

KAF-S Bernoulli®

Self-Cleaning Automatic Filter

- No contact cleaning
- No process interruption

PN 2.5–10
DN 300–1.000
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-S Bernoulli® filter is a versatile self-cleaning, virtually 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 of 0.09, for example, at a high flow rate, simple, robust design, with high performance, low weight, and space saving.

Characteristics

- Unique self cleaning function works from 0.1–25 bar
- From a working pressure of 0.3 bar
- The filter can be integrated in the pipe system in any installation position
- Filtration stage $\geq 100 \mu$ /micron – 10 mm

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.



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Brief description

A specially shaped flushing disk gives rise to an increase in speed between the disk and strainer in the flushing process. The resulting local pressure drop causes internal evacuation of the contaminant particles from the strainer insert. Solid components are flushed out via the simultaneously opened flush valve. 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.

- Filtrate 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 2 bar.

Operating instructions

The comprehensive instructions accompanying the filter must be followed!

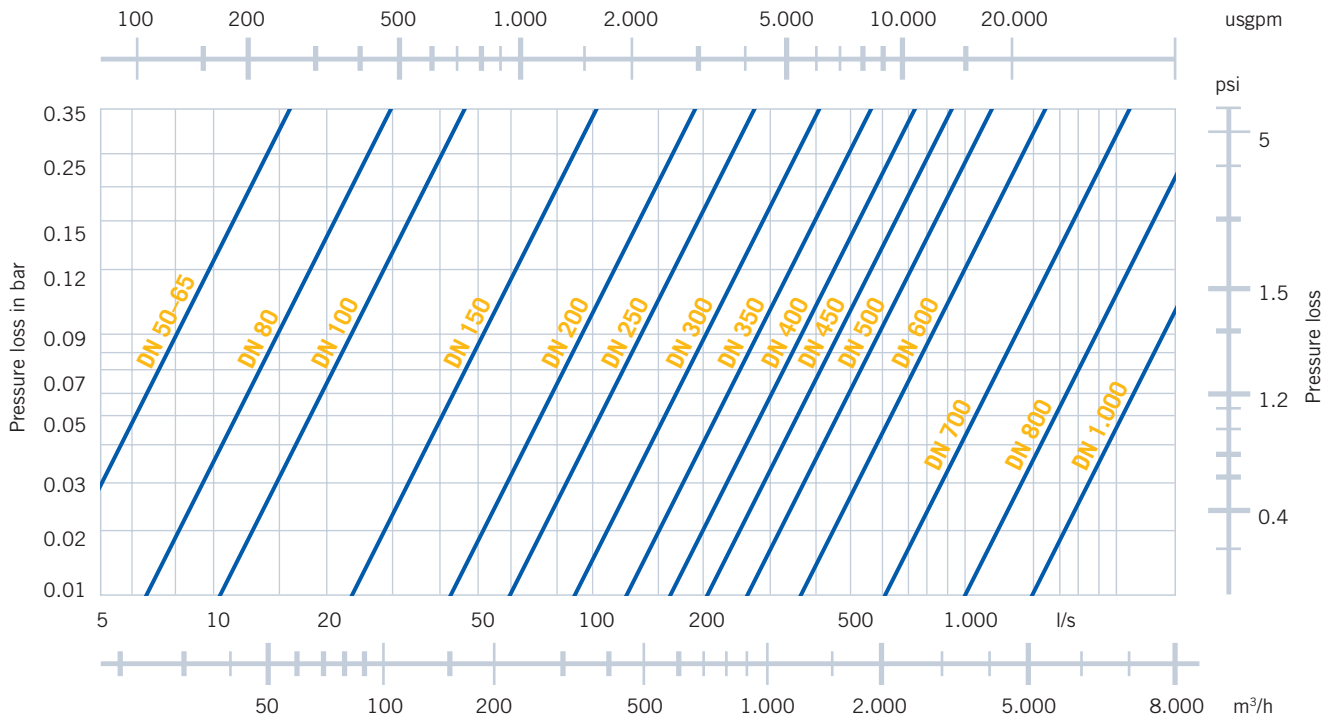
The filter is installed in pipes using flanges. Ensure that the standard version of the filter is installed vertically or horizontally in a mechanically stress-free manner without additional loads. The medium must flow in the direction specified on the housing. Incorrect installation can cause filter malfunctions. If the contaminant drain pipe is laid with an ascending gradient ensure that the inlet pressure of the filter is at least a 0.3 bar higher than the counter pressure in the contaminant drain pipe (pay attention to the loss through friction in

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. 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 in the filter strainers, thereby increasing the speed between the piston 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.

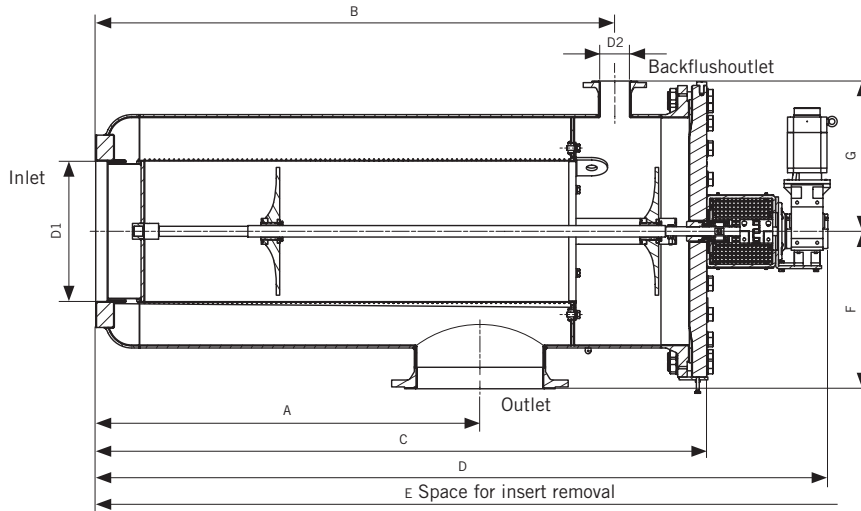
pipes). Before using with a medium other than the medium specified in the design, or for different operating data, the resistance of the materials of the parts and seals touched by the pressure-bearing membrane to the medium to be filtered must be checked by the customer; it may be necessary to consult with the manufacturer and to execute a conformity evaluation in accordance with PED EN 2014/68/EU (if there is a CE-mark requirement).

Filter dimensioning chart/Pressure loss diagram



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****
	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	1.950	2.610	375	385	200	200–1.100	2.2	1.8
	350	100	950	1.260	1.481	1.990	2.500	410	410	300	300–1.500	2.6	2.1
	400	100	1.010	1.325	1.535	2.040	3.100	485	465	450	400–2.000	3.5	2.8
	500	150	1.590	2.205	2.350	2.850	3.900	695	555	1.600	800–3.000	5.5	4.3
	600	200	1.540	3.055	3.490	4.290	4.750	900	805	2.300	1.200–4.000	9.5	8.0
	700	200	2.650	3.255	3.750	4.550	5.750	1.200	1.100	2.800	1.500–5.000	12.5	10.4
	800	200	2.550	3.300	4.195	4.750	7.000	1.060	940	3.200	2.500–8.000	14.5	12.0
	1.000	250	3.100	3.990	5.100	6.100	7.700	1.360	1.140	3.800	5.000–9.000	15.0	11.5
GRP	300	100	900	1.280	1.600	2.100	2.900	430	390	140	300–1.000	2.2	1.8
	350	100	1.000	1.430	1.810	2.310	3.170	500	450	205	300–1.500	2.6	2.1
	400	100	1.220	1.670	2.100	2.600	3.700	550	500	220	500–1.800	3.5	2.8
	500	150	1.680	2.220	2.700	3.200	4.400	650	580	550	800–2.500	5.5	4.3
	600	200	1.950	2.570	3.120	3.950	4.600	780	700	750	1.200–4.000	9.5	8.0
	700	200	2.300	2.990	3.650	4.450	4.850	920	820	1.000	1.500–5.000	12.5	10.4
	800	200	2.550	3.300	4.100	5.100	7.000	1.060	940	1.400	2.500–6.500	14.5	12.0
	1.000	250	3.100	3.990	5.100	6.100	7.700	1.360	1.140	1.800	5.000–9.000	15.0	11.5
Cast Iron** (EN-GJS-500-7/ GGG-50/ ASTM 80-55-06)	300	100	890	1.250	1.460	1.960	2.540	380	450	520	200–1.100	2.2	1.8
	350	100	1.010	1.325	1.670	1.990	900	485	465	650	300–1.500	2.6	2.1
	400	100	1.010	1.325	1.670	2.120	2.900	485	465	700	400–2.000	3.5	2.8

* Dependent on pressure phase

** Rubberlined on request

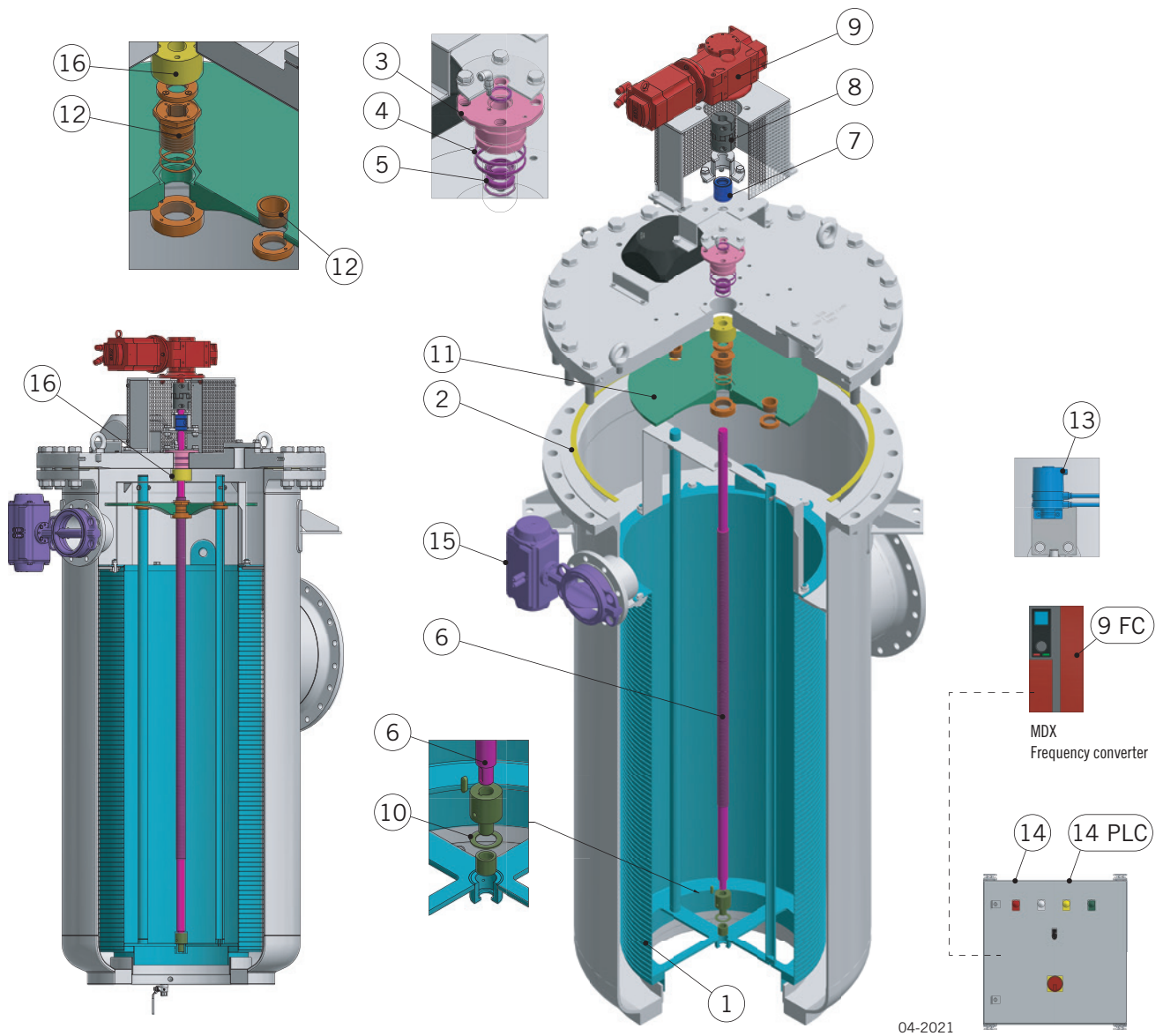
*** Dependent on filtration degree

**** EconSense® is a processor controlled flush water management system. For EconSense® control and functions the Em4 processor LCP has to be used.

Technical data

Technical data		
	Standard	Special versions
Filter insert/filtration degree	0.2–5 mm	Additional on request e.g. 0.1 mm
Filter cover	Cover with hex bolts + nuts	–
Venting device	–	On request
Drain unit	–	On request
Connections	EN 1092-1 PN 10/16	As specified by the customer (e.g. ANSI, JIS)
Materials		
Housing		
Plastic	GRP/FRP (polyester-based fiber-reinforced plastic)	Cast Iron (rubberlined)
Stainless steel	SS316Ti, steel	Steel (rubberlined), special alloy steels
Cast Iron	GGG50/EN-GJS-500-7/ASTM-80-55-06	–
Seals	NBR	On request
Perforated plate/ slotted hole strainer	SS316Ti/SS316	Titan, Hastelloy, Monel, Super Duplex, Uranus
Flushing disk	POM/GRP	–
Piston rod	SS316L	Super Duplex S32750/S32760
Differential pressure switch	Ms chem. nickel-plated (Membrane)	Hastelloy, Monell (Membrane)
Version		
Differential pressure switch	Electrical with 1 st contact for start of cleaning, protective class IP 65	Protection rating in Ex-conformant version (ATEX), Transmitter 4–20 mA, HART protocol
Control	Multi-function unit mounted (Crouzet Millenium III)/delivered separately	Allen Bradley/Rockwell/Siemens, Eexd, Explosion-protected (ATEX)
	400 V/3 phase/60 Hz	On request
	Protective class IP 64	Protection class in Ex version
Cylinder	Pneumatically activated	Electrical (depending on nominal diameter) (ATEX)
Required compressed air	6 bar Butterfly valve	–
Contaminant outlet valve fitting		
Surface treatment, internal		
Steel housing/Cast Iron	Corrosion protection oil/Chemonit 33 (rubberlined)	Chemonit 31 (rubberlined) Corrocoat, Polyglass
Stainless steel housing	Glass bead blasting or blasted	Pickled and passivated
GRP/FRP housing	Chemical-resistant vinylester liner	Corrocoat, Polyglass
Surface treatment, external		
Steel housing/Cast Iron	Epoxy in RAL 5010 blue	Customer specification
Stainless steel housing	Glass bead blasting or blasted	–
GRP/FRP housing	GRP outer color or through-colored in RAL 5015 blue	Customer specification, Polyurethane paint
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, PED, NORSOK, DOSH, MOM, GOST, RTN

KAF®-S spare part sets



04-2021

KAF®-S spare part sets

Set	Content	Set	Content
1	Insert, sealing (optional), set of bolts (without spindle set 6 & 10)	9 FC	Frequency Converter (mounted in 14)
2	Cover gasket	10	Bearing unit insert
3	Cover bushing	11	Flushing disc
4	Sealing & snap ring for cover bushing	12	Flushing disc bushings
5	Sealing for spindle	13	Differential pressure switch or transmitter
6	Spindle	14	Control unit complete LCP cabinet with 9 FC & 14 PLC
7	Bearing unit for spindle	14 PLC	Only CPU controller
8	Coupling	15	Flushing valve
9	Motor with gear box	16	Special spindle bearing (optional)

Recommended spare part sets KAF®-S

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, 4 and 5 can be reduced to 1 pcs.

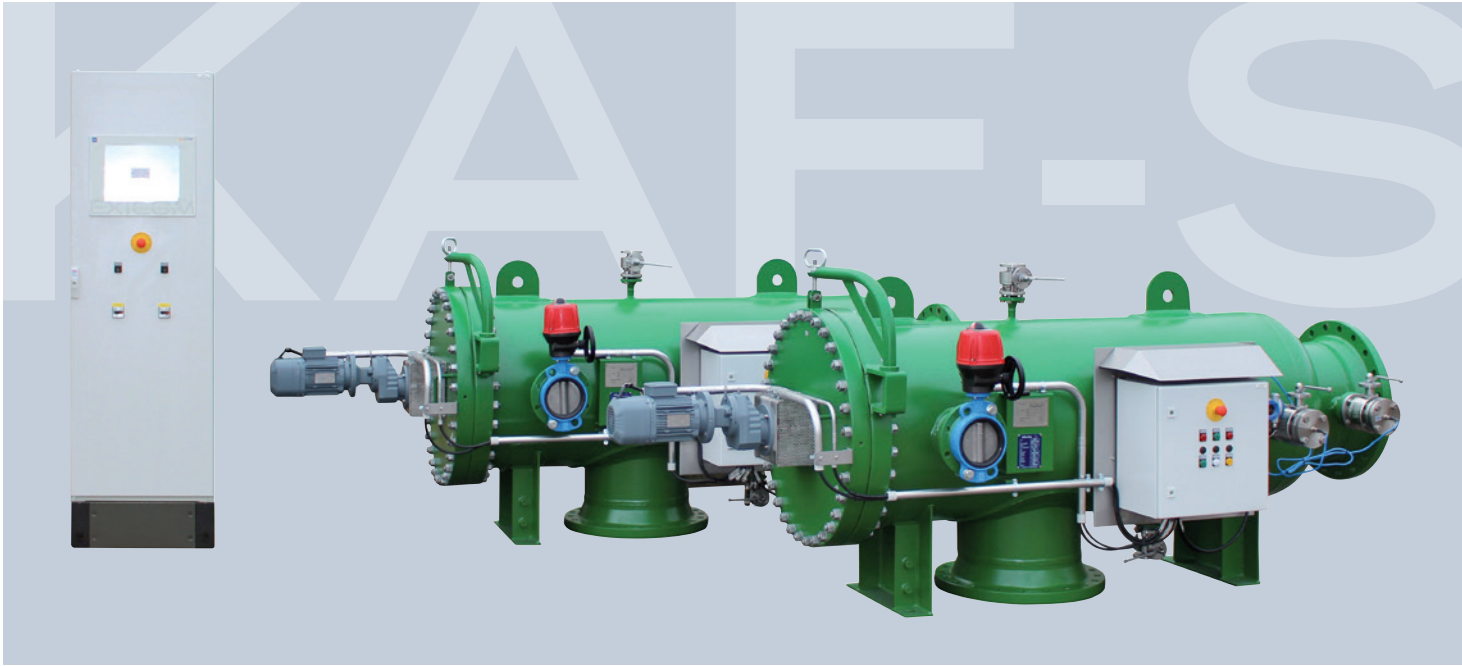
**** Recommended number of strategical spare packages 30% of filter's in operation/min. 1 package. If purchased with 4–7** years operational spares package can be reduced by those positions.

Commissioning spares		
SET	Recommended quantity per filter	Lead time rating*
2	1	●
4	1	●
5	1	●

2–3 years operation spares		
SET	Recommended quantity per filter	Lead time rating*
2	2	●
3	1	● ●
4	2	●
5	2	●
7	1	●
10	1	●
12	1	● ●

4–7** years operational spares		
SET	Recommended quantity per filter***	Lead time rating*
1	1	● ●
2	2	●
3	1	● ●
4	3	●
5	3	●
6	1	● ●
7	1	●
8	1	●
10	1	●
11	1	● ●
12	1	● ●
13	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	1	● ●
4	1	●
5	1	●
6	1	● ●
7	1	●
8	1	●
9	1	●
10	1	●
11	1	● ●
12	1	● ●
13	1	● ●
14	1	● ●
15	1	● ●



KAF-S 20" Giza



KAF-S DN 500



KAF-S DN 500



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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.