

Flexible Polymers _ Foam



LUCOBIT resins and their use in foam applications

_ General

Polyolefin foams are a relatively recent development in comparison with other foams such as polyurethane and polystyrene. The main processes were introduced in the 1960s, with significant commercial operation production beginning in the 1970s.

Polyolefins are tough, flexible and resistant to chemicals. Foams made from polyolefins inherit these properties. Most polyolefin foams have a closed-cell structure, which makes the foams suitable for applications where buoyancy is important, as well as providing resiliency for packing applications. In addition, polyolefin foams are used in

building and construction, automobiles, insulation, sports and leisure, and agriculture.

Polyolefins used in foaming applications include polyethylene, polypropylene and copolymers, such as ethylene butyl acrylate.

Manufacturing technologies for polyolefin foams are classified depending on type of blowing agent, degree of crosslinking and type of equipment.

The following table shows the LUCOBIT products and its main properties fit for use in foam applications:

Sound protection (also AU) Insulation tubes (TPO + EPDM based) Construction foams Flexible foams (e.g. sport mats)				
Product	Material	Colour	Shore A	MFR ¹⁾ 190 °C / 2.16 kg
Lucofin® 1400HN	EBA (16 % BA)	natural	90	1.4
Lucofin® 1400MN	EBA (17 % BA)	natural	88	7
Lucofin® 1492	MAh grafted EBA (17 % BA)	natural	92	5
Lucopren® EP 1500H-90 ²⁾	PP EPM	natural	90	0.6
Lucopren® EP 1500M-90 ²⁾	PP EPM	natural	88	8

¹⁾ average ²⁾ MFR 230 °C / 2.16 kg

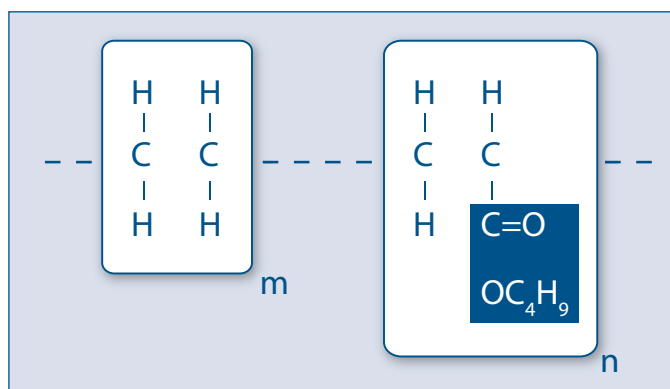


_ LUCOBIT products

Foams, foams, foams: crosslinked or non-crosslinked, extruded or moulded, physically blown or chemically blown, batch or continuous process. LUCOBIT products are good for any foam providing:

- Low compression set
- Exceptional cushioning characteristics
- Means of controlling cell size
- Excellent low temperature behaviour

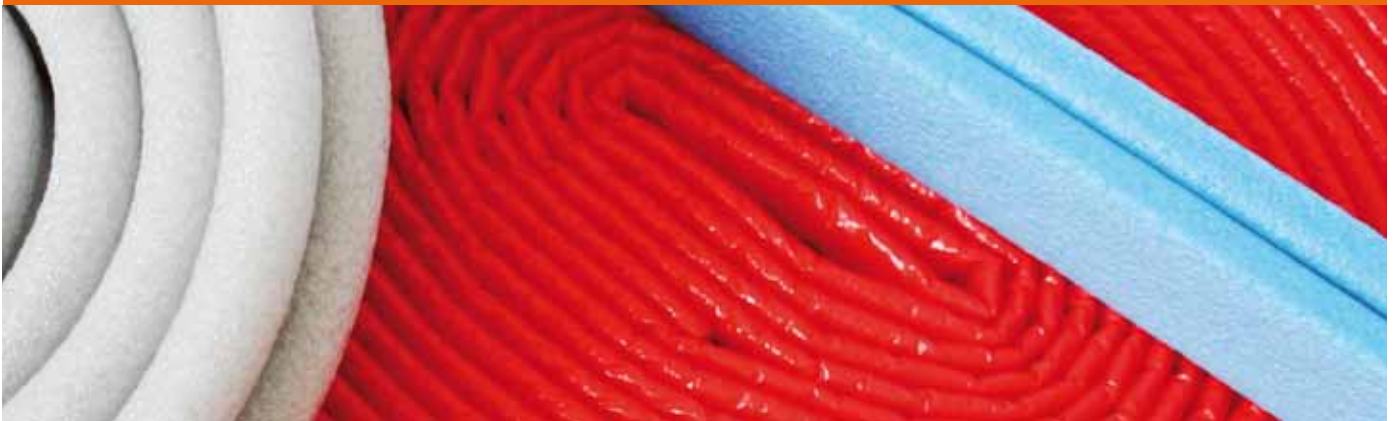
The majority of LUCOBIT products is based on ethylene butyl acrylate copolymer (EBA). The repeat unit of EBA copolymers is shown in the Figure. This structure explains many of its unique properties as explained on the next page.



Our Brands

Lucofin®
Lucopren®

Products – that makes you successful

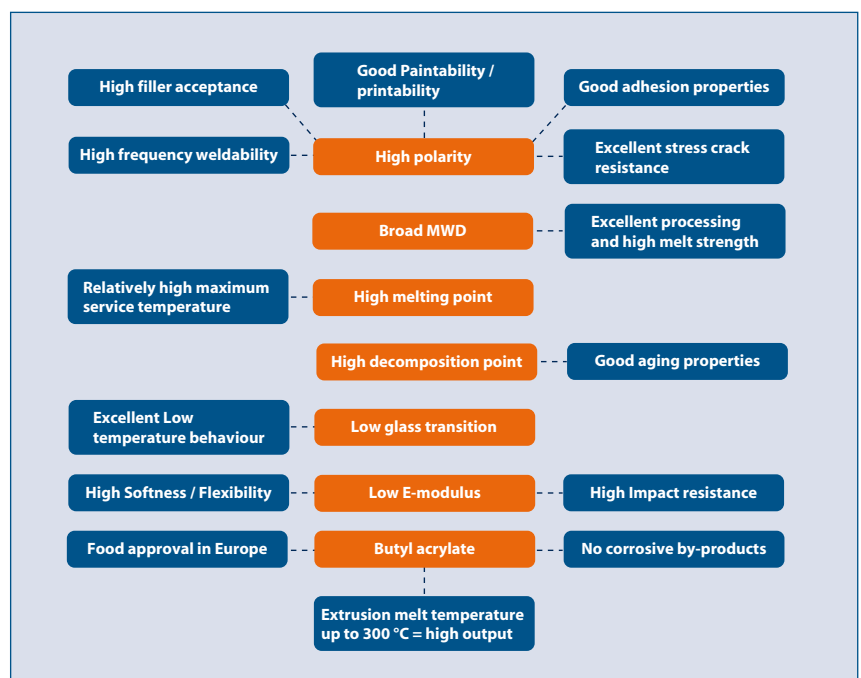


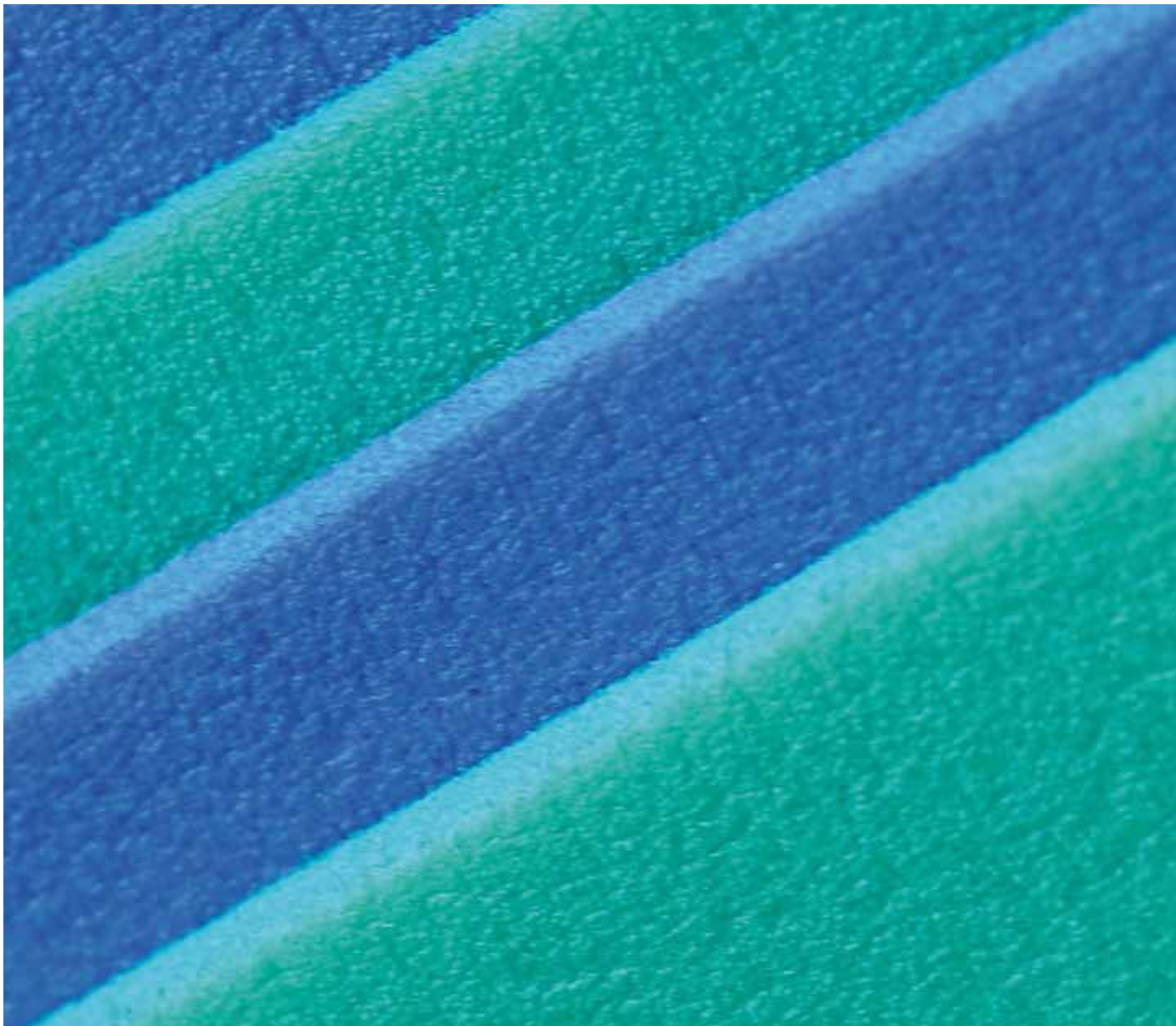
Advantages of LUCOBIT products compared to plastomers and EVA

The stream of truth flows through its channels of mistakes. The speciality plastics based on flexible polyolefins which are marketed and sold by LUCOBIT AG under the trade names Lucofin® types are doubtless products that you have long known to be quality materials. Particularly with a view to our grafted and non-grafted EBA grades, our distribution partners repeatedly tell us that there is a certain information gap as far as cost-effectiveness is concerned. What may at first glance appear to be more expensive compared with other polymer systems does in fact almost always, on closer inspection, prove to be the cheapest solution overall and in the long term.

It is essential here not to interpret the performance of a product solely in terms of the price per unit of quantity. You only obtain an objective result if you examine all technical aspects. In terms of our EBA grades competing on both a commercial and technical basis with EVA, plastomers, but also EBA products from other manufacturers, the Lucofin® materials are proving time and time again to be the optimum solution for an increasingly large number of our customers' end applications.

A sustainable assessment must take account not just of the simple formula of „dosage x price“ but also the value attached to the technical advantages afforded from the use of Lucofin® EBA. The following table illustrates the key properties – as marked in orange – and the resulting advantages – as marked in blue – of Lucofin® 1400HN and 1400MN. If all of these factors impacting on cost effectiveness are assessed in an objective and unbiased way, it is ultimately apparent that Lucofin® EBA materials usually constitute the better solution.





Case Study

Customer

Major producer of crosslinked polyethylene foam.

Previous situation

LDPE and EVA based foam.

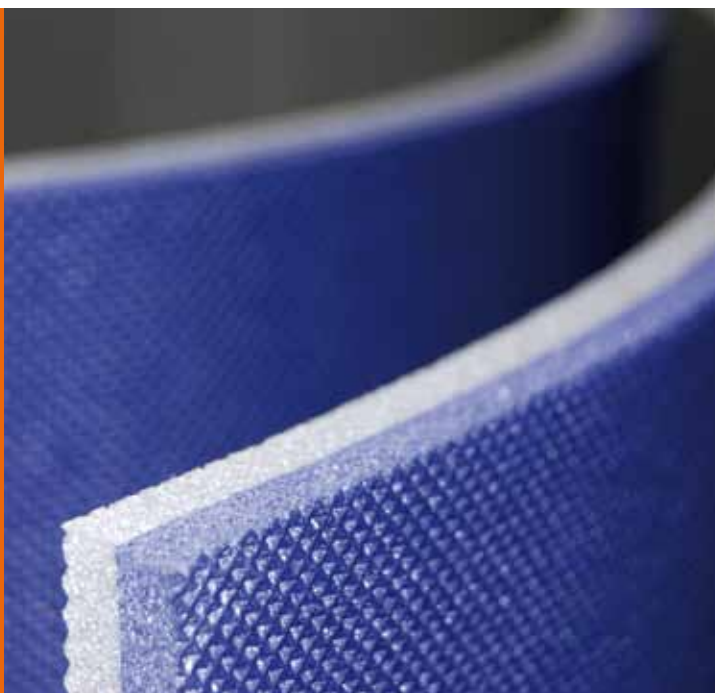
Solution now

LDPE and Lucofin® 1400HN.

Benefits to the customer

- Cushioning comfort improved by 10 % due to more effective energy absorption
- Cell size reduction combined with improved thermal insulation
- Reduction of compression creep by 5 % resulting in better long term properties

Low temperature properties of polyethylene foams

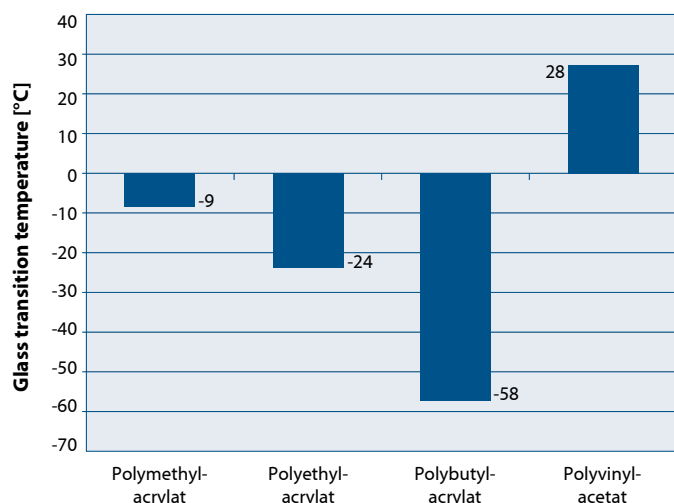


LDPE foams are semi-rigid. In order to impart more softness and resiliency to LDPE foams polar copolymers in the range between 10 % - 50 % are often added as part of the formulation. Suitable polar copolymers are Polybutylacrylat, Polymethylacrylat, Polyethylacrylat and Polyvinylacetat. In order to be fit for use in their specific applications and markets, such as automotive, building and aerospace, excellent low temperature properties are often very important.

At the glass transition temperature polymers change their properties from rigid to more rubbery. A low glass transition temperature of a polymer is therefore important to retain soft and flexible properties also at low temperatures.

Left-hand figure compares the glass transition temperatures of some common polar copolymers. It can be seen that Polybutylacrylat has the lowest glass transition temperature. Consequently Ethylenbutylacrylat (EBA) is the copolymer of choice for low temperature applications.

Glass transition temperature of various polar copolymers



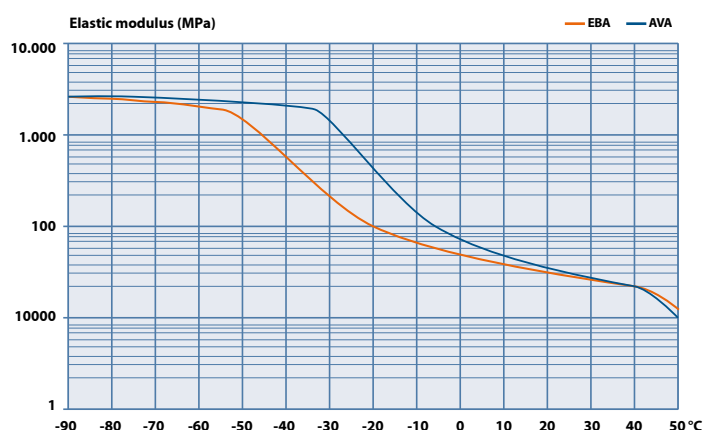
Right-hand figure shows the elastic modulus of Ethylenbutylacrylat (EBA) and Ethylenvinylacetat (EVA) as a function of temperature. The increase of modulus being equivalent with losing flexibility, takes place for EBA at temperatures roughly – 20 °C lower compared to EVA.

Therefore, Ethylenbutylacrylat (EBA) in blend with LDPE is an excellent starting material to produce soft and resilient foams keeping these properties even at very low temperatures.

Applications for EBA / LDPE foams include – among many others – pipe insulation, expansion joints, gaskets and camping mats.

All Lucofin® grades as offered by LUCOBIT AG are based on Ethylenbutylacrylat (EBA) making them perfectly suited to be used in all polyolefin foams, especially in those foams, where superior low temperatures properties are a must.

EBA / EVA Dynamical Mechanical Analysis



Solutions in flexible polyolefins

— Competence and diversity

LUCOBIT AG develops, produces and sells top quality materials for the plastics processing industry. Our focal area of business is in high-quality speciality plastics based on flexible polyolefins which are used in waterproofing, asphalt and in numerous other segments of flexible polymers. LUCOBIT products are supplied to compounding companies all over the world.

Competence, experience and the specialist knowledge from 40 years of product history are the reasons behind LUCOBIT AG's success as a first class point of reference on the national and international markets. As a flexible and group-independent company, we are present and active in all significant plastics markets around the world – supported by a far-reaching sales networks which offers our customers a direct contact partner wherever they need one. Wherever they can be found, LUCOBIT AG products and services stand for consistently high quality standards, top rate workability and diverse opportunities for use.

— Thinking and acting

Constant innovation and the willingness to venture into new terrain – this approach is an integral part of the way we think and act. In this way, we not only secure our own future, but also that of our customers. The LUCOBIT materials research is also always using the latest knowledge and methods to further optimize our products. The responsible use of our natural resources is of equal importance to us. Development and production of lasting products and a distinctive environmental awareness are deeply rooted within our company. An ecological approach is top priority for us.

The compliance with international standards is a matter of course. LUCOBIT AG is ISO-certified according to the standards DIN EN 9001 (quality management) and DIN EN 14001 (environment management).

— Services and solutions

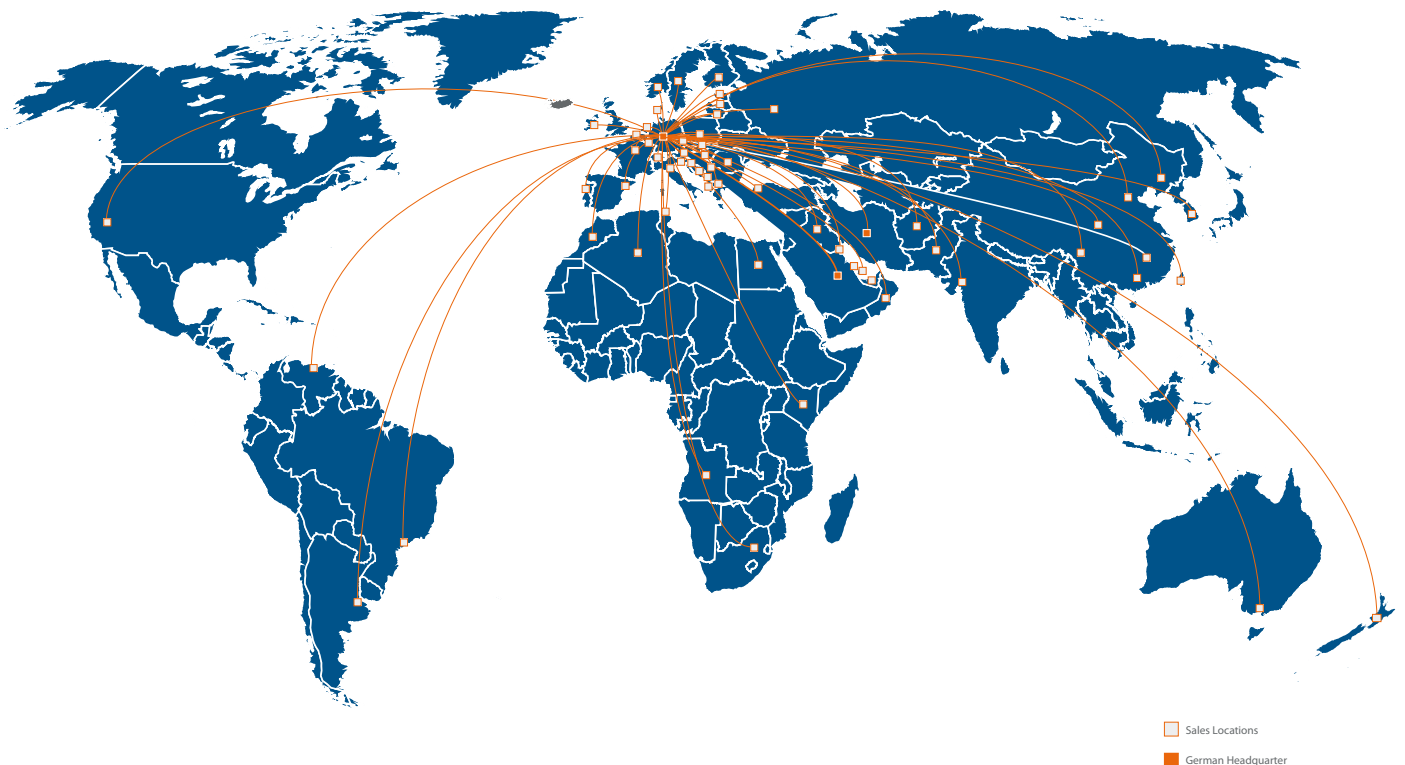
The focal point of our daily work is the task to satisfy our customers and to offer them tailor-made solutions which suit their specific requirements. Customer-oriented service therefore has top priority at LUCOBIT AG. This is reflected in our business processes and organisational structures. Short decision-making processes and reaction times are as much a part of this as binding agreements and the targeted

implementation of agreed arrangements. High qualification demands on our employees are a guarantee for the observation of these principles. Our work is characterised by our reliability, readiness for action and flexibility.

Uncompromising quality and first class services are our trademarks. We offer our customers comprehensive consultancy services and support ranging from product development and the calibration of specialty plastics for their specific production facilities to the optimisation of production processes and concepts for transport and logistics. Your task is our challenge. Together with you, we want to use perspectives in markets of the future and help these grow.



Locations



Note

The information provided in this document is based on our product tests and present technical knowledge. It does not release purchasers from the responsibility of carrying out their receiving inspections. Neither does it imply any binding assurance of suitability of our products for a particular purpose. As LUCOBIT cannot anticipate or control the many different conditions under which this product may be processed and used this information does not relieve processors from their own tests and investigations. Any proprietary rights as well as existing legislation shall be observed.



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