



Your choice for wall and panel mounted AC drives

Emotron FDU & Emotron VFX
IP20/21 up to 160 kW





Globally well proven

The IP20/21 versions of the globally well proven Emotron FDU and Emotron VFX AC drives are optimized for mounting in electrical cabinets (IP20) or directly on a control room wall (IP21). The IP20/21 units offer reliable, cost-efficient and user-friendly operation of your motor driven equipment. Robust mechanical design, easy access to connection terminals and a high level of component integration, together with smart control functions make the IP20/21 members of the Emotron FDU/VFX family the preferred choice for your centralized AC drive applications. For decentralized applications and harsh environment though, our IP54 units still offer the best choice. Emotron FDU and Emotron VFX AC drives are available for motor powers up to 3 000 kW.

The robust drive for easy use

Robust and complete

To achieve high reliability and enable an easy use the CG development team has been analyzing possible causes of failure and misuse and applied suitable countermeasures when designing the IP20/21 range. The result is internally highly integrated AC drives suitable for easy installation and long time of trouble-free operation, together with using coated boards.

Easily accessible power terminals

To simplify the power supply and motor connections the terminals are integrated in the enclosure and enables cable access from the outside of the unit. Still the IP20/21 protection is achieved when the cable has been connected.

Compact format

In electrical cabinets and control rooms space, is limited. A compact format is therefore essential when installing AC drives. Our range of IP20/21 drives up to 160 kW has therefore got a size optimized design without compromising with reliability or user friendliness.

Built-in DC-choke

With AC drives it is common to use inductors, either on the AC supply side (AC-choke) or in the capacitor DC-link (DC-choke) to reduce AC line harmonics and minimize the stress on the internal power capacitors. An important benefit of using DC-choke instead of AC-choke is that the supply voltage can be fully utilized without substantial voltage drop. Hereby the rated motor power can be maintained when applying an AC drive. CG Drives & Automation has been one of the pioneers using integrated DC-choke and continues to offer it as an integrated standard solution due to its good performance.

Integrated EMC filter

All drives in the series are delivered with a built-in Category C3 EMC-filter as standard. C3 requirements are fulfilled with 80 m motor cable.

Speed controlled cooling fan

Emotron FDU and Emotron VFX AC drives have speed controlled fans as standard. Controlling the fan speed in accordance with the cooling needs ensures a stable internal temperature that extends the lifetime of your investment and also reduces noise.

Full control

The control features of IP20/21 versions of Emotron FDU and Emotron VFX are the same as in the well proven IP54 and high power modular versions. This means either direct torque control in Emotron VFX for dynamically demanding applications or our straightforward control scheme in Emotron FDU optimized for flow and pressure control in pumps, fans and compressors. All members of the Emotron FDU/VFX range also contain a PID process controller, programmable logic and load monitoring.

Direct torque control for accurate and fast control (Emotron VFX)

With its direct torque control, Emotron VFX is the choice for all dynamic or constant torque applications. Operation is optimized and you are in full control of the process. Emotron VFX protects the operation from interruptions thanks to the very accurate and quick speed and torque control.



A clean and robust mechanical design with few circuit boards and internal electrical connections ensures a trouble-free operation.

Controlled power-up

Emotron FDU and Emotron VFX from 30 kW/D2 offer a unique function which 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 AC drive on and off with an external contactor, as often as needed, without damaging the unit.

The torque control reacts extremely quickly and eliminates disturbances due to peak loads, abrupt load changes or incorrectly 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.

Sensorless speed controller increases efficiency (Emotron VFX)

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. Encoder feedback (option) can though be applied when higher control accuracy or position measurement is required.

Fast and smooth process control

The built-in PID regulator is used for fast and smooth control of, for example, flow, pressure or temperature. The reference value can be set via an analogue input, via fieldbus communication, or via the control panel. The measured actual value is derived from a process sensor connected to an analogue input or a PT100 input.

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 a factory built-in option, guarantees very rapid but soft braking without any jerky movements. Regenerative braking with active front end technology (AFE) is available as an option, saving considerable energy costs as well as reducing harmonic distortions.

Spin start

For loads with high inertia or low friction like large fans and centrifuges the spin start function offers a reliable restarting capability after a power interruption by detecting motor speed and direction of rotation and controlling the load to its requested operational state without unnecessary high current peaks, blown fuses or extended mechanical stress.

Dedicated control for pumps and fans save energy with speed control

Being able to continuously adapt the operation of your pumps and fans to match demand by controlling motor speed results in considerable energy and maintenance savings, compared to the use of throttling valves or dampers. The latter is like running a car at full throttle while controlling the speed using the brakes. Further energy savings, as well as reduced motor noise, are offered thanks to flux optimization. This function increases motor efficiency by adjusting the output voltage to the actual load, improving the motor's actual power factor.

Sleep function optimizes operation

A built-in sleep function optimizes the process by stopping the motor when the built-in PID process regulator determines that it does not need to run in order to keep up the requested level. The motor is restarted as soon as the controlled process so requires. This reduces energy consumption and equipment wear. You can also set the sleep mode to be activated in low flow or no flow situations that are not detected by the PID control, for example due to valves which are closing too slowly. This avoids the pump and motor overheating and energy being wasted.

Automatic pump rinsing increases efficiency

Emotron FDU and Emotron VFX AC drives can be set for automatic pump rinsing using a timer. When a pump is running at low speed or standing still, sludge often sticks to the impeller, reducing the pump's efficiency.

With an Emotron FDU or Emotron VFX AC drive, you can set the pump to run at full speed for certain intervals or for a certain time at start-up, before returning to normal operation. This cleans the pump and pipes and increases efficiency.



Multiple control for efficiency and reliability

Using multiple pumps or compressors to keep a constant flow or pressure despite varying demands is a flexible, reliable and cost-efficient method. At all times you only use the number of pumps or compressors needed and thus the amount of energy required. An Emotron FDU or Emotron VFX controls up to seven motors without PLCs or other external equipment. When, for example in a pressure control application, one pump reaches its limit, or when the demand decreases, more pumps are started or stopped in accordance with the determined need. The pressure control is maintained by the built-in PID process regulator. Which pumps to start or stop is decided by the integrated controller, giving them all equal running time. Should one pump or motor break down, the system automatically switches over to the next in line, avoiding unnecessary downtime.

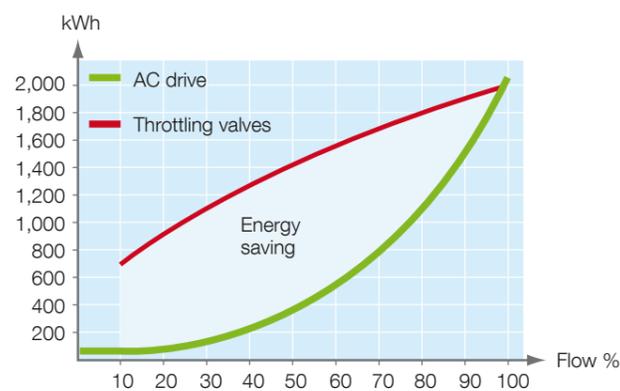
Programmable logical and timer functions

The Emotron FDU/VFX AC drive offers built-in programming blocks, such as logical functions, comparators and timers. This opens the way for customizing functionality according to your requirements. You can, for example, set the AC drive to automatically clean a pump using a timer.

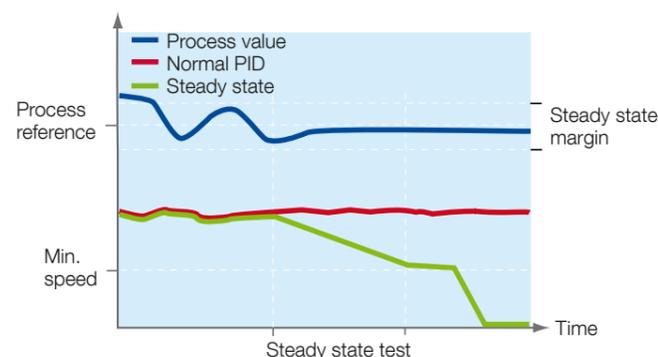
Motor load monitor with auto-set

A built-in load monitor protects your process against damage and downtime. The load curve of the controlled equipment is monitored across the entire speed range. This is achieved by activating automatic curve identification (Auto-Set) during commissioning.

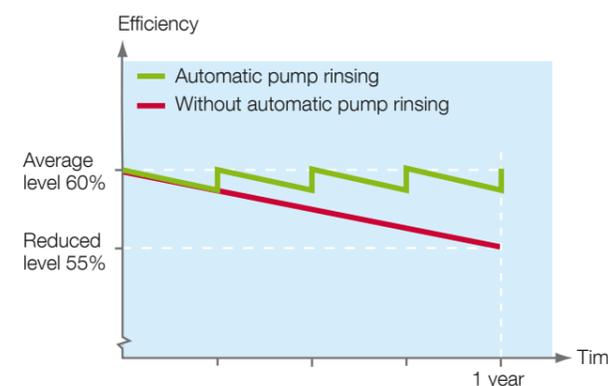
Any over- or underload situation that could cause inefficiency or damage is detected immediately. You can easily set the warning and safety stop levels that allow you to take preventive action before damage occurs. There is no need to worry about dry-running, overheating or blocked pipes. And you will be warned if, for example, your compressor is idling, a fan belt is broken or a valve has not fully opened. The AC drive simply protects the process and makes sure it works as efficiently as possible.



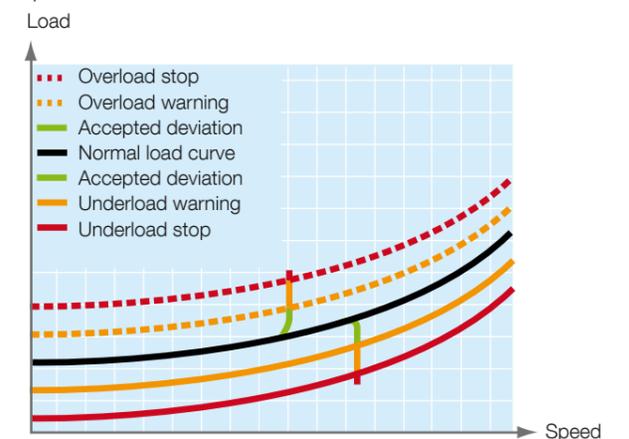
Speed control offers considerable energy savings. In this pump application, energy consumption is reduced by up to 50% compared to throttling valves. Calculation assumes a 2.2 kW motor.



Emotron FDU saves energy by pausing the motor whenever it does not need to be run in order to keep up the required pressure. The sleep mode can also be activated in low flow situations not detected by the PID control, thus avoiding overheating and energy waste.



Emotron FDU offers automatic pump rinsing. In this example a centrifugal pump at a sewage treatment plant is set to run at full speed for certain intervals to rinse out sludge, thereby increasing efficiency.



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



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



All IP20/21 models – sizes C2 to F2, 11–160 kW.

Multi-lingual control panel with single-function keys and copy function

Designed for global application the Emotron FDU and Emotron VFX AC drives carry a multi-lingual display unit as standard. The control panel has a window system with unique menu numbers and separate menu keys and start/stop keys and each key has only one main function to avoid confusion during commissioning or operation. When settings have been made for one AC drive via the control panel, they can easily be copied to other drives of the same type. Just remove the panel, attach it to the next unit and transfer the settings. This saves a lot of time and ensures that the drives have exactly the same settings. A PC serial communication connection is available behind the control panel.

The Emotron FDU/VFX family of drives offers several other user-friendly features that make both the operator's and the installation engineer's work easier and more reliable.

These include:

- Your own process units. Reference and process feedback can be set in your own process units – m³/s, bar, Pascal, etc.
- 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.
- All the data available in the AC drive is accessible via fieldbus ethernet communication.

Options

Standard options

- IP21 top cover
- Industrial Ethernet communication (Modbus/TCP, EtherCAT, Profinet etc)
- Fieldbus communication (Profibus DP, DeviceNet)
- Serial communication via RS232 or RS485 with Modbus RTU
- Extended digital I/O board.
- PTC/PT-100 Motor protection board (PTC + max 3 PT-100)
- Encoder board (TTL (5 V) and HTL (24 V))
- Crane control board (Emotron VFX)
- External control panel

Factory options

- Brake chopper, integrated
- Extended EMC protection (1st environment Category C2)
- Safe stop without a contactor, i.e. Safe Torque Off (STO), for fulfilling machine safety standards EN 13849-1 and EN 62061 requirements.

Other options

- Motor filters (output choke, sinus-filter, common mode filter)
- Active front end for regeneration or low harmonics (only available above 45 kW)
- Brake resistors

Applications

Emotron FDU

- Pumps
- Fans
- Compressors
- Blowers

Emotron VFX

- Cranes
- Crushers
- Centrifuges
- Extruders
- Conveyors
- Mills
- Mixers
- Winches
- Winders
- Test benches



Technical data

EMOTRON FDU & EMOTRON VFX – IP20/21 DRIVES

| | |
|------------------|--------------------------|
| Rated power | 11 – 160 kW @ 400 VAC |
| Supply voltage | 230 – 480 VAC, 3-phase |
| Rated current | 25 – 293 A |
| Protection class | IP20 (optional IP21) |
| Standards | CE (UL & GOST R pending) |

The Emotron FDU/VFX family of AC drives covers motor power of 0.55-3,000 kW and supply voltage 230-690 VAC. The range includes encapsulation from IP20 to IP54. For further technical information, please see the Emotron VFX/FDU 2.0 technical catalogue.

| Model | Max. output current [A] | | Frame-size | P _{mot} 400 V [kW] | P _{mot} 460 V [hp] | I _{nom} [A] | Weight [kg] | Dim. HxWxD [mm] |
|------------|-------------------------|-----|------------|-----------------------------|-----------------------------|----------------------|-------------|------------------------|
| | VFX | FDU | | Normal duty | | | | |
| 48 - 025 | 38 | 30 | C2 | 11 | 15 | 25 | 17 | 446 x 176 x 266 / 272* |
| 48 - 030 | 45 | 36 | | 15 | 20 | 30 | | |
| 48 - 036 | 54 | 43 | | 18,5 | 25 | 36 | | |
| 48 - 045 | 68 | 54 | | 22 | 30 | 45 | | |
| 48 - 058** | 70 | 70 | | 30 | 40 | 58 | | |
| 48 - 060 | 90 | 72 | D2 | 30 | 40 | 60 | 30 | 545 x 220 x 282 |
| 48 - 072 | 108 | 86 | | 37 | 50 | 72 | | |
| 48 - 088 | 132 | 106 | | 45 | 60 | 88 | | |
| 48 - 105** | 126 | 126 | | 55 | 75 | 105 | | |
| 48 - 106 | 127 | 127 | | 55 | 75 | 106 | | |
| 48 - 142 | 170 | 170 | E2 | 75 | 100 | 142 | 53 | 952 x 275 x 313 |
| 48 - 171 | 205 | 205 | | 90 | 125 | 171 | | |
| 48 - 205 | 246 | 246 | | 110 | 150 | 205 | | |
| 48 - 244 | 293 | 293 | F2 | 132 | 200 | 244 | 68 | 952 x 335 x 313 |
| 48 - 293** | 352 | 352 | | 160 | 250 | 293 | | |

*IP21 version with top cover, **Q3-Q4/2014

Emotron is now CG!

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