

L-force *energy recovery*



Efficient, simple and good for the environment



Lenze

L-force | Your future is our drive

Cost efficiency, saving time and improving quality are the challenges of the future. Lenze is meeting these challenges with L-force – the drive and automation family with wide-ranging solutions and compatible interfaces and components. L-force means faster project planning and commissioning, enhanced performance and flexibility in production.

Driven by innovation – New ideas for new possibilities

Always on the lookout: Our idea of innovation is working on even better solutions for our customers, every day.

Driven by flexibility – High degree of scalability for individual solutions

Scalability is an important aspect of the L-force philosophy. Performance, scope of functions, software, service provisions and aftersales care – Lenze will provide you with exactly the combination you require.

Driven by usability – Simple solutions, even for complex applications

We always focus on the user. Therefore, when we developed L-force, we made sure that people with plenty of practical experience were involved, right from the start.

Driven by compatibility – Universal products and solutions

Don't waste any more time searching for suitable components and the right interfaces. With L-force, everything is compatible.

Energy recovery - helping to protect the environment

Our L-force products will help you to produce more energy-efficient drive solutions.



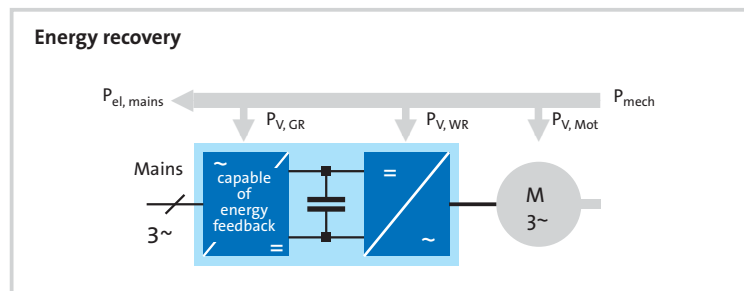
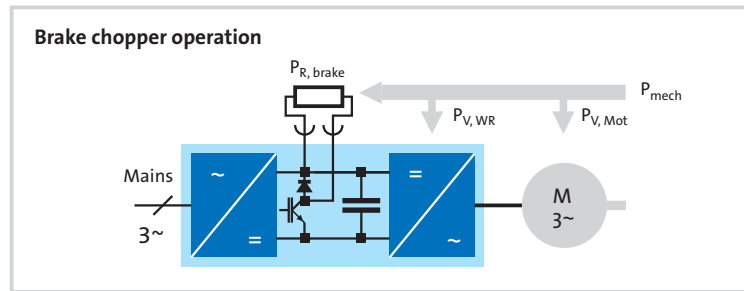
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Energy recovery | an efficient alternative

In many applications the electric drives have to be repeatedly accelerated and braked. When accelerating and driving, electric energy is converted into kinetic energy. When braking, some of the energy released in motor mode has to be recovered by the drive. In inverter drives, this regenerative energy is often converted into heat using a brake resistor and is therefore lost. In applications with a lot of braking, it is increasingly profitable to make use of energy recovery, especially as energy costs continue to spiral.

Regenerative feedback is very straightforward

Generally inverters only allow you to convert braking energy into heat using an integrated brake chopper. If the braking power produced in the application is to be fed back to the mains, regenerative power supply modules are used for this purpose. These can also be easily used in multi-axis applications and a modular design cuts down on wiring.



Applications where this approach is worthwhile

The following table clearly shows those applications in which it is sufficient to use a brake chopper, or better still to fit energy recovery.

Frequency of braking, length of braking	Description of application – examples	Operation with brake chopper and brake resistance	Operation with energy recovery
No braking	Applications in which the drives coast after being switched off – Pumps, fans	No measure required	
Spontaneous one-off braking	Applications, in which the drives are shut down unexpectedly (emergency stop) – feed drives, line drives	Use of brake chopper recommended	
Short-time cyclic braking	Applications, in which the average braking power is low (up to 10 % P_{mot}) – conveyors, travelling drives	Use of brake chopper recommended	
Intensive cyclic braking	Applications, in which the average braking power is high (10 % ... 100 % P_{mot}) – hoists, intermittent drives	Use of a brake chopper still possible	Energy recovery recommended, the higher investment costs pay off in the long term
Continuous braking	Applications, in which under normal operating conditions, there are virtually only braking operations – test stands, unwinders		Energy recovery recommended, the higher investment costs pay off quickly

Advantages for you | Reduction in life cycle costs

Recovery of braking energy can make a big difference to the reduction of life cycle costs in applications with frequent and intensive braking, e.g. intermittent drives with a very short cycle time or when a drive is being continuously run in generator mode.

Power from the mains during cyclic operation

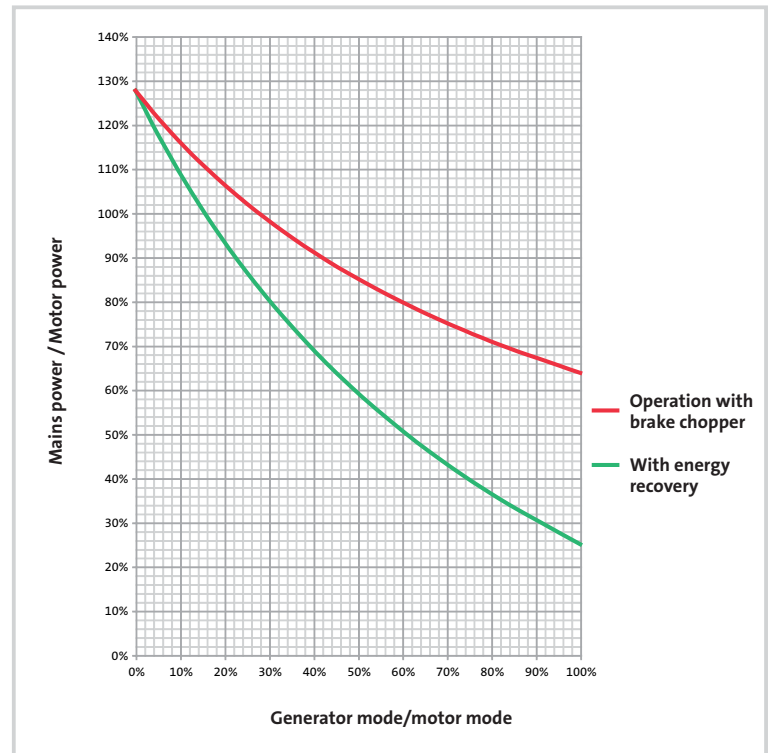
The graphics on the right shows how the amount of power taken from the mains falls as the ratio between generator mode and motor mode increases. Even if regenerative power is being converted into heat via a brake chopper, the amount of mains power halves from 128 % (continuous operation in motor mode with 28 % losses in the inverter and motor) down to 64 % when switching between motor mode and generator mode in a ratio of 1:1.

If the power produced during a braking operation is not converted into heat, but returned to the mains, the power input falls much more sharply.

Reduction in energy costs

When deciding on whether to feed braking energy back into the mains rather than wasting it by heating it depends to a large extent on how much energy can be saved. If the savings to be made in the first three years of operation are more than the additional investment costs, the change is most likely to be cost-effective.

This example shows what savings can be made taking the example of a hoist drive.



Drive power when lifting:

$$P_{\text{mot}} = 22 \text{ kW}$$

Drive power when lowering:

$$P_{\text{gen}} = 16 \text{ kW}$$

If the drive is running in lowering operation during 25 % of the time, this results in a medium braking power of $P_{\text{Br}} = 16 \text{ kW} \cdot 0.25 = 4 \text{ kW}$.

Due to the losses in the drive ($\eta = 75 \%$) 3 kW is returned to the mains.

With electricity costing €0.10 / kWh, savings of €3000 can be made over an operating time of 10 000 hours.

Advantages for you | Increase in efficiency through power recovery

Our expertise and components will help you to realise energy recovery in all your machines with ease. Energy-efficient solutions will help you to protect the environment.

Low system costs

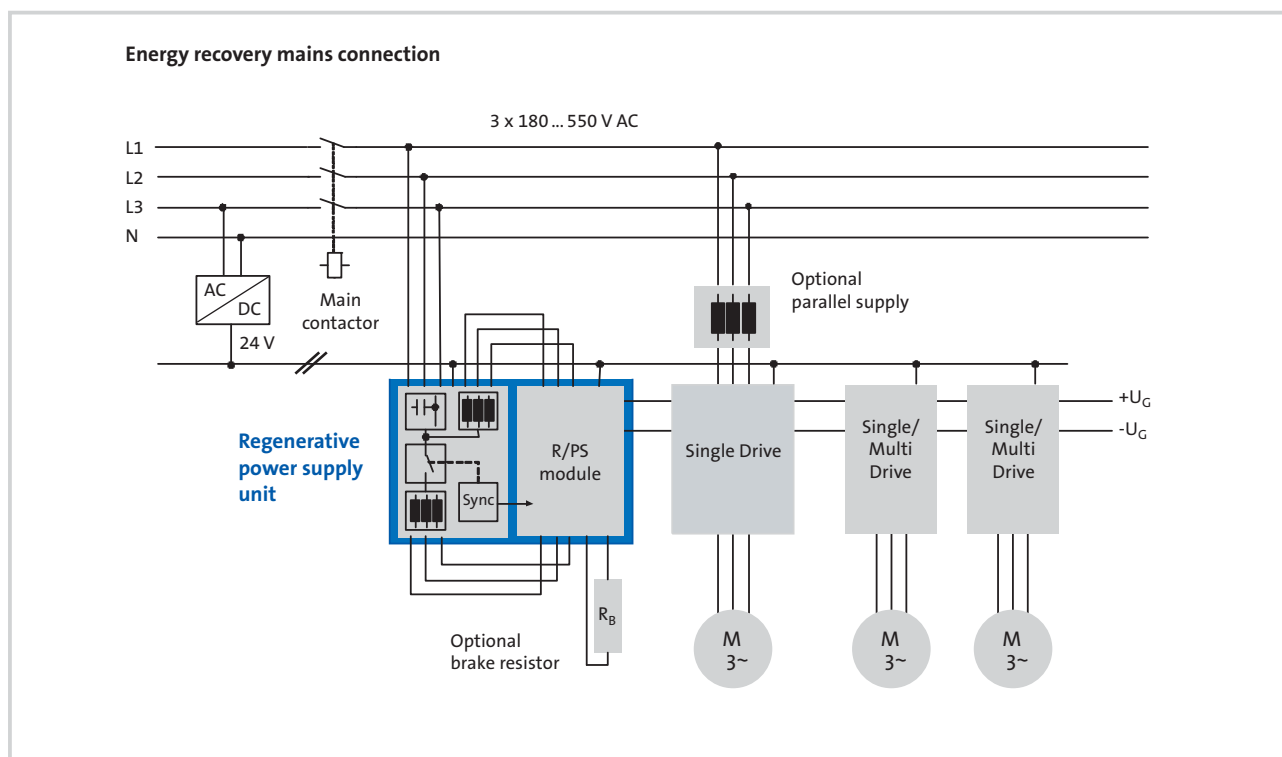
The regenerative modules are part of the L-force family.

Energy efficiency made simple

Efficient solutions deliver advantages and protect the environment. The easy way to save energy and money.

The advantages of the L-force regenerative power supply modules:

- ▶ **Scalable supply power**
For increasing the supply power, uncontrolled rectifiers can simply be switched parallel.
- ▶ **High overload capacity**
The regenerative power supply modules can make several times their rated power available for brief periods, which makes them ideally suited to intermittent drives.
- ▶ **Integrated brake chopper**
In the case of mains breaks, braking power can be converted into heat by means of an external resistor.



System design

Quick mounting by
module design

System with regenerative power supply modules

The mechanical design of the regenerative power supply modules for the 9400 Servo Drives allows them to fit seamlessly into the range of supply and axis modules.

Like the axis modules, the two regenerative power supply modules for rated powers of 15 kW and 27 kW consist of an installation backplane, the pluggable electronic part, and the mains filter.

The mains filters are positioned to the left of the regenerative power supply modules and are linked to the modules via integrated connecting cables.

The busbar connections for the DC-bus operation are integrated in the installation backplane.

If the backplanes of the regenerative power supply module and axis modules are installed side by side, connecting bars can be easily slide through the cutouts to the sides – they are easy to release, slide through and screw down.

The electronic devices can then be easily plugged to the backplanes and the system quickly commissioned.



Energy Recovery | Technical data

Regenerative power supply modules

Type designation		E94ARNE0134		E94ARNE0244	
Operating mode		Supply	Power recovery	Supply	Power recovery
Rated power (V _{mains} = 400 V)	kW	15.0	7.5	27.0	13.5
Mains voltage range		3/PE AC 180 V-0% ... 550V+0%; 45 Hz-0% ... 65 Hz+0%			
Rated mains current	A	26.0	13.0	47.0	23.5
Max. output power (V _{mains} = 400 V)	kW	44.9	22.4	81.1	40.5
Overload period	s	0.5	0.5	0.5	0.5
Recovery time	s	4.5	4.5	4.5	4.5
Dimensions (H x B x T) with installation backplane	mm	350 x 120 x 288 481 x 120 x 288		350 x 120 x 288 481 x 120 x 288	
Mass	kg	6.0		6.0	

Assigned mains filters

Res. motor cable length up to 60 m (e. g. 6 axes of 10 m each)		E94AZMR0264SDB	E94AZMR0474SDB
Res. motor cable length up to 500 m (e. g. 10 axes of 50 m each)		E94AZMR0264LDB	E94AZMR0474LDB
Rated mains current	A	26,0	47,0
Dimensions (H x W x D)	mm	485 x 149 x 272	485 x 209 x 272
Mass	kg	25/26	36/37

Performance features | Overview

Interfaces	24 V electronics supply interface	✓
	Analog inputs / outputs	2 / 2
	Digital inputs / outputs	8 / 4
	CANopen	✓
	X7 (Sub-D, 9-pole) – no function	✓
	X8 (Sub-D, 15-pole) – input for mains synchronisation	✓
Extension modules	Number of slots	2
	Ethernet, PROFIBUS, CANopen, PROFINET, EtherCAT, DeviceNet	✓
Memory module – Functional range	MM220 – S/R application – application-specific control functions, applicable by means of the Engineer	✓
Safety module	SM0 – no safety function	✓

It's good to know | why we are there for you



"Our customers come first. Customer satisfaction is what motivates us. By thinking in terms of how we can add value for our customers we can increase productivity through reliability."



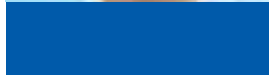
Lenze drive and automation solutions



"We will provide you with exactly what you need – perfectly co-ordinated products and solutions with the right functions for your machines and installations. That is what we mean by 'quality'."



"Take advantage of our wealth of expertise. For more than 60 years now we have been gathering experience in various fields and implementing it consistently and rigorously in our products, motion functions and pre-configured solutions for industry."



"We identify with your targets and strive towards a long-term partnership which benefits both sides. Our competent support and consultation process means that we can provide you with tailor-made solutions. We are there for you and can offer assistance in all of the key processes."

You can rely on our service. Expert advice is available 24 hours a day, 365 days a year, in more than 30 countries via our international helpline: 008000 24 Hours (008000 2446877).

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