

MADE
IN
GERMANY

R6

COMBIVERT R6



Line Regen Systems
Up to 1000 kVA



The kinetic energy of electric drives can be a valuable energy potential. Historically, that kinetic energy was eliminated through friction and/or a mechanical or electric braking device.

Regenerative loads are becoming more common due to increased usage of distributed high efficiency AC drives and servo systems.

The same drive controller offer the possibility of converting the kinetic energy of the mechanical system into stored energy in the DC-circuit. Typically the excess energy is dissipated in a braking resistor as heat. However, in combination with a regenerative unit, it is possible to feed back the energy into the main line power supply.

This is particularly useful in all applications where prolonged or continuous downward motion occurs or heat dissipation to the surrounding environment is not wanted.

The **KEB COMBIVERT R6** regen units are able to supply and feed back energy of single inverters or a common DC-link of several drive controllers. The systems can be designed to match the required power by cascading of several units.



R6

COMBIVERT R6



Saving energy through regeneration -

An environmental contribution that pays off!

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Passenger and freight elevators

- replacement of traditional braking resistors
- reduced fire hazard of the system
- return on investment through energy savings possible after less than 2 years of operating time
- passive Harmonic Filter options to achieve app. 5% TDD and compliance in accordance with IEEE519.

Connection of generators to utility system

- power quality standards (e.g.: IEEE-519 / THiD < 8 %) can be met with harmonic filters
 - combustion engines
 - wind energy plants
 - hydropower plants

Eccentric loads

- increased efficiency of variable speed drives with changing kinetic and regenerative load cycles

Benefits

- Easy replacement for braking resistors
- Usable for all common supply voltages of 180 ... 528 V AC, 50/60 Hz
- Compatible with all typical DC - powered drive controller
- Integrated pre-charging circuit
- Compact and lightweight devices
- Wide power range up to 1.000 kVA
- Cascadable power parts
- Optional choke or harmonic filter
- Reduced fire risk in sensitive areas
- Energy meter for the validated savings
- freely configurable inputs and outputs
- Various field bus interfaces available by operator

Theatre technology

- no heating of resistors
- energy optimization
- low-noise braking operation

Lifting and conveyor / Storage retrieval systems

- DC-interconnected operation of multiple drives support energy sharing
- return of peak energy into the main line power supply
- no additional heat sources

Test branches and test systems

- permanent regeneration of energy
- can be cascaded for large loads

Centrifuges

- regenerative braking of high centrifugal masses
- utilization of kinetic energy
- increased productivity due to short start-up and run-down times



Functionality COMBIVERT R6 - Simplified diagram

The KEB COMBIVERT R6 units can regenerate energy of drive controllers back to the main line power supply. Also energy for the motor operation is supplied to single drive controllers or as a common DC-link of several inverters.

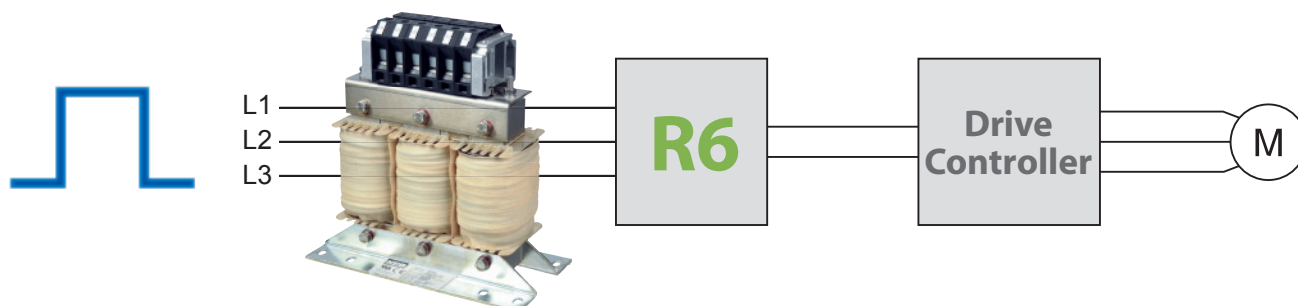
In supply mode the COMBIVERT R6 precharges the DC-link and acts like a typical B6 rectifier. The DC-link voltage corresponds to the rectified AC supply voltage.

In case of energy is fed into the DC-link by one or several drives in deceleration or braking operation, the regen unit will feed back this energy back to the main line AC power supply. The energy is provided to all other consumers on the grid.

Depending on the system design either standard chokes or harmonic filters can be used to improve the THDi (lower harmonics).

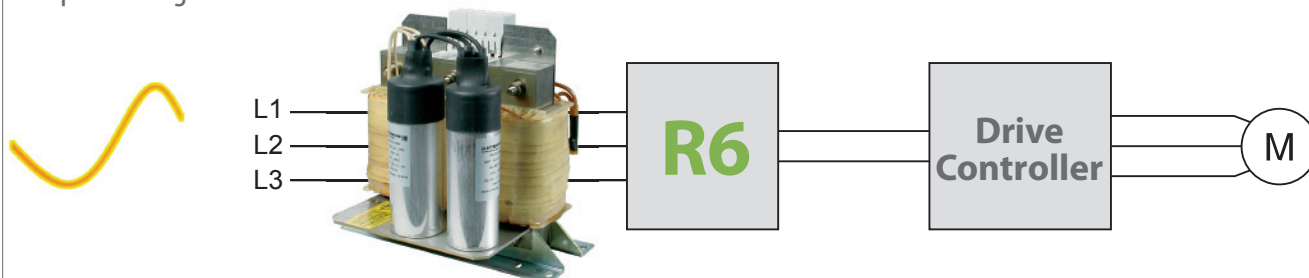
With standard KEB COMBILINE main chokes all industrial requirements are fulfilled (block shaped regeneration). Using the KEB COMBILINE Harmonic Filters will result in nearby sinusoidal current waveform for supplying and regenerating energy (THDi typ. < 8%)

Simplified diagram with commutation choke



With **KEB COMBILINE** harmonic filters, the **R6 - System** generates sinusoidal current at the main line power supply.

Simplified diagram with harmonic filter



Next to the established control version R6-S the modulation scheme was improved with the “**N**atural **C**urrent **M**odulation”. This new R6-NCM technology is available with the new control Type, called “N-version”

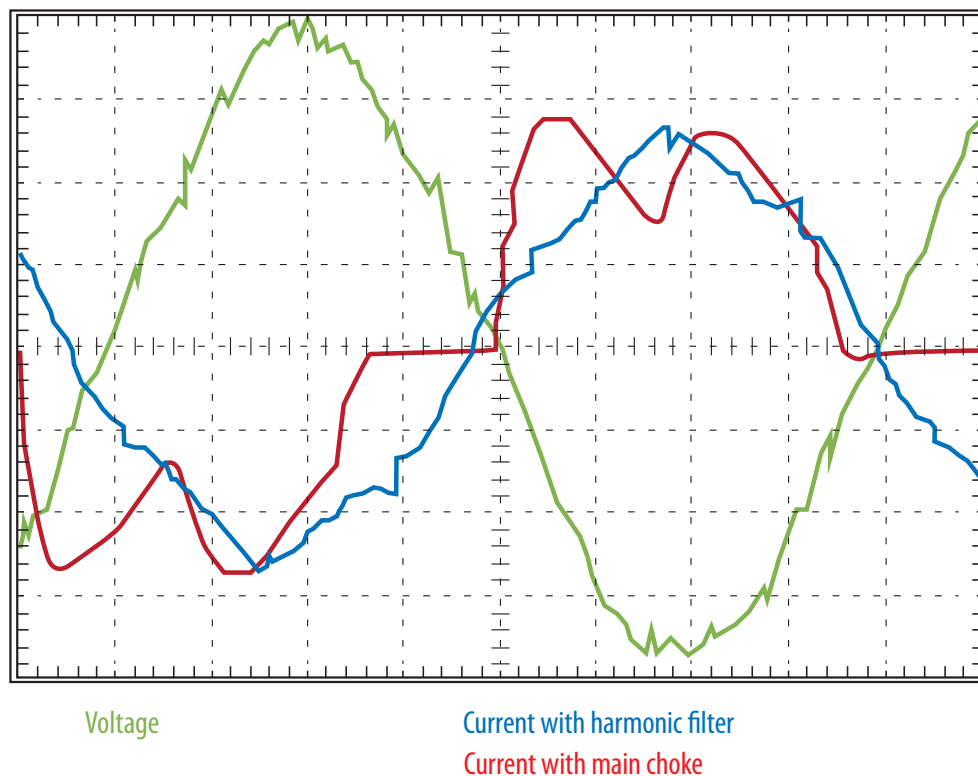
The **N**atural **C**urrent **M**odulation principle emulates the current waveform of a typical B6 rectifier system also in regeneration mode. This results in a much smoother commutation and an additional synchronization module (as used with R6-S) is no longer required.

The essentially advantages of R6-NCM

- Reduced noise level in regen mode
- Improved current waveforms (reduced THDi values)
- Standard main chokes and patented harmonic filters of the KEB COMBILINE Z1 series can be used
- No additional synchronization unit needed



Voltage / Current diagram for regenerative operation with R6-NCM



Supply and Regenerative Systems

Article code		15R6_1E-900A	19R6_1E-900	19R6_1E-910A	25R6_1R-900A	29R6_1P-910D
control version		N / S	N / S	N / S	N / S	N / S
housing size		E			R	P
phases		3				
rated voltage	[V]	400			400	
mains voltage range	[V]	180 ... 528+0 %			305 ... 528+0 %	
mains frequency [Hz]	[Hz]	50 / 60				
Regenerative operation						
output rated power	[kVA]	18	45		153	346
rated active power	[kW]	17	42		140	330
max. power output	[kVA]	27	67.5	81	230	433
max. active power	[kW]	25.5	63	75	210	413
regenerative rated current	[A]	26	65		221	500
regenerative DC current	[A _{DC}]	32	80		270	590
over load current (E.OL) 60 s	[A]	39	97.5	117 [10s]	331	625
max. regenerative DC current 60 s	[A _{DC}]	48	120	144 [10s]	405	738
Power supply operation						
input rated power	[kVA]	18	48.5		153	336
rated active power	[kW]	16	44.5		135	310
max. input power	[kVA]	27	72.5	87 [10s]	230	420
max. active power	[kW]	24	67	80 [10s]	202	388
rated supply current	[A]	26	70		221	485
DC supply current	[A _{DC}]	32	87		270	590
over load current (E.OL) 60 s	[A]	39	105	126 [10s]	331	606
max. DC supply current 60 s	[A _{DC}]	48	130	156 [10s]	405	738
overload disconnection	[%]	160	160	200	160	160
DC-fuse internal		optional		-	optional	-
dimensions (A x B x C)	[mm]	130 x 290 x 208			340 x 520 x 357	340 x 960 x 453
weight	[kg]	5.6			25	97.5

Assignment of filters and chokes / hamonic filter

	Size	15R6	19R6	19R6	25R6	29R6
COMBIVERT R6-N	max. over load	160%	160%	200%	160%	160%
	EMC filter	16E6T60-3000	20E6T60-3000	20E6T60-3000	25E4T60-1001	30E4T60-1001
	Choke	15Z1B04-1000	19Z1B04-1000	20Z1B04-1000	25Z1B04-1000	29Z1B04-1000
	Harmonic filter	15Z1C04-1000	19Z1C04-1000	19Z1C04-1000	25Z1C04-1000	29Z1C04-1000
COMBIVERT R6-S						
	EMC filter	15E4T60-1001	19R6T60-1001	19R6T60-1001	25E4T60-1001	30E4T60-1001
	Choke	15Z1B05-1000	19Z1B05-1000	19Z1B05-1011	25Z1B04-1000	29Z1B04-1000
	Harmonic filter	15Z1C04-1002	19Z1C04-1002	19Z1C04-1002	25Z1C04-1000	29Z1C04-1000
	synchronisation unit	integrated	integrated	integrated	00R6940-2408	00R6940-2408
	synchronisation cable	00F50C3-4010	00F50C3-4010	00F50C3-4010	00F50C3-4010	00F50C3-4010

EMC-Filters

To comply the requirements for radio interference EMC Filters are used. These are also needed to protect the connected equipment.

Depending on the requirements the KEB COMBILINE EMC filters and ferrits can fulfil the requirements for industrial use or home usage.

The E6 series Filters are characterized by unique low leakage current (typically less than 3 mA). This feature makes them applicable in sensible applications with restricted leakage current or enhanced fire hazard protection requirements.



Chokes and harmonic Filters

To minimize harmonics to the main power supply line reactors or harmonic filters are used. Additionally the electronic equipment is protected from high current peaks, charging currents and main faults. Also the lifetime of the power parts will be increased.

With simple mains chokes respectively commutation chokes the standard industrial requirements are fulfilled. The KEB COMBILINE harmonic filters reduce harmonic even more, resulting in a sinusoidal current in supply and regen mode.

Harmonic filters also offer extra benefit, that there is no additional voltage loss as it is typically for normal mains chokes.

The chokes for the designated use with COMBIVERT R6-S series have the synchronization unit already integrated in the choke and harmonic filter.

Technical data and additional accessories such as ferrites, decoupling diodes and fuses, please refer to the technical documentation of the respective devices.



Headquarters

Karl E. Brinkmann GmbH

Försterweg 36 - 38 • D - 32683 Barntrup
Telefon +49 5263 401-0 • Telefax 401-116
Internet: www.keb.de • E-Mail: info@keb.de

KEB Antriebstechnik GmbH • Geared Motors
Wildbacher Straße 5 • D - 08289 Schneeberg
Telefon +49 3772 67-0 • Telefax 67-281
Internet: www.keb-drive.de • E-Mail: info@keb-drive.de

COMPANIES

AUSTRIA

KEB Antriebstechnik
Austria GmbH
Ritzstraße 8
A - 4614 Marchtrenk
Tel: +43 7243 53586-0
Fax: +43 7243 53586-21
E-mail: info@keb.at
Internet: www.keb.at

CHINA

KEB Power Transmission
Technology (Shanghai) Co. Ltd.
No. 435 QianPu Road
Songjiang East Industrial Zone
CN-201611 Shanghai, P.R. China
Tel: +86 21 37746688
Fax: +86 21 37746600
E-mail: info@keb.cn
Internet: www.keb.cn

FRANCE

Société Française KEB
Z.I. de la Croix St. Nicolas
14, rue Gustave Eiffel
F - 94510 LA QUEUE EN BRIE
Tel: +33 149620101
Fax: +33 145767495
E-mail: info@keb.fr
Internet: www.keb.fr

GREAT BRITAIN

KEB (UK) Ltd.
Morris Close
Park Farm Industrial Estate
GB - Wellingborough
NN8 6 XF
Tel: +44 1933 402220
Fax: +44 1933 400724
E-mail: info@keb-uk.co.uk
Internet: www.keb-uk.co.uk

ITALY

KEB Italia S.r.l. Unipersonale
Via Newton, 2
I - 20019 Settimo Milanese (Milano)
Tel: +39 02 3353531
Fax: +39 02 33500790
E-mail: info@keb.it
Internet: www.keb.it

JAPAN

KEB - Japan Ltd.
15 - 16, 2 - Chome
Takanawa Minato-ku
J - Tokyo 108 - 0074
Tel: +81 33 445-8515
Fax: +81 33 445-8215
E-mail: info@keb.jp
Internet: www.keb.jp

RUSSIA

KEB CIS ZAO
Lesnaya str, house 30
Dzerzhinsky (MO)
RUS - 140091 Moscow region
Tel: +7 495 6320217
Fax: +7 495 6320217
E-Mail: info@keb.ru
Internet: www.keb.ru

USA

KEB America, Inc
5100 Valley Industrial Blvd. South
USA - Shakopee, MN 55379
Tel: +1 952 2241400
Fax: +1 952 2241499
E-mail: info@kebamerica.com
Internet: www.kebamerica.com

Representative offices

- Belgium
- Brazil
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