



# KITO

# Armaturen GmbH

QUALITY · PROTECTION · SAFETY



Flame-transmission-proof KITO® devices for storing and transporting combustible fluids, vapours and gases

Typical KITO® flame arrester elements, which prevent the propagation of flames and explosions (both deflagration and detonation) in all kinds of tank farms.

Our tested and certified tank accessory satisfies the current version of EN ISO 16852, which includes safety regulations and environmental protection.



## Explosion-proof and endurance-burning-proof KITO®-end-of-line devices



Venting lines on tanks, vessels and pipelines that enable an on-going exchange of gases, must be protected with explosion-proof devices. These are called end-of-line deflagration or endurance-burning flame arresters (with the appropriate design).

They enable tanks to breathe out flammable gases and breathe in fresh air unrestricted in total safety. A weather hood made of acrylic glass and strainer prevents the penetration of rain, dirt and foreign objects. Weather hoods made of metal are also available.

The KITO® flame arrester element prevents flashback in the vessel.

Simple versions of this are the KITO® ventilation hoods (fig. 1-3).

The KITO® endurance burning type flame arrester is able to prevent a continuously burning flame from flashback into the vessel (fig. 1 and 2). In the event of a fire, the acrylic glass cover burns immediately and completely or the metal cover swings open. This enables the high temperature created by the burning gas/air or product vapour/air mixture at the flame arrester element to escape into atmosphere.

In order to limit wasteful and polluting vapour losses, KITO® valves are used. The flame arrester works on the same principle as a ventilation hood, but has additional valve inserts integrated to regulate pressure.

There are KITO® valves for pressure, for vacuum (fig. 4) or as combined pressure/vacuum valves (fig. 5). In many cases, where incoming and outgoing gas flow rates are similar, we recommend a combined KITO® breather relief valve. However, where gas flow may strongly differ (e.g. on large tanks with differing pump flow rates for filling and discharging), the installation of separate KITO® valves is usually more economical.

We are at your disposal to calculate the number and size of valves in line with the applicable regulations required for your needs. For this purpose we require information about the tanks, the permissible pressures, the output of the pumps connected as well as the specific features of the product and relevant standards.



Fig. 1: KITO® Deflagration and endurance burning proof ventilation hood

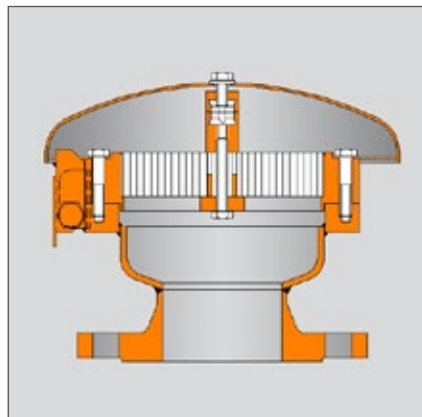


Fig. 2: KITO® Deflagration and endurance burning proof ventilation hood

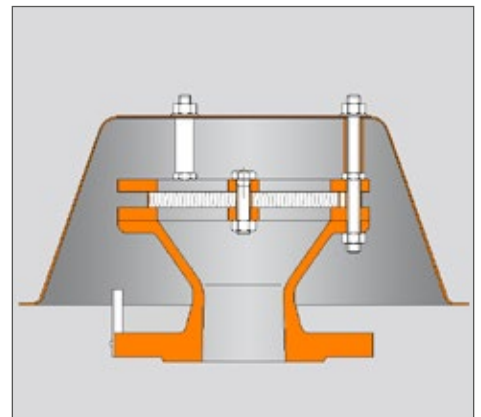


Fig. 3: KITO® Deflagration proof ventilation hood

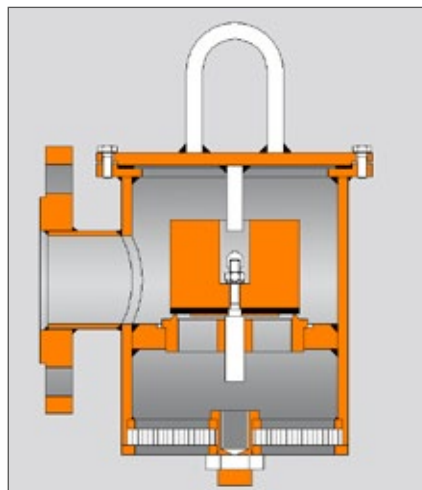


Fig. 4: KITO® Deflagration proof vacuum relief valve

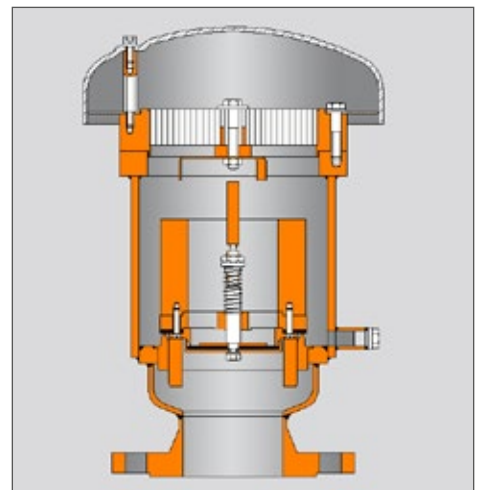


Fig. 5: KITO® Deflagration and endurance burning proof pressure and vacuum relief valve





# Detonation proof KITO® flame arresters



In the event of explosive gas-air mixtures igniting in a pipeline, a (stable) detonation can develop from a deflagration under certain instances.

The impact of such a detonation is considerable with greatly increased pressure and flame speed; our KITO® detonation flame arresters are specifically designed for such scenarios.

The fitted KITO® flame arrester element remains functional and arrests the flame front following the pressure wave.

We can also develop certified devices for an unstable detonation (although these are not considered according to German regulations).

The selection of suitable in-line detonation flame arrester is based on the classification of the required medium in explosion group classes. Our range encompasses KITO® devices for all explosion groups in various designs (fig. 6 onwards).

Usage is limited to pressures < 1.2 bar; designs for higher pressures are also available (fig. 11).

The devices can be installed anywhere and for any direction; almost all KITO® in-line detonation flame arresters are also bi-directional, i.e. they provide protection from both sides. The KITO® flame arresters have been optimised to reduce pressure drop with a cost-effective modular design. Liquid product detonation flame arresters are designed for the protection of liquid filled pipelines (fig. 8).

Non-return valves are solely used in suction lines filled with liquids (fig. 9).

Dry types of detonation flame arresters can also act as endurance burning flame arresters. For this purpose a pipe of a pre-determined length, based on the nominal diameter of the pipe, has to be connected to the outlet flange of the arrester. This installation replaces the ventilation hood (fig. 2).

In some special system designs, e.g. installation in torch lines or thermal incineration plants, the incorporation of one or more thermal sensors on the KITO® flame arrester element is mandatory for identifying an outbreak of fire. An appropriate circuit must be connected that triggers emergency measures against a potential 'stabilised burning' caused by any incoming mixture.

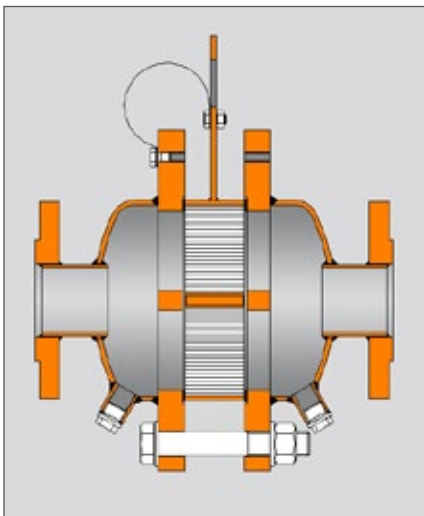


Fig. 6: KITO® Bi-directional in-line detonation flame arrester, short-time burning proof

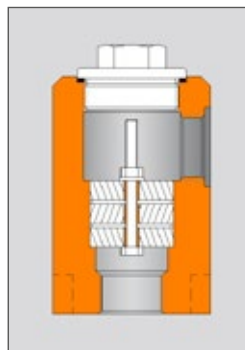


Fig. 7: KITO® Uni-directional in-line detonation flame arrester

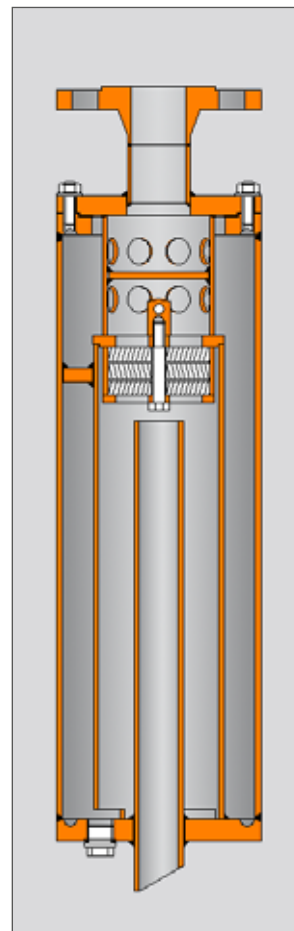


Fig. 8: KITO® Uni-directional end-of-line liquid detonation flame arrester

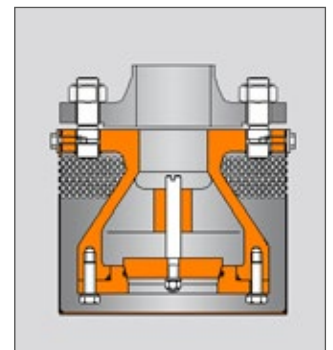


Fig. 9: KITO® Detonation proof foot valve

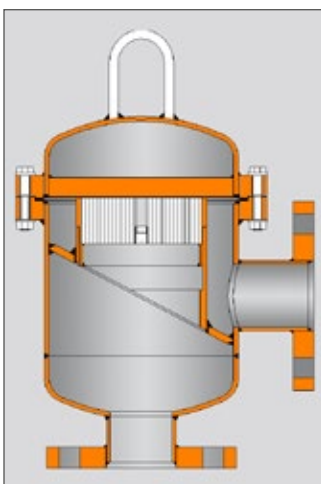


Fig. 10: KITO® Uni-directional in-line detonation flame arrester, short-time burning proof, angled design



Fig. 11: KITO® Bi-directional in-line detonation flame arrester, short-time burning proof, even at increased pressures



Fig. 12: KITO® Bi-directional in-line detonation flame arrester, short-time burning proof



## Deflagration-proof KITO® flame arresters



If explosive gases ignite in a pipe then the explosion initially starts as deflagration characterised by relatively low pressures and flame speeds.

KITO® in-line deflagration flame arresters (fig. 13 to fig. 16) are installed to prevent a flame spreading to other parts of the system. In contrast to detonation arresters, there are limits for the length of pipe between any possible source of ignition and the flame arrester.

Where there are special conditions, e.g. installation in torch lines or thermal incineration plants, the incorporation of one or more thermal sensors on the KITO® flame arrester element is mandatory for identifying an out-break of fire (fig. 14). An appropriate circuit that triggers emergency measures to prevent a potential stabilized burning must be connected.

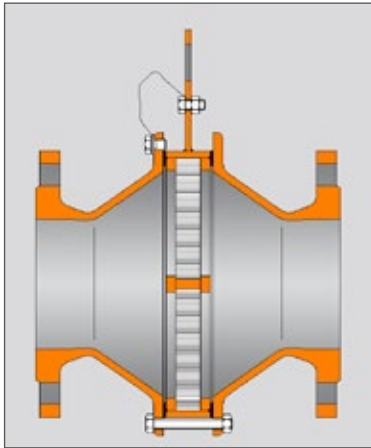


Fig. 13: KITO® Bi-directional in-line deflagration flame arrester, short-time burning proof

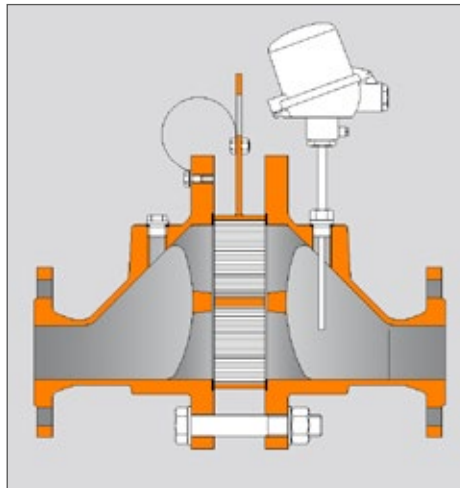
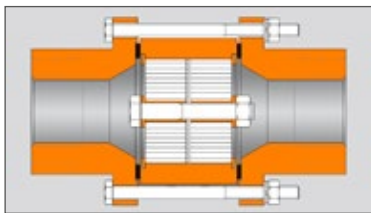


Fig. 14: KITO® Bi-directional in-line deflagration flame arrester, short-time burning proof



Fig. 15: KITO® Bi-directional in-line deflagration flame arrester, short-time burning proof

Fig. 16: KITO® Bi-directional in-line deflagration flame arrester, short-time burning proof



## Special areas of application for KITO® devices

We have specifically developed KITO® ar valves for rail tank cars with a particularly low profile. There are versions for pressure, pressure/vacuum and combinations with a gas compensation coupling (fig. 17) as well as with KITO® flame arrester elements.

In addition, devices without flame arrester elements and special designs for corrosive media are included in our range (fig. 18).

We also manufacture special flame arresting devices for installation in tanks and road tankers (fig. 19). As well as detonation flame arresters, pressure, vacuum and combined valves are also available. These devices comply with the requirements for tanks according to ADR and RID.

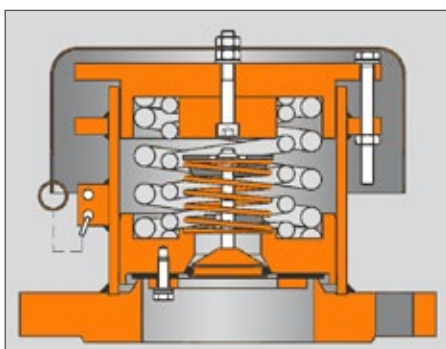


Fig. 17: KITO® rail tank car valve



Fig. 18: KITO® container device



Fig. 19: KITO® container device





## Design of the KITO® flame arrester element



**KITO® deflagration, detonation and endurance burning flame arresters comply with the international standard EN ISO 16852. They have all been systematically type approved and are supplied with a CE declaration of conformity. They therefore fully comply with the European directive 2014/34/EU (ATEX 100).**

**The German Code of Practice 967 issued by VdTUEV and the German Ordinance on Industrial Safety and Health are the German implementations of the European Directive 99/92/EG. They clearly stipulate the necessity for various tank flame arrester.**

We have developed the KITO® grid – the centrepiece of our flame arrester elements – based on the principle of the Davy screen and its derivation, the 'gravel pot'.

Although the Davy screen and gravel pot no longer conform to the latest requirements, the KITO® grid complies with all regulations and specifications.

A KITO® grid consists of two stainless steel strips, the height of which varies depending on the design.

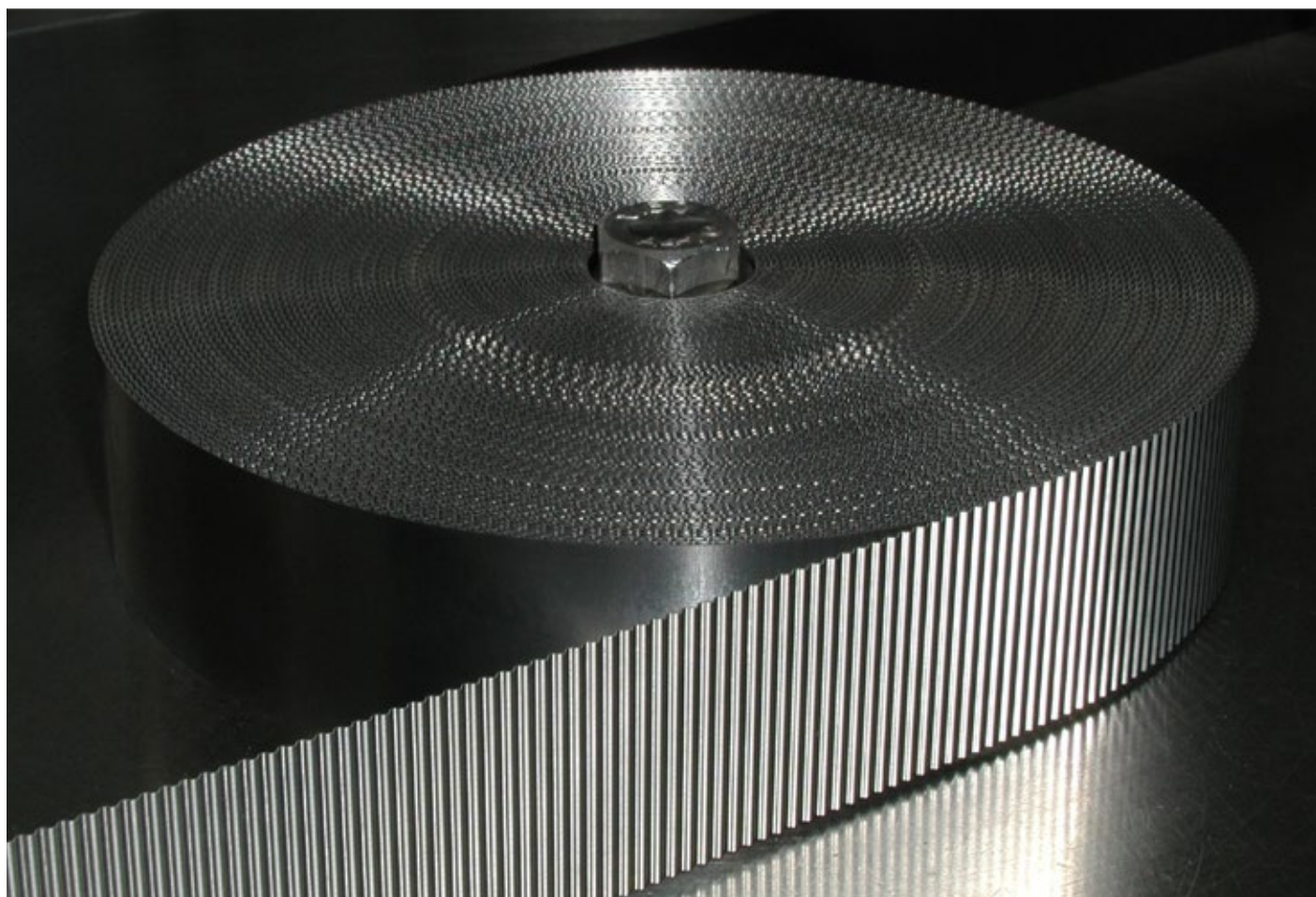
One flat and one corrugated stripe are wound tightly together, producing a gap of triangular section between the flat and the corrugated strip. This forms a circular element of variable diameter subject to the number of windings.

The KITO® flame arrester elements usually consist of one or more KITO® grids as well as a surrounding KITO®-casing.

The gap of the KITO® flame arrester element depends on the maximum experimental safe gap (MESG) of the material being protected (a material property) but should not be used as an equivalent. There are extensive tables and documentation available about this.

Gaps for gas/air or vapour/air mixtures with unknown or deviating flashback characteristics can be determined in cooperation with test houses such as PTB, BAM or IBExU and manufactured by us. Also in such cases, the device can be CE marked through an individual verification procedure.

Supplying special designs as OEM parts or components in line with ATEX is one of our specialities.



*KITO® grid during the production process*



## Additional KITO® devices



In addition to our flame arresters according to international standard, we manufacture a variety of versions from in-line valves to end-of-line valves with particularly low set pressures (fig. 20).

Special features and special versions such as e.g. heating with electricity (fig. 21), water or steam, inductive proximity switches etc. can be manufactured according to the client's specification.

Our devices are of course also available in special materials e.g. plastics (fig. 22) or highly corrosion resistant materials as well as special designs.

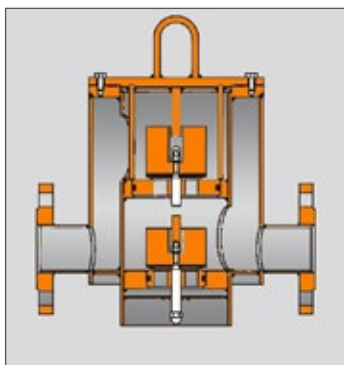


Fig. 20: KITO® In-line pressure and vacuum relief valve



Fig. 21: KITO® Deflagration and endurance burning proof pressure and vacuum relief valve with electrical heating



Fig. 22: KITO® In-line pressure or vacuum relief valve made of plastic



## Maintenance of KITO® devices

One of the special features of all KITO® devices is the minimal maintenance requirement. However, the type approval requires the devices to be checked regularly depending on the operating conditions. Being an approved manufacturer and registered maintenance company we will be pleased to give our advice about control checks as

well as other maintenance and adjustment work and how to do this safely. We also offer training for your staff on how to maintain our devices, at our premises or on-site, whichever is more convenient for you. You can order spare parts for our KITO® devices at short notice by specifying the type and factory number. This and other informa-

tion is to be taken from the nameplate which identifies each device.

Older devices without CE marking are not allowed to be replaced completely with spare parts. Please do not hesitate to contact us for advice in such cases.



The KITO®-KARE program (KITO® Authorized Repair Engineers) includes certified service partners in the areas of maintenance and repair of KITO® devices.

Our service partners offer qualified and direct support on site.

This guarantees the highest quality and safety of our products. For further information about a service partner near you, please contact us or visit our website [www.kito.de](http://www.kito.de)

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