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.
Applications

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

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

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
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%)

With KEB COMBILINE harmonic filters, the R6 - System generates sinusoidal current at the main line power supply.
Next to the established control version R6-S the modulation scheme was improved with the “Natural Current Modulation”. This new R6-NCM technology is available with the new control Type, called “N-version”.

The Natural Current Modulation 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

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<th>Article code</th>
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<th>19R6_1E-900A</th>
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### Regenerative operation

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### Power supply operation

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## Assignment of filters and chokes / harmonic filter

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Accessories for **COMBIVERT R6-series**

**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.
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