insufficient. As the tested PolymerMetals are non-electrical conductive products it was decided not to measure the current density potential curves. The contact resistance in the Meg-Ohm-sphere was too high.

### Test in moorland

Marshy soil is to be said very aggressive (DVGW rating no. -15 up to -19)

Reasons are:

- very low soil resistance (appr. 950-1200 Ohm x cm)
- very high salt content (chloride 800 - 1250 mg/kg / sulphate 4300 - 19000 mg/kg)
- very high moisture contents (appr. 55 - 85%)
- anaerobic conditions, proved by hydrogen-sulphide

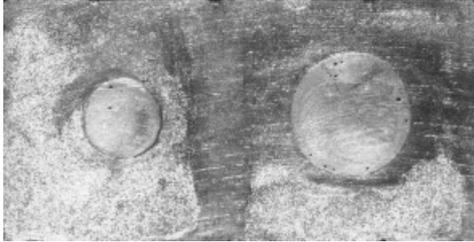
The cast iron plates and PolymerMetals, machined and non-machined, were stored in a considerable depth of marshy soil for more than one year.

### Test in artificial see water (laboratory test)

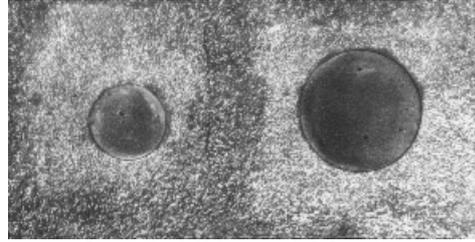
The cast iron plates and PolymerMetals - machined and non-machined - were stored in a laboratory in considerable depth of artificial sea water (DIN 50 900) for more than one year.

## Samples

The following photographs show the different PolymerMetals applied to cast iron which have been partly machined after full curing. After they have been stored for 12 months in aggressive moorland or artificial sea water the samples have been examined. The following four photographs concern machined samples which have been exposed to artificial sea water:



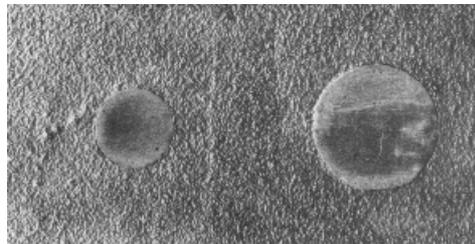
Sample MM-metal SS-steelceramic



Sample MM-metal SS-steel



Sample MM-metal oL-steelceramic



Sample MM-metal UW

## Result

The results of both tests were nearly the same. Due to the strong reaction caused by the aggressive soil or by the sea water the cast iron plates were coated with ferric hydroxide. While the surface of the cast iron plates were differently affected, the PolymerMetals still remained unchanged after storage of more than 12 months. They were only covered with rust deposit. Even peak-to-valley heights from previous treatments could clearly be recognised. There was no contact corrosion, not even at the transitional point of the PolymerMetal and the cast iron. It was proved that PolymerMetals are not electrically conductive and cannot constitute any local element with cast iron.

## Tested PolymerMetals

MM-metal SS-steelceramic  
MM-metal SS-steel 382  
MM-metal SS-steel  
MM-metal SQ  
MM-metal oL-steelceramic  
MM-metal UW  
Ceranium®  
MM-metal S-steel

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## Technical Report PolymerMetal®

### TEC-# 006

Microscope photographs, direct-MM-bonding, bonding on contaminated surfaces, pressure tight tests

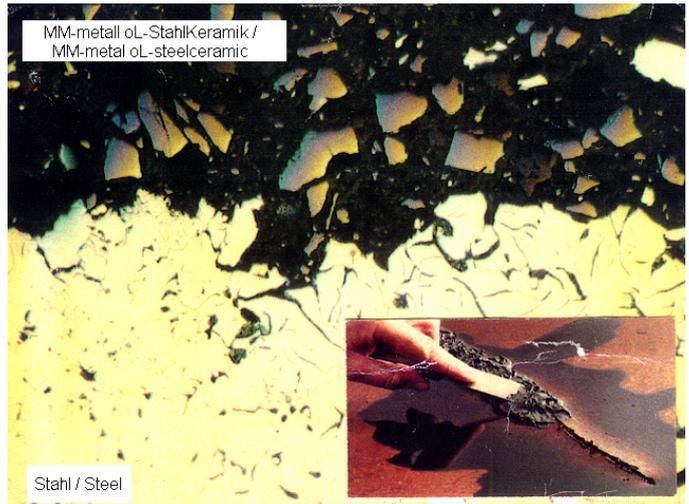
### Used products

MM-metal oL-steelceramic

### Description

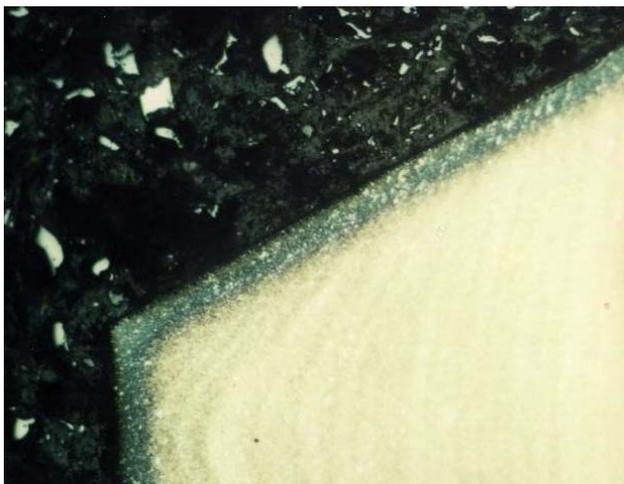
MM-metal oL-steelceramic is a PolymerMetal tested and certified for the repair of oily, greasy or fuel contaminated metals and alloys in case of stress due to cracks, corrosion, abrasion, impact or chemicals. The degree of soiling does not in any way affect the bonding with the structure of the soiled metal surface. High technical data and also the chemical resistance and bonding with the structure on a dirty metallic surface are remarkable features of MM-metal oL-steelceramic.

This technology is approved by Lloyd's Register of Shipping.



### Microscope photographs / direct-MM-bonding

The following pictures show microscopic photographs of the fully cured PolymerMetal MM-metal oL-steelceramic magnified by a factor of 100 and 500. Here the bonding between MM-metal oL-steelceramic and metallic surfaces (steel or casting), which have been contaminated by various applied oils before, has been analyzed.



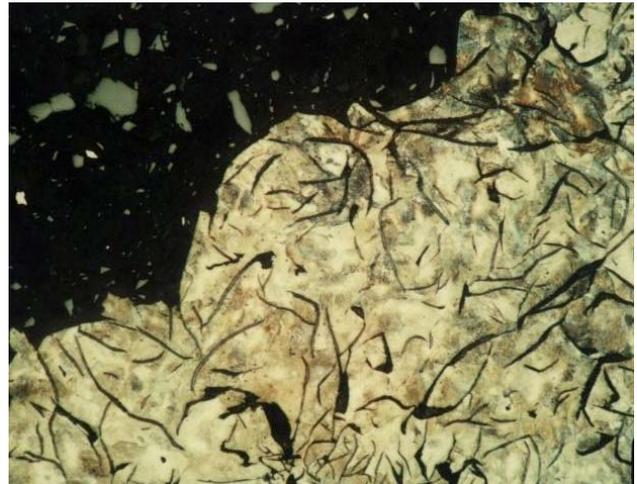
on industry gear oil / steel  
(Magnification 100)



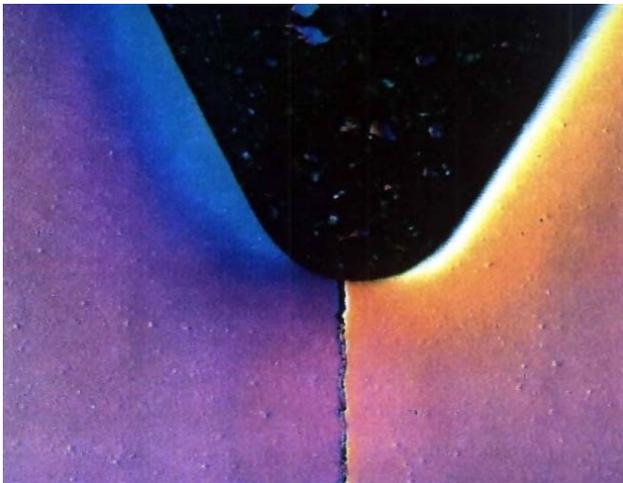
on petroleum / casting  
(Magnification 100)



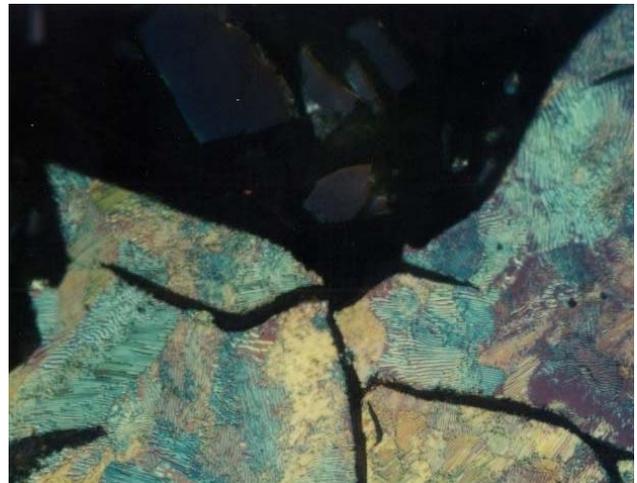
on diesel / steel  
(Magnification 100)



on compression oil KSL 68 / casting  
(Magnification 100)



on hydraulic oil T 29-50 / steel  
(Magnification 100)

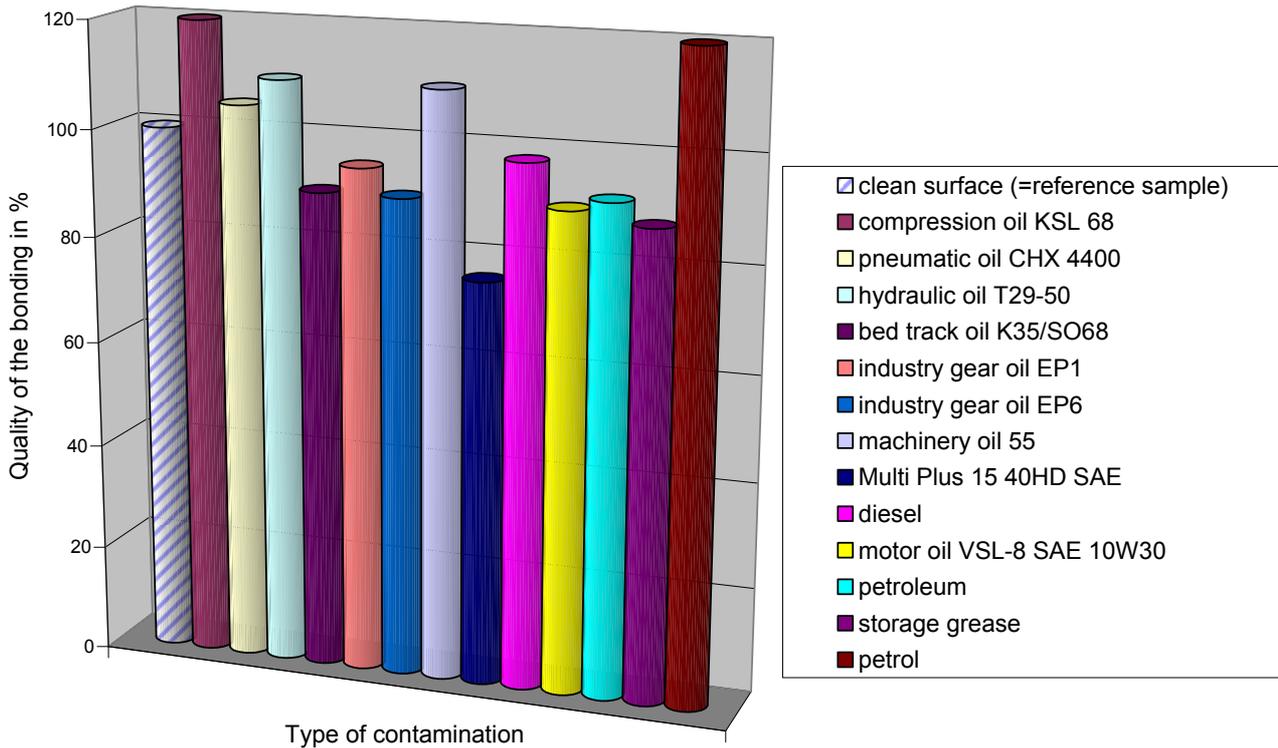


on gear oil / machine oil 55  
(Magnification 500)

MM-metal oL-steelceramic penetrates and absorbs oil, grease and fuel. The direct-MM-bonding technology secures the direct and high solid bonding on contaminated surfaces.

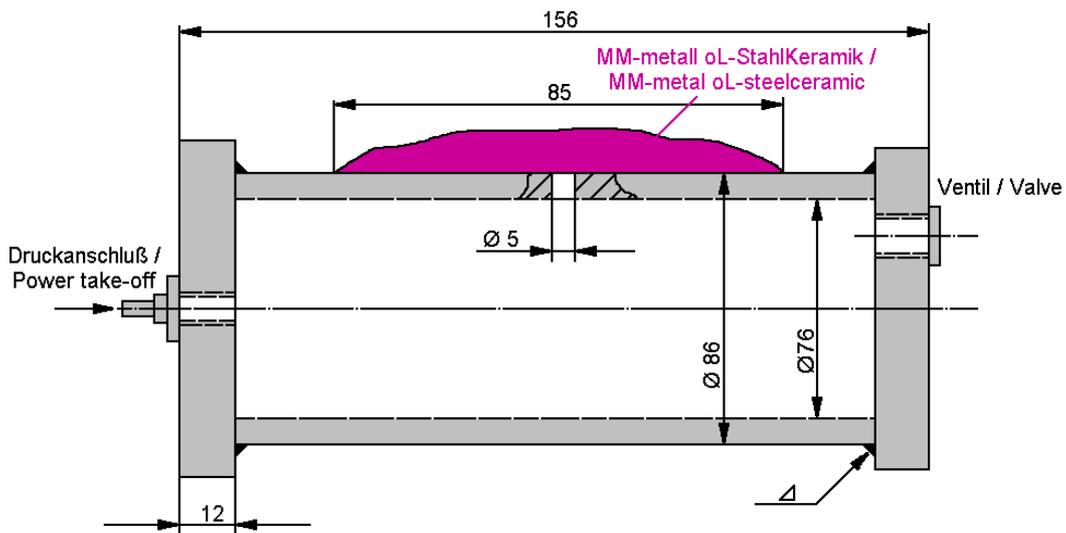
### Bonding on oily surfaces

Tests have been carried out to evaluate the quality of the bonding on different surfaces. At the reference test MM-metal oL-steelceramic and Hardener yellow have been applied to a cleaned (that means oil free) and roughened metal surface. The reference value of 100% stands for the quality of the various determined technical data during bending, shearing & hydraulic tests after total curing time. Other values have been determined by applying MM-metal oL-steelceramic on different contaminated metal surfaces. The test results demonstrate that sometimes better technical values were reached after application on oily metal surfaces than on clean metal surfaces.



### Testing of pressure tightness

To be able to evaluate the quality of the application of MM-metal oL-steelceramic on oily surfaces, tests have been carried out at company M.A.N. under supervision of the classification society Lloyds Register of Shipping. Here special test pipes made off steel have been created according to the following drawing. Around a leakage of a size of diameter 5 mm the metallic shiny surface (Rz 65 µm) of the test cylinder was contaminated with oil. Then the cold-curing MM-metal oL-steelceramic with Hardener yellow was applied around the leakage with a layer thickness of up to max. 8 mm. After full curing of the PolymerMetal the test cylinder has been filled with a liquid and pressure was built up. Then the system was checked against pressure tightness.



Pressure	Temperature of test cylinder	Auxiliaries	Result
100 bar	20 °C	-	pressure tight
150 bar	20 °C	-	pressure tight
200 bar	20 °C	-	after 8 hours small leakage

In the course of the time the research and development division of MultiMetall was successful to continue optimising the material MM-metal oL-steelceramic and new tests with same conditions have been carried out at MultiMetall. The following results were achieved:

Pressure	Temperature of test cylinder	Auxiliaries	Result
200 bar	20 °C	-	pressure tight
300 bar	20 °C	-	pressure tight
350 bar	20 °C	-	after 2 hours small leakage
150 bar	75 °C	pipe clip	pressure tight
400 bar	75 °C	pipe clip	pressure tight

The pipe clip was fixed around the test cylinder in the area of the leakage. Reinforcing elements as e.g. fibres or mats consisting of glass or carbon have not been used. These would have increased the physical strength essentially.

The tests have been carried out at M.A.N. (test report No. 1731/82) under supervision of Lloyds Register of Shipping (certificate No. 301954) in 1982, the test at MultiMetall in 1995.

Extract of the certificate: „The test results of MM-metal oL-steelceramic may be classed as ranging from good to exceptionally good. All test results were in support of the maker’s claim that MM-metal oL-steelceramic will bond on oily surfaces with a high degree of reliability.”

**Practical example**

At Weatherford pressure tests have been carried out with MM-metal oL-steelceramic. The test piece was pressure tight up to a tested pressure load of 4.000 psi (~ 275 bar).

Here are some photographs incl. test records:





Weatherford CDL 9405R1c)

Program : 1.58  
 Date : 900025  
 Part No. : 0  
 Serial No. : 0  
 Assembly : 0

Acquiring Date 21.01.2006  
 Acquiring Time 11:00:03

**Admin Data**

Company ACOTS  
 Order no. KLAUS  
 Operator

**Pipe Data**

Pipe Type 31/2" PIPE  
 Manufacturer  
 Pipe Diameter  
 Weight  
 Grade  
 Lubricant  
 Comment

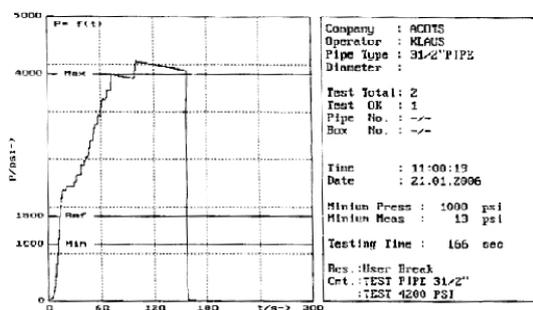
**Pressure Values**

Pressure Range 5000 psi  
 Max. Pressure 4000 psi  
 Min. Pressure 1000 psi  
 Ref. Pressure 1500 psi

**Sensor Data**

Sensor Type  
 Sensitivity (mV/V) 2.000

Weatherford CDL 9405R1c) Ver. 1.30 Date 900025



Further information can be provided upon request.

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## Technical Report PolymerMetal®

### TEC-# 023

Comparison compressive strength

### Used products

MM-metal SS-steel 382, MM-metal SS-steel

### Description

All manufacturers from polymer-metallic repair products are endeavoured to offer highest product quality. To do justice to these requirements, MultiMetall develops and produces polymer-metallic products on a high level.



The strength particularly the compressive strength describes, how much a work piece can be stressed before it breaks.

Important are the cohesion forces which hold together the smallest

parts of a work piece. As soon as the loading exceeds the cohesion forces the work piece breaks.



Based on its high user-orientated and developing potential MultiMetall does have a superior position in the area of polymer-metallic materials for years.

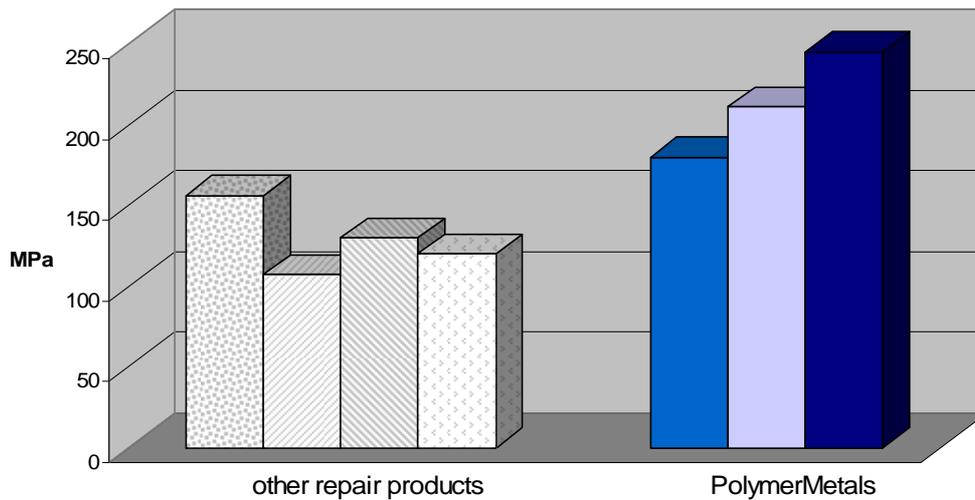


The following table compares the highest compressive strength data of polymer-metallic repair products from other producers with the data of some PolymerMetals produced by MultiMetall. The compressive strength of the MultiMetall-products has been determined by tests executed by IFAM / Germany according to DIN EN ISO 604.



<b>Repair products from other manufacturers</b>	<b>MPa</b>	<b>PSI</b>
Repair product A	156	22620
Repair product B	107	15515
Repair product C	130	18850
Repair product D	120	17400
<b>PolymerMetals from MultiMetall</b>	<b>MPa</b>	<b>PSI</b>
MM-metal SS-steel	180	26100
MM-metal SS-steel 382	211	30595
MM-metal SS-steel 382 (aftercured)	245	35525

### Compressive strength



The drawing shows, that MultiMetall's PolymerMetals do without exception deliver higher data in comparison with work piece-similar products from competitors.

**MultiMetall**  
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## *Worldwide repairs carried out with PolymerMetall® in the industry*

(Photographs incl. description of each repair can be found  
on our website [www.polymermetal.com](http://www.polymermetal.com), „Worldwide repairs“, REP-number)

### REP-# Description

- 001 Repair of 14 bearing bushes of the gear box, which is destined to the bucket wheel drive of an excavator for the field of open-cast mining. The worn bearing bushes with a diameter of 280 to 580 mm and a width of 130 to 150 mm were reconstructed with MM-metal SS-steelceramic and Hardener yellow. The standstill time of the excavator was considerable reduced to 72 hours.
- 003 The packing surface of an aluminium mould used for the production of foamed plastic car seats was repaired by applying MM-metal SS-steelceramic. The thermal loading is 150 °C, the pressure 10 kg/m<sup>2</sup>.
- 004 5 cracks in the casing of the water pump D-6300/80 at a land reclamation station was repaired with MM-metal SS-steelceramic and Hardener yellow.
- 007 Repair of heat exchangers using Ceramium and Hardener CE.
- 009 Repair of a worn bearing seat on the drive of a bulldozer with MM-metal SS-steelceramic and Hardener yellow.
- 011 Machining of MM-metal SS-steelceramic with diamond tools, e.g. Syndite PKD (trademark of „De Beers Diamond Division“). Data for machining: cutting speed  $v_c = 60 - 125$  m/min • cutting depth  $a_p = 0,5 - 1$  mm • feed  $f = 0,1 - 0,2$  mm/U
- 013 Deep grooves at the surface were filled out with Ceramium and Hardener CE.
- 014 Corrosion damages at a brake drum caused by brake dust were repaired by using MM-metal SS-steelceramic and Hardener yellow.
- 015 Sealing of a steam pipe under pressure using MM-metal UW while the plant was still operating with a pressure of 87 psi at a temperature of 160 °C.
- 017 Repair of a cracked valve casing by using MM-metal SS-steelceramic and Hardener yellow.
- 020 Repair of a paper roll with a diameter appr. 600 mm, length appr. 3400 mm and weight 8000 kg. Cause of damage: undersize of up to 1 mm at one journal bearing of 270 mm diameter. The repair has been carried out with MM-metal SS-steelceramic and Hardener yellow. After curing the roll has been machined with diamond tools.
- 021 Cracked welding seams in a silo tank were repaired by using MM-metal SS-steelceramic and Hardener yellow.
- 023 Repairing of a car engine Mercedes Benz near the crankshaft by using MM-metal SS-steelceramic and Hardener yellow. For reinforcement a 1 mm steel plate with the outline of the hole was patched into the engine.
- 024 Sealing of a leakage in a fuel tank using MM-metal oL-steelceramic with Hardener red referring the direct-MM-bonding.
- 025 Repair of four cracks on the cylinder block of a big engine called „Super MAZ“ were repaired with MM-metal SS-steelceramic and Hardener yellow. One of the cracks passed the oil channel and was therefore sealed with MM-metal oL-steelceramic and Hardener red.
- 028 Repair of a CV-plant's double cross spray head for the manufacture of rubber-insulated cable with MM-metal SS-steelceramic and Hardener yellow.



- 029 Repair of a grinding machine in a cement company. The damage, a worn out bearing housing, was repaired with MM-metal SS-steelceramic and Hardener yellow. Herewith the previous repair method „resurfacing by welding“ was replaced.
- 030 Repair of a turbine casing using MM-metal SS-steelceramic and Hardener yellow. Operating conditions: pressure 4 bar, temperature 150 °C.
- 031 A cylinder head of a car engine having corroded under water channels was repaired by applying MM-metal SS-steelceramic and Yellow hardener.
- 033 The seat of a ball bearing of a shaft, which serves for lining up, showed an abrasion of 0,2 mm. First the seat of the ball was turned off by 0,5 mm, then the repair site was cleaned with MM-Degreaser Z. Afterwards MM-metal SS-steel with Hardener yellow was applied. Finally the original shaft diameter was reached again by machining. Now the shaft was operational again without any problems.
- 035 The upper part of an impeller of a pump for filling up the ready cement in sacks was exposed to very strong wear and tear. In the meantime it was tried to restore by build-up welding. The final repair has been carried out with Ceramium and Hardener CE.
- 036 The contact surfaces of a supercharger have been rebuilt with MM-metal SS-steelceramic and Hardener yellow.
- 037 A cracked gearbox casing was repaired using MM-metal SS-steelceramic, Hardener yellow and MM-Fabric tape (metal).
- 038 During the first run of a diesel locomotive's engine a shrinkage cavity in the casting was found above the engine block near the central lubrication. Oil was leaking from this cavity. The repair was carried out with MM-metal oL-steelceramic and Hardener yellow. After several test runs the repaired engine has been installed into a new diesel locomotive.
- 040 During the maintenance on a fuel/oil storage tank several leakages were noticed. After sandblasting the leakages were sealed by using the Direct MM-Bonding method with MM-metal oL-steelceramic and Hardener red. Furthermore parts affected by pitting were coated by applying MM-metal SS-steel, pasty. 24 hours were needed for the repair works with PolymerMetals, curing time included. The usual repair procedure including emptying of the tanks, cleaning of steel walls and welding would have taken 6 days.
- 046 Sealing of a cooling water pipe made of steel without switching off the plant. Cause of the damage was material fatigue. The repair was carried out with MM-metal UW with Hardener UW3 and MM-Fabric tape (glass fibre).
- 048 Repair of an automatic glass machine at a channel for broken glass and water. The coating procedure was affected in two steps - first application with Ceramium, pasty, followed by a second application with Ceramium, liquid. The previous reconstruction procedure was build-up welding.
- 051 Repair of a water piping which was under pressure by using MM-metal UW and Hardener UW3. The sealing has been carried out while water was still escaping.
- 052 Sealing of a warm water pipe in a heat station with MM-metal UW and Hardener UW9 together with MM-Fabric tape.
- 053 Leakage removal at a hydraulic pressure header tank with MM-metal UW and Hardener UW3.
- 054 A leakage in a cooling pipe was sealed without reducing the water pressure. The repair was carried out with MM-metal UW and Hardener UW9.
- 056 Sealing of a steam pipe under pressure by using MM-metal UW and Hardener UW3. Reason for the repair were cracks of welding seams caused by vibration at a working pressure of 2 bar and a temperature of 90 °C.
- 058 Repair of an installation pipe with MM-metal UW and Hardener UW3. The leakages have been caused



by corrosion due to water and sand.

- 059 Sealing of a cooling water pipe in the high-hazard area of a high-pressure water installation without interrupting operation. The leakage was a 5 cm long crack at a water pressure of 2,5 bar. The sealing was carried out with MM-metal UW and Hardener UW3 without pressure reduction. Materials used were a pre-shaped metal sheeting and MM-Fabric tape (glass fibre).
- 062 The repair of a crack on the drying drum of a cotton spinning machine was carried out with MM-metal SS-steelceramic and Hardener yellow. Data: steam pressure 3 bar, steam temperature 180 - 240 °C.
- 063 Reconstruction of the sealing surface of the cover at a turbine. The repair was carried out with Ceramium, liquid and Hardener CE at an electric generating station.
- 064 A crack at an enamel coated chemical plant for the production of solvents was filled with Ceramium and Hardener CE.
- 066 Repair of two turbine rotors. Damages were present at all areas of the blades where the water leaves the blades. First large holes have been welded. Then the erosive areas have been filled up with Ceramium, pasty. Finally a supplementary layer of VP 10-017 has been applied as protection against cavitation.
- 067 Cavitation damages on a flange were repaired by using Ceramium pasty and Hardener CE.
- 070 Repair of a bucket wheel excavator for the field of open-cast mining by applying Ceramium liquid. The main drive shaft of the bucket wheel rim, which was damaged due to abrasion, was reconstructed at a length of 400 mm with a diameter of 360 mm. The diameter has been reduced to 350 mm before the rebuilding.
- 071 Repair of the bottom part of a coal mill. The repair has been carried out both with Ceramium pasty and Ceramium liquid.
- 072 Coating of the inner respectively outer diameter of a penstock pipe with diameter appr. 1,5 m , length appr. 900 m. Damages were caused by erosion and abrasion due to water and sand. The coating was affected with Ceramium pasty with Hardener CE.
- 074 Repair of an oil / gas tank under arctic temperature. The repair was carried out with MM-metal UW and Hardener UW3 in Russia.
- 076 A seized oil pump was repaired by using Molymetall.
- 077 Sealing of micropores in fittings using Sealium by immersion or brush method.
- 078 Repair of a water piping system which was under pressure using MM-metal UW and Hardener UW3.
- 079 Durable repair of a hydraulic piping using MM-metal oL-steelceramic and MM-Fabric tape (steel). Pressure load 180 bar.
- 080 Repairing a damaged bearing bush using Molymetall.
- 081 Leakages (micro pores) in a cylinder head were closed with Sealium.
- 082 Casting defects on compressor housings were repaired using MM-metal S-steel.
- 083 Repair of heat exchangers using Ceramium and Hardener CE.
- 085 Axial and radial groves on drilling upright machines and bed ways were filled with Molymetall and machined down to size.
- 086 Various purposes of VP 10-017, a tough and elastic polymer-ceramic, which can be applied e.g. on covers, models, pump housings, mountings, pipe works, machines and plants. VP 10-017 offers a durable, elastical, high impact and wear resistant corrosive protection. VP 10-017 can be applied with brush or spatulas in one go to an application thickness of 300 µm even on vertical surfaces.



- 087 Durable repair of a leakage in a piping system under water by using MM-metal UW and Hardener UW9.
- 088 A machine casing was repaired by using MM-metal oL-steelceramic and Hardener red and afterwards Hardener yellow. The application has been done using the direct-MM-bonding technology.
- 089 Repair of the soot blower compressor at a heat station by coating the additional cooler with Ceramium. The coating was affected in two steps: a first application of Ceramium pasty type, afterwards a second application with Ceramium liquid type.
- 090 A cover with Ceramium was reconstructed. The coating was affected in two working procedures: First a surface reconstruction with Ceramium, pasty and Hardener CE. Second an application with Ceramium, liquid with Hardener CE.
- 091 Coatings with VP 10-017 for air coolers, tanks and other big surfaces. VP 10-017-coatings as surface protection and protection against corrosion do offer a very smooth, flexible and wear resistant surface. VP 10-017 is temperature resistant up to 100 °C and offers a very high chemical resistance.
- 092 Sealing of 3 hydrogen pipings by using MM-metal SS-steelceramic. Hydrogen was escaping at 350 psi. A metal sleeve with a pressure compensating valve was prepared. MM-metal SS-steelceramic was applied to the sleeve and the pipings. While the valve was open the sleeve was assembled, therefore the hydrogen could easily escape through the opened valve. After totally curing of MM-metal SS-steelceramic the valve was closed and the installation was ready to operate. If the pipings had been exchanged the whole installation would have had to be stopped.
- 094 Blocking valves have been reconstructed by using Ceramium. Responsible was serious wear and tear on the steel alloy caused by the clay loam.
- 097 Due to corrosion creep the coating peeled off at a bigger area in the zone of the stuffing box packing of a shaft treated with flame spaying (1. picture). After suitable surface preparation the shaft was coated with the wear resistant material Ceramium, pasty (2. picture), after curing machined to nominal measure (3. picture) and finally put into operation again in a paint coating machine at a paper mill. The formerly common company repair solution by metal spraying was not considered because the machine would have been too long out of order.
- 101 A conveying belt of a compost filling plant showed a 120 mm x 130 mm long triangle fracture at the corner. After cleaning and degreasing with MM-Degreaser Z an application of MM-Elastomer 95 with Hardener EL95 was done. Afterwards the conveying belt was put into action again with a tensile stress of 5 bar.
- 104 An additional water-centrifugal pump being damaged by erosion and cavitation was rebuilt using Ceramium. Housing and flanged socket were coated inside with VP 10-017.
- 105 Coating of a turbine impeller due to cavitation damages. Here the materials Ceramium and Hardener CE were used.
- 106 A chrome plated hydraulic piston showed strong surface flaking. As there were thinnest layers and antifricition properties required, the repair was affected with Molymetall.
- 109 Repair of a hair crack at a main engine block of a bulldozer (make Komatsu). The hair crack was appr. 20 inches long. A first attempt to repair by electro welding failed. Then the engine block was successfully restored by using the direct-MM-bonding method with MM-metal oL-steelceramic.
- 111 Repair of a water pump. Damage: a crack of approx. 15 cm length. Data of the pump: year of construction 1969, power: 1500 m3/h, material: GGG-40.3, working pressure 20-40 bar. The pump has been repaired with MM-metal SS-steelceramic, Hardener yellow and MM-Fabric tape (carbon). Several attempts to carry out the repair by conventional welding before failed.
- 112 Corrosion and abrasion damages on high pressure fan casings in a paper-mill have been removed using Ceramium pasty and Hardener CE.
- 113 Repair of gas drilling surge valves. Abrasion due to escaping gas (2800 psi) and carrying contaminations



such as e.g. sand. The repair has been carried out using Ceramium. A later inspection did not reveal any damages.

- 116 Repairing of oil pipes using MM-metal oL-steelceramic. The origin of the damage were leaky welding seams.
- 117 A damaged shaft of a conveyer worm was rebuilt using Ceramium. An inspection after 6 months did not reveal any damages on the conveyer worm.
- 120 Sealing of a cracked pump casing at reduced water outlet using MM-metal UW and Hardener UW3.
- 121 The bearing seat of a brake shield was reconstructed to its original size with Molymetall. First 2 mm were turned down and then Molymetall was applied. After total curing (appr. 12 h) the size of the original diameter of the seat was reached by turning down again.
- 123 Repairs with MM-metal UW and Hardener UW3 are possible under arctic conditions at temperatures even down to minus 20 °C.
- 127 Repair of a car's cooling water circulating pump with MM-metal SS-steel, liquid and Hardener yellow, liquid.
- 128 A carburettor has been repaired using MM-metal SS-steelceramic with Hardener yellow.
- 136 A worn pump casing was coated with Ceramium liquid. Depending on the application consistency, Ceramium can be applied with a brush, a spatula or any other suitable tool or by pouring or injecting. Before coating, the surface must be roughened e.g. by sand blasting and then cleaned with MM-Degreaser Z or Acetone.
- 137 Due to steady climate influence (salty air and rainfall) several strong corroded areas and a leakage of a natural gas carrying pipe system on an oil platform have been repaired with MM-metal oL-steelceramic. To avoid any extra costs the repair was carried out without switching off the system and so the repair has been done at a pressure of 10 bar. Gas streamed out of a leakage of a 10 inch, therefore a provisional valve was built, through which the gas was able to stream out until the final closure of the leakage. A construction consisting of a plate and a nut was made, which was then fixed on the leaky place of the pipe by using MM-metal oL-steelceramic. After the PolymerMetal was cured this valve was closed by using a screw. Finally a coating of MM-metal oL-steelceramic was applied over the complete provisional construction for safety reasons.
- 138 The worn-out shaft of a gear motor for moving an ore conveyer belt was repaired with PolymerMetal. For this the polymer material Molymetall was applied to the damaged shaft on the spot and after partial curing reduced to the desired dimension by grinding by hand with abrasive paper. The solution of the problem by using a PolymerMetal had the big advantage that through this a dismantling of the facility or shaft was not necessary. Due to this modern type of repair, the customer was able to save around 67 hours of machine shut-down.
- 139 After many years of working, the worn-out rock shaft of a crushing plant for recycling demolition material was repaired with MM-metal SS-steel 382 in September 2002. First the driving fly wheel was carefully dismantled to receive access to the shaft. After the surface preparation of the up to 1 mm worn-out shaft area, MM-metal SS-steel 382 was applied and then machined down to the desired diameter. A replacement due to the necessary dismantling of the damaged shaft, the purchase and the assembly of a new shaft, would have involved considerable additional costs and time. An examination 4,5 years later (March 2007) has come to the result, that the repaired work piece is still in function without any complaints.
- 141 A damaged injection mould for manufacturing plastic cups at a refuse dressing plant was repaired with MM-metal SS-steel.
- 142 Several defective covers of a heat exchange system were repaired with VP 10-017.
- 143 Several valves of a line system on an oil platform were damaged. The problem was abrasion caused by the transportation of sand and sea water. The damages were repaired with the help of Ceramium, pasty.



- 144 In a power plant a turbine paddle was worn out due to water. The pasty variant of the PolymerMetal Ceramium was used to rebuild the worn-out areas.
- 145 A reeling machine was worn out due to abrasion. After roughening the surface to be treated, it was coated with the PolymerMetal MM-metal SS-steel and therefore put into working order again.
- 147 In a mining plant the cost and time intensive new acquisition of a replacement shaft for a damaged shaft of a vibrating screen was prevented by the repair with MM-metal SS-steel.
- 148 Several holes and damaged spots respectively in the roof of a big tank at an oil refinery were first coated with Ceramium. Then a layer of MM-Elastomer was applied to compensate any bigger tensions.
- 149 Due to abrasion a worn out metal ring of a dredging pump had to be replaced. With the help of MM-metal SS-steel the new metal ring was fixed. PolymerMetals present a high shearing strength; MM-metal SS-steel offers a value 30 MPa.
- 150 A broken pump casing was repaired with the help of the PolymerMetal MM-metal SS-steelceramic.
- 151 Into an old cracked valve with a broken flange, a pipe with a suitable diameter was inserted and fixed by using the PolymerMetal MM-metal SS-steel. Then this connection was secured by several screws.
- 152 Onto a damaged area of an axle end MM-metal SS-steel, later MM-metal SS-steel 382 was applied to receive a higher surface quality. After curing, the work piece was machined down with a lathe to the desired diameter.
- 165 The slideways and bedways of 10 elder threading machines for the processing of drilling rods for the natural gas and oil industry have been rebuilt with Molymetall by injection/moulding. The application thickness was partly up to 7 mm. Because of the high wear resistance, the very low coefficient of friction and the self-lubricating properties of Molymetall the customer is very satisfied after several previous failed repairs with competitive products. The machines are in service again successfully for several years.
- 169 In an approximately 8 m long pipe section of a fuel pipe situated in sea water (location Middle East) of a well known energy provider, a considerable wall thickness recession was detected by ultrasonic tests caused by corrosion and erosion. Prior to the decision of repairing the 16 inch (outer diameter) big piping, a pre-test was carried out. Here MM-metal UW was used together with fabric tapes made of glass fibre. The above photographs show the corresponding test application of a slightly slimmer pipe. After the good test results the actual pipe (16 inch outer diameter, original wall thickness ~ 13 mm, wall thickness recession at thinnest spot to approx. 5 mm; in addition to that deep pittings; water temperature during application approx. 14 – 18 °C; operation pressure in pipe approx. 5,5 up to max. 10 bar) was also repaired later. In the end 100 units of MM-metal UW / Hardener UW were used for this operation. Here the pipe was prepared/machined (roughened) in the worn area. Then, under water, a first (base) coat was applied. Afterwards the fabric tapes were prepared – that means they were coated from both sides with the mixed MM-metal UW – and then wrapped around the pipe onto the still not cured base coating. For a good repair success it was important that the pot life was kept, that means the time which is available for processing the material.
- 170 The pump capacity of a diesel pump decreased due to a leakage. There was a small leak probably resulting from an untight soldered seam or a crack in the copper pipe at a difficult accessible repair place at a measuring plug. A soldering/welding linked the measuring steel plug (diameter approx. 25 mm) with a ¾-inch copper pipe. By using MM-metal SS-steelceramic and Hardener yellow the damage was repaired and later the customer (a water treatment company) put the pump into operation again with the usual working pressure of 16 bar.
- 171 In fractionating columns or cracking facilities in the chemical or petrochemical industry, there are operating temperatures of 200 - 300 °C and pressures of 0,3 - 2 bar. During the extraction of heavy fuel, side products like anthracene, creosote, naphthalene, disinfectant, etc. are generated, which will cause chemical corrosion of the inner walls in the long run. After various investigations it was decided to apply the hot-curing PolymerMetal® VP 10-500 as a protective coating on the inner walls of a new plant. VP 10-500 possesses a very good temperature and also a good chemical resistance against various chemicals originated by the oil. Untreated inner walls made of stainless steel (steel grade SA240-316L) are corroded already after 6 months. In contrast the functionality of the VP 10-500 coating is still given



without any objections even after 8 years.

- 172 A refinery's gas washer for cleaning sour natural gas suffered from hard exposures and had massive corrosion damages in several areas. There appear high temperatures (140 °C), pressure (3 bar) and a line of chemicals (Amines MDEA, H<sub>2</sub>S, CO<sub>2</sub>, O<sub>2</sub>, various acids, ...). With MultiMetall's coating material Ceramium® CH / Hardener CH1 excellent results were achieved. Further details can be found here [www.metalexistence.com/gaswasher](http://www.metalexistence.com/gaswasher)
- 173 A piping made of carbon steel in a refinery had a severe leakage with benzol streaming out with high pressure (10 bar). With the help of an auxiliary construction, MM-metal oL-steelceramic and MM-metal SS-steel the leak was sealed. Here besides the common application method (trowelling) also the injection method was used. Further detailed information can be found here [www.metalexistence.com/benzenepipe](http://www.metalexistence.com/benzenepipe)
- 174 Alternatively to extensive conventional repair procedures (e.g. welding works) at floating roof tanks an expensive drain of the liquid stored in the tank can if applicable be abstained from by using a repair method with PolymerMetall®. MM-metal oL-steelceramic can be applied on problematic surfaces (contamination due to oil, fuel et cetera). The additional purpose of the flexible material MM-Elastomer is effective against tensions. Here are further information available for the application at floating roof tanks: [www.metalexistence.com/f-roof](http://www.metalexistence.com/f-roof)
- 175 The slewing bearing (Ø 4371 mm) of a bucket-wheel excavator showed some deviations outside of the tolerance range at some spots in the area between upper structure and chassis. For the solution of this repair problem the high-strength repair material MM-metal SS-steel 382 was chosen. The very thin fluid product type is extreme flowable and pourable. Further information about this application can be found here: [www.metalexistence.com/slewingbearing](http://www.metalexistence.com/slewingbearing)

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*Worldwide repairs carried out with PolymerMetal®*

REP-# 093



Repair of a ship propeller shaft made of bronze in the zone of the stuffing box packing with Ceramium pasty and Hardener CE. The original shaft diameter of 630 mm was machined down to 615 mm over a length of 60 cm. After the application of Ceramium the diameter was 632 mm. Finally the applied Ceramium was turned down to the requested diameter. For the complete repair 39 units of Ceramium / Hardener CE were used for applying 4 layers. Additionally 3 layers of glass fibre fabric tape were processed.

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**REP-# 115**



Repair of a leaking simplex compact packing. The repair was difficult due to oil pouring out of the repair site. Therefore it was decided to use the direct-MM-bonding method by applying the PolymerMetall directly on the greasy surface. Here MM-metal oL-steelceramic with Hardener red was chosen.

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## Worldwide repairs carried out with PolymerMetal®

REP-#139



After many years of working, the worn-out rock shaft of a crushing plant for recycling demolition material was repaired with MM-metal SS-steel 382 in September 2002. First the driving fly wheel was carefully dismantled to receive access to the shaft. After the surface preparation of the up to 1 mm worn-out shaft area, MM-metal SS-steel 382 was applied and then machined down to the desired diameter. A replacement due to the necessary dismantling of the damaged shaft, the purchase and the assembly of a new shaft, would have involved considerable additional costs and time. An examination 4,5 years later (March 2007) has come to the result, that the repaired work piece is still in function without any complaints.

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## Worldwide repairs carried out with PolymerMetal<sup>®</sup>

REP-#140



In a steel plant the repair of a broken spool reducer with a weight of 40 t would have taken up 10 days by using the conventional way of welding. By using the repair technology of MultiMetall combined with the PolymerMetal MM-metal SS-steel and MM-Release agent a repair time of just 27 hours was necessary. At the spool reducer a stress of 120 MPa occurs.

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Worldwide repairs carried out with PolymerMetal®

REP-#144



A turbine paddle was worn out caused by a water-sand-mixture. The pasty variant of the PolymerMetal Ceramium was used to rebuild the worn-out areas.

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REP-#150



A broken pump casing was repaired with the help of the PolymerMetal MM-metal SS-steelceramic.

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REP-#152



Onto a damaged area of an axle end MM-metal SS-steel, later MM-metal SS-steel 382 was applied to receive a higher surface quality. After curing, the work piece was machined down with a lathe to the desired diameter.

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## Worldwide repairs carried out with PolymerMetal®

REP-#156



The welding at 19 places of transformers had micro cracks and blowholes, where oil exuded. First the paint has been removed with an electro drill equipped with an abrasive tool and the metal has been cleaned at the defective areas. Then MM-metal oL-steelceramic with Hardener red and afterwards Hardener yellow was applied. After checking the tightness of the repaired areas the corresponding areas have been painted over again.

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## Worldwide repairs carried out with PolymerMetal®

REP-# 163



A tool form of nickel for the torsos production of complex medical rubber dummies had to be adapted in the cervical region. The form was first cut in the cervical area. The attempt by soldering to join again the parts of the form being adjusted in the meantime, failed. Leakages by embedded air bubbles occurred in the cast parts in the area of the seam. By the alternative application of Ceramium BD the form could be put into operation again successfully. The seam was grinded 2 mm deep, cleaned with acetone and warmed up in the stove on 100 °C. Then Ceramium BD was applied in the repair area. After sufficient curing of approx. 1 - 1,5 hours the form was grinded and covered with Sealium respectively immersed in Sealium. The result was a clean surface without noticeable passages in the seam. The form stood firm easily the working temperature of 265 °C.

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**REP-# 170**



The pump capacity of a diesel pump decreased due to a leakage. There was a small leak probably resulting from an untight soldered seam or a crack in the copper pipe at a difficult accessible repair place at a measuring plug. A soldering/welding linked the measuring steel plug (diameter approx. 25 mm) with a 3/4-inch copper pipe. By using MM-metal SS-steelceramic and Hardener yellow the damage was repaired and later the customer (a water treatment company) put the pump into operation again with the usual working pressure of 16 bar.

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# Produktübersicht / Product Overview

Prod-#	Produkt (Deutsch / German)	Product (Englisch / English)	Einheit/Unit	Notizen/Notes
	<b>MM-metall SS-StahlKeramik</b>	<b>MM-metal SS-steelceramic</b>		
200	MM-metall SS-StahlKeramik, pst.	MM-metal SS-steelceramic, pst.	1000 g	
249	Härter gelb, pst.	Hardener yellow, pst.	50 g	
248	Härter rot, pst.	Hardener red, pst.	100 g	
	<b>MM-metall SQ</b>	<b>MM-metal SQ</b>		
300	MM-metall SQ, pul.	MM-metal SQ, pow.	1000 g	
301	Härter SQ2, fl.	Hardener SQ2, liq.	220 g	
302	Härter SQ8, fl.	Hardener SQ8, liq.	220 g	
	<b>MM-metall SS-Stahl 382</b>	<b>MM-metal SS-steel 382</b>		
217	MM-metall SS-Stahl 382, pst.	MM-metal SS-steel 382, pst.	1000 g	
249	Härter gelb, pst.	Hardener yellow, pst.	50 g	
218	MM-metall SS-Stahl 382, fl.	MM-metal SS-steel 382, liq.	1000 g	
250	Härter gelb, fl.	Hardener yellow, liq.	50 g	
	<b>MM-metall SS, pastöse Konsistenz</b>	<b>MM-metal SS, pasty consistency</b>		
201	MM-metall SS-Stahl, pst.	MM-metal SS-steel, pst.	1000 g	
205	MM-metall SS-Aluminium, pst.	MM-metal SS-aluminium, pst.	600 g	
209	MM-metall SS-Kupfer, pst.	MM-metal SS-copper, pst.	1000 g	
211	MM-metall SS-Bronze, pst.	MM-metal SS-bronze, pst.	1000 g	
249	Härter gelb, pst.	Hardener yellow, pst.	50 g	
	<b>MM-metall SS, flüssige Konsistenz</b>	<b>MM-metal SS, liquid consistency</b>		
202	MM-metall SS-Stahl, fl.	MM-metal SS-steel, liq.	1000 g	
206	MM-metall SS-Aluminium, fl.	MM-metal SS-aluminium, liq.	600 g	
210	MM-metall SS-Kupfer, fl.	MM-metal SS-copper, liq.	1000 g	
212	MM-metall SS-Bronze, fl.	MM-metal SS-bronze, liq.	1000 g	
250	Härter gelb, fl.	Hardener yellow, liq.	50 g	
	<b>MM-metall oL-StahlKeramik</b>	<b>MM-metal oL-steelceramic</b>		
2460	MM-metall oL-StahlKeramik, pst.	MM-metal oL-steelceramic, pst.	1000 g	
249	Härter gelb, pst.	Hardener yellow, pst.	50 g	
248	Härter rot, pst.	Hardener red, pst.	100 g	
246	MM-metall oL-StahlKeramik, pst.	MM-metal oL-steelceramic, pst.	500 g	
253	Härter gelb, pst.	Hardener yellow, pst.	25 g	
248	Härter rot, pst.	Hardener red, pst.	100 g	
	<b>MM-metall UW</b>	<b>MM-metal UW</b>		
1160	MM-metall UW, pul.	MM-metal UW, pow.	1000 g	
1170	Härter UW3, fl.	Hardener UW3, liq.	250 g	
1180	Härter UW9, fl.	Hardener UW9, liq.	250 g	
116	MM-metall UW, pul.	MM-metal UW, pow.	500 g	
117	Härter UW3, fl.	Hardener UW3, liq.	125 g	
118	Härter UW9, fl.	Hardener UW9, liq.	125 g	
	<b>Ceramium®</b>	<b>Ceramium®</b>		
601	Ceramium, pst.	Ceramium, pst.	695 g	
611	Härter CE, pst.	Hardener CE, pst.	55 g	
602	Ceramium, fl.	Ceramium, liq.	695 g	
607	Härter CE, fl.	Hardener CE, liq.	55 g	
	<b>Ceramium® CH</b>	<b>Ceramium® CH</b>		
622	Ceramium CH, pst.	Ceramium CH, pst.	1000 g	
623	Härter CH1, pst.	Hardener CH1, pst.	75 g	
624	Härter CH1, fl.	Hardener CH1, liq.	65 g	
625	Härter CH2, pst.	Hardener CH2, pst.	80 g	
626	Härter CH2, fl.	Hardener CH2, liq.	70 g	
	<b>XETEX® BD</b>	<b>XETEX® BD</b>		
455	XETEX BD, pst.	XETEX BD, pst.	750 g	
456	Härter BD, fl.	Hardener BD, liq.	50 g	

# Produktübersicht / Product Overview

Prod-#	Produkt (Deutsch / German)	Product (Englisch / English)	Einheit/Unit	Notizen/Notes
	<b>VP 10-017</b>	<b>VP 10-017</b>		
705	VP 10-017, fl.	VP 10-017, liq.	800 g	
706	Härter VP 10-017 rot, fl.	Hardener VP 10-017 red, liq.	400 g	
707	Härter VP 10-017 grau, fl.	Hardener VP 10-017 grey, liq.	400 g	
	<b>VP 10-500</b>	<b>VP 10-500</b>		
701	VP 10-500, pst.	VP 10-500, pst.	650 g	
711	Härter VP 10-500, pst.	Hardener VP 10-500, pst.	650 g	
702	VP 10-500, str.	VP 10-500, br.	650 g	
712	Härter VP 10-500, str.	Hardener VP 10-500, br.	650 g	
	<b>Molymetall®</b>	<b>Molymetall®</b>		
401	Molymetall, pst.	Molymetall, pst.	800 g	
403	Härter Molymetall, pst.	Hardener Molymetall, pst.	30 g	
404	Härter Molymetall, fl.	Hardener Molymetall, liq.	30 g	
	<b>Sealium®</b>	<b>Sealium®</b>		
551	Sealium, fl.	Sealium, liq.	2000 ml	
	<b>MM-metall S</b>	<b>MM-metal S</b>		
101	MM-metall S-Stahl, pul.	MM-metal S-steel, pow.	1000 g	
102	MM-metall S-Eisen, pul.	MM-metal S-iron, pow.	1000 g	
105	MM-metall S-Aluminium, pul.	MM-metal S-aluminium, pow.	650 g	
108	MM-metall S-Kupfer, pul.	MM-metal S-copper, pow.	1650 g	
109	MM-metall S-Bronze, pul.	MM-metal S-bronze, pow.	1650 g	
147	Härter S8, fl.	Hardener S8, liq.	250 g	
148	Härter S15, fl.	Hardener S15, liq.	250 g	
	<b>MM-Elastomer</b>	<b>MM-Elastomer</b>		
951	MM-Elastomer 95, pst.	MM-Elastomer 95, pst.	370 g	
952	MM-Elastomer 95, fl.	MM-Elastomer 95, liq.	370 g	
953	MM-Elastomer 95, str.	MM-Elastomer 95, br.	370 g	
962	Härter EL95, fl.	Hardener EL95, liq.	110 g	
956	MM-Elastomer 85, fl.	MM-Elastomer 85, liq.	370 g	
964	Härter EL85, fl.	Hardener EL85, liq.	110 g	
958	MM-Elastomer 65, fl.	MM-Elastomer 65, liq.	370 g	
966	Härter EL65, fl.	Hardener EL65, liq.	74 g	
960	MM-Elastomer 40, fl.	MM-Elastomer 40, liq.	370 g	
968	Härter EL40, fl.	Hardener EL40, liq.	89 g	
	<b>MM-Sets</b>	<b>MM-Sets</b>		
802	MM-Basic Set	MM-Basic Set	Stück / pc	
803	MM-Set SS	MM-Set SS	Stück / pc	
804	MM-Set oL	MM-Set oL	Stück / pc	
805	MM-Set UW	MM-Set UW	Stück / pc	
806	MM-Set VP 10-500	MM-Set VP 10-500	Stück / pc	
	<b>Zubehör</b>	<b>Accessories</b>		
10	MM-Lösung Z, fl.	MM-Degreaser Z, liq.	1000 ml	
11	MM-Lösung Z, fl.	MM-Degreaser Z, liq.	250 ml	
14	MM-Trennmittel, fl.	MM-Release agent, liq.	100 ml	
33	Mischplatte (Kunststoff)	Mixing plate (synthetic material)	20 x 12 cm	
16	Mischstab (rostfreier Stahl)	Mixing stick (stainless steel)	Stück / pc	
15	Mischbecher (Kunststoff)	Mixing cup (synthetic material)	Stück / pc	
25	Messlöffel rot	Measuring spoon red	Satz / set	
26	Messlöffel gelb	Measuring spoon yellow	Satz / set	
29	Messlöffel VP 10-500	Measuring spoon VP 10-500	Satz / set	
18	Gewebeband (rostfreier Stahl)	Fabric tape (stainless steel)	100 x 10 cm	
20	Gewebeband (Glasfaser)	Fabric tape (glass fibre)	1000 x 5 cm	
22	Gewebematte (Glasfaser)	Fabric mat (glass fibre)	30 x 40 cm	
23	Applikationsroller	Application roller	Stück / pc	
34	Temperaturindikator (Einweg)	Temperature indicator (one-way)	15 Stück / pc	

## Hinweise / Notes:

Konsistenz/consistency: pst./pst.=pastös/pasty; fl./liq.=flüssig/liquid; pul./pow.=pulvrig/powdery; str./br.=streichbar/brushable

EXW = Lieferung ab Lager Deutschland excl. Verpackung / delivery ex works stock Germany excl. packing

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In order to find out which PolymerMetall® could be used to solve your repair problem we would like to ask you to fill in and send back this form. Additional sketches, drawings, photographs etc. could be helpful. We thank you for your effort!

**Description of the device**

Machine/Plant/Construction: .....

Damaged device (Name): .....

Function: .....

Material of the device: .....

Relevant dimensions (e.g. length, width, height, diameter, wall thickness...):  
of the device: .....

of the damaged area: .....

Damage description (e.g. crack, wear, leakage,... – in detail please):  
.....  
.....  
.....

Reason and cause of damage (Why?... Whereby?... – in detail please):  
.....  
.....

Constructive weakening (structural/mechanical strength) of the device due to damage  
 No |  Yes

Notes/Other: .....

**Influences on the repair area at operating conditions**

Thermal stress  
min ..... °C | max ..... °C | Durable Ø ..... °C

Mechanical stress  
 No |  Yes ..... MPa |  Yes .....

Pressure load by fluids  
 No |  Yes ..... bar |  Yes.....

Chemical stress  
 No |  Yes Chemical(s) (if so with concentration data)      Chemical temperature  
..... °C  
..... °C  
..... °C

Tribological stress

<input type="checkbox"/> No   <input type="checkbox"/> Yes		Sliding wear (Adhesion)	<input type="checkbox"/> Yes		Impact particle wear (Abrasion)
<input type="checkbox"/> Yes		Sliding abrasion (Abrasion)	<input type="checkbox"/> Yes		Drop erosion wear (Surface fatigue)
<input type="checkbox"/> Yes		Particle erosion – fluids (Erosion, Abrasion)	<input type="checkbox"/> Yes		Cavitation wear (Surface fatigue)

