



Baerlocher Additives for PVC
Lead Stabilisers



we add character to plastics

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Plastics open new avenues for the future. Additives essentially determine properties and quality of the end product. As a global leader in additive supply, Baerlocher has for more than 50 years been successfully providing support to the plastics industry by developing and manufacturing high-quality plastics additives.

Baerlocher products

- Baeropan
- Baerostab
- Baeropol
- Baerodur
- Baerorapid
- Baerolub
- Baerocid
- Ceasit, Zincum



Thirteen production sites in Germany, Great Britain, Italy, France, the United States, Malaysia, India, 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 800 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), the United States (Dover, Ohio) and India (Mumbai).

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.

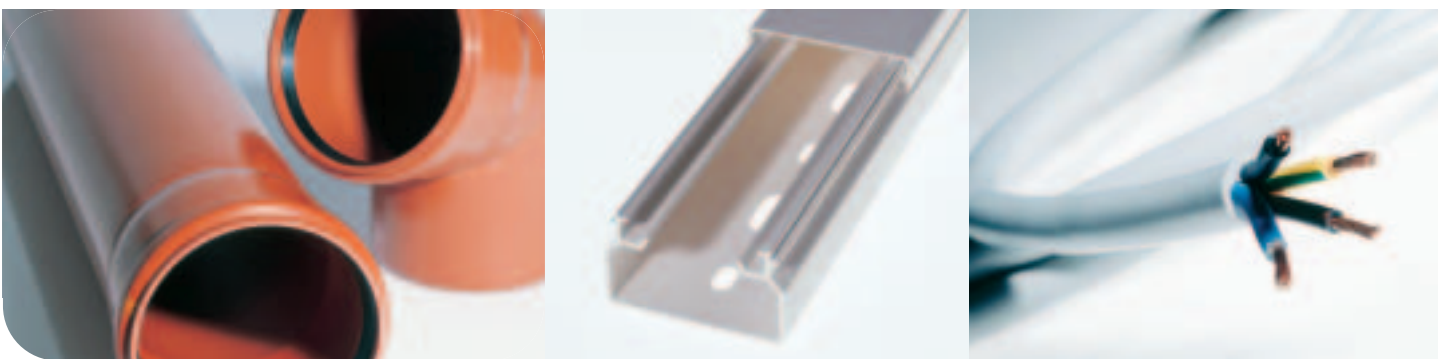
For example, it is a well-known fact that lead compounds are used as pigments, such as minium, white lead and patent yellow or lead chromates in a variety of shades from yellow to fiery red.

Lead and PVC

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

Applications

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



Stabiliser systems

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

Benefits:

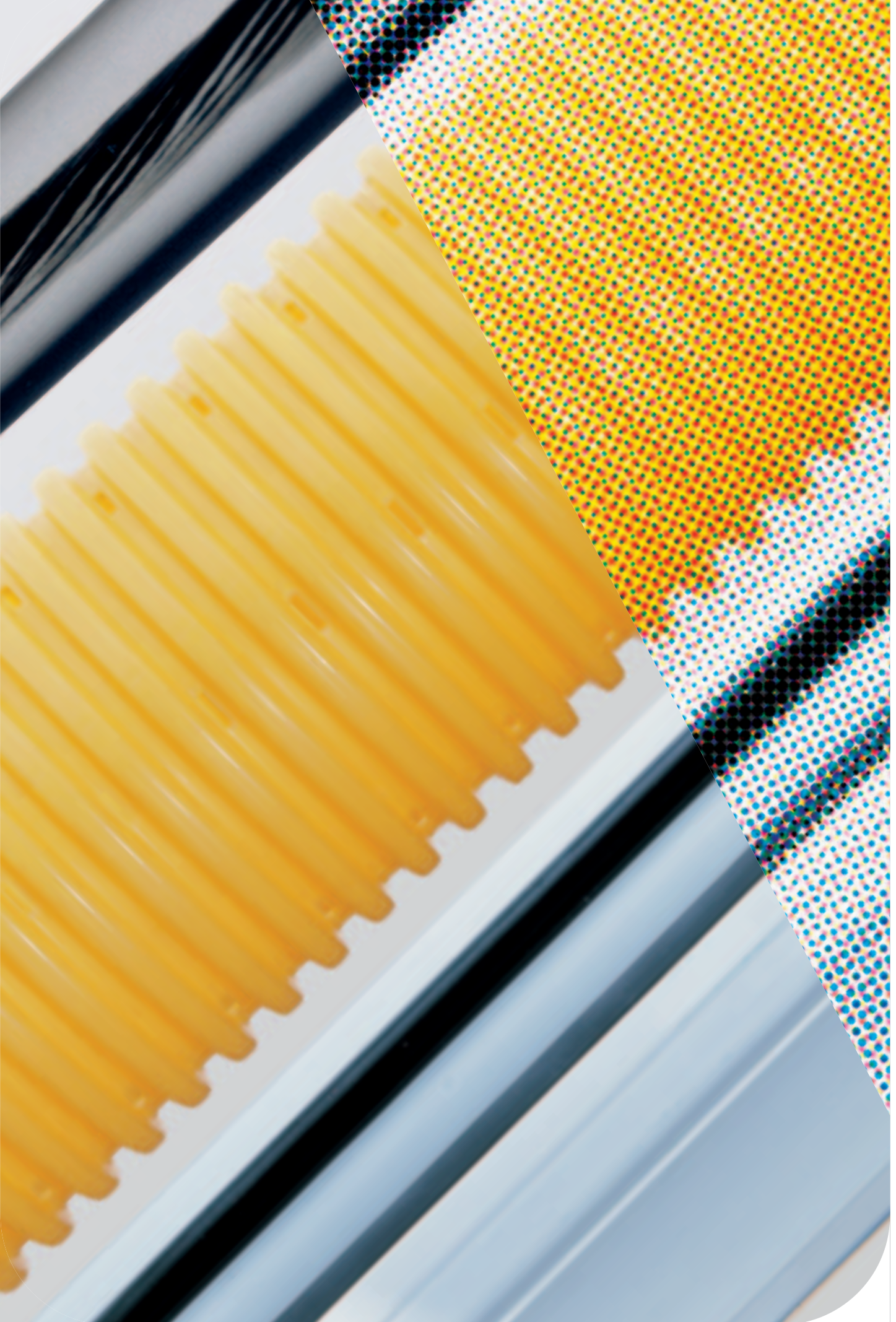
- Excellent long-term heat stability
- Pigmenting effect of basic primary lead stabilisers beneficial in light coloured applications
- Low solubility in water, no leaking into the environment
- No odour during processing and in the final product
- No detrimental effects on the Vicat softening temperature 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 sulfate	Baerostab V 220 MC
Tetrabasic lead sulfate	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/cm³ 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, Pb₃O₄, PbO₂). Trilead tetroxide (Pb₃O₄), 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.

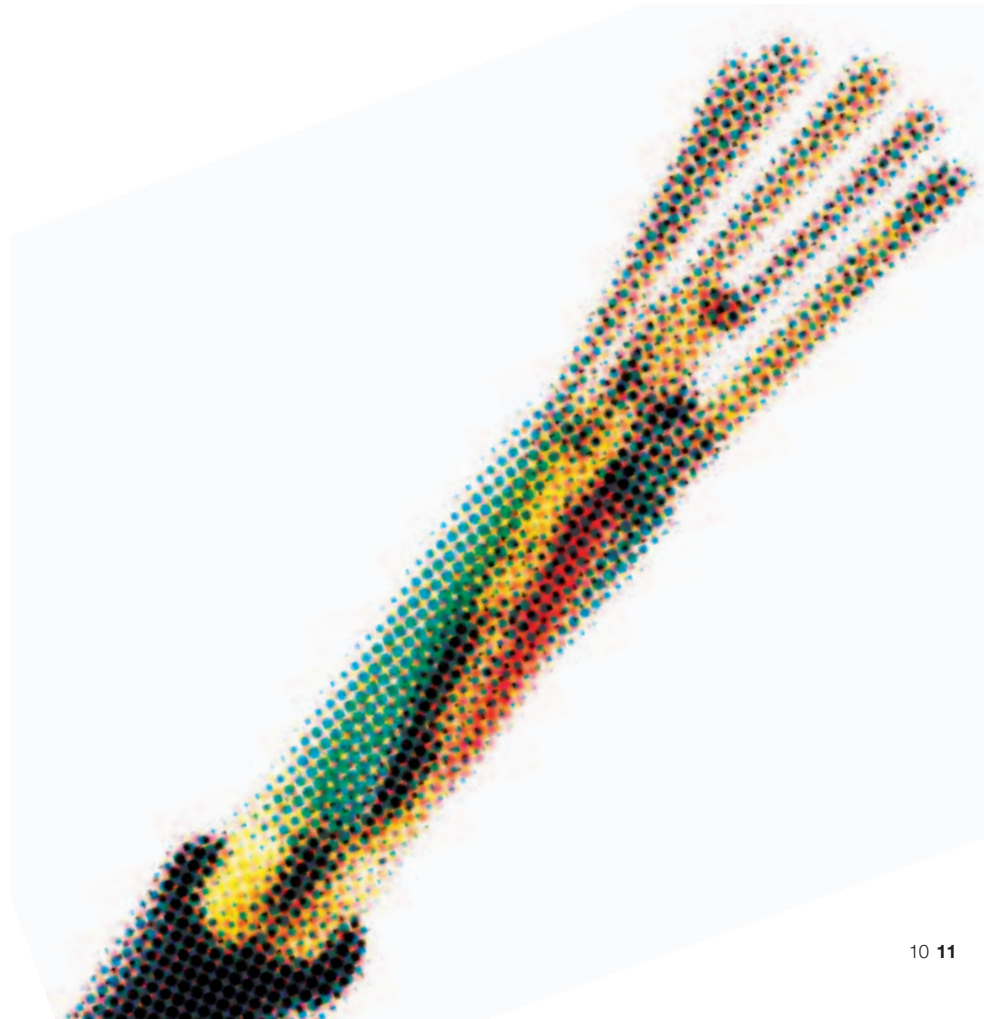
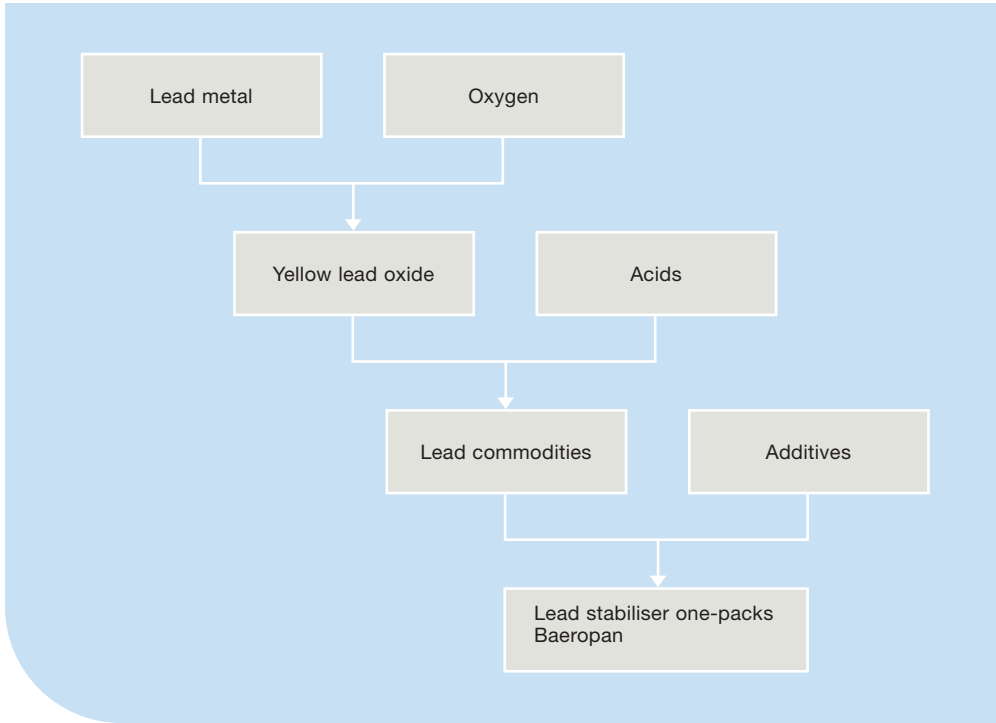
The yellow modification transforms to the more stable red type when exposed to moisture. Only the yellow modification can be used for making lead commodities. Therefore the internal production of lead oxide is an important prerequisite for the production of high-quality products.

Lead commodities are produced by reacting yellow PbO with acids.

PbO	+ sulfuric acid	tribasic lead sulphate or tetrabasic lead sulfate
	+ 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/sulfite

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

Detailed information and regulations regarding safety at work are given in the Technical Regulations on the Handling of Dangerous Substances (Technische Regelungen für Gefahrstoffe, TRGS 505). This brochure is available from: Carl Heymann Verlag KG, Luxemburger Straße 449, 50939 Köln.

It contains information on:

- a) Application areas
- b) Prohibited applications
- c) Concentration limits at the workplace
- d) Protective measures for employees
- e) Medical check-ups
- f) Employment restrictions
- g) Operating instructions
- h) Obligations as to gathering and publishing relevant information
- i) Labelling
- j) Storage

2. Storage

Lead products have to be stored in compliance with the Technical Regulations on the Handling of Dangerous Substances (Technische Regeln für Gefahrstoffe), TRGS 514. Regulations regarding the provision of water for fire fighting are contained in the so-called LÖRüRL (Löschwasserrückhalterichtlinie). Specific regulations have to be observed in case the quantities stored exceed certain limits (emergency regulations, Seveso II Guideline).

3. Labelling

Baerlocher lead commodities must be labelled in accordance with EC Directives 67/548/EWG and 1999/45/EU (and their updates). In case the materials are re-packed, the new packaging must also be labelled in accordance with the above EC Directives.

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

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^3 , according to the Technical Regulations on Airborne Emissions (TA Luft). You can contact Baerlocher's technical department for advice on dust filter equipment.

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. Upon request, a video on the safe handling of powder products is available from Baerlocher.



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 sulfate	Tetrabasic lead sulfate	Dibasic lead phthalate	Dibasic lead stearate	Neutral lead stearate	Dibasic lead phosphite	Dibasic lead phosphate/sulfite
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 ³)* 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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The following brochures are available:

Baerlocher Additives for PVC

- Additives for PVC (Overview)
- Acrylate Processing Aids and Impact Modifiers
- Lead Stabilisers
- Organotin Stabilisers
- Lubricants
- Window and Technical Profiles
- Cables and Wires
- Calendered Films and Sheets
- Plastisol
- Sheets and Foamed Profiles
- Pipes and Fittings

Baerlocher Additives

- Metallic Stearates

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