

KAF[®] Bernoulli[®]

Self-Cleaning Automatic Filter

- No contact cleaning
- No process interruption

PN 2.5–25
DN 40–1000
EN/ANSI/JIS/GOST



Design Appraisal
Certificate no.
HPC1461050/34963-16/TS



Type Approval
Certificate no. 16/20086



ISO 9001:2015



EN 13445
AD 2000



Applications

The self-cleaning automatic KAF[®] 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.

Characteristics

- Unique self cleaning function works from 0.1–25 bar
- Minimum working pressure 0.1 bar
- 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 preventional maintenance.

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.



KRONEFILTER.COM
SOLUTIONS IN FILTRATION

Brief description

The KAF® 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.

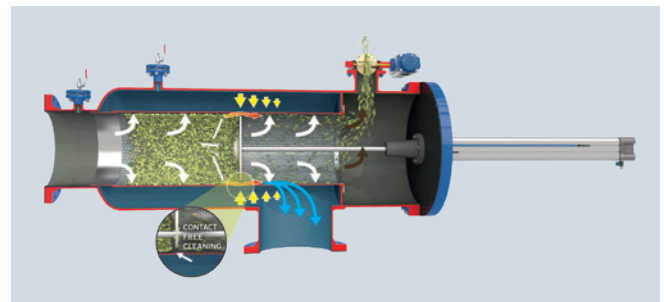
Functional description of the cleaning process

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® product video

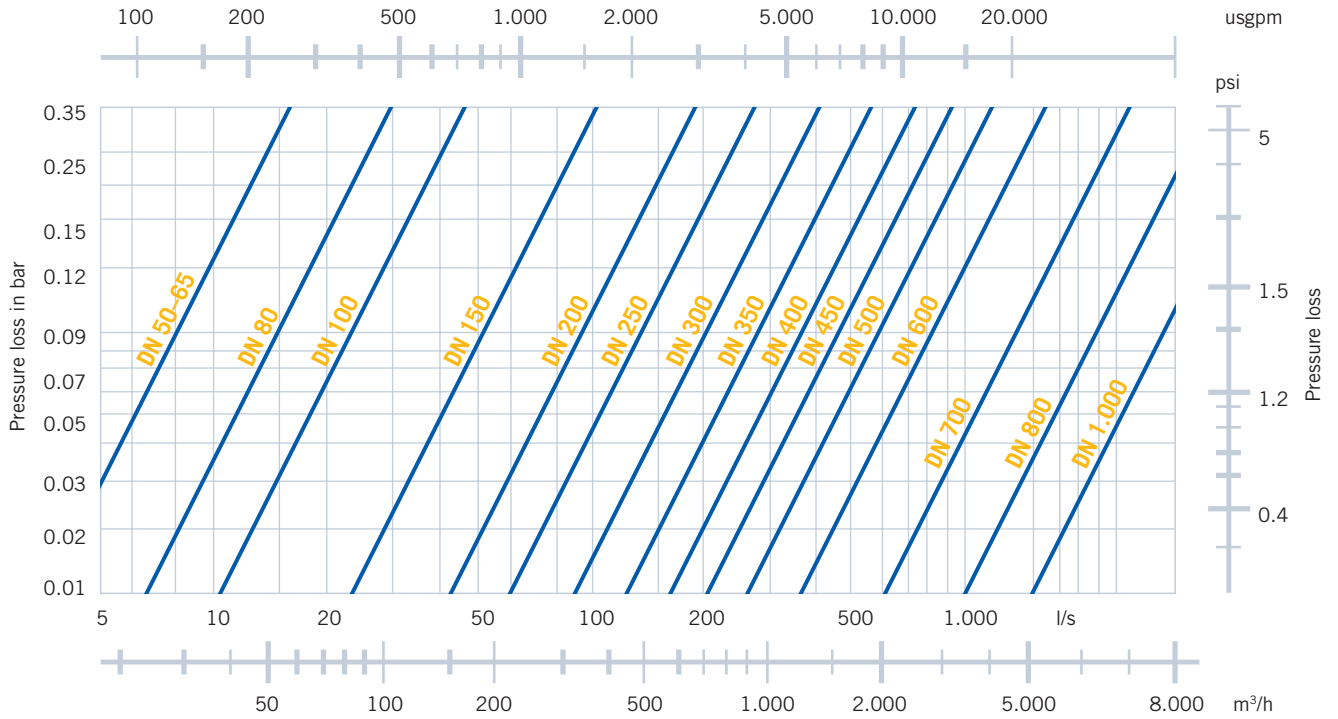
Info about the function

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



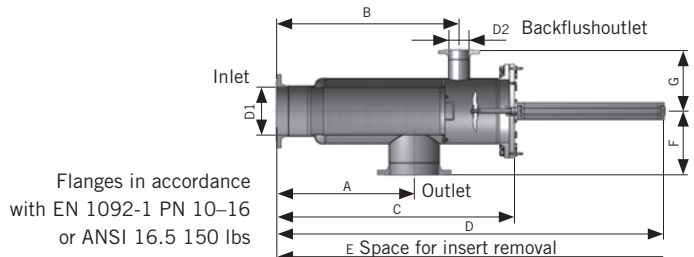
Filter dimensioning chart/Pressure loss diagram

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



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**	50	25	310	385	520	1.020	1.100	200	135	25	8-45	0.04	0.03
	65	25	310	385	520	1.020	1.100	200	135	30	8-45	0.05	0.03
	80	40	405	510	620	1.100	1.200	235	190	35	15-80	0.08	0.05
	100	40	430	480	680	1.305	1.400	240	240	40	40-120	0.12	0.08
	150	40	490	680	810	1.450	1.550	260	255	80	50-300	0.26	0.17
	200	80	590	790	1.010	1.950	2.050	290	280	110	100-500	0.42	0.27
	250	100	740	980	1.250	2.180	2.280	345	330	165	160-800	0.96	0.60
	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	40/50	25	400	540	650	1.200	1.300	160	160	15	8-45	0.04	0.03
	65	25	400	540	650	1.200	1.300	160	160	17	8-45	0.05	0.03
	80	40	440	600	720	1.300	1.400	190	175	20	20-90	0.08	0.05
	100	40	460	640	800	1.370	1.450	220	200	25	40-120	0.12	0.08
	150	50	500	720	890	1.680	1.750	250	240	30	70-300	0.26	0.17
	200	80	600	870	1.130	2.000	2.100	325	300	60	150-500	0.42	0.27
	250	100	660	1.000	1.290	2.300	2.400	370	330	90	200-700	0.86	0.60
	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	12.13	
Cast Iron** (EN-GJS-500-7/ GGG-50/ ASTM 80-55-06)	50	40	300	580	730	1.210	1.300	240	240	50	15-80	0.08	0.05
	65	40	300	580	730	1.210	1.300	240	240	50	15-80	0.08	0.05
	80	40	300	580	730	1.210	1.300	240	240	50	15-80	0.08	0.05
	100	40	430	580	730	1.210	1.300	240	240	60	40-120	0.12	0.08
	150	40	490	690	850	1.440	1.600	260	240	200	50-300	0.26	0.17
	200	80	620	810	1.000	1.670	1.780	300	280	270	100-500	0.42	0.27
	250	100	890	1.250	1.460	2.420	2.540	380	450	520	160-800	0.86	0.60
	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	2.900	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, Exd, 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

Recommended spare part sets KAF®

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 and 3 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 or 3A	1	●

2–3 years operation spares		
SET	Recommended quantity per filter	Lead time rating*
2	2	●
3 or 3A	2	●
5	1	●

4–7** years operational spares		
SET	Recommended quantity per filter****	Lead time rating*
1	1	● ●
2	2	●
3 or 3A	3	●
5	1	●
7	1	● ●
8 (optional for filters >= DN500)	1	● ●
10	1	● ●
14 (or SET 4 optional)	1	●
4 (optional to SET 14)	1	● ●

Strategical spare package recommended purchase latest 1 year after START-UP****		
SET	Recommended quantity per filter	Lead time rating*
1	1	● ●
2	1	●
3 or 3A	1	●
4	1	● ●
5	1	●
7	1	● ●
8 (optional for filters >= DN500)	1	● ●
9	1	●
10	1	● ●
11	1	● ●
12	1	● ●



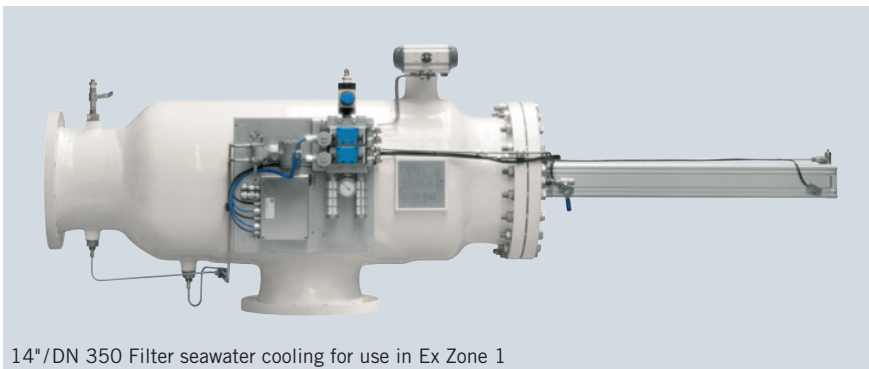
24"/DN 600 KAF® Filter – Bioethanol plant



24"/DN 600 KAF® Filter – Seawater cooling



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



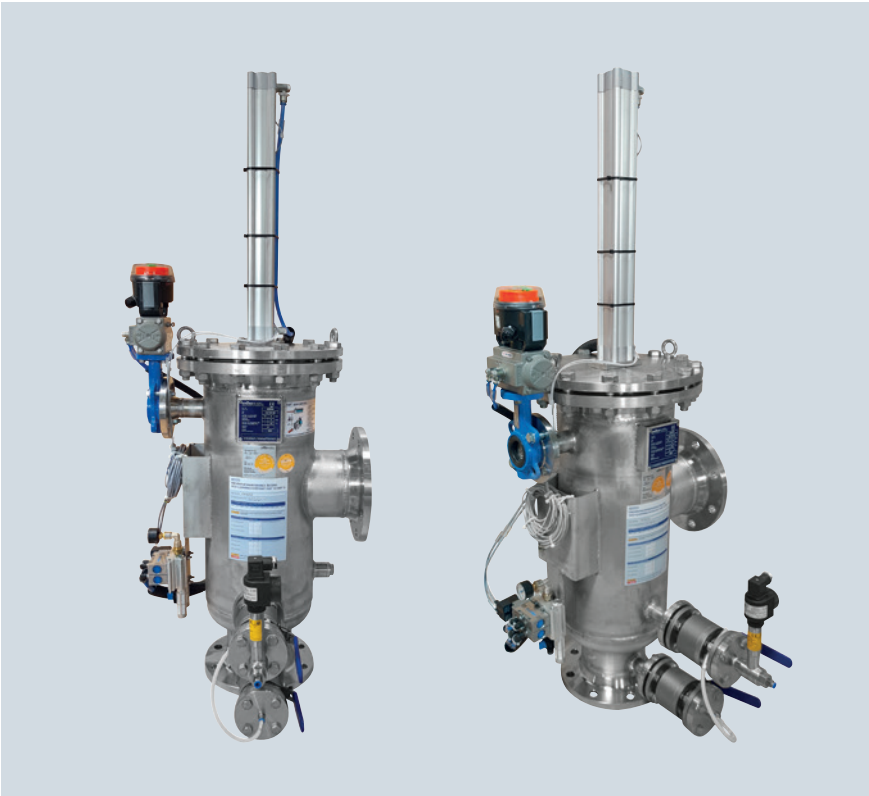
14"/DN 350 Filter seawater cooling for use in Ex Zone 1



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



DN 150 Super duplex SS



Krone Filter Solutions GmbH

Industriestrasse 19 | 28876 Oyten/Germany
Phone +49 4207 98769-0 | Fax +49 4207 98769-27
filter@krone-filter.com | www.krone-filter.com
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.



Torsten Schroeder

Senior Specialist to Lloyd's Register EMEA
A member of the Lloyd's Register group

71 Fenchurch Street, London, EC3M 4BS, United Kingdom

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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.

71 Fenchurch Street, London, EC3M 4BS, United 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



Torsten Schröder
Senior Specialist
Engineering Systems
Hamburg Technical Support Office
Lloyd's Register EMEA
T +49 (0)40 349 700 10 259
E torsten.schroeder@lr.org

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.