

# Full control of your power



Emotron VFX 2.0 variable speed drive

**emotron**<sup>®</sup>  
*DEDICATED DRIVE*



OPERATED BY  
MAN  
MANITEX  
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# Safe and efficient control of movements

*Emotron VFX 2.0 variable speed drives ensure you get the most out of your applications, whether they are cranes, crushers, mills or mixers. With full control of the process you will benefit from reliable, cost-efficient and user-friendly operation, protected against damage and downtime.*

*The combination of direct torque control, accurate speed control and efficient vector braking makes Emotron VFX the ideal alternative to costly servo systems and DC motor drives.*

*With all its functions included in a compact IP54 enclosure, the Emotron VFX is cost-efficiently installed close to the application. An intuitive user and process interface makes it easy to communicate critical parameters to other parts of your process. Fit-for-purpose is the key term for Emotron VFX.*

## **Protective and efficient starts**

Protective starts are ensured with Emotron VFX. Reduced start currents result in smaller fuses, cables and energy bills. A crusher or a mill loaded with material can be difficult to start. This is dealt with efficiently by Emotron VFX boosting the torque to overcome initial peak loads. Starting a heavily loaded crane without jerky movements is also critical. The Emotron VFX gives an instant, yet soft, start by ensuring the pre-magnetized motor has enough power to deliver the torque needed to start the movement at the very moment the mechanical brake is released.

## **Controlled ramping for safe start-up**

Emotron VFX offers a unique function that protects your equipment by ensuring a controlled ramping up of the DC link voltage. This so called HCB ramping (Half Controlled Bridge) offers a safe start-up, and detects phase failure and asymmetries. As there are no built-in resistors or bulky contactors, both size and maintenance are reduced.

You can safely turn the variable speed drive on and off with an external contactor, as often as needed. In other drives this could cause breakdowns or serious damage.





# Optimized operation and full control

## Direct torque control eliminates disturbances

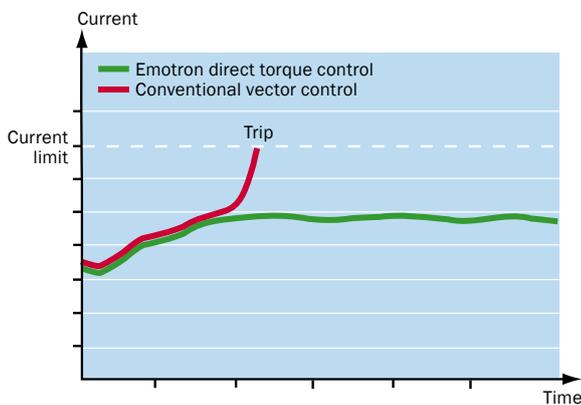
With its direct torque and speed control, the Emotron VFX is the choice for all dynamic applications. Operation is optimized and you are in full control of the process.

Emotron VFX protects the operation from interruptions thanks to a very accurate and quick speed and torque control. The torque control reacts extremely quickly and eliminates disturbances due to peak loads, abrupt load changes or inaccurately set ramp times.

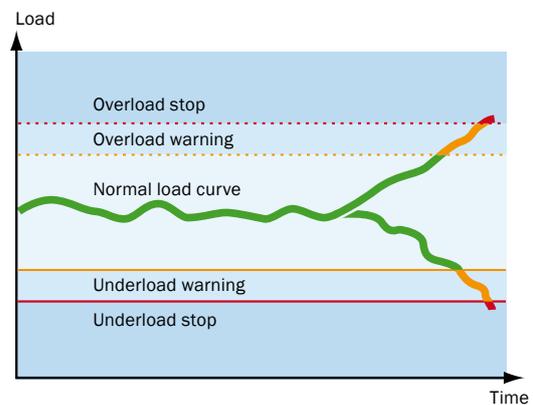
The fast torque response results in safer, more cost-effective operation, for example of a crane where frequent and critical starts and stops demand instant high torque, or of a crusher where speed quickly needs to be adjusted to changes in load or type of material.

## Protection against damage and downtime

A built-in shaft power monitor and a unique load curve protection function protect your process against damage and downtime. The load curve of the controlled equipment is monitored across the entire speed range. Any over- or underload situation that could cause inefficiency or damage is detected immediately. You can easily set the warning and safety stop levels that allow you to take preventive action before damage is done. There is no need to worry about a crusher jamming or a mixer running with a broken blade. A warning is sent, or a safety stop activated, before any damage can occur. Emotron VFX protects the process and makes sure it works as efficiently as possible.



Direct torque control means that abrupt load changes do not cause disturbances and downtime. The response time is extremely short since the Emotron VFX compares actual and required torque 40,000 times a second.

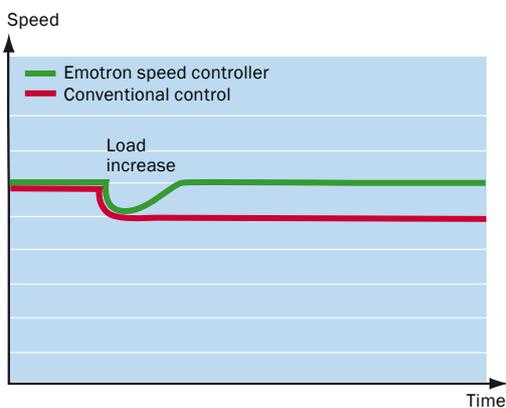


The unique load curve protection detects any deviation from normal load across the whole speed range, and sends a warning or stops the process before any damage is done (patent EP 1772960).



### Speed controller increases efficiency

Emotron VFX has an internal speed controller that increases efficiency. It reacts immediately to load changes that cause deviation in motor speed, and quickly adjusts speed to the set reference value. The controller works without an external feedback and an autotune function reduces set-up time.

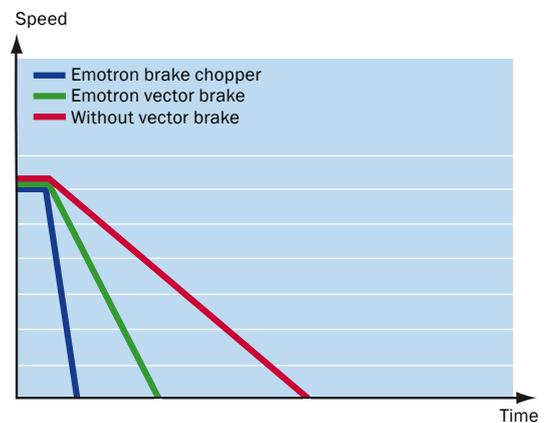


A speed controller ensures efficient operation by immediately adapting speed to meet load changes.

### Safe and efficient braking

An integrated vector brake function offers rapid and protective braking. No mechanical brakes are required. The braking energy is dissipated through the motor itself, which helps avoid interruptions due to excessive brake voltage.

In mill applications quick and secure stops are often needed for safety or productivity reasons. These are ensured by using the vector brake. For a heavily loaded crane a brake chopper, available as an option, guarantees very rapid but soft braking without any jerky movements.



An integrated vector brake function halves the braking time. A brake chopper is available as an option when extremely short braking time is required. The example shown is true when full braking power is used.



## User-friendly and reliable operation

*Emotron VFX 2.0 offers several user-friendly features that make both the operator's and the installation engineer's work easier and more reliable.*

### Your own process language

Several process values and system parameters are available via the communication interface, including current, voltage, shaft power, energy consumption and operating time. In addition to selecting the language to be displayed you can easily set operation parameters in the units of your specific process, for example m/sec, tons/hour, cycles/min or units/hour. No confusion, no time spent on translation and no risk of mistakes. The result is easier and more reliable monitoring of your process.

### Virtual connection of logical functions

Emotron VFX supports the virtual connection of logical functions, comparators and timers. This opens the way for the use of more options by making more I/Os available. Different logical functions can be combined without cables or external I/Os. For example, the Emotron VFX can be set to clear a milling machine by reversing it when it begins to lose speed because of excessive load. The destination and source of a virtual connection can be set easily using the control panel.



*Operation parameters can be set in your own process units – m/sec, cycles/min, units/hour, etc. This makes monitoring easier and more reliable.*



*Emotron VFX supports the virtual connection of logical functions, comparators and timers. The destination and source of a virtual connection can be set easily using the control panel.*



### **Flexible and easy setup**

Emotron variable speed drives offer easy programming and commissioning. Up to four parameter sets can be used to create settings for different modes, for example when switching between different motors or from automatic to manual process control. Very short response times increase availability and reliability.

When updating a parameter, you can opt to have the change applied to all sets automatically. In addition, only one setting is required to set the variable speed drive in speed, torque or frequency mode. Parameters are loaded directly to/from the variable speed drive by connecting a standard RS232 cable between the PC serial communication port and a contact under the control panel on the front.



*Emotron VFX offers easy programming and commissioning. Up to four parameter sets can be used and parameters are loaded to/from the variable speed drive by connecting an RS232 cable directly to the front.*

### **Full process control – local or remote**

All the data available in the variable speed drive can be used for your process control via fieldbus communication. You can easily switch between local and remote control of the variable speed drive simply by pushing a button on the control panel. The existing settings remain in place while switching over and the process is not affected.

By connecting the variable speed drive to an Industrial Ethernet network you can perform your control via any communication interface or using a PLC. This facilitates commissioning and reduces set-up time. Remote monitoring and configuration via, for example, a PC in a control room provide a comprehensive and informative operator interface and give easy access to the connected units for setting process parameters, viewing process status, etc.

### **Informative manuals help you achieve optimal use**

Studying our manuals helps you achieve optimal use of the variable speed drive and its functionality in your specific application. The manuals are concise and easy to understand, with recommendations and examples that reduce set-up time.

### **Easy copying of settings**

When settings have been made for one Emotron VFX via the control panel they can easily be copied to other Emotron VFX units. Just remove the panel, attach it to the next drive and transfer the settings. This saves a lot of time and ensures that the drives have exactly the same settings.



*The removable control panel has a copy function that allows you to transfer settings to other Emotron VFX units.*

# Ease the burden of your crane



## Cranes

- Instant yet soft starts using direct torque control, motor pre-magnetization and precise brake control. These shorten cycle time, increase safety and reduce mechanical stress.
- Fully synchronized travel motions of rail-mounted cranes reduce maintenance and noise levels. Speed and wheel position are controlled so that the crane rides parallel to the rail.
- Hoisting speed can be increased when the crane is empty or carrying a light load by operating the hoist motor in the field weakening area. The result is shorter cycle times and optimized operation.
- Hoisting and grabbing can be operated simultaneously. Opening and closing the grab while it is being hoisted reduces cycle times and stress on ropes.
- No jerks to cause swinging loads when braking with heavy loads. Direct torque control and brake chopper smoothly reduce speed to zero before the mechanical brake is activated.
- The crane can be set to stop automatically at end positions without jerky movements. The operator can safely drive at full reference.

# Power when you need it



## Crushers

- Lower start currents mean you can use smaller fuses or a smaller generator. The result is less stress and lower investment and energy costs.
- Direct torque control handles abrupt load changes and overcomes initial peak loads. This ensures reliable operation without interruptions or false trips and reduces mechanical stress.
- Motor speed is continuously adapted to the amount and size of rock and the feeder speed is adapted to load variations. This minimizes energy consumption and wear.
- The load curve function sends a warning or stops the crusher in situations that could cause damage or reduce efficiency, for example if the feeder is broken or harmful material gets into the crusher. No energy is wasted and downtime is reduced.

# Milling with minimal effort



## Mills

- Lower start currents mean you can use smaller fuses. The result is less stress and lower investment and energy costs.
- Direct torque control adjusts the torque to handle abrupt load changes and overcome initial peak loads. This ensures reliable operation without false trips and reduces mechanical stress.
- Motor speed is continuously adapted to the amount and size of material, minimizing energy consumption and wear, as well as reducing milling time and improving product quality.
- The load curve function sends a warning or stops the mill in situations that could cause damage or reduce efficiency, for example if harmful material gets into the mill. No energy is wasted and downtime is reduced.

# Mixing efficiency with safety



## Mixers

- Lower start current means you can use smaller fuses. The result is less stress and lower investment and energy costs.
- A built-in shaft power monitor determines when the viscosity is right. This ensures optimized operation and higher product quality.
- Motor speed is continuously adapted to viscosity level, minimizing energy consumption and wear, as well as improving product quality.
- The load curve function sends a warning or stops the mixer in situations that could cause damage or reduce efficiency, for example if a blade is broken. No energy is wasted and downtime is reduced.



## Cost-efficient and flexible installation

*Installing Emotron VFX 2.0 is cost-efficient and flexible. The compact format and IP54 classification means the units can be installed close to the application. Flexible cable connection reduces the need for tools and terminals.*

### **Compact IP54 for cost-efficient installation**

Emotron VFXs in the 2.5-250 A range are compact standalone units, all IP54 classified and just as protected against dust and water as an electric motor. They have a robust steel construction and can withstand harsh environments. You can install the units close to the application, saving time and space as well as the cost of cabinets and long motor cables.

### **High power units are also compact**

The 300-1,500 A units can be mounted in compact, Emotron-designed IP54 cabinets that are considerably smaller than most solutions on the market. This makes the Emotron VFX easier to handle and more cost-efficient to install compared to other variable speed drives in the same range. The cabinet has a programmable control panel on the front for easy access.



*The compact standalone units of 2.5-250 A are IP54 classified, which eliminates the need for costly cabinets and long motor cables.*

### **Flexible cable connections**

Emotron VFX offers flexible connection of a large number of cables and a wide range of cable types. You can easily mount different cable sizes or double cables. The connectors are easily accessible by removing the bottom plate of the housing.



*You can easily connect a large number and a wide range of cables to Emotron VFX.*



Emotron VFX offers versatile communication options with the other control devices in the process or, for example, a control room.

## Options add functionality

A number of options are available to let you customize the Emotron VFX 2.0 functionality and fully utilize the product according to your needs. Four different options can be combined.

### Combine more options

The compact option boards for the Emotron VFX increase flexibility and cost-efficiency. They are easy to mount and up to four options can be combined, for example fieldbus communication, motor protection, encoder feedback and crane control. Up to three I/O boards can be mounted, each providing three relays and three digital inputs.

### Safe and efficient crane control

A crane option board is used to control travel and hoist motions. It also offers additional I/O:s for crane control signals. The board includes a speed deviation monitor for the hoist. Crane applications are easily configured according to the operator's needs. The Emotron solution supports 4-speed, 3-position (stepless) and analogue reference joysticks.

### Shortened braking time

Emotron VFX offers very efficient vector braking. For applications that demand an even shorter braking time, a built-in brake chopper is available as a factory-installed option, used in combination with brake resistors dimensioned according to the requirements of the specific application.



The compact option boards are easily mounted and allow you to combine up to four different options, for example fieldbus communication, motor protection, encoder feedback and crane control.



Fieldbus communication, Industrial Ethernet communication and serial communication are supported.

### Versatile communication options

Like all Emotron products, the Emotron VFX provides for versatile communication options with the other control devices in your process or, for example, a control room. The communication possibilities include:

- Fieldbus communication via Profibus DP and DeviceNet
- Industrial Ethernet communication via Modbus/TCP
- Serial communication via RS232 or RS485 with Modbus RTU
- Analogue and digital outputs

Several process values and system parameters are available via the communication interfaces, including speed, current, voltage, power factor, shaft power, shaft torque, energy consumption and operating time.

### Efficient motor protection

An internal intelligent temperature control offers improved motor protection and ensures a stable temperature that extends equipment lifetime. Up to three PTC and up to three PT100 sensors can be connected to monitor motor temperature and give temperature feedback. You can also connect two PT100 sensors for motor protection and one PT100 for process feedback, measuring temperature without using a transmitter. For units up to 46 A, an isolated motor thermistor input offers a low-cost solution approved in accordance with the DIN 44081/44082 standard.

### Encoder for higher speed accuracy

An encoder can be connected for more accurate speed control or for increased safety with deviation control in crane applications. Both TTL (5 V) and HTL (24 V) encoders can be used. The option supports differential as well as single-ended encoder signals. A +5/+24 V DC output is available for encoder power supply.

### Safe stop without a contactor

A safe stop option board provides protection against unexpected starts during mechanical maintenance, in accordance with the EN 13849-1 and EN 62061

standards. This cost-efficient solution saves both money and space since you no longer need a contactor to disconnect the motor. The EMC performance is also improved since the motor cable shield is not interrupted.

### Liquid cooling saves energy and space

Emotron VFX models from 90 A can be provided with liquid cooling, offering considerable savings. Operating and maintenance costs are lower since ventilation or air conditioning is no longer needed to cool the cabinet and the surrounding room. Energy consumption can be reduced by recycling the heat produced by the variable speed drive. For units from 300 A mounted in cabinets, space is also saved. In addition, the cabinet can have a protection class higher than IP54 since no ventilation openings are required.

### Extended EMC protection

The Emotron VFX is delivered with a built-in 2nd environment category C3 EMC filter as standard. A 1st environment category C2 EMC filter is available as an option. The Emotron VFX is then delivered with the filter built into the housing, which means the protection class of the unit is not affected.

### Reduced harmonic distortions

A 12-pulse rectifier offers a cost-efficient reduction of harmonic current distortions. It reduces power losses in equipment such as transformers and conductors, and eliminates the need to over dimension these components.

### Standby supply

This option makes it possible to supply the control circuits of the Emotron VFX unit via an external 24 V AC/DC supply in order to maintain communication and set up the system without the 3-phase mains being connected. Communication backup is also provided should the 3-phase main power supply fail.

# Simplified troubleshooting and maintenance



*Maintenance is simplified and downtime reduced thanks to a number of features. Fewer critical parts, which are easy to access, increase reliability. Detailed alarms help you identify the process problem quickly in order to take preventive action.*

## **Detailed alarm codes make troubleshooting easier**

Efficient alarm detection and detailed codes help you to achieve reliable operation and simplify troubleshooting. Should a problem occur in the process, a full status report will then be generated and stored in the variable speed drive, detailing all activities and values at the time of the alarm. You can quickly identify the cause of the problem and can take corrective measures without experiencing unnecessary downtime. Connecting the Emotron VFX to an Industrial Ethernet network further simplifies fault-finding and offers the option of remote supervision.

## **Fan control extends equipment lifetime**

Emotron VFX has speed controlled fans as standard. This ensures a stable temperature that extends equipment lifetime and also reduces noise. The fans are the only moving mechanical parts and easy to replace. Emotron VFX has fewer and more accessible boards than most other variable speed drives. This increases reliability, facilitates maintenance and reduces downtime. Connecting the Emotron VFX to an Industrial Ethernet network further simplifies fault-finding and offers the option of remote supervision.

## **Fold out for easy access**

The power modules of the Emotron VFX models 300-1,500 A can be folded out of the cabinet and unhitched, since they are attached with hinges. This makes the units easy to access and facilitates maintenance and service. Components can be replaced quickly on site without taking the drive apart, thereby greatly reducing downtime.

*Detailed alarm codes simplify troubleshooting. Should a problem occur in the process, a full status report will help you to quickly identify the cause and take corrective measures.*

A wide range to suit your needs



#### Technical data

Emotron VFX 2.0 variable speed drives are available in the following range:

Rated power	0.75-1,500 kW
Supply voltage	230-690 V, 3-phase
Rated current	2.5-1,500 A
Protection class	IP54
Approvals	Global standards

For further technical information, please see the Emotron VFX 2.0 data sheet.

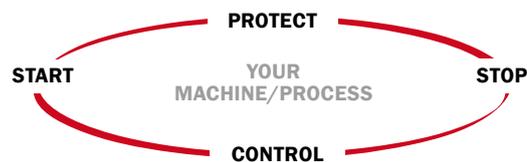
# Dedicated drive

Emotron develops products for starting, protecting, controlling and stopping machines and processes driven by electric motors. Our drive is to create measurable benefits for our customers through reliable, cost-efficient and user-friendly solutions. By focusing on selected applications, such as pumps, cranes and lifts, we can offer functionality optimized for specific needs.

Since 1975 we have established a solid position as an innovative and pioneering company. Research and development takes place at our head office in Sweden and at our subsidiaries in Germany and the Netherlands. Germany is also the location for the Emotron technical centres for lift and crane solutions. We have sales offices in Sweden, Germany, the Netherlands, China and Latin America, as well as a worldwide network of distributors and service partners.



## Products for your specific needs



Our complete product portfolio offers optimum solutions for your specific needs. The products are all based on the same technology platform and can easily be integrated in complete solutions. Wide power range, high protection class and compliance with global standards mean they fulfil the highest demands.

- *Shaft power monitors* – protect your process from damage and unplanned downtime.
- *Softstarters* – ensure smooth starts and safe stops.
- *Variable speed drives* – minimize energy consumption and wear.



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