

KAF[®]-G Bernoulli[®] heavy duty filter system

Self-Cleaning Automatic Filter

PN 2,5–25
DN 300–1000
EN/ANSI/JIS/GOST

- No contact cleaning
- No process interruption



Applications

The self-cleaning automatic KAF[®]-G Bernoulli[®] filter is a versatile self-cleaning, nearly maintenance-free filter for removal of particulate contaminants from highly polluted waters as well as process fluids e.g. from natural water sources (sea water, river water) and heating or cooling circuits and processes. It operates at a working pressure as low as 0.3 bar and is characterized by extremely low pressure loss, simple, space saving, robust design with high performance and low weight. The special guided disc systems makes the system even more robust for sudden extreme dirt loads, vacuum conditions or other heavy duty service conditions.

Approvals

3.1. Certificate, DGRL/TÜV, GL, LS, DNV, ABS, TR TF/TR CU Certificates (EAC), ASME U-Stamp, Lloyd's Register Type Approval Certificate No. 16/20086

CE conformity evaluation according 2014/68/EU and marking according the directive.



Characteristics

- Unique self cleaning function works from 0.1–25 bar
- Minimum working pressure 0.1 bar, better filter work under vacuum conditions at outlet
- The filter can be integrated in the pipe system in any installation position
- Filtration rate $\geq 100 \mu$ /micron – 10 mm
- Very low maintenance
- Low energy consumption
- Only few spare parts needed. Deliverable in SET's for easy and regular preventive maintenance.

KRONEFILTER[®].COM
SOLUTIONS IN FILTRATION

Brief description

The KAF®-G Bernoulli® is a fully automatic self-cleaning filter and can be mounted vertically as well as horizontally. During operation the medium flows through the strainer insert from inside to outside and the dirt remains inside the strainer. The filter is equipped with a differential pressure monitoring system that automatically triggers the flushing process before any blockages in the filter strainer cause significant flow reductions. The flushing process can also take place after a predetermined time. Due to the a specially shaped flushing disk the speed between the disk and strainer in the flushing process rises. The resulting local pressure drop causes an internal suction effect and the contaminant particles are removed from the strainer insert. Solid components are flushed out via the opened flush valve.

- Outlet flow is not interrupted in this process; the flushing volumes are low
- The pressure drop in the system is minimal

Notice:

The compatibility between medium and vessel or sealing material is the responsibility of the operator.

The design of the pressure vessel is based on a quasi-static operation (load cycle number ≤ 1000 according to AD 2000 Merkblatt S1, section 1.4). Max. Differential pressure inlet - outlet 1 bar.

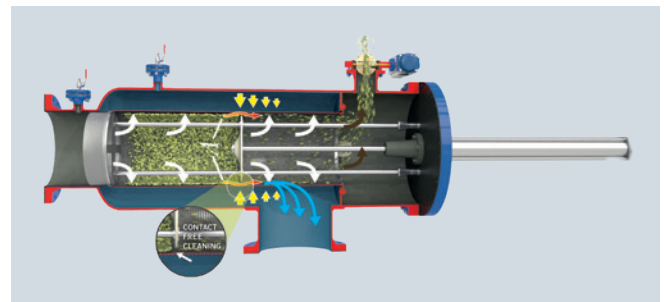
Functional description of the cleaning process

The contaminated medium flows into the filter through the flange marked "inlet". The contaminated medium flows through the filter insert from the inside to the outside and exits out of the flange marked "outlet" as cleaned medium. The flushing phase of the filter is either activated when the set differential pressure is attained, or the flushing phase is activated after a set time interval or by pressing the button. The flushing valve opens and larger contaminant particles are flushed out with the continuously flowing medium stream due to a pressure gradient. Subsequently the piston usually performs two strokes, thereby increasing the speed between the flushing disc and strainer wall. The contaminants are sucked off due to the resultant local pressure drop. The flushing time can be set by the controller according to the operating conditions, and flushing frequency depends on the level of contamination in the medium.

Operating instructions

The comprehensive instructions accompanying the filter must be followed!

The filter is installed in piping via flanges. Ensure that the standard version of the filter is installed vertically or horizontally in a mechanically stress-free manner without additional loads. The medium must flow in the direction specified on the housing. Incorrect installation can cause filter malfunctions. If the flush outlet pipe is installed with a gradient ensure that the inlet pressure of the filter is at least 0.3 bar higher than the counter pressure in the flush outlet pipe (pay attention to the loss through friction in pipes). Before using with another medium or other operation conditions than specified in the design, the resistance of the materials of the pressure-bearing parts and seals touched by the medium to be filtered must be checked by the customer; it may be necessary to consult with the manufacturer and to execute a conformity evaluation in accordance with PED EN 2014/68/EU (if there is a CE-marking requirement). The filter needs regularly maintenance (every 1–2 years). Please consider instructions delivered with the filter.



KAF®-G product video

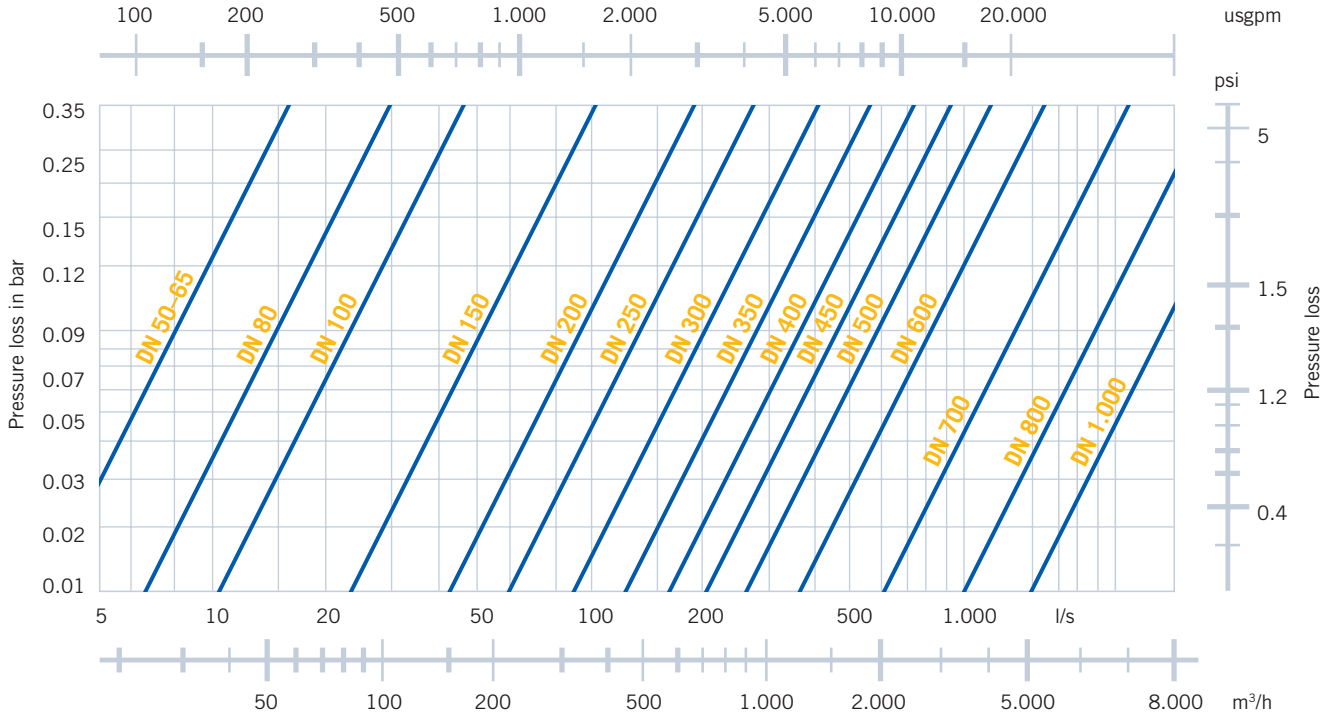
Info about the function

<https://www.krone-filter.com/video.php?id=HhEbh25cuZ4>



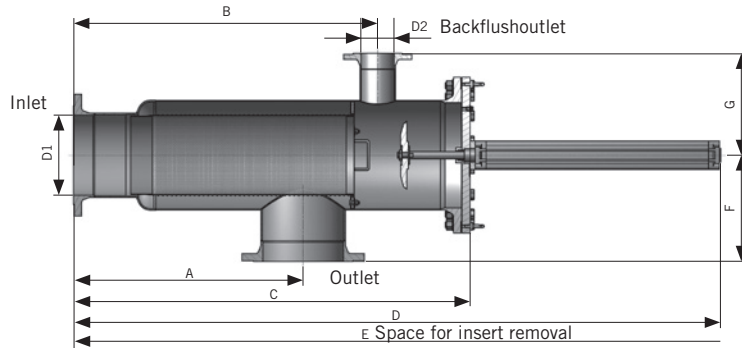
Filter dimensioning chart/Pressure loss diagram

At 200 µm filter fineness



Dimensioning example (0.2 mm filtration degree)/selection chart at 500 m³/h, the use of a DN 250 or DN 300 is recommended at 200 µm.

Technical data and dimensions



Flanges in accordance with EN 1092-1 PN 10-16 or ANSI 16.5 150 lbs

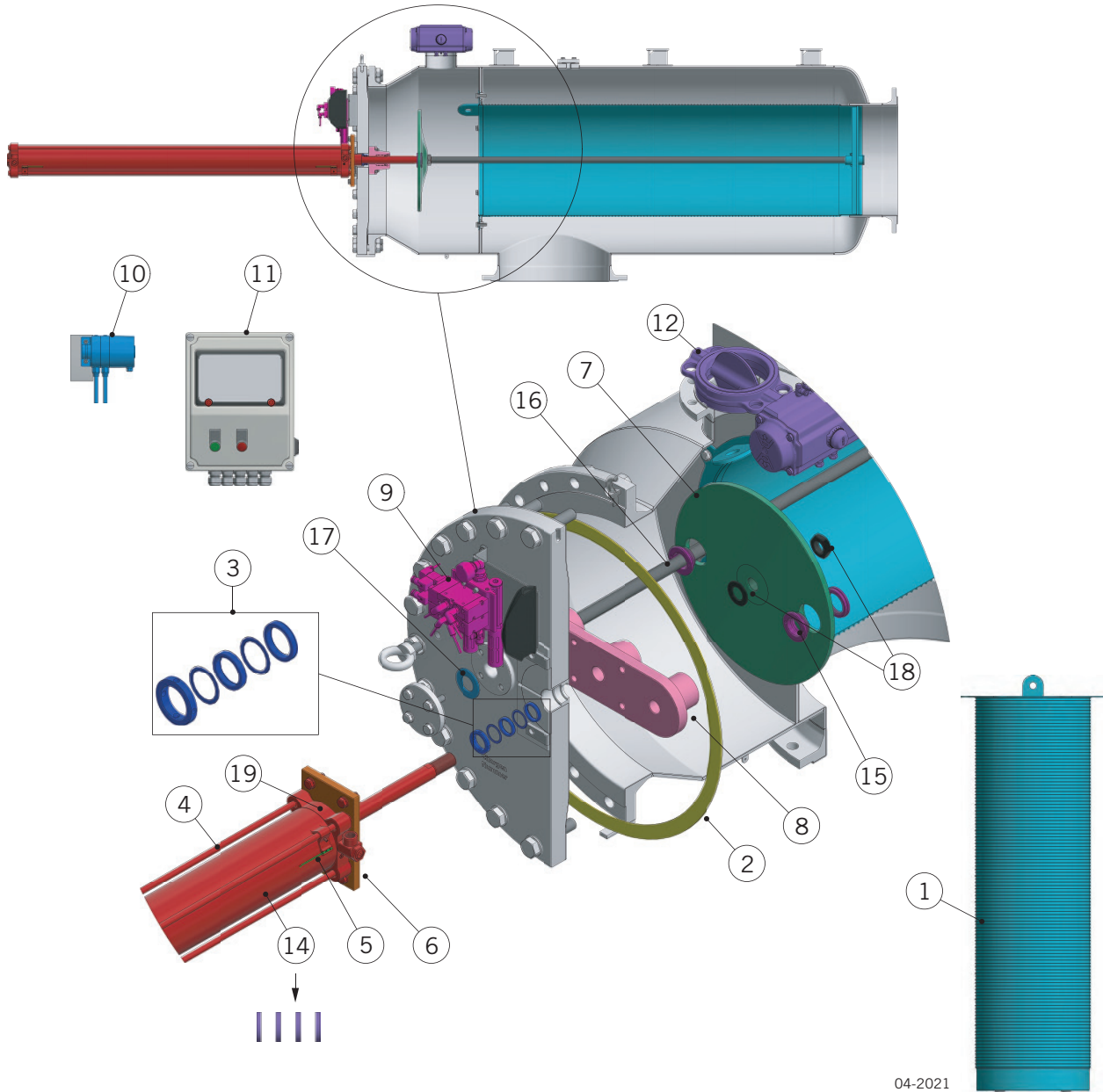
| Material | D1 | D2 | A | B | C | D | E | F | G | Weight * | Flowrate *** | Example flushing volume/backflush (adjustable) | Flushing volume **** |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------|-------------------|--|----------------------|
| | DN | DN | mm | mm | mm | mm | mm | mm | mm | approx. kg | m ³ /h | m ³ | m ³ |
| SS316Ti/SS316L/ steel** | 300 | 100 | 890 | 1.155 | 1.440 | 2.510 | 2.610 | 375 | 385 | 200 | 200-1.100 | 1.50 | 0.94 |
| | 350 | 100 | 950 | 1.260 | 1.481 | 2.467 | 2.500 | 410 | 410 | 300 | 300-1.500 | 2.80 | 1.71 |
| | 400 | 100 | 1.010 | 1.325 | 1.535 | 3.010 | 3.100 | 485 | 465 | 450 | 400-2.000 | 3.70 | 2.20 |
| | 450 | 100 | 1.010 | 1.325 | 1.535 | 3.010 | 3.100 | 485 | 465 | 450 | 400-2.000 | 3.70 | 2.20 |
| | 500 | 150 | 1.590 | 2.205 | 2.350 | 3.800 | 3.900 | 695 | 555 | 1.600 | 800-3.000 | 6.50 | 3.87 |
| | 550 | 150 | 1.590 | 2.205 | 2.350 | 3.800 | 3.900 | 695 | 555 | 1.600 | 800-3.000 | 6.50 | 3.87 |
| | 600 | 200 | 1.540 | 3.055 | 3.490 | 4.650 | 4.750 | 780 | 805 | 2.300 | 1.200-4.000 | 8.10 | 4.83 |
| | 700 | 200 | 2.650 | 3.255 | 3.750 | 5.650 | 5.750 | 800 | 900 | 2.800 | 1.500-5.000 | 12.60 | 7.39 |
| | 800 | 200 | 2.550 | 3.300 | 4.195 | 6.660 | 7.000 | 1.060 | 940 | 3.200 | 2.500-8.000 | 15.00 | 8.75 |
| | 1.000 | 250 | 3.100 | 3.990 | 5.100 | 7.000 | 7.700 | 1.360 | 1.140 | 1.800 | 5.000-9.000 | 20.00 | 12.13 |
| GRP | 300 | 100 | 900 | 1.280 | 1.600 | 2.800 | 2.900 | 430 | 390 | 140 | 300-1.000 | 1.50 | 0.94 |
| | 350 | 100 | 1.000 | 1.430 | 1.810 | 3.058 | 3.170 | 500 | 450 | 205 | 300-1.500 | 2.80 | 1.71 |
| | 400 | 100 | 1.220 | 1.670 | 2.100 | 3.600 | 3.700 | 550 | 500 | 220 | 500-1.800 | 3.70 | 2.20 |
| | 450 | 100 | 1.220 | 1.670 | 2.100 | 3.600 | 3.700 | 550 | 500 | 220 | 500-1.800 | 3.70 | 2.20 |
| | 500 | 150 | 1.680 | 2.220 | 2.700 | 4.300 | 4.400 | 650 | 580 | 550 | 8.00-2.500 | 6.50 | 3.87 |
| | 600 | 200 | 1.950 | 2.570 | 3.120 | 4.500 | 4.600 | 780 | 700 | 750 | 1.200-4.000 | 8.10 | 4.83 |
| | 700 | 200 | 2.300 | 2.990 | 3.650 | 4.750 | 4.850 | 920 | 820 | 1.000 | 1.500-5.000 | 12.60 | 7.39 |
| | 800 | 200 | 2.550 | 3.300 | 4.100 | 6.660 | 7.000 | 1.060 | 940 | 1.400 | 2.500-6.500 | 15.00 | 8.75 |
| | | 1.000 | 250 | 3.100 | 3.990 | 5.100 | 7.000 | 7.700 | 1.360 | 1.140 | 1.800 | 5.000-9.000 | 20.00 |
| Cast Iron** (EN-GJS-500-7/ GGG-50/ ASTM 80-55-06) | 300 | 100 | 890 | 1.250 | 1.460 | 2.420 | 2.540 | 380 | 450 | 520 | 200-1.100 | 1.50 | 0.94 |
| | 350 | 100 | 1.010 | 1.325 | 1.670 | 2.730 | 900 | 485 | 465 | 650 | 300-1.500 | 2.80 | 1.71 |
| | 400 | 100 | 1.010 | 1.325 | 1.670 | 2.730 | 2.900 | 485 | 465 | 650 | 400-2.000 | 3.70 | 2.20 |

* Dependent on design pressure, ** Rubberlined on request, *** Dependent on filtration degree **** EcoSense® is a processor controlled flush water management system. For EcoSense® control and functions the Em4 processor LCP has to be used.

Technical data

| Technical data | | |
|---|---|--|
| | Standard | Special versions |
| Filter insert/filtration degree | Slot wedge wire 150–1.000 µm Basket with perforated plate 1–10 mm | Others on request e.g. 100 µm |
| Filter cover | Cover with hex bolts + nuts | Quick release bolts, davit |
| Venting device | – | On request |
| Drain device | – | On request |
| Connections | Flange in accordance with EN 1092-1 11B PN 10/16 | As specified by the customer (e.g. ANSI, JIS) |
| Materials | | |
| Housing | | |
| Plastic | GRP/FRP (polyester-based fiber-reinforced plastic) | Special alloy steels (e.g. Duplex SS, Super Duplex SS) |
| Stainless steel/steel | SS304/SS316Ti, steel | |
| Cast Iron | GGG50/EN-GJS-500-7/ASTM-80-55-06 | |
| Seals | NBR | On request |
| Perforated plate/ slotted hole strainer | SS316Ti/SS316 | Titanium, Hastelloy, Monel, Super Duplex, Uranus |
| Flushing disk | POM/GRP | – |
| Piston rod | SS316L | Duplex, Super Duplex |
| Differential pressure switch | Ms chem. nickel-plated (Membrane) | Hastelloy, Monell (Membrane), Stainless steel |
| Version | | |
| Differential pressure switch | Electrical with 1 contact for start of cleaning, protection class IP65 | Protection class in Ex-compliant version (ATEX), Transmitter 4–20 mA, HART protocol, diaphragm seals |
| Control | Multi-function unit mounted (Crouzet Millenium III)/delivered separately | Crouzet Millenium en4/Allen Bradley/Rockwell/Siemens, Excd, Explosion-protected (ATEX) |
| | 230 V/50 Hz/1Ph | On request |
| | Protective class IP 64 | Protection class in Ex version |
| Cylinder | Pneumatically actuated | Electrical (depending on nominal diameter), EX-compliant (ATEX) |
| Required compressed air | 6 bar | 3.5 bar (Maximator) |
| Contaminant outlet valve fitting | Butterfly valve | Angle seat valve, ball valve |
| Surface treatment, internal | | |
| Steel housing | Chemonit 33 (rubberlining) | Corrosion protection oil, Corrocoat, Polyglass, Epoxy coating |
| Cast Iron | Chemonit 33 (rubberlining) | Chemonit 31 (rubberlining), KTW compliant rubberlining |
| Stainless steel housing | Pickled and passivated | Glass bead blasted |
| GRP/FRP housing | Chemical-resistant vinylester liner | Corrocoat, Polyglass |
| Surface treatment, external | | |
| Steel housing | Epoxy in RAL 5010 blue | Customer specification |
| Cast Iron | Epoxy in RAL 5010 blue | Customer specification |
| Stainless steel housing | Pickled and passivated | Glass bead blasted |
| GRP/FRP housing | GRP outer color or through-colored in RAL 5015 blue | UV-resistant painting, customer specification |
| Range of application of the materials according to temperature | | |
| Steel/stainless steel housing/ Cast Iron | Temperature limits: In accordance with PED or AD2000 legislation –29 °C to 95 °C | Special version: +120 °C |
| GRP housing | Temperature limits: –70 °C to +60 °C | Special version: +120 °C |
| Design/Certification | | |
| | Declaration of Conformity, 3.1 Material Certificates – Lloyds Register certified foundry acc. to DGRL 2014/68/EU for cast iron (GGG50/EN-GJS-500-7/ASTM 80-55-06) | ASME-Code, ATEX, PED, NORSOK, DOSH, MOM, GOST, RTN, EN 13445 |

KAF®-G spare part sets



04-2021

KAF®-G spare part sets

| Set | Content |
|-----|---|
| 1 | Insert, sealing (optional), set of bolts |
| 2 | Cover gasket |
| 3 | Piston rod to cover sealing/gasket |
| 4 | Pneumatic cylinder, restrictors, set of bolts** |
| 5 | Set limit switches |
| 6 | Flange for pneumatic cylinder |
| 7 | Flushing disc, fixing nut, special washer |
| 8 | Piston rod guide |
| 9 | Complete solenoid valve unit |
| 10 | Differential pressure switch |

| Set | Content |
|-----|--|
| 11 | Control unit/LCP with CPU |
| 12 | Flushing valve |
| 13 | Tubes, adapter fittings |
| 14 | Wearing parts set pneumatic cylinder ("air" repair package)* |
| 15 | Bushings for flushing disc guide pipes |
| 16 | Guide rods for flushing disc incl. fixing |
| 17 | Flange seal for guide rods |
| 18 | Special washer & special fixing nut (for flushing disc) |
| 19 | Cylinder head & bearing unit pneumatic actuator* |

* Repair; not recommended for ATEX certified components

** Recommended for ATEX component – complete with certificate

Recommended spare part sets KAF[®]-G

For commissioning / continuous operation & strategical spares

- Please note this is only a general recommendation, which may have project related changes.
- Please ask for your detailed spare part quotation for your self-cleaning filter.
- After your definitions of spare packages, Krone will check if technical developments apply and always quote newest technical development

- 2– 4 weeks
- 4– 8 weeks
- 10–16 weeks for special materials or versions

* Lead time depends on version, model and materials. Exact delivery time will be mentioned in quotation by Krone Filter Solutions.

** Dependent on filter operational stress/flush frequency depending on water quality.

*** If purchased together with 2–3 year operational spares the SET 2, 3 and 17 can be reduced to 1 pcs.

**** Recommended number of strategical spare packages 30% of filter's in operation/min. 1 package. If purchased with 4–7** years operational spares package can be reduced by those positions.

| Commissioning spares | | |
|----------------------|---------------------------------|-------------------|
| SET | Recommended quantity per filter | Lead time rating* |
| 2 | 1 | ● |
| 3 | 1 | ● |
| 17 | 1 | ● |

| 2–3 years operation spares | | |
|----------------------------|---------------------------------|-------------------|
| SET | Recommended quantity per filter | Lead time rating* |
| 2 | 2 | ● |
| 3 | 2 | ● |
| 5 | 1 | ● |
| 15 | 1 | ● |
| 17 | 1 | ● |

| 4–7** years operational spares | | |
|--------------------------------|-------------------------------------|-------------------|
| SET | Recommended quantity per filter**** | Lead time rating* |
| 1 | 1 | ● ● |
| 2 | 2 | ● |
| 3 | 3 | ● |
| 5 | 1 | ● |
| 7 | 1 | ● ● |
| 8 | 1 | ● ● |
| 10 | 1 | ● ● |
| 14 (or SET 4 optional) | 1 | ● |
| 4 (optional to SET 14) | 1 | ● ● |
| 15 | 1 | ● |
| 17 | 2 | ● |

| Strategical spare package recommended purchase latest 1 year after START-UP**** | | |
|---|---------------------------------|-------------------|
| SET | Recommended quantity per filter | Lead time rating* |
| 1 | 1 | ● ● |
| 2 | 1 | ● |
| 3 | 1 | ● |
| 4 | 1 | ● ● |
| 5 | 1 | ● |
| 7 | 1 | ● ● |
| 8 | 1 | ● ● |
| 9 | 1 | ● |
| 10 | 1 | ● ● |
| 11 | 1 | ● ● |
| 12 | 1 | ● ● |
| 15 | 1 | ● |
| 17 | 1 | ● |



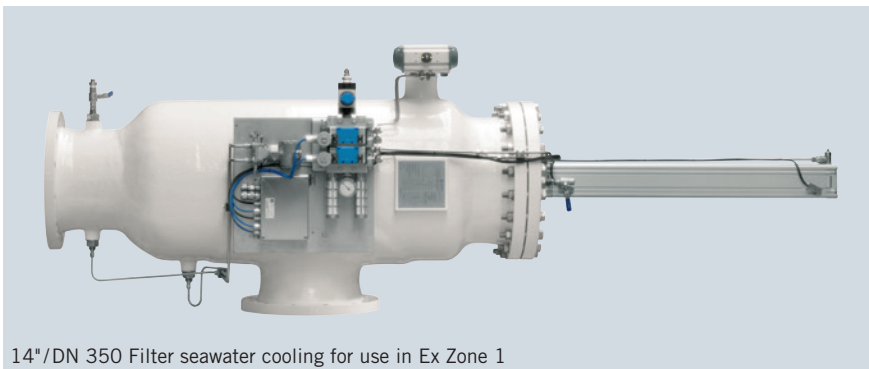
24"/DN 600 KAF® Filter – Bioethanol plant



24"/DN 600 KAF® Filter – Seawater cooling



3 x 16"/DN 400 KAF® Filter – desalination



14"/DN 350 Filter seawater cooling for use in Ex Zone 1



300 JIS/DN 300 ship seawater cooling for use in Ex Zone 1



200 JIS/DN 200 ship seawater cooling for use in Ex Zone 1



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www.krone-filtershop24.com

**KRONE***FILTER*.COM
SOLUTIONS IN FILTRATION

Type Approval Certificate

This is to certify that the undernoted product(s) has/have been tested with satisfactory results in accordance with the relevant requirements of the Lloyd's Register Type Approval System.

| | |
|---------------------------|--|
| Manufacturer | Krone Filter Solutions GmbH |
| Address | Industriestr. 19, Oyten, 28876, Germany |
| Type | Automatic self-cleaning and basket filters |
| Description | Single, duplex and self-cleaning automatic filter with several housing sizes and combinations made from standard materials spheroidal iron castings EN-GJS-500-7 (GGG 50)* or EN-GJS-400-15 (GGG 40), carbon steel optional rubber lined or stainless steel. |
| Trade Name | KSF, KMF, KDF-K, KDF-V, KAF, KAF-S, KAF-G, KRF |
| Application | Filter depending on type for diesel oil, oil or water piping systems in ship and offshore installations classed or intended for Classification with Lloyd's Register. |
| Specified Standard | Lloyd's Register Rules and Regulations for the Classification of Ships, July 2021 |
| Other Conditions | The manufacturer's installation instructions are to be sought. *) Not to be used for applications with expected significant chock or vibration loads. |



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Type Approval Certificate

This certificate is not valid for equipment, the design, ratings or operating parameters of which have been varied from the specimen tested. The manufacturer should notify Lloyd's Register EMEA of any modification or changes to the equipment in order to obtain a valid Certificate.

Previous Version: 16/20086

The Design Appraisal Document HTS/ENS 34963-16, Issue 1 and its supplementary Type Approval Terms and Conditions form part of this Certificate.

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Kingdom

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Appendix

| RATINGS | Filter type: | Nominal pressures: [bar] | Size range: | Material: |
|---------|--------------|--------------------------|-----------------|---|
| KSF | | 6, 10, 25 | DN 15 – DN 600 | Spheroidal iron casting |
| KMF | | 6, 10, 25 | G ½” – 2 ½” | Spheroidal iron casting |
| KDF-K | | 6, 10, 25 | DN 15 – DN 250 | Spheroidal iron casting |
| KDF-V | | 6, 10, 25 | DN 100 – DN 600 | Spheroidal iron casting, carbon steel |
| KRF | | 6, 10 | DN 32 – DN 400 | Spheroidal iron casting, carbon steel |
| KAF | | 6, 10 | DN 50 – DN 1000 | Spheroidal iron casting, carbon or stainless steel, |
| KAF-S | | 6, 10 | DN 50 – DN 1000 | Spheroidal iron casting, carbon or stainless steel, |
| KAF-G | | 6, 10 | DN 50 – DN 1000 | Spheroidal iron casting, carbon or stainless steel, |

| Material: | Temperature range: | For fluids**: |
|---|--------------------|--------------------------------|
| Spheroidal cast iron | -10 up to +300°C | MDO, HFO, oil, water, seawater |
| Austenitic stainless steel: 1.4571, 1.4401, 1.4404, 1.4408, 1.4539, 1.4301, 1.4541, SA240-304L, SA240-316Ti, SA240-321, SA240-316L, SA240-904L, | -196 up to +300°C | MDO, HFO, oil, nitrogen |
| Duplex stainless steel: 1.4462, 1.4463, UNS S31803 | -40 up to +250°C | seawater |
| Super duplex: 1.4410, UNS 32750 | | |
| Carbon steel: St 50, P235GH, P245GH, P250GH, P265GH, SA516 Gr60, SA516 Gr70 | -40 up to +100°C | MDO, HFO, oil, water, seawater |

**) including fluids and mixture of similar evaluation class

Pressure reductions at elevated temperatures are to be considered.

Media depending on type: KAF, KAF-S, KAF-G, KRF: water, seawater

KSF, KMF, KDF-K and KDF-V: MDO, oil, nitrogen, water, seawater

LLOYD'S REGISTER TYPE APPROVAL – DESIGN APPRAISAL DOCUMENT

Issued by: Hamburg Technical Support Office (HPC 1461050)

Issued to: KRONE FILTER SOLUTIONS GMBH

For: SINGLE, DUPLEX AND AUTOMATIC FILTER

Types: KSF, KMF, KDF-K, KDF-V, KAF, KAF-S, KAF-G, KRF

The undernoted documents have been reviewed for compliance with the requirements of the Lloyd's Register Type Approval System Procedure TA14 Version 04 (September 2020) and this Design Appraisal Document forms part of the Certificate.

APPROVAL DOCUMENTATION

| | | |
|--------------------------------|--|------------|
| - | Application Checklist | 19.05.2021 |
| 16/20086 | Previous Type Approval Certificate | 09.09.2016 |
| - | Product Catalogue / general Data sheets for types KSF, KMF, KDFK, KDFV, KDF and KRF | 2014 |
| KSF LR Data sheet, Rev. 4 | KSF | 2016 |
| KSF080.04.16.00.01, Rev. 0 | AW 613 PN16 DN 80 incl. Parts list | 22.04.2008 |
| KSF80.04.16.01.01, Rev. 1 | Body DN 80 GR4 | 10.03.2006 |
| KSF000.05.16.02.01, Rev. 0 | Cover GR5 | 25.03.2009 |
| KMF LR Data sheet, Rev. 4 | KMF | 2016 |
| KMF000.03.05.16.00.01, Rev 0 | KMF GR3 incl. Parts list | 22.11.2013 |
| KMF000.03.05.16.01.01, Rev 0 | Body KMF GR3 / GR1 ½" – G2" | 22.11.2013 |
| KSF000.03.05.16.02.01, Rev.1 | KSF Cover GR3 | 24.11.2011 |
| KDFK LR Data sheet, Rev. 4 | KDFK | 2016 |
| KDFK080.06.05.10.00.01, Rev. 0 | KDFK DN 80 PN 10 incl. Parts list | 24.02.2011 |
| KDFK080.04.05.10.01.02, Rev.2 | KDFK Body GR4 DN 80 PN10 JIS 10K | 20.03.2014 |
| KSF000.06.10.02.01, Rev. 0 | Cover GR6 | 31.03.2009 |
| KDFK250.07.05.10.00.01 | KDF-K Double filter DN 250 PN 16 | 23.10.2019 |
| KDFK250.07.05.10.01.01 | KSF Body DN 250 PN 10 Gr. 7 | 23.10.2019 |
| KSF00.08.05.10.02.01, rev. 1 | Cover KSF Gr.8 | 01.04.2009 |
| KDFV LR Data sheet, Rev. 2 | KDFV | 2016 |
| KDFV150.07.05.10.00.20, Rev 1 | KDFV GR7 DN 150 incl. Parts list | 12.07.2012 |
| KDFV150.07.05.10.01.20, Rev 1 | KDFV Body GR7 DN 150 | 27.04.2012 |
| KDFV150.07.05.16.08.20, Rev 4 | KDFV Body Change Over GR7 DN 150 | 12.07.2012 |
| KSF000.07.05.10.02.01, Rev. 0 | Cover GR7 | 24.02.2011 |
| KAF LR Data sheet, Rev. 0 | KAF | 2016 |
| KAF150.01.16.05.00.01, Rev. 0 | KAF DN 150 PN5 JIS B 2220 K5 FF incl. Parts list | 16.05.2014 |
| KAF150.00.05.05.01.02, Rev. 0 | Body KAF DN 150 PN5 | 16.05.2014 |
| KAF150.00.16.05.01.02, Rev. 0 | Body KAF DN 150 PN5 rubber lined incl. Parts list | 16.05.2014 |
| KAF150.00.05.10.02.01, Rev. 0 | KAF Cover DN 150 PN 19 / DNC-50 | 12.12.2013 |
| KAF150.00.16.10.02.01, Rev. 0 | KAF Cover DN 150 PN 19 / DNC-50 incl. Parts list | 12.12.2013 |
| KRF LR Data sheet, Rev. 4 | KRF-BF | 2016 |

TEST REPORTS

| | | |
|---------------|--|------------|
| - | Production Quality Assessment in Oyten | 30.06.2021 |
| HPC1461050/01 | LR Works Inspection including hydrostatic burst pressure tests at 100 bar for type KSF: DN 50, size 2; KSF: DN 80, size 4 and KSF: DN 100, size 8 | 14.12.2015 |
| HPC1461050/02 | hydrostatic burst pressure tests at 100 bar for type KMF: 2 ½" size 4; type KDF-K : DN 80, size 6 and KDF-K: DN 20, size 2 witnessed by LR Surveyor at Krone in Oyten | 17.12.2015 |
| HPC1461050/03 | hydrostatic burst pressure tests at 40 bar for type KAF: DN 200, PN 10 and at 64 bar for type KDF-V: DN 150, size 7, PN 16 witnessed by LR Surveyor at Krone in Oyten | 21.12.2015 |
| HPC1461050/04 | Visit of an existing installation with function test of KAF self-cleaning automatic filter at 'Elbphilharmonie Hamburg' | 11.01.2016 |



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Supplementary Type Approval Terms and Conditions

Type Approval certifies that a representative sample of the product(s) referred to herein has/have been found to meet the applicable design criteria for the use specified herein. It does not mean or imply approval for any other use, nor approval of any product(s) designed or manufactured otherwise than in strict conformity with the said representative sample.

Type Approval is based on the understanding that the manufacturer's recommendations and instructions and any relevant requirements of the Rules and Regulations are complied with.

Type Approval does not eliminate the need for normal inspection and survey procedures required by the Rules and Regulations. Lloyd's Register EMEA reserves the right to cancel or withdraw this Type Approval Certificate in accordance with the Lloyd's Register Type Approval System Procedure.