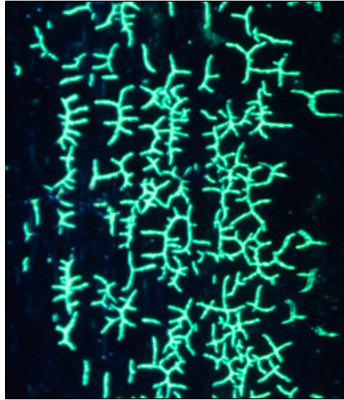




**KD-CHECK Penetrants**  
Agents for Penetrant Testing

**KARL DEUTSCH**

# Agents for Penetrant Testing



Crack indication with fluorescent penetrants

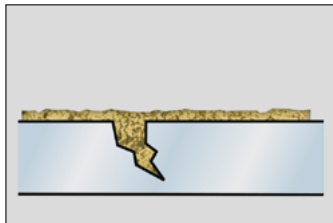
## When is Penetrant Testing Used?

Penetrant testing is a method of non-destructive material testing which is used to make surface cracks visible. A prerequisite for the applicability of the method is that the defect to be detected is open to the workpiece surface; internal material defects are not detected.

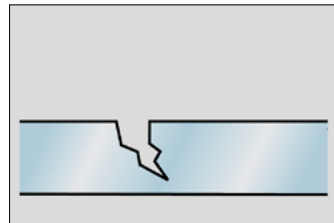
Mainly metallic materials are tested, but plastics or ceramic materials can also be examined with penetrant testing. Here, it is recommended to carry out a compatibility examination before starting the test.

Cracks or pores detectable by penetrant testing typically have a width of 0.5  $\mu\text{m}$  to 10  $\mu\text{m}$  and a depth of 20  $\mu\text{m}$  to 200  $\mu\text{m}$ .

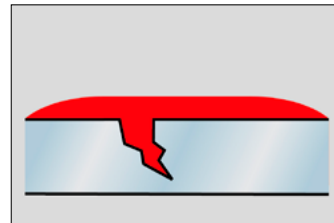
## The Individual Steps of Penetrant Testing



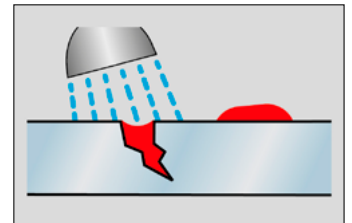
1. Dirty crack



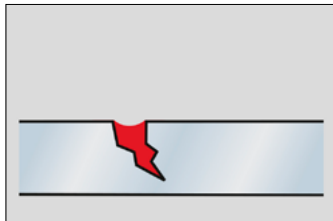
2. Ideally pre-cleaned



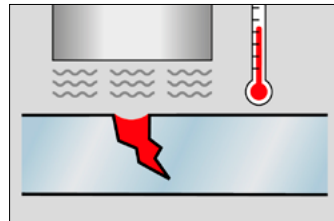
3. Application of testing agent



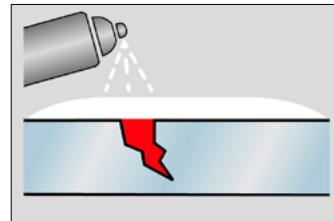
4. Intermediate cleaning



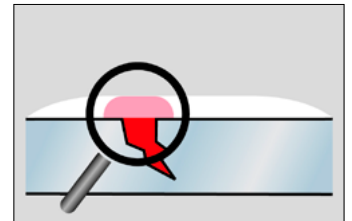
5. Ideal intermediate cleaning



6. Drying



7. Application of developer



8. Inspection

### KD-CHECK testing agents are ...

- suitable for use in all applications where high demands are made on penetrant testing. They are used in the automotive, aerospace and marine sectors, mechanical engineering, container and reactor construction, maintenance, welding technology, as well as many other industrial sectors.
- type-tested according to DIN EN ISO 3452-2 and meet the requirements of other standards (ASTM E165, ASTM E1417 and many more). For the aviation sector, many testing agents are offered which are approved to AMS2644 and listed on QPL-AMS2644.
- marked by "Low sulphur and halogen content according to DIN EN ISO 3452" with regard to the corrosive components (sulphur, fluorine, chlorine) and fulfil the requirements of the ASME Code, Section V, Article 6.
- made in Germany: developed and produced in Wuppertal.

Under this QR code (scan or click), you will find the following on our website for all our chemical products:

- **Technical Information Sheets**
- **Safety Data Sheets**



# Dye Penetrants

Red dye penetrants are often used on construction sites, in workshops, for repairs or for sampling inspections because of their easy handling. As only one can of cleaner, penetrant and developer each is required **for quick, manual tests**, the method is also popular for mobile testing.

The evaluation takes place in normal daylight or under daylight lamps, eliminating the need for complex darkening structures. However, red dye penetrant is also often used in series testing, especially when **larger components** need to be tested.

Wetting properties play a particularly important role in the selection of testing agents. In addition to modern water-based testing agents, which also comply with wastewater regulations and testing requirements, classic oil-based testing agent formulations continue to be offered for special applications.



Testing agent application with electrostatics at a penetrant testing station



Crack indication with red dye penetrant on a weld seam

## KD-CHECK RDP-1

- Red dye penetrant, type II
- Base: oil
- Low viscosity
- Excellent wetting properties on smooth surfaces

## KD-CHECK RDP-2

- Red dye penetrant, type II and III
- Base: water
- Optimal dripping properties
- Low background

<b>Sensitivity level</b>	Level 2 (DIN EN ISO 3452-2)	
<b>Application</b>	IIAe, IICe, II Ee	
<b>Approvals</b>	DIN EN ISO 3452-2, 3452-6, ASME Code, Section V, Article 6	DIN EN ISO 3452-2, ASME Code, Section V, Article 6
<b>Biodegradable</b>	-	✓
<b>Temperature range</b>	-30 °C to +50 °C on test surface	+10 °C to +50 °C on test surface
<b>Suitability</b>	All metals and non-metals. Suitability for plastics must be checked.	
<b>Packaging</b>	500 ml aerosol can, 1 l, 5 l, 10 l, 25 l, 200 l, 1000 l	

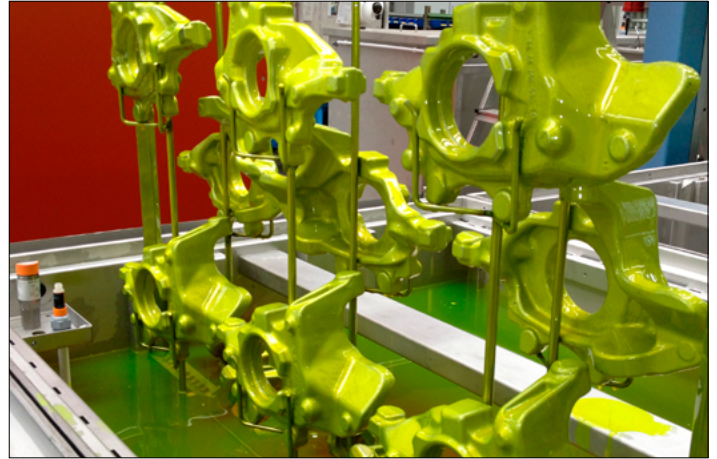
# Fluorescent Penetrants

## Sensitivity Level 0.5 and 1

Due to the higher sensitivity of fluorescent penetrants, they are mostly used in penetrant testing of series of **critical components**, such as in the aerospace and automotive industries. When used in stationary systems, a large number of test pieces can be checked for the finest cracks in a short time in a reproducible manner. In conjunction with dry developers that are applied by dusting or electrostatically, sensitivity during testing is increased even further.

In addition to classic penetrants for the automotive sector and industry, we also offer special, self-developed testing agents that meet the requirements of AMS2644 and are listed in the Qualified Parts List (QPL). They therefore meet the requirements of the extensive aviation regulations for testing agents.

All fluorescent KD-CHECK testing agents comply with the requirements regarding corrosive components according to DIN EN ISO 3452 and ASME Code, Section V, Article 6. Most testing agents are furthermore biodegradable, so that easy and environmentally friendly disposal is ensured.



Dip tanks enable high throughput with consistent wetting



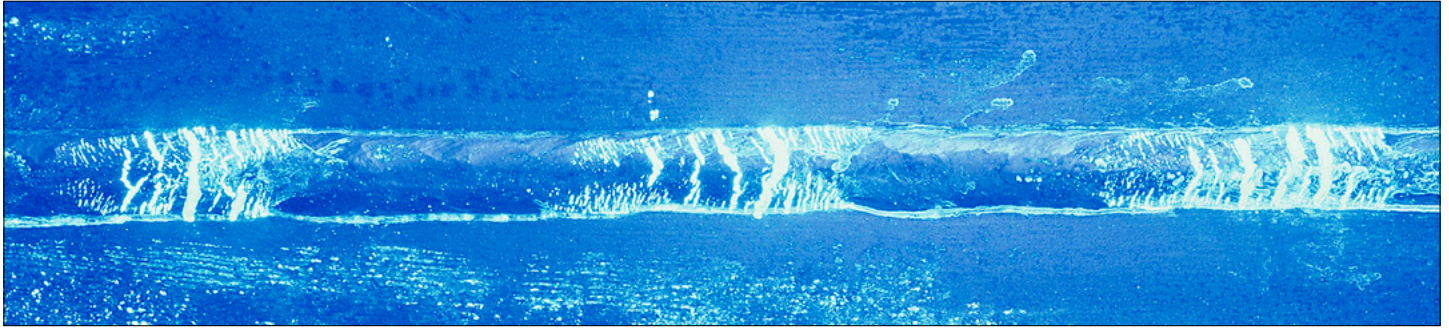
Larger containers are available for extensive series testing

■ KD-CHECK FWP-3	■ KD-CHECK FWP-4	■ KD-CHECK FP-WB-1
<ul style="list-style-type: none"> <li>▪ Fluorescent penetrant, type I</li> <li>▪ Base: water</li> <li>▪ Especially suited for rough surfaces</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fluorescent penetrant, type I</li> <li>▪ Base: surfactants</li> <li>▪ Very low background fluorescence</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fluorescent penetrant, type I</li> <li>▪ Base: water</li> <li>▪ Strong contrast</li> </ul>

<b>Sensitivity level</b>	Level 0.5 (DIN EN ISO 3452-2)	Level 1 (DIN EN ISO 3452-2)	Level 1 (DIN EN ISO 3452-2)
<b>Application</b>	IAa, IAb, IAc, IAd, ICa, ICb, ICc, ICd		
<b>Approvals</b>	DIN EN ISO 3452-2, ASME Code, Section V, Article 6		
<b>Biodegradable</b>	✓		
<b>Temperature range</b>	+10 °C to +50 °C on test surface		
<b>Suitability</b>	All metals and non-metals. Suitability for plastics must be checked.		
<b>Packaging</b>	1 l, 5 l, 10 l, 25 l, 200 l, 900 l	1 l, 5 l, 10 l, 25 l, 200 l, 1000 l	

# Fluorescent Penetrants

## Sensitivity Level 2, 3 and 4



Crack indication with fluorescent penetrant on a weld seam

	<b>KD-CHECK FWP-1</b>	<b>KD-CHECK FWP-6</b>	<b>KD-CHECK FP-WB-2</b>
	<ul style="list-style-type: none"> <li>Fluorescent penetrant, type I</li> <li>Base: oil</li> <li>Especially suited for smooth surfaces</li> </ul>	<ul style="list-style-type: none"> <li>Fluorescent penetrant, type I</li> <li>Base: surfactants</li> <li>Very low background fluorescence</li> </ul>	<ul style="list-style-type: none"> <li>Fluorescent penetrant, type I</li> <li>Base: water</li> <li>Very strong contrast</li> </ul>
<b>Sensitivity level</b>	Level 2 (DIN EN ISO 3452-2)		
<b>Application</b>	IAa, IAb, IAc, IAd, ICa, ICb, ICc, ICd		
<b>Approvals</b>	DIN EN ISO 3452-2, ASME Code, Section V, Article 6		
<b>Biodegradable</b>	-		✓
<b>Temperature range</b>	+10 °C to +50 °C on test surface		
<b>Suitability</b>	All metals and non-metals. Suitability must be checked.		
<b>Packaging</b>	500 ml aerosol can, 1 l, 5 l, 10 l, 25 l, 200 l, 1000 l		1 l, 5 l, 10 l, 25 l, 200 l, 1000 l

	<b>KD-CHECK FWP-2</b>	<b>KD-CHECK FWP-22</b>	<b>KD-CHECK FWP-33</b>
	<ul style="list-style-type: none"> <li>Fluorescent penetrant, type I</li> <li>Base: surfactants</li> <li>Highest sensitivity according to DIN EN ISO 3452-2</li> </ul>	<ul style="list-style-type: none"> <li>Fluorescent penetrant, type I</li> <li>Base: surfactants</li> <li>Resistant to washing over</li> </ul>	<ul style="list-style-type: none"> <li>Fluorescent penetrant, type I</li> <li>Base: surfactants</li> <li>Very strong contrast</li> </ul>
<b>Sensitivity level</b>	Level 4 (DIN EN ISO 3452-2) Level 3 (AMS2644)	Level 2 (DIN EN ISO 3452-2) Level 2 (AMS2644)	Level 3 (DIN EN ISO 3452-2)
<b>Application</b>	IAa, IAb, IAc, IAd, ICa, ICb, ICc, ICd		
<b>Approvals</b>	DIN EN ISO 3452-2, AMS2644, ASME Code, Section V, Article 6	DIN EN ISO 3452-2, AMS2644, ASME Code, Section V, Article 6	DIN EN ISO 3452-2, ASME Code, Section V, Article 6
<b>Biodegradable</b>		✓	
<b>Temperature range</b>	+10 °C to +50 °C on test surface		
<b>Suitability</b>	All metals and non-metals. Suitability for plastics must be checked.		
<b>Packaging</b>	1 l, 5 l, 10 l, 25 l, 200 l, 1000 l		

# Cleaner

Cleaners are used for both **pre-cleaning** and **intermediate cleaning** in the testing process. The appropriate cleaner is selected based on the type of contamination or the penetrant used. The component surface can also influence the selection.

The main application for cleaners in pre-cleaning is to remove grease and oil from previous processing steps. For intermediate cleaning, the cleaner should thoroughly absorb the penetrant from the surface and also evaporate quickly.

Stronger contamination often requires more active solutions, whereby a minimal layer of the surface is chemically removed in order to open up possible defects. In such cases, additional steps such as washing and drying often need to be carried out before the actual penetrant testing.



Pre-cleaning of a test piece with KD-CHECK PR-2

## KD-CHECK PR-1

- Cleaner, method C
- Base: oil
- Highly suitable for cleaning oily, greasy and cooling lubricated surfaces

## KD-CHECK PR-2

- Cleaner, method C
- Base: alcohol/ketone
- Universally applicable

<b>Application</b>	Pre-, intermediate and final cleaning
<b>Approvals</b>	DIN EN ISO 3452-2, 3452-6, AMS2644, ASME Code, Section V, Article 6
<b>Temperature range</b>	-30 °C to +50 °C on test surface
<b>Suitability</b>	All metals and non-metals. Suitability for plastics must be checked.
<b>Packaging</b>	500 ml aerosol can, 5 l, 10 l, 25 l, 200 l, 900 l

## KD-CHECK PREW-S

- Aqueous, strongly acidic
- Base: phosphoric acid
- Ideal for cleaning aluminium components
- Applied by: spraying, dipping, manually

## KD-CHECK PREW-AS

- Aqueous, strongly alkaline
- Composed of: non-ionic surfactants, additives, defoamers, solubilizers
- Applied by: spraying, dipping, manually

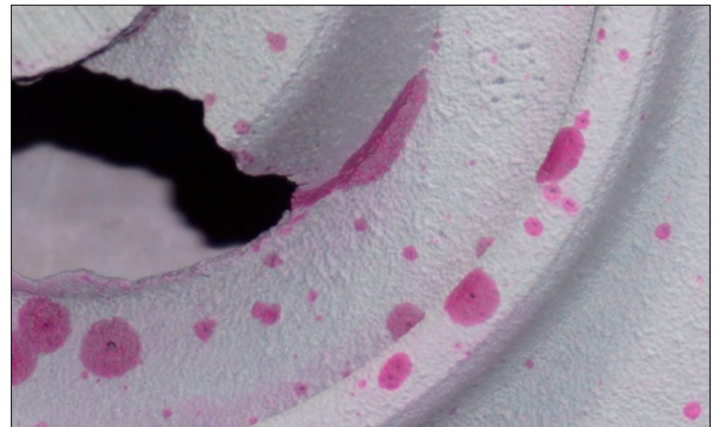
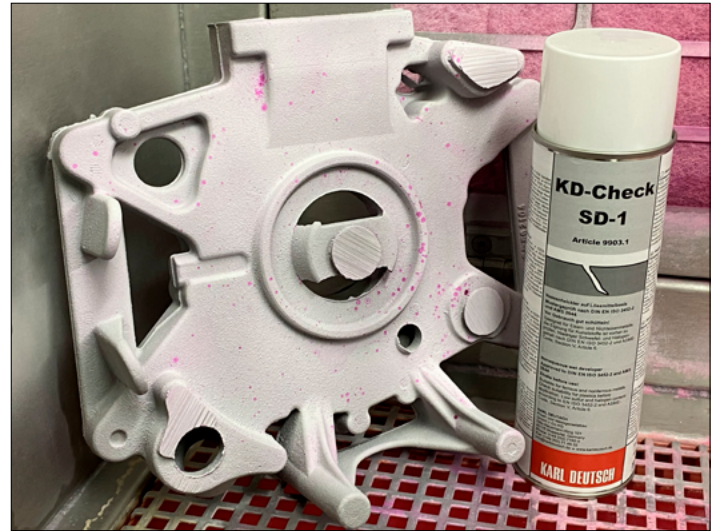
<b>Application</b>	Pre- and final cleaning	
<b>Concentration</b>	1:10 to 1:100	1:5 to 1:150
<b>Temperature range</b>	+20 °C to +90 °C	-
<b>Suitability</b>	Aluminium alloys and acid-resistant metals/alloys. Suitability must be checked.	(Stainless) steel and alkaline-resistant metals/alloys. Suitability must be checked
<b>Packaging</b>	1 l, 5 l, 10 l, 25 l, 200 l, 1000 l	

Developers serve to increase the sensitivity of penetrants, thereby enhancing the contrast between the testing agent and the background. It is important that developers form an even, non-reflective coating that does not fluoresce itself when using fluorescent penetrants.

The wet developer KD-CHECK SD-1 consists of highly volatile solvent with white pigments. This combination significantly improves the contrast when testing with dye penetrants. On the other hand, it dissolves the penetrant in the crack and draws it into the developer layer. Its easy application via aerosol can and its suitability for use with red dye penetrants make it ideal for mobile testing.

The dry developer KD-CHECK DD-1 is only used with fluorescent penetrants. After application, this developer only adheres to the areas where the penetrant emerges from the defect. This delivers excellent reproducible results, making this dry developer particularly suitable for series testing.

The wet developer KD-CHECK WDD uses water as a carrier medium and therefore does not expose employees or the workplace to solvent vapours. Even if handled improperly, highly flammable air-solvent mixtures cannot form. In addition, when used in a pre-heated immersion tank, the use of drying ovens is usually unnecessary.



Reliable identification of finest cracks through excellent contrast between penetrant and background

	■ KD-CHECK SD-1	■ KD-CHECK DD-1	■ KD-CHECK WDD
	<ul style="list-style-type: none"> <li>Wet developer, solvent-based</li> <li>Dries quickly</li> <li>Creates a thin and uniform developer layer</li> </ul>	<ul style="list-style-type: none"> <li>Dry developer</li> <li>Excellent contrast between background and crack indication</li> <li>Application via dusting, vortex chamber and electrostatics</li> </ul>	<ul style="list-style-type: none"> <li>Wet developer, water-based, suspendable</li> <li>Odourless and solvent-free</li> <li>Ideal for immersion application</li> </ul>
<b>Form</b>	d + e	a	c
<b>Approvals</b>	DIN EN ISO 3452-2, AMS2644 ASME Code, Section V, Article 6	DIN EN ISO 3452-2, AMS2644, ASME Code, Section V, Article 6	DIN EN ISO 3452-2, ASME Code, Section V, Article 6
<b>Temperature range</b>	-30 °C to +50 °C on test surface	+10 °C to +50 °C on test surface	Approx. +60 °C in immersion tank
<b>Suitability</b>	All metals and non-metals. Suitability for plastics must be checked.		
<b>Packaging</b>	500 ml aerosol can, 5 l, 10 l, 200 l*	1 kg, 20 kg	1 l, 5 l, 10 l, 25 l

\*165 l of content in 200 l barrel

# Accessories and Systems for Penetrant Testing



KARL DEUTSCH offers an extensive range of accessories for penetrant testing:

- **UV-LED Lamps** for various fields of application: As large area lamps for stationary use or hand lamps for mobile testing.
- **Test Blocks** for all established standards (DIN EN ISO 3452, ASME, ASTM etc.)
- **Other Accessories** such as hand sprayers for powder, spray attachments for aerosol cans and electrostatic units for testing agents and developers



When designing penetrant testing systems, we support our customers from the testing task all through to commissioning. Due to standardised modules, we can always respond individually to the testing tasks at hand.

- **Testing Stations** are ideal for manual sampling inspections or for testing of singular parts.
- **Semi-Automatic Systems** offer higher throughput for different test pieces due to their flexibility and are therefore ideally suited for small-scale series testing.
- **Fully Automatic Systems** are designed for maximum throughput and deliver reproducible results even for large series with high quantities.



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DIN EN ISO  
9001  
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# KARL DEUTSCH