

Active energy management devices for electric drives

# Peak load reduction by plug & play

With the devices of the Pxt series, German Michael Koch GmbH supplies simple application-specific systems for the active energy management of electric drives. As active connection elements between converters and storage units, they are characterized by a wide voltage range, independence from the manufacturer of the drive electronics and many application advantages in a variety of applications. The devices meet the requirements for higher energy efficiency, uninterruptible power supply, peak load reduction and

reduction of system perturbation. In addition, there is now another helpful feature via Plug&Play: load peaks are intercepted via the plug-on module PxtMX at a level defined by the user. The associated energy management tasks are handled by the Pxt system.

The product family of active energy management systems with the meaningful name Pxt, which may also be pronounced "P times t" (equal to energy), now reaches a new dimension with significantly higher functionality. The devices

fulfill the task of temporarily storing excess or necessary electrical energy of the drive system largely independent of the mains. The Pxt, as the connecting part between the drive and the storage unit, thus regulates the energy balance of the drive system, whether for a single drive or for several axes in the DC link system. The goals here are manifold. They range from simply saving electrical energy, i.e. increasing energy efficiency, to adapting a machine to a weak power supply infrastructure.



Ready for automatic peak load reduction: PxtMX module, measurement and control unit for peak load limitation, plugged onto a PxtRX active energy management device, which regulates the specific energy flow between the drive controller and the storage system.

## Active energy management systems from small to large

The tasks are performed by two active basic devices connected directly to the DC link of the drive controllers, i.e. frequency converters or servo controllers. The PxtFX device is designed for specially developed electrolytic capacitors. With a maximum storage voltage of 450 volts DC and a maximum current carrying capacity of 40 amps for one minute or 20 amps duration, a peak power of 18 kilowatts can be realized. The PxtRX handles storage voltages up to 800 volts DC with a current carrying capacity of up to 60 amps peak for 45 seconds or 30 amps duration. The decisive task of sizing the system lies with application engineering: The power required by the drive system in the worst case of the load cycle as the product of voltage times current must be just as suitable as the energy to be made available as the product of power times time. The modular system demonstrates its strengths here, because it is variable in power through parallel connection of the active devices. This is also the case for the amount of energy through suitable additions to the storage units. For example, the system starts with a PxtFX with two kilojoules of storage and ends open to the top, i.e. theoretically with an unlimited number of PxtRXs in conjunction with an equally unlimited number of double-layer capacitor modules.

While the PxtFX is sized for short cycles that are repeated millions of times, its bigger brother PxtRX is especially sized for use with higher energy density storages. In conjunction with electrolytic capacitors and double-layer capacitor modules, which Koch has qualified and approved for such use in elaborate processes, a modular system is available that enables application-specific solutions of

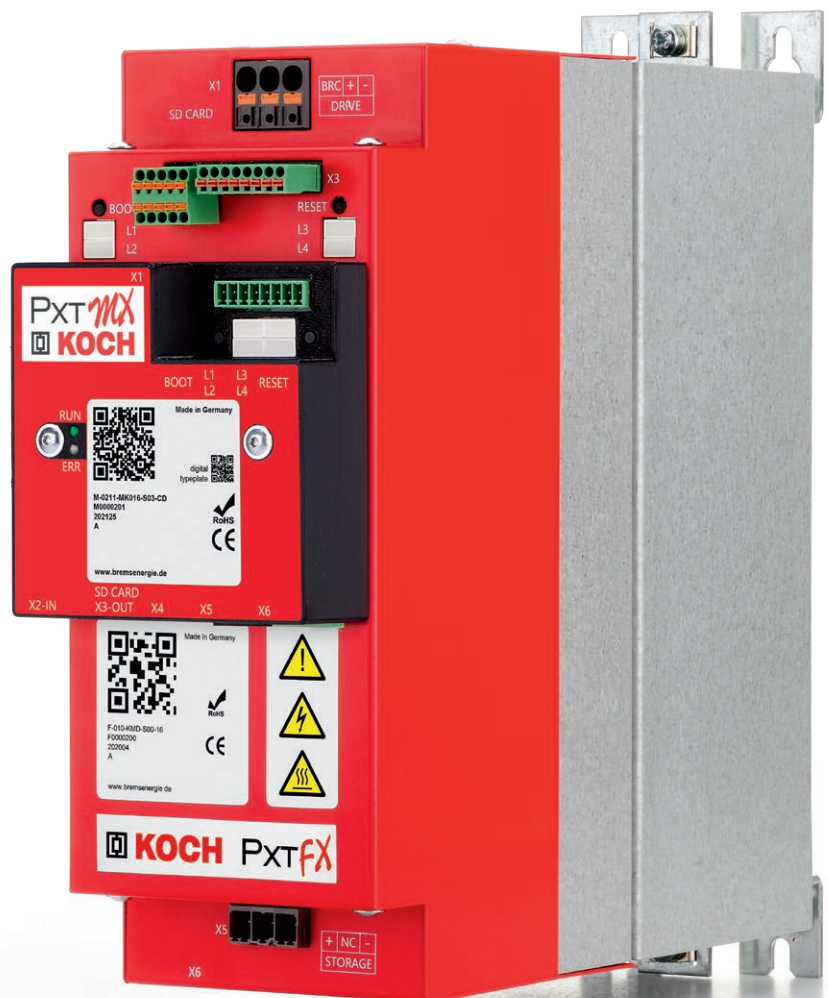
outputs up to well over 200 kilowatts and energies likewise well over 2 megajoules. The core portfolio of active energy management devices with storage units is supplemented by peripheral products that make their use even easier and, above all, safer. The product range extends from passive and active discharge units to mains-independent 24-volt emergency power supplies, and from systems based on individual devices to ready-to-connect control cabinet solutions to suit the application.

Koch's energy management system has also already been able to convince in terms of peak load reduction. However, so far, the communication with the drive was

necessary for this. As a command receiver from the drive controller, the system provides the necessary energy precisely when the inverter actively requests it. This type of peak load reduction is therefore controlled by the drive controller, but above all without the direct influence of power requirements from the grid. This gap is now closed by the plug-on module called PxtMX, which, in addition to a very user-friendly solution for peak load reduction, also brings a significant improvement in connectivity with fieldbus connection.

## Linchpin PxtMX

The small black-red box PxtMX looks rather inconspicuous, but



PxtMX on an active energy management device PxtFX: unit with 4 kilojoules of energy for automatic peak load reduction for small power requirements.



Small black box makes the difference: PxtMX from Michael Koch GmbH brings peak load reduction via Plug&Play to the drive scene with the Pxt family.

i.e. to smooth them out. Other variables such as power or voltage have a secondary, i.e. subsequent, character compared to the current intensity.

### Measurement and control at high speed

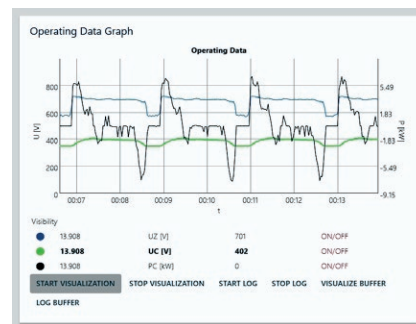
To determine the rms current value as accurately as possible, the PxtMX evaluates the information it receives from the connected current transformer, each of which measures one of the three phases. The current measuring transformer that Koch has qualified and approved for its system cover network powers of up to 100 kilowatts. In other words, this means that systems with plug-and-play load peak reduction through PxtMX can serve machines and plants that request maximum power peaks of 100 kilowatts from the grid. Further current transformers with an increased power spectrum are to follow.

The plug-on module, which is not only plugged on but also firmly screwed onto the active energy management device for safety, contains its own computer structure that operates completely independently of the connected active energy management

it has it all: It comes with many interfaces such as six digital I/Os, USB and K-bus connection as well as an external 24-volt supply. The latter enables operation even when it is not plugged on. Status displays via LEDs, bootloading and reset options help the user directly on site. A micro SD memory card provides future-proofness because, among other things, it allows simple firmware updates. And anyone who relies on fieldbus communication can use the options that the device also offers for this.

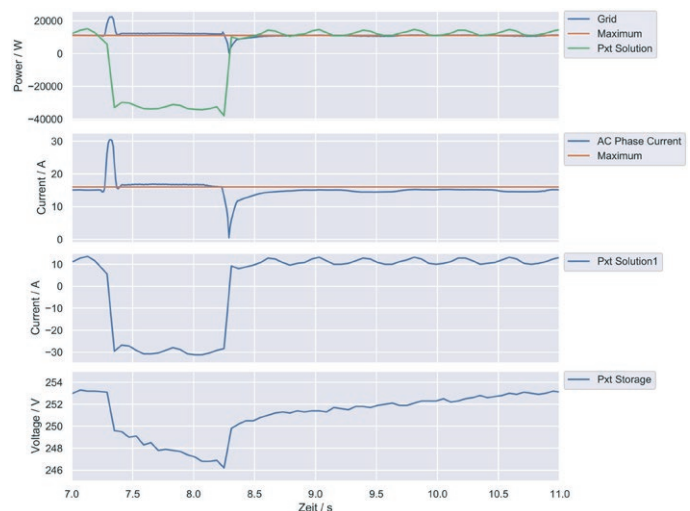
However, the central feature of the PxtMX is peak load reduction via Plug&Play. In combination with an active energy management system, the device now makes it possible to reduce the mains current consumption in cyclic applications almost to the level of the required average effective current without any further intervention. The overall system is therefore based directly on the current, and the PxtMX is controlled as a function of an effective current value between the supply network and the DC-link of the drive. The basis for determining the effective current value is again the measurement of the input mains current of the drive system. This is considered by

Koch to be the decisive variable, because it influences the electrical infrastructure of the entire drive system. Load peaks are decisive for the dimensioning of the fuses and cables. The task is to avoid these peaks in relation to the power grid,



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

Function of the PxtMX: Load peak reduction shown on a cycle: Orange is the maximum allowed effective current from the grid. Below is the state of charge of the storage unit - at the end ready for the next support.





Koch's PxtMX uses current transformers with a folding core to keep the installation effort as low as possible.

device(s) controlled by the PxtMX. This hardware independence enables, among other things, fine and correspondingly fast control, which is necessary to be able to detect even short current peaks in the millisecond range and to include them in the calculation of the effective current value. Algorithms are also used to calculate the setpoint current value and corresponding specifications to the active Pxt(s), which further accelerate the process.

The PxtMX is therefore not just a supplementary module, but clearly the boss in the ring. The module measures the mains currents, based on these measured values it regulates the active energy management devices located in the internal K-bus. In the case of the device to which the PxtMX is plugged, communication takes place directly via the plug connection, possible further devices are connected via the external plug connector of the K-bus by cable.

## Peak load reduction easy to implement

The process of peak power reduction is easy to explain: While the machine is operating below the level of the preset maximum effective current, the active Pxt device fills the power storage units connected to it. If the consumption of the machine exceeds the level

of the rms current, energy is introduced from the storage units via the active Pxt device in addition to the mains current. Depending on the level of any power peaks as well as the duration of the current demand via effective current, the Pxt system is to be sized, i.e. the higher the power peak, the more Pxt units, the longer the supply time, the more storage units. So while the installation of the system as well as its commissioning is an

easy plug&play task, the sizing has to be done carefully.

Determining the load cycle is the first step in this process. Based on the data collected, the maximum effective current value from the power grid and the requirements for power and energy requested from the active energy management system must be defined. The active energy management system is thus sized. The customer has the choice of purchasing the devices and storage units separately or in a ready-to-connect control cabinet under the type designation KTS. The PxtMX can also be parameterized on the basis of the data, which is usually already done at the Koch factory. The desired maximum effective current value can be set in steps of one ampere. It can thus be easily ensured that the effective current value remains approximately below the current limits of the fuses used in relation to the power supply



Peak load reduction up to 100 kilowatts: A plug-on module PxtMX also controls large ready-to-connect control cabinet solutions KTS with energy management devices Pxt and storage units.

system. In addition, there are a few system-related parameters that are given to the device.

On site at the machine, no further tasks remain apart from the mechanical assembly and the electrical connection of the system including the current measuring transformers. The selected current measuring transformers are specially designed with folding cores so that existing lines can be conveniently equipped. Commissioning can be carried out without further parameterization, let alone programming. This also makes the solution highly interesting for retrofits on existing machines and systems. For example, a ready-to-connect KTS control cabinet system in combination with PxtMX makes moving a machine to a site with a weak power supply a simple exercise. Waiting times for infrastructure improvements through new lines and transformers can also be bridged without limiting productivity.

### Tools make work easier

The PxtTerminal software tool can be used to display static and dynamic data of the entire Pxt system. This means the device data, the set parameters, device and error statuses as well as the dynamic data of the application in real time. In addition to the direct observation and analysis of the data, it is also possible to save them as log files and evaluate them yourself afterwards or have them analyzed by Koch.

Common to all individual devices up to the PxtMX is the so-called digital type plate - PxtTypeplate. When the QR code of a device is scanned using a smartphone or tablet, a WebApp displays not only the technical data of the specific device and its concrete design, but also inspection and test reports.



Associated documents such as the operating manual are available for download. In this way, all users of the device can access the individual documents and information of the device of the Pxt family, independent of location and paper.

### Another building block of sustainability

Application engineering, sizing tools, support in selection and testing - this is what Koch stands for in its day-to-day business. The devices and systems of the Pxt

family are available with very short delivery times, fully parameterized ex works, ready for operation directly after connection to the DC link. With the "Plug&Play load peak reduction" feature of the PxtMX, Koch brings another element to relieve the power grid and reduce the infrastructure effort. All in all, then, a family of devices that makes a positive contribution that goes beyond a stable energy budget for a machine or plant. It thus meets the requirements of sustainability in the long term.



Device Information	
	<b>PxtFX</b> F0000206 F-062A-MK171-K00-c0
Technical Data	Parameters
<b>Storage</b>	
Storage Capacity Per Module	2 kJ
Power Modules	1
Total Storage Capacity	2 kJ
Expandable	Yes
<b>Weight &amp; Dimensions</b>	
Weight	9.6 kg
Dimensions (H x W x D)	297 x 100 x 276 mm
<b>Environmental Conditions</b>	
Ambient Temperature (Transport & Storage)	-10 to 65 °C
Ambient Temperature (in Operation)	0 to 40 °C
Humidity (Transport & Storage)	0 to 95 %
Humidity (in Operation)	0 to 85 %
<b>Hardware Features</b>	

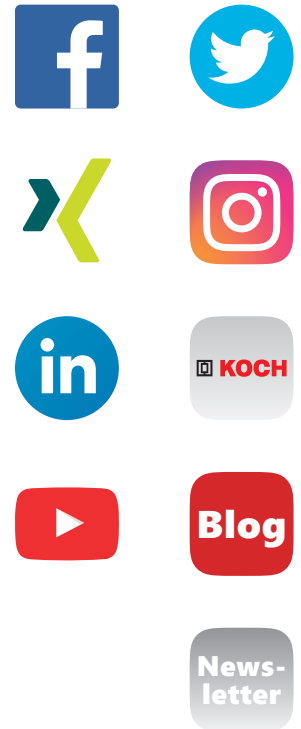


Via QR code scan to the digital nameplate of the devices: Information right on the spot.

## 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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