Agriculture is one of many applications for medium-pressure filtration.

*Image: Stauff*


**Easier medium-pressure filtration**

# New series saves weight in mobile applications

Medium-pressure filters are designed to protect hydraulic systems without adding unnecessary weight. To this end, Stauff is expanding its filtration range with the SFM series up to 280 bar.

Apart from their design, the dimensions and weight of each component play a key role in mobile hydraulic systems. Each component needs to be powerful enough to meet the requirements, but take up as little space as possible and be as light as possible. This can result in a conflict of objectives, particularly with filters: they have to reliably protect sensitive components, such as pumps, valves or cylinders,

The new medium-pressure filters save up to 15% in weight.
*Image: Stauff*

Hartmut Reich, Product Manager for Filtration at Stauff Germany.
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from particles in the oil flow, but at the same time remain compact and efficient with the lowest possible transport costs. This is precisely where the new Stauff SFM series of filters comes in. The housings are designed for a maximum working pressure of 280 bar. They are therefore suitable for applications where high-pressure filters have often been used to date, but where this was not technically necessary. Compared to high-pressure filters of the same size, users of SFM medium-pressure filters save up to 15 percent in weight. "The most powerful model does not always need to be used in mobile hydraulics. It is crucial that the filter is designed to fit the application," explains Hartmut Reich, Product Manager Filtration at STAUFF Germany. "A more lightweight medium-pressure solution can be more constructive and efficient if the pressure range of a high-pressure filter is not required." Typical applications of the SFM series include small and medium-sized construction machinery, applications in agriculture, municipal vehicles or road sweepers, among others. In these machines, hydraulic systems operate under changing loads, strong vibrations, dirty environments and fluctuating temperatures. The filter therefore needs to match the volumetric flow but, at the same time, be robust, easy to integrate, and low-maintenance.

### Technical key data and dimensions

The SFM series is designed as an inline medium-pressure filter for mobile and industrial hydraulic systems. Its filter housings are made of carbon steel and are powder coated as standard. The maximum working pressure is 280 bar, and the maximum volumetric flow is 100 litres per minute. NBR (Perbunan®) is used as the standard sealing material, but alternative sealing materials are available on request. The series is available in four sizes: 10, 15, 21 and 26. As with STAUFF filter housings, the sizes indicate the maximum volumetric flow in US gallons per minute, and so have to be multiplied by 3.79 to obtain the litre figure. Size 15, for instance, has a maximum volumetric flow of about 57 litres per minute. This enables the filter to be selected according to the required volumetric flow and available installation space. These filters are suitable for mineral oil-based hydraulic and lubricating oils as well as for biodegradable fluids. STAUFF relies on its proven SE series of filter elements for filtration. This means that different filter media and grades are available, so that this component can also be adapted to the respective application. "Oil purity is a prerequisite for the availability of hydraulic systems," explains Reich. "Particles in oil have been proven to be responsible for up to 80% of all failures and malfunctions of a machine. That is why we do not consider filtration as a peripheral accessory, but rather as an integral part of the system design."

### Tested safety reserve

Among others, the series underwent burst pressure and pressure fatigue tests at the STAUFF Technology Centre. The target of the burst pressure test was a minimum of 840 bar. This equates to three times the safety factor based on the maximum working pressure of 280 bar. A minimum of 1084 bar was reached, hence a safety factor of 3.9. The series also passed the pressure fatigue test according to ISO 10771-1. In this test, the series completed 10 million test cycles at 280 bar and 100,000 test cycles at 320 bar. These values show that the SFM series is designed for the medium-pressure range but has prov-

### Key filter types in the "Made by Stauff" hydraulic and lubricating oil circuit

*Pressure filters are installed after the pump to clean the oil of wear particles before it flows through the downstream components, such as valves and cylinders. Alongside their function as protective filters, pressure filters also serve to maintain the required purity class. Return-line filters are generally installed on or in the oil tank to remove impurities from the oil before it flows back into the oil tank. Diffusers are used in conjunction with return-line filters to ensure that the returning oil flow is calmed and reaches the oil tank without foaming or swirling up deposited dirt. Suction strainers are primarily used as functional protection of the downstream pump in the circuit. Suction filters should always be installed if there is a particularly high risk of pump damage due to coarse contamination. This risk exists if impurities collect in the tank and it cannot be cleaned. Tank filler breathers are fitted to the oil tank and prevent the ingress of dirt from the environment by ventilating the tank. Desiccant air breathers remove moisture from the air flowing into the tank, thereby preventing water from accumulating in the oil. Offline and bypass filters operate independently of the main volumetric flow and clean a partial flow of oil continuously or as required. They are either permanently integrated into the hydraulic system or used as mobile filter systems. Thanks to their fine filtration, they contribute significantly to long-term stabilisation of oil purity and enable even the smallest particles and ageing products to be removed efficiently without affecting the main circuit.*

en reserves above the normal working pressure. This combination is crucial for practical use. The housing is lighter in weight than a corresponding high-pressure solution, but the design is not simplified at the expense of durability. The design adheres to the actual requirements profile: durable enough for mobile and industrial hydraulic applications, but not heavier than required.

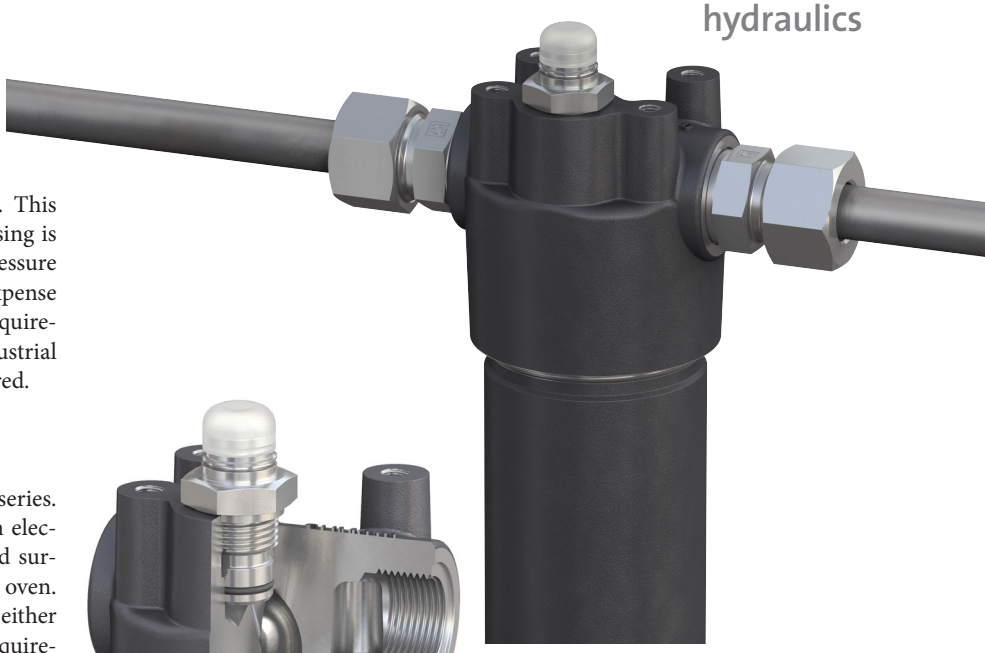
## Powder coating as an integral part of the housing concept

Its surface also contributes to the durability of the series. SFM housings are powder coated as standard. An electrically charged powder is applied to the prepared surface of the filter housing and then cured in the oven. This forms an even, resistant layer, which can have either a fine or coarse structure depending on the requirements. At STAUFF, a phosphating process precedes powder coating. This protects the housings from corrosion during transport and storage and, at the same time, improves adhesion of the final coating. This is particularly relevant for mobile machines as dirt, moisture, the effects of UV and ozone, strong temperature changes and mechanical loads can put the surface under constant stress. Powder coating protects the housings against wear and corrosion under these conditions and thus contributes to the service life of the units. The durability of STAUFF coatings was confirmed in a cross-hatch test according to DIN EN ISO 2409. More environmentally-friendly production also plays a crucial role alongside the technical benefits: powder coating is a solvent-free process. Compared to traditional wet coating, fewer volatile organic compounds are released, and barely any waste is produced. There is a further important aspect for manufacturers of mobile machines. The housings can be coated in many standard colours, including RAL or NCS colours, or even in customised colours. This protects the surface, at the same time as visually integrating it into the design of the machine.

## Detecting contamination in good time

A filter element absorbs particles from the oil flow. As the dirt loading increases, the differential pressure rises above the element. If the element is not changed in good time, the volumetric flow can be restricted or a bypass opened depending on the design of the system. A contamination indicator displays the condition of the filter element and thus aids the planning of maintenance work. A Visual Contamination Indicator with temperature suppression is available with the SFM series. The background to this: cold oil is more viscous than warm oil. Once a machine has started or at low ambient temperatures, the differential pressure can therefore be briefly higher, even though the filter element is not yet dirty. Without temperature suppression, in this phase the display could signal a need to replace the filter, a situation that is in actual fact only temperature-based.

Temperature suppression prevents false indicators, such as this. Below a defined oil temperature, the display remains in its normal position or suppresses the alarm. Only when the oil is sufficiently warm is the differential pressure evaluated as a meaningful indicator of the degree of contamination of the filter element. “A contamination indicator should warn the operator, but equally reliably warm the operator,” explains Hartmut Reich. “It is important to distinguish temperature-related effects from actual loading on the element, especially with mobile machines with cold starts and changing operating conditions.”



Pressure filters are installed after the pump to clean the oil of wear particles before it flows through the downstream components, such as valves and cylinders.

*Image: Stauff*

A Visual Contamination Indicator with temperature suppression is available with the SFM series.

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## In-house produced filter elements

Apart from the housings, the filter element is decisive when it comes to the efficiency of filtration. Hydraulic and lubricating oils use filter materials, such as glass fibre fleece, stainless steel mesh or filter paper, depending on the application. Filter fineness is generally between 3 and 250 µm. A typical STAUFF filter element consists of up to seven different filter materials, which are mechanically combined and folded into a star shape. Folding increases the effective surface of the filter, increases its dirt absorption capacity, and delivers enhanced filtration performance in tight spaces. In addition to precise manufacturing, the quality of a hydraulic or lubricating oil filter also depends on carefully connecting the filter layers using special adhesives as well as the sealing materials used. ■