KOCH

Benefits of active energy management for drive controllers

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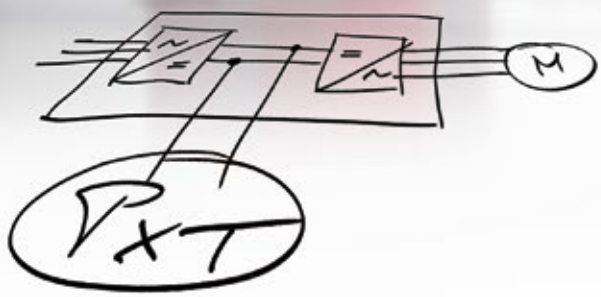

A solution for
many applications

PXTRX

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PxтRX: A solution for many applications

As the heart of an active energy management system, the very dynamic device with the designation PxтRX from Michael Koch GmbH from Germany ensures a demand-oriented power supply, which brings many advantages for drive systems. This means: A direct saving of electrical energy or the increase of productivity of a machine or plant.

Machine failures or data losses caused by power fluctuations, for example, as well as undesirable load peaks for the power grid are no longer acceptable today. In addition, motors are often running at full speed even though this is not necessary. Apart from unnecessary environmental pollution, the savings potential in this area alone is around 30 percent. So, anyone who is still using inefficient drive technology should think about active energy management for drive controllers, which optimizes the energy balance in a drive system.

The PxтRX active energy manager from Koch ensures coordinated energy flows between storage media and the drive controller.

Link between storage and DC grid

Drive controllers or frequency converters function in electrical drive technology as the commanding instance in a drive system. Since such devices first convert the alternating current from the mains into direct current and then into the appropriate alternating current for the motor, they are also called converters. Subsequently, this "converted alternating current" then generates the desired direction and speed in the drive. The management of the energy level is therefore of great importance for the functionality of the drive controller.

This is exactly where the PxтRX device from Michael Koch GmbH comes in and controls the energy balance of the drive system there. The PxтRX is the active connection between electrical power storage units and the DC network of the single- or multi-axis drive controller or drive system. Various electrical storage devices can be used for this purpose: Batteries, electrolytic capacitors or super or double layer capacitors. Whatever tasks the energy budget of the DC-link sets for the PxтRX, the device will perform them so quickly that it is virtually unnoticeable for both man and machine.

Incidentally, this statement also applies to use in a DC network. The advantages of a direct current network compared to an alternating current network are increasingly being discussed in the industry. The balancing of the energy budget of a DC grid, which is necessary for stable operation, is

created by an active energy management system based on the PxTRX. Due to its flexibility, the PxTRX is adaptable in power and energy according to demand.

For the optimum energy balance of a drive

In particular, the following dimensions must be taken into account: Performance, energy quantities, reaction speed, dynamics, maintenance intervals and frequency of use in different applications. The specific dimensions of the application determine which objectives are to be achieved, for example, in the case of weak networks, what is to be protected at all and for how long. The amount of energy required can then be determined from this. In addition, it must be determined how quickly the grid supply should be replaceable, how frequently the applications are required in practice, and how often the replacement power supply must be maintained and the power storage units required for it replaced. Subsequently, the type and size of the replacement supply can be defined.

When defining the active energy management system with the intelligence of the PxTRX at its core, the aim is always to be able to maintain the critical production processes in a trouble-free manner, even with an extreme number of cycles. This is done by compensating for frequently occurring voltage fluctuations in weak networks, smoothing power peaks or absorbing regenerative energies. In specific cases, the dynamics of the production processes can even be increased.

The four main areas of application

Essentially, the following four variants for applications are requested separately or in combination, whereby a combination of benefits is very often determined as the result at the end of the decision-making process:

1. Management of braking energy

The classic case of a braking energy buffer function is described by short cycles and very frequent repetitions. The consequence of using an active energy management: More energy efficiency. For this case, the PxTRX automatically takes braking energy from the system, which would otherwise cause a voltage swing. If required, this energy can be fed back into the drive controller. At the same time, this function provides more peace and balance in the DC link. In this way, the PxTRX protects the drive electronics, especially very significantly during short, hard cycles, which extends their service life and reduces unplanned failures. Provided the mechanics allow it, drive systems can run or drive faster. This means that the output of the machine increases and so does productivity. This fact is then often of higher priority in the business decision than the former goal of optimized energy efficiency.

Even with a cycle time of less than one second, over 100 million cycles are possible. Aluminum electrolytic capacitors with an energy volume of nominally over two kilojoules or a multiple thereof are used as the storage medium for this purpose. The suitable storage devices are equipped with a fuse, monitoring of the state of charge, and discharge capability via built-in discharge resistors in PTC technology. They can be cascaded (connected in parallel) very easily via simple connectors, depending on requirements.

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2. Reduction of peak loads

High driving loads of short duration generate undesired effects on the network. Therefore, application engineering defines a certain amount of energy for the PxtRX, which is specifically made available on command for load peaks. This means that for this case, the PxtRX also calms the grid. Due to the reduced peak currents, the effort for installation and protection of the drive system can be significantly lower in the long term - which in turn leads to cost savings.

Depending on the frequency or the required amount of energy specified by the application or the defined objective, two different storage media qualify for this: electrolytic capacitors or supercapacitor modules. In the case of supercapacitor modules, at least one million cycles are possible. Depending on the requirements, the number of cycles can be significantly increased. Energy quantities of up to 1.6 megajoules per PxtRX are thus possible. For a higher performance of over 100 kilowatts, the PxtRX units only need to be cascaded.

Short loads stress the grid. The PxtRX provides the required energy on demand and thus calms the grid.

3. Management of power grid failures

Another area of application for the PxtRX device is bridging voltage dips or supplying the drive system with energy in the event of a power failure. If the drive controller is no longer sufficiently supplied with energy, the PxtRX takes over this function and keeps the drive constantly running from its storage units according to the defined specification. The choice of storage type again depends on the operator's requirements and the strength of the network. If the network failures are rather frequent (several times per day) but of short duration, electrolytic capacitors are suitable as storage media due to their high cycle stability. If the amount of energy required is significantly higher, supercapacitor modules could also be considered. If supercapacitor modules are combined with batteries, then the PxtRX can make the most of its strengths as an uninterruptible system because it is directly connected to the DC-link. Incidentally, the capacitors and batteries installed by Koch are maintenance-free.

If the mains supply collapses, the PxtRX keeps the system in operation. And it does so for the period for which the amount of energy of its storages is sized for.

With an additional 24-volt emergency power supply (NEV) from Koch, which was specially developed for use in active energy management systems, devices such as controllers, IPC, sensors and brakes remain active which are supplied by a 24-volt DC network. The modular principle also applies to the NEV: If the power of one NEV is not sufficient to supply the connected devices, one or more additional NEV devices can be operated in parallel. The NEVs are supplied from the power storage units of the active energy management system.

The PxTRX in combination with its power storage units and possible further devices such as the NEV thus neutralizes voltage fluctuations as well as unplanned or also planned grid interruptions. The latter is almost the next use case "Mains-independent operation". If a drive has to overcome obstacles in the infrastructure that do not allow power supply, the active energy management system recognizes this as a grid interruption and reacts accordingly. The drive energy required to overcome the obstacles is then supplied from the storage units as needed and, above all, without interruption.

Koch's emergency power supply: The NEV is used to supply electrical power to a 24 V DC circuit independently of the mains.

4. Mains-independent operation

Continuous production processes are the goal of every operator - regardless of the geographical location of the plant or machine. However, regional conditions with regard to energy supply can vary greatly from country to country and even within a country. Unstable grids, for example, are among the critical location factors. No wonder, then, that regulatory measures such as limiting power peaks are increasing significantly. On the other hand, critical locations also require consideration of all other factors that can usually significantly overcompensate for these deficits.

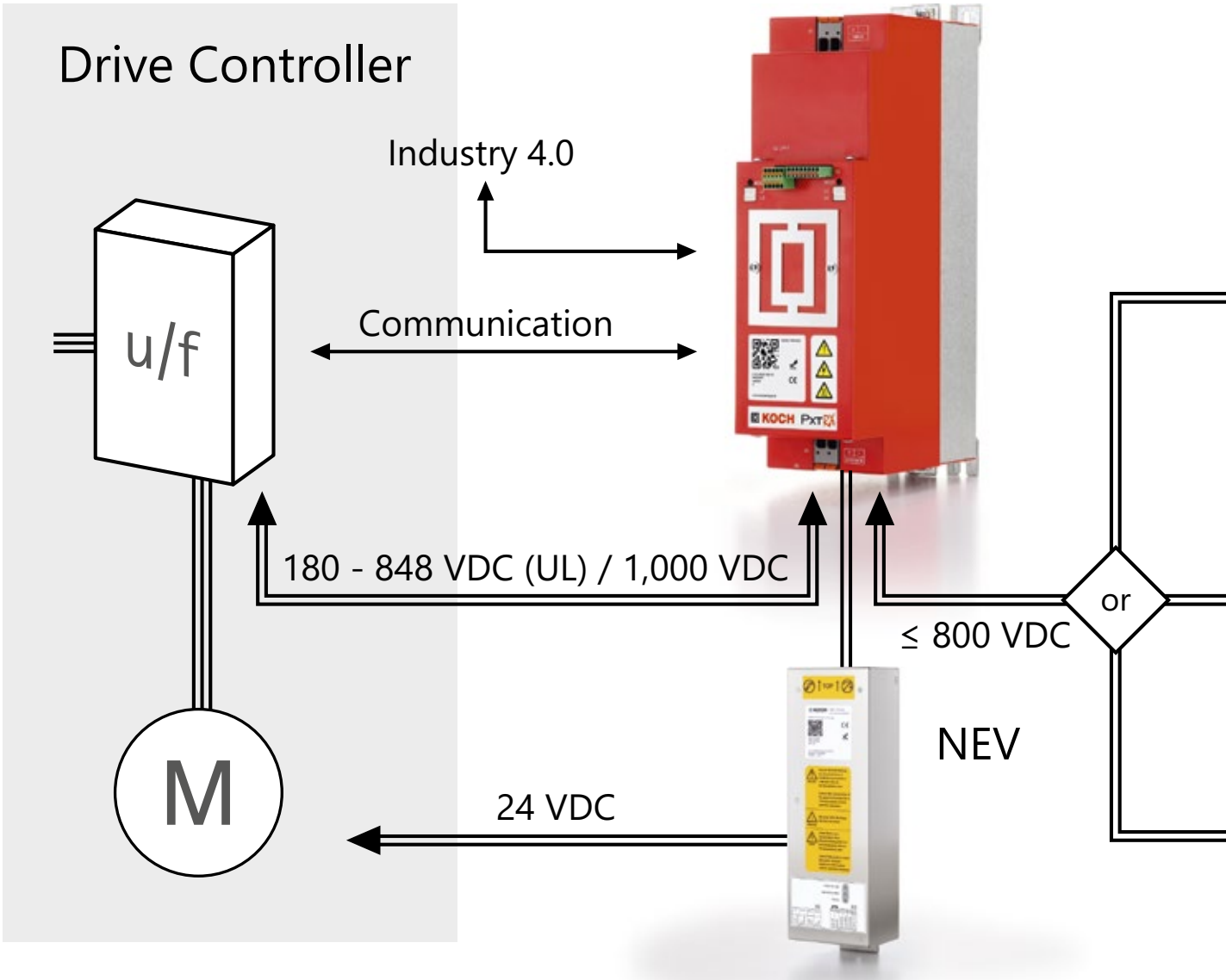
If a supply from the grid is only available from time to time in a country or region, the PxTRX, together with suitable power storage units, provides the amount of energy required for continuous operation. For the case of rather infrequent charging as well as long off-grid operation, the PxTRX is suitable in combination with batteries. In this way, 280 megajoules per device are possible. This corresponds to an amount of energy that can supply drives with a power requirement of 7.5 kilowatts for well over ten hours. As described above, an emergency power supply (NEV) also supports the 24-volt DC networks of the periphery. As with the other use cases, the requirements of the drive controller DC link determine the composition of the PxTRX system. The criteria for selecting the system components storage medium and safety result from the required power, energy quantity and number of cycles, which are defined by the application.

The PxTRX can balance DC-links up to 850 volts DC voltage level. This means it stores excess energy temporarily and replaces missing energy. In addition, it calms the network connected to the machine. The PxTRX becomes a universal solution

by managing the different power storage media electrolytic capacitors, supercapacitors and even batteries, thus providing a great benefit for a wide range of applications as a maintenance-free system.

The idea behind the PxTRX

In principle, the customer is to be relieved of time-consuming and tiresome work. At the same time, Koch offers him a powerful package that he can use as a plug & play. With the ready-to-connect KTS control cabinet solution, which includes all the necessary parts of the active energy management system, the customer does not have to do any planning, install anything, wire anything, or worry about any details. He receives a system that, above



The PxTRX can handle various storage media, which can be selected according to the application and the requirements derived from them. And all this maintenance-free.

all, is already optimally tailored to his individual requirements.

The dimensions of power and energy quantities can be dosed quite precisely and various tasks can be taken into account, such as the absorption of regenerative energy or peak load reduction. If desired, a specific PxTRX can be set up for each plant in extreme cases. As a result, the customer benefits from a high level of additional safety, efficiency and, in many cases, higher productivity.

Capacitors

...

Supercaps

...

Batteries

...

Ultimately, these many benefits condense into competitive advantages that play a decisive role in the market for the operator.

Determination of the technical sizing

The configuration is assembled according to the user's specific requirements and is supplied complete with power storage and safety features. If there is not enough space for a PxTRX in the control cabinet of the machine, Koch also offers completely assembled and interconnected KTS control cabinets, which only need to be connected by the operator. The technical design is based on simulations of the real load profiles in the actual system environment. Koch also takes care of this after the few necessary data have been determined together with the customer. As, for example, with the selection between a cyclic or infrequently occurring use and the general data of power, duty cycle as well as cycle duration. This information then defines the active devices and the storage units, the peripherals such as the safety features. Thus the system is determined down to the options. After the calculation, the user receives an initial solution proposal, which then provides the basis for the further detailed definition of the suitable system.

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In addition, the user can consider further individual requirements. To increase the safety of assembly and maintenance personnel, for example, there is the option of integrating a particularly safe, switchable passive discharge option for the energy storage units. Koch specially developed the SDU overload-proof discharge unit for this case. For larger energy quantities and even faster discharging, the DDM 4.0 active safe discharge unit is selected. In combination with a large safe braking resistor, even storage units in the megajoule range are quickly brought to a safe voltage level.

Free choice and digital helpers

With Koch, the customer therefore has a choice of all the components required for the application. If he purchases only the active energy management device, the customer retains overall responsibility for the system, from the safety and the power storage units to the safe discharging and connection of the system. With the complete KTS solution, he transfers the overall responsibility for active energy management completely to Koch. In between, any gradation is possible. Another advantage of the complete solution: At Koch, all devices and components already undergo various tests and trial runs during the individual production steps, which are concluded with a comprehensive final test of the entire system with all its internal dependencies before delivery.

Testing and documentation in accordance with standards is a given, and the digital nameplate "PxtTypeplate" provides the user with all system and component information in addition to the nameplate information directly on site on his smartphone or tablet. Another digital helper for optimized use of the active energy management system in the machine or plant is called "PxtTerminal". By this, Koch primarily means a visualization tool for the static information of the system as well as the dynamic data of the application. Directly during operation of the machine or plant, "PxtTerminal" can be used to track and analyze the most important energy management data in real time. Trained users can also change parameter settings via "PxtTerminal".

Via QR code scan to the digital nameplate of the devices: Information right on the spot.

Main element of PxtTerminal: Display of the dynamic data of the application in real time.

Summary

The PxτRX active energy management device from Koch basically qualifies for almost any machine or plant that is operated with one or more electric drives. The PxτRX active energy management devices with the associated energy storage units are connected directly to the DC link of the drive controller as a plug & play solution. The system actively and elegantly compensates for any voltage or energy fluctuations that occur in the DC-link. Either electrolytic capacitors, double-layer capacitors or even batteries serve as energy storage devices. Suitable digital helpers bring product- and application-related information for assembly, operation, analysis and optimization directly to the machine or system. In addition to secure and efficient energy management, the installation and operation of Koch's active energy management systems thus also becomes a convincing, positive user experience.

Technical data PxτRX

Criteria	PxτRX
Max. operating voltage U_{Zmax} (UL)	848 [VDC]
Max. operating voltage U_{Zmax} (IEC)	1.000 [VDC]
Max. peak power Pmax (at U_C = 800 VDC)	48 [kW] (peak 45s at a cycle time of 180s)
Max. continuous output Pmax (at U_C = 800 VDC)	24 [kW] (continuous)
Max. storage current (peak) I_C	60 [A] (peak for 45s at a cycle time of 180s)
Max. Storage current (continuous) I_C	30 [A] (continuous)
Max. storage voltage U_{Cmax}	800 [VDC]
Min. starting voltage for the system (DC-link or storage)	approx. 45 [VDC]

Application examples with PxτRX

Chairlift

Controlled braking in case of power failure, temporary storage of braking energy during normal operation.

Metal Saw

In the event of a power failure, continue driving the saw until the saw blade has moved out of the workpiece.

What we offer:

- Tested product quality
- Certified processes
- Individual application support
- Machine specific design and sizing
- Rapid reaction
- Quick delivery times
- On-time delivery
- Reliable partner
- Long-term business relationship
- Direct customer relations

Use our communication channels:

Your specialist for:

- Active energy management devices and systems
- Safe braking resistors

We look forward to hearing from you!

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