



Baerlocher Additives for PVC  
**Lead Stabilizers**



we add character to plastics

**BÆRLOCHER**





## we add character to plastics

Plastics open new avenues for the future. Additives essentially determine properties and quality of the end product.

For more than 50 years, Baerlocher, a global leader in supplying additives has been successfully providing support to the plastics industry by developing and manufacturing high-quality plastics additives.

**[www.baerlocher.com](http://www.baerlocher.com)**

### **Baerlocher products**

Baeropan	Baerocid
Baerostab	Ceasit
Baeropol	Zincum
Baerolub	



Fourteen production sites in Germany, Great Britain, Italy, France, the United States, Malaysia, India, China, Korea, Brazil, Peru and Argentina as well as a sales network covering more than 40 countries make the Baerlocher group of companies a strong partner. This global presence and more than 1200 employees worldwide make sure that we are always close to the customer. Future-oriented, we are continuously investing in research and development. A large number of in-house research scientists and technical experts ensure our considerable creative potential and innovative power. Baerlocher has R+D facilities in Germany (München-Unterschleissheim), France (Marseille), Italy (Lodi) and the United States (Dover, Cincinnati) and India (Dewas).

Environmentally sound production processes as well as the safety and protection of people and environment are key corporate goals. As a globally active group of companies we are aware of our responsibility, regardless of time or place. We are committed to the principles of "Responsible Care": Our quality management is certified to ISO 9001 and our environmental management system to ISO 14001, encouraging our employees to work together in a responsible way. This policy will not least benefit our customers.

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The starting material for all Baerlocher lead products is high purity lead metal.

## **Baerlocher PVC Additives**

- **high-performance**
- **tailor-made**
- **quality-controlled**
- **future-orientated**
- **cost-efficient**

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# Properties and Applications

## History

“Like tin and iron, lead is among the longest-known metals, and was made mention of already in the Old Testament”, the famous chemist Dr J. Jakob Berzelius, a professor at the Royal Swedish Academy of Sciences, wrote in his chemistry textbook in 1824.

Lead is easy to mine and both pure lead and lead alloys have favourable mechanical properties. In addition, lead can be formed into many different compounds and has therefore always been extensively used across a wide range of applications.

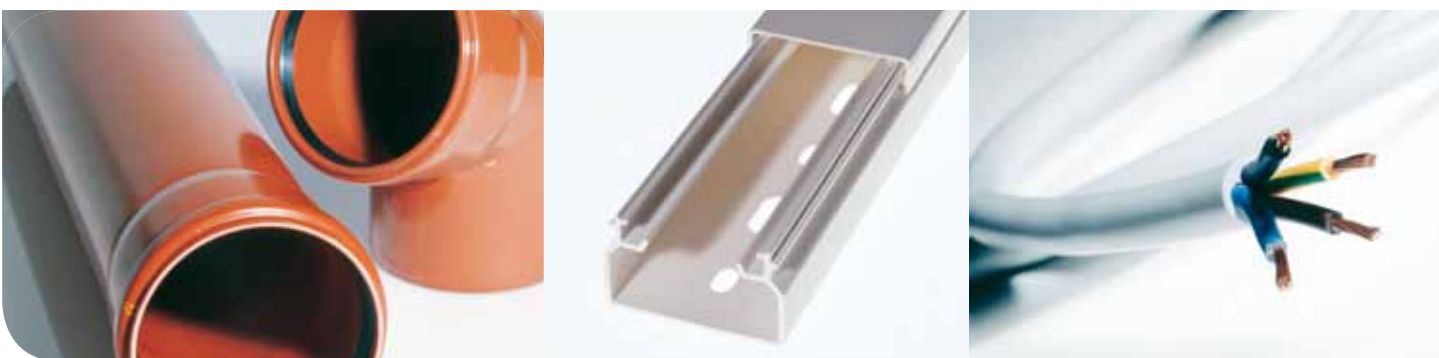
For example, it is a well-known fact that lead compounds are used as pigments, such as minium, white lead and patent yellow or lead chromates in a variety of shades from yellow to fiery red.

## Lead and PVC

Lead compounds were among the first materials to be used as Stabilizers to prevent the decomposition of PVC. A Union Carbide patent from 1934 describes the use of lead oxide as a heat stabilizer for vinyl resin enamels. Only compounds derived from bivalent lead are relevant in practice, with basic primary lead stabilizers and lead soaps being the most commonly used PVC Stabilizers.

## Applications

Typical applications of lead Stabilizers include recyclable PVC profiles, pipes and cables with a long service life.



### **Stabilizer systems**

Primary lead Stabilizers are generally used in conjunction with lead soaps, calcium soaps, lubricants and antioxidants.

Benefits:

- Excellent long-term heat stability
- Pigmenting effect of basic primary lead Stabilizers beneficial in light coloured applications
- Low solubility in water, no leaking into the environment
- No odour during processing and in the final product
- No detrimental effects on the Vicat softening temperature of rigid PVC

Disadvantages:

- Lead compounds in biologically available form are chronically toxic (as explained in the notes on precautions in handling lead products).
- Discolouration in contact with sulphur-containing compounds (sulphur staining)

### **Principle of action**

Basic lead compounds are excellent HCl scavengers and are able to bind substantial amounts of hydrogen chloride during the decomposition of PVC. The resulting lead chloride is very stable, insoluble in water and does not encourage the decomposition of PVC.





# Overview

## Lead Commodities

Baerlocher offers a wide range of lead commodities, allowing costumers to create their own formulation or modify existing recipes. The products are available in various modifications already containing lubricants, additional metal soaps, plasticizers or antioxidants besides the respective lead commodity.

Our customers can further choose from a variety of product forms: regular or low-dusting powder as well as low-dusting or non-dusting granules, pellets or flakes.

Chemical basis	Product name
Tribasic lead sulphate	Baerostab V 220 MC
Tetrabasic lead sulphate	Baerostab V 420 MC
Dibasic lead phthalate	Baerostab Pebetal
Dibasic lead stearate	Baerostab Pb 51 S
Neutral lead stearate	Baerostab Pb 28 f
Dibasic lead phosphite	Baerostab Pebefos FP
Dibasic lead phosphite/sulfite	Baerostab Pebefos





# Production

The starting material for all Baerlocher lead products is high-purity lead metal of 99.985 % purity, DIN 1719. The DIN standard defines the composition and maximum allowable content of foreign metals. Lead metal has a density of 11.336 g/cm<sup>3</sup> and a melting point of 327.4 °C. It is oxidised by way of the Barton process to produce yellow lead oxide. Lead forms various compounds with oxygen (PbO, Pb<sub>3</sub>O<sub>4</sub>, PbO<sub>2</sub>). Trilead tetroxide (Pb<sub>3</sub>O<sub>4</sub>), or minium, for example, is commonly used in corrosion-resistant paints. For the production of lead commodities suitable for plastics processing bivalent lead oxide which exists in two modifications is needed:

- a) a stable type, red lead oxide, also referred to as massicot, resulting from the oxidation of lead metal at temperatures below 488 °C.
- b) a more reactive type, yellow lead oxide, also referred to as litharge, produced by oxidation at temperatures above 488 °C.

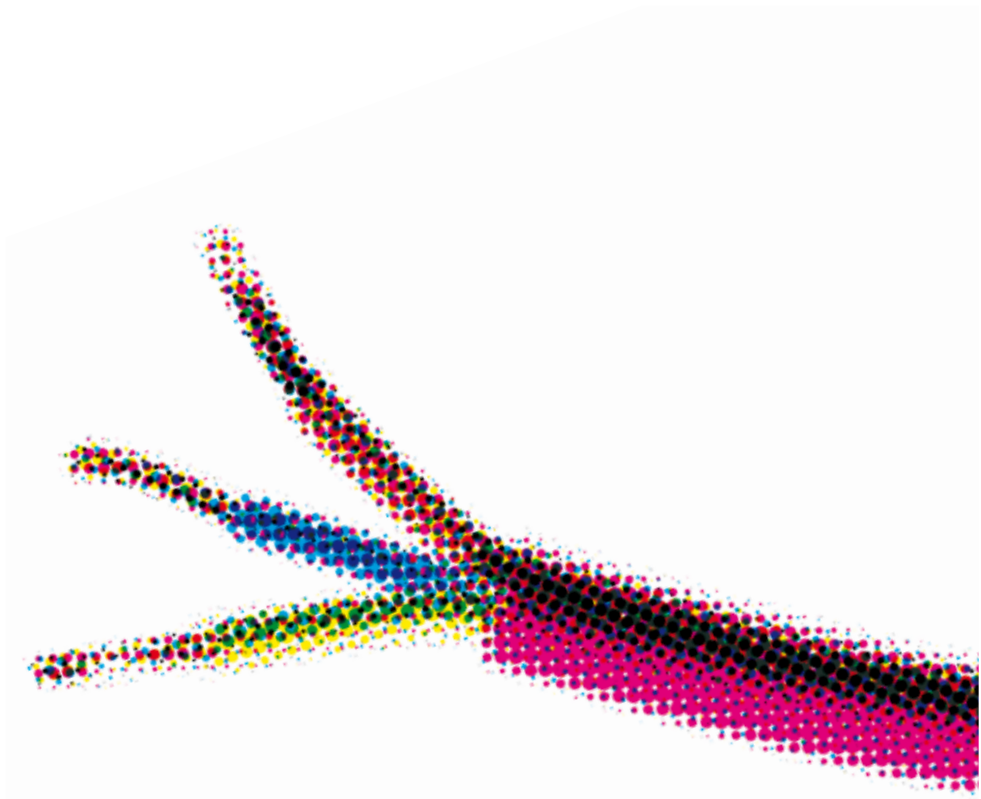
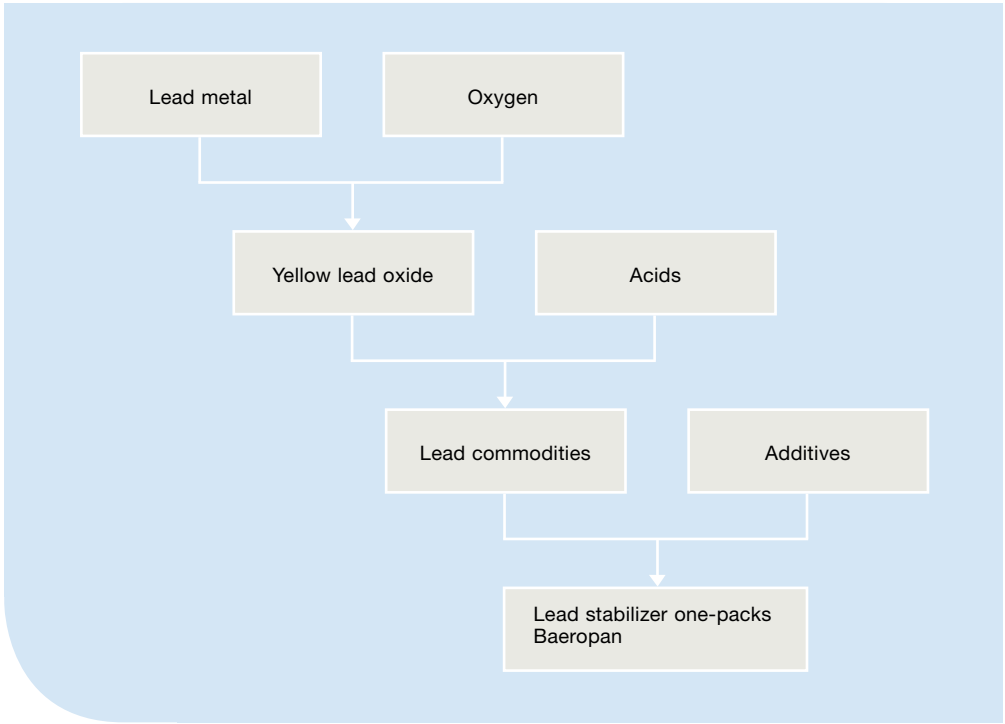
The yellow modification transforms to the more stable red type when exposed to moisture. Only the yellow modification can be used for making lead commodities. Therefore the internal production of lead oxide is an important prerequisite for the production of high-quality products.

## Lead commodities are produced by reacting yellow PbO with acids.

PbO	+ sulfuric acid	tribasic lead sulphate or tetrabasic lead sulphate
	+ phthalic anhydride	dibasic lead phthalate
	+ stearic acid	dibasic lead stearate or neutral lead stearate
	+ phosphoric acid	dibasic lead phosphite
	+ phosphoric acid sulfurous acid	dibasic lead phosphite/sulphite

The resulting lead commodities are mixed with additives to obtain diverse products or, in the case of low-dusting grades, mixed with other additives and then granulated. Non-dusting product forms are produced by a melt process.

**Production scheme for Baerlocher lead products:**





# Special Notes

## Precautions when handling lead compounds

Lead commodities are classified as dangerous to humans and aquatic organisms. The necessary precautions when handling lead products are described in detail in Baerlocher's safety data sheets and in the relevant statutory rules and regulations.

### 1. Safety at work

Based on the Council Directive 89/391/EEC (as amended) the European Union and the Member States have issued many regulations and guidance documents to support companies in health and safety at work, when handling dangerous substances i.e. lead compounds. They are containing important information on:

- a) Application areas
- b) Prohibited applications
- c) Concentration limits at the workplace
- d) Protective measures for employees
- e) Operating instructions

An overview can be found on the website of the European Agency for Safety and Health at work ([osha.europa.eu](http://osha.europa.eu)). Important information on national level can be found e.g.

Technische Regelungen für Gefahrstoffe TRGS 505 (Germany)  
([www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/TRGS-505.html](http://www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/TRGS-505.html))

### 2. Storage

Lead containing products are affected by the Council Directive 96/82/EC on the control of major-accident hazards involving dangerous substances (Seveso II Directive), which recently has been updated by the Seveso III Directive. It has to be implemented in the Member States by 1 June 2015. Specific requirements have to be observed in case the quantities stored or handled exceed certain limits.

Important information about storage on national level can be found e.g.

Technische Regelungen für Gefahrstoffe TRGS 510 (Germany)  
([www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/TRGS-510.html](http://www.baua.de/de/Themen-von-A-Z/Gefahrstoffe/TRGS/TRGS-510.html))

Storage of dangerous substances (United Kingdom) (<http://www.hse.gov.uk/pubns/books/l135.htm>)

### 3. Labelling

Baerlocher lead commodities must be labeled in accordance with EC Directives 67/548/EWG, 1999/45/EU and Regulation EC 1272/2008 (as amended). In case the materials are re-packed, the new packaging must also be labeled in accordance with the above EC Directives and Regulations.

### 4. Water pollution

Baerlocher lead commodities are classified as toxic (WGK2) to aquatic organisms. The relevant national regulations regarding the handling of substances toxic to aquatic organisms must be observed.

## 5. Waste disposal

On European level the revised EU Waste Framework Directive lays down measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste.

According to Germany's Closed-Loop Recycling Act, all waste must either be recycled or disposed of properly.

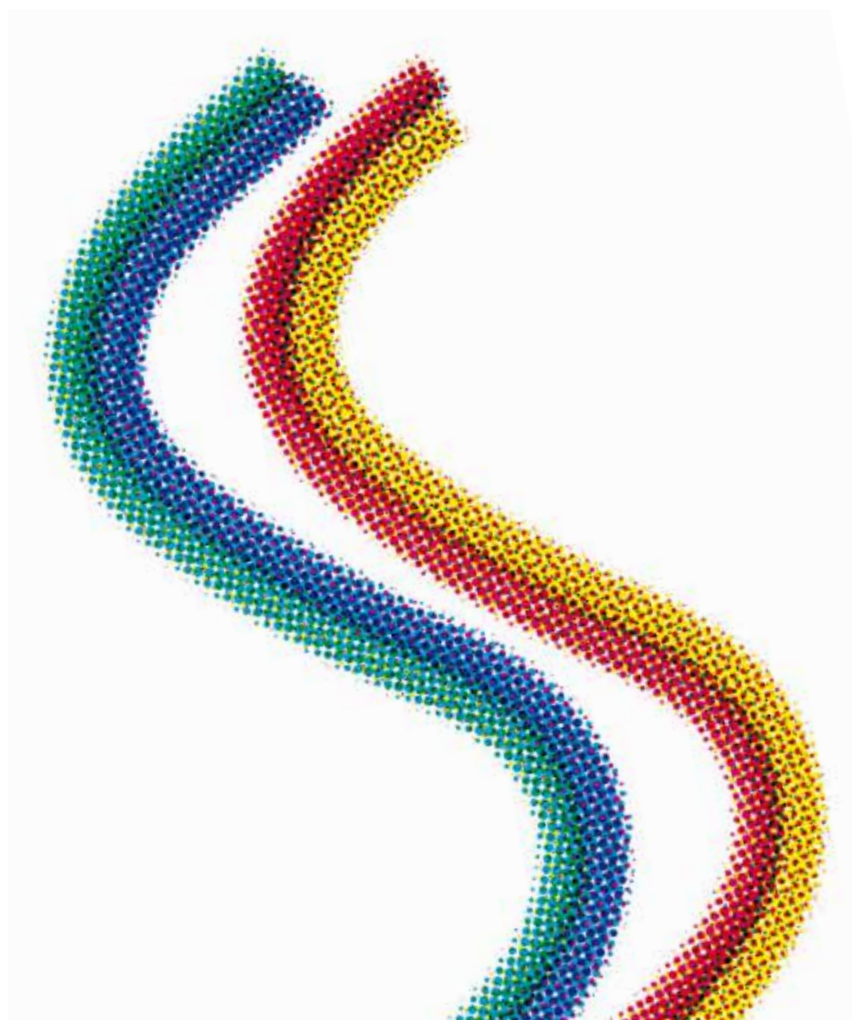
Residual material and empty packaging have to be disposed of in accordance with the instructions given in our safety data sheets. The correct labelling of waste is described in TRGS 201.

## 6. Exhaust air

The concentration limit for lead in air emissions is 0.5 mg/m<sup>3</sup>, according to the German Technical Regulations on Airborne Emissions (TA Luft). You can contact Baerlocher's technical department for advice on dust filter equipment. The relevant national regulations in other countries must be observed.

## 7. Explosion hazard protection

Baerlocher lead stearates and modifications in powder may form explosive dust concentrations in air and are therefore subject to specific regulations concerning emergency and improving the safety and health of workforce. Regulations regarding explosion hazard protection are contained in the VDI Guidelines 2263 and 3673 and in the VDE standards DIN VDE 0165 and 0170/0171.



# Properties

## Properties of Baerlocher lead commodities

Baerostab	V 220 MC	V 420 MC	Pebetel	Pb 51 S	Pb 28 f	Pebefos FP	Pebefos
Chemical basis	Tribasic lead sulphate	Tetrabasic lead sulphate	Dibasic lead phthalate	Dibasic lead stearate	Neutral lead stearate	Dibasic lead phosphite	Dibasic lead phosphite/sulphite
Total ash (%) HV 030	96.0 – 98.0	97.0 – 99.0	78.5 – 80.5	54.5 – 56.5	28.5 – 30.5	97.9 – 99.9	97.9 – 99.9
Lead content (%) HV 042	81.0 – 83.0	82.0 – 84.0	74.0 – 76.0	50.0 – 52.0	27.0 – 29.0	81.0 – 83.0	81.0 – 83.0
Moisture content (%) HV 063	max. 0.2	max. 0.2	max. 0.2	max. 0.2	max. 1.0	max. 0.8	max. 0.8
Sieve residue (%) HV 021	max. 0.2 (40 µm)	max. 0.2 (40 µm)	max. 0.2 (40 µm)	max. 0.2 (71 µm)	0 (800 µm)	max. 0.2 (40 µm)	max. 0.2 (40 µm)
Tamped density (g/l) HV 091	600 – 1400	1500 – 3500	500 – 800	350 – 750	500 – 1000	500 – 1000	500 – 1000
FFA (%) Free fatty acid HV 067	–	–	–	max. 0.1	max. 1.0	–	–
Density (g/cm <sup>3</sup> )* DIN 53 193	6.6	7.2	4.5	2.0	1.4	7.0	6.1

\*The values are given for information purposes only





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August 2013



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Please download the following brochures  
from our webpage:

### Baerlocher Additives for PVC

- Extrusion and Injection Moulding
- Cables and Wires
- Calendered Films and Sheets
- Lead Stabilizers
- Lubricants
- Organotin Stabilizers
- Plastisol
- Sheets and Foamed Profiles

### Baerlocher Special Additives

- Metallic Stearates

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