Application

Recycling Technology
Shredding Technique
Continuity and Experience

Conventionally shredders work with directly starting motors or speed-controlled with frequency inverters to limit the starting currents (U/f – inverter).

When directly starting on the mains supply surge currents occur that can reach 9-times the rated current, this must be considered at the dimensioning of the power supply.

**KEB** offers a new approach which allows a high-dynamical control of speed-variable shredders.

The frequency inverters **KEB COMBIVERT F5 – ASCL** with optimized field-oriented control without encoder feedback, adjust the voltages and currents on asynchronous motors accurately to the load requirements.

**KEB COMBIVERT F5 – ASCL** operate within the optimal range of the characteristic and provide nearly over the entire speed range the breakdown torque as peak torque. Thus the power input for the torque generation remains within the operating range.

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**M/n - characteristic**

**Startup**

**Operation**

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Trust the market leader for electrical controls on shredders.
KEB COMBIVERT F5 – ASCL on a shredder increases the material throughput and improves the material quality:

- Start-up under load is possible
- High-dynamic adjustment to the load situation
- Infrequent reversing procedures are accomplished automatically
- Information from the inverter like torque or speed can be used for the control of slides, conveyors etc.
- Manual emptying of shredders is no longer necessary – thus resulting in fewer down times
- Different speeds at start-up and changing acceleration times are possible

A reduction of the energy costs is ensured by:

- Reduced power input at start-up procedure
- High-dynamical compensation of load jumps and compensation of the slip
- Stable speed in case of load, since the energy existing in the system is used for shredding the material
- Less power input due to fewer reversings
- Lower energy base rate since lower maximum currents are required

Further advantages for the employment of KEB COMBIVERT F5 – ASCL on shredders:

- Employment of turbo coupling is omitted
- Smaller dimensioning of the diesel motor due to the lower maximum currents of the diesel-electrical plants
- Switching of the contactors without control current causes no contactor wear
- Omission of the main contactors by the option „Safe Stop“ in accordance with EN 954-1 Kat. 3 and/or STO according to EN 13849
- Protection of the machine mechanics (gear, shaft, etc) through precisely adjustable torque
- Energy saving by using a frequency inverter on hydraulic drives
The speed of the motor on mains breaks in a little. The motor must increase the slip to provide the required torque. The current rises from quiescent value to approx. 165 % of the rated current.

The motor on mains “falls out of step”. The speed decreases to zero. The slip rises to maximum value. Thus the drive is unable to provide the required torque of 3 x MN directly on mains. 100 % slip causes maximum current (in this case approx. 500 % of rated motor current).

The “hard” connection of the mains voltage to the standing motor causes a maximum slip and thus a high current at moderate torque (see M/n characteristic page 2).

Startup

Load jump 150 %

The speed of the motor on mains breaks in a little. The motor must increase the slip to provide the required torque. The current rises from quiescent value to approx. 165 % of the rated current.

Load jump 300 %

The motor on mains “falls out of step”. The speed decreases to zero. The slip rises to maximum value. Thus the drive is unable to provide the required torque of 3 x MN directly on mains. 100 % slip causes maximum current (in this case approx. 500 % of rated motor current).
performance

The inverter accelerates the motor with a voltage and frequency ramp. The motor operates only within the optimal range of the characteristic. The slip is compensated and thus minimized. More torque shortens the acceleration with substantially smaller current consumption from the mains supply.

% of rated torque

By increasing the frequency the inverter readjusts the motor speed to the set value. Slip and current are slightly lower than at mains operation.

% of rated torque

The inverter reduces the output frequency at maximum voltage. Therefore the motor is overmagnetized and generates substantially more torque than would be possible at mains operation. In spite of the demanded high torque of 3 x MN the drive is able to compensate this!
Because of increased environmental awareness and a competition of different drive technologies, the energy consumption and noise development of machines and plants have become crucial application criteria.

With fixed displacement pumps and **KEB COMBIVERT F5** energy-efficient hydraulic drives are realized, which achieve up to 30% energy saving compared to a displacement-controlled drive. As the flow rate is proportional to the speed, one receives a variable flow rate from a fixed displacement pump.

**Following advantages are achieved through the employment of KEB frequency inverters e.g. on baling press, hydraulic shredder, ancillary units, etc.:**

- Reduced energy consumption particularly in no-load and partial-load operation
- Continuously adjustable volume flow rate (0 - 100%)
- Flow control already integrated in the frequency inverter
- Employment depending on design in 1- to 4-quadrant operation
- Low noise level
- Operation in field weakening range (speeds > 1500 rpm))
- High pressures even at small speeds in short-time and pressure hold-up operation at zero-extraction are possible
- High efficiency factor (η *~* 70 % with asynchronous motor, 80 % with synchronous motor)
- Same system for 50/60 Hz 380 … 480 V mains
- \( \cos \phi \approx 1 \)
- Reduction of motor rating by 87-Hz-characteristic
- No current peaks at startup
- No limit of Start/Stop
- Easy integration into the machine control
- Possible saving of control valves, bypass valves, etc.
- Fast response time by using synchronous motors
- Saving of further pumps because speed-variable
Installation units as well as through-mount versions in protection class IP 54 or higher
- Factory-mounted brake resistor
- Absorption of pulse energy without additional space requirement

Für jede Umgebung das richtige Kühlkonzept
- STANDARD - air cooling
- LIQUID COOLED - (LC) liquid cooling
- EXTERNAL HEAT - (EH) push-through heat sink for the thermal separation of the power circuit
- FLAT-REAR - (FR) - direct thermal connection to heat sinks

<table>
<thead>
<tr>
<th>Design</th>
<th>Rating</th>
<th>Installation version IP20</th>
<th>Available versions</th>
</tr>
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<tr>
<td></td>
<td>[kW]</td>
<td>B x H x T [mm]</td>
<td>FR</td>
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<tr>
<td>G</td>
<td>... 22</td>
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<tr>
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<td>340 x 960 x 454</td>
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<tr>
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<td>670 x 940 x 368</td>
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<tr>
<td>Pmodular</td>
<td>... 900</td>
<td>2/3 x 340 x 960 x 454</td>
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</tbody>
</table>

Frequency inverter
KEB COMBIVERT F5 0.37 … 900 kW

For the handling of your specific task requirements qualified personnel is available to you in the responsible regional offices and in the head office.
Companies

Austria
Karl E. Brinkmann GmbH
Försterweg 36 - 38
D-32683 Barntrup
Internet: www.keb.de

France
Société Française KEB
Z.I. de la Croix St. Nicolas
F - 94510 LA QUEUE EN BRIE
Tel.: +33 (0)149620101
Fax: +33 (0)145767495
E-mail: info@keb.fr
Internet: www.keb.fr

Great Britain
KEB (UK) Ltd.
6 Chieftain Business Park,
Morris Close
Park Farm, Wellingborough
GB - Ndrhtans, NN8 6 XF
Tel.: +44 (0)1933 402220
Fax: +44 (0)1933 400724
E-mail: info@keb-uk.co.uk
Internet: www.keb-uk.co.uk

Germany
Karl E. Brinkmann GmbH
Försterweg 36 - 38
D-32683 Barntrup
Internet: www.keb.de

China
KEB Power Transmission Technology (Shanghai) Co. Ltd.
No. 435 QianPu Road
Songjiang East Industrial Zone
CN-201611 Shanghai, PR. China
Tel.: +86 (0)21 37746688
Fax: +86 (0)21 37746600
E-mail: info@keb.cn
Internet: www.keb.cn

France
Société Française KEB
Z.I. de la Croix St. Nicolas
F - 94510 LA QUEUE EN BRIE
Tel.: +33 (0)149620101
Fax: +33 (0)145767495
E-mail: info@keb.fr
Internet: www.keb.fr

Great Britain
KEB (UK) Ltd.
6 Chieftain Business Park,
Morris Close
Park Farm, Wellingborough
GB - Ndrhtans, NN8 6 XF
Tel.: +44 (0)1933 402220
Fax: +44 (0)1933 400724
E-mail: info@keb-uk.co.uk
Internet: www.keb-uk.co.uk

Italy
Karl E. Brinkmann GmbH
Försterweg 36 - 38
D-32683 Barntrup
Internet: www.keb.de

Japan
KEB - Japan Ltd.
15 - 16, 2 - Chome
Takanawa Minato-ku
Tokyo 108 - 0074
Tel.: +81 (0)33 445-8515
Fax: +81 (0)33 445-8215
E-mail: info@keb.jp
Internet: www.keb.jp

Russia
KEB RUS Ltd.
Lesnaya str, house 30
Dzerzhinsky (MO)
RUS - 140091 Moscow region
Tel.: +7 (0)495 6320217
Fax: +7 (0)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 in
Belgium • Korea • Sweden • Spain

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