

multiwave passive: PASSIVE FILTER AGAINST HARMONICS.

The robust filter for simple tasks with the proven highly linear components from the KBR portfolio.



Improves the cos phi

For networks with a high proportion of frequency converters

Improves the total harmonic distortion of the voltage (THD-U)

Cost effective filter

Filters a harmonic from the mains

Robust construction

+ ...and much more

The loads in industrial networks are increasingly dominated by a large number of small and large converters. These are introduced with the new acquisition of machines or the retrofitting of existing machines to increase the energy efficiency.

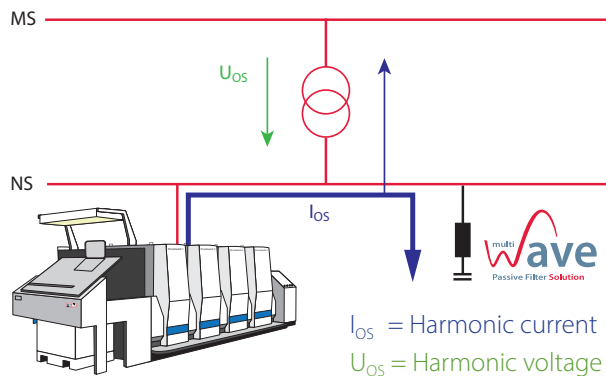
In this context, two effects can be observed. The decrease in motors operated directly from the grid reduces the need for inductive fundamental reactive power from the grid. At the same time, however, there is more and more reactive power caused by the harmonic currents of the converters.

The impedance of the network transformer plays a decisive role. A large part of the harmonic voltage is created here, leading to faults in the consumers. Frequently, the standard limit values for harmonics are already violated in the main distribution. This results in unreliable operation of the machines with an increased number of malfunctions in the control system. As a solution, KBR offers the harmonic filters of the **multiwave passive** product group as a matched filter circuit system.



The control and monitoring of the multiwave passive

Mode of operation passive harmonic filter



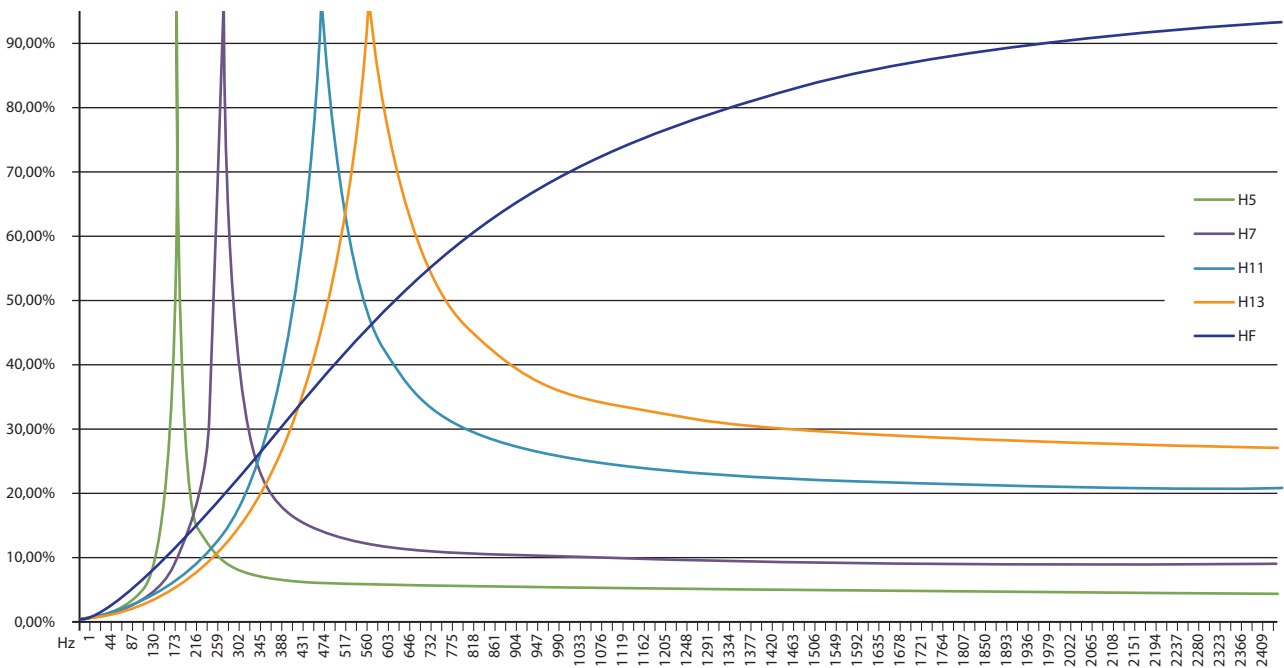
The **multiwave passive** has been developed specifically for networks with a high ratio of 5th and 7th harmonics, which are typical for industrial networks. The system is placed centrally in the low-voltage main distribution and takes over a large part of the harmonic current (see picture above). The degree of network cleaning depends on the design of the passive filter. The result is a significant improvement of the total harmonic distortion of the voltage (THD-U) and a lesser thermal load on the transformer.

The **multiwave passive** is controlled and monitored with the **multicom D6** compensation controller equipped with a special filter circuit system program. The **multicom D6** controls contactors and fans and monitors the system for overcurrent and overtemperature. Various network measuring functions are implemented as well as an error memory that can be displayed in the plain text display. You can also operate several systems in one mains in server/client operation.

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multiwave passive

Frequency ranges of different filter stages



Example configuration with H5 stages

Number of filter modules	Type multiwave passive ... with H5 stages		Transformer with u_k 6 %							Max. Harmonic current
			630 kVA	1000 kVA	1250 kVA	1600 kVA	2000 kVA	2500 kVA	Suction effect in %	
2	...073/02-1100-4,25-SSEB	1 cabinet	73	63	57	51	46	40	190	
3	...109/03-1110-4,25-SSEB	1 cabinet	80	72	67	61	56	50	285	
4	...146/04-1111-4,25-SSEB	1 cabinet	84	77	73	68	63	57	380	
5	...182/05-1111-4,25-SSEB	2 cabinets	87	81	77	72	68	63	475	
6	...218/06-1111-4,25-SSEB	2 cabinets	90	84	80	76	72	67	570	
7	...255/07-1111-4,25-SSEB	2 cabinets	91	85	82	79	75	70	665	
8	...291/08-1111-4,25-SSEB	2 cabinets	—	87	84	81	77	73	760	

Continuation multiwave passive

The compensation power of the **multiwave passive** is considerable. For example, a filter with 250 kvar fundamental reactive power can draw a harmonic current of up to 665 A from the mains. The broad-band filter effect yields the following typical degrees of compensation:

- 5th harmonic 85 %
- 7th harmonic 43 %
- 11th harmonic 32 %
- 13th harmonic 30 %

In order to guarantee this filter capacity in the long term, it is necessary to use components with a high load capacity. Once more, the components from our own production are the most convinc-

Do you have any questions concerning a product or a special requirement? We will be happy to advise you personally.

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ing. KBR developed the high-power inductor used specifically for this system type. The UHPC premium capacitors with an overload capability of up to twice the rated current can reliably absorb the harmonic currents.

Overall, we offer you a coherent concept for the significant improvement of your voltage quality at an unbeatable price/performance ratio.

Example configuration multiwave passive 146/04

Technology	LC series resonant circuit
Fundamental current	210 A
Max. permissible operating current	435 A continuous
Power dissipation	1500 W full load, 500 W idle
Control	Controller multicomp D6...-MW-5
Switch element	Capacitor contactors
Housing design	Sheet steel cabinet, HxWxD in mm: 2000 x 800 x 600, base 200 mm, interior and exterior paint RAL 7035 (other paint on request), Door hinge left (optionally right), Feed from bottom (on request from top), protection class I
Weight	400 kg
Ventilation	Integrated ceiling ventilation, temperature-controlled
Fuse	Back-up fuse 500 A

Technical Data

Connection	3-phase 3-wire	
Rated voltage	400 V ± 10 %	
Technology	LC series resonant circuit	
Response time	Real-time	
Harmonic compensation	according to design	
Reactive power compensation	36 kvar per stage	
Capacitors	low-loss UHPC power capacitors	$U_{\text{Bem}} = 525 \text{ V}$
Filter circuit inductors	Linear filter circuit inductors with built-in temperature monitoring	Detuning factor according to design (e.g. 4.25 %)
Grounding system	TT, TN-C, TN-S-, TN-C-S, IT	
Housing	Sheet steel cabinet	Interior and exterior paint RAL 735 (other paint finishes on request), module plates galvanized, door hinge left (optionally right), power supply at bottom (from top on request), protection class I
	Protection type	IP 20 (IP 54 on request), the components used correspond to BGV-A2
	Ambient temperatures	+40 °C maximum, short-term +35 °C 24-hour average +20 °C annual average -10 °C low
	Ventilation	Built-in roof ventilators
	Fuse	Group fusing with NH fuses and fuse bases (NH isolator on request)