



# Secure the flow and save energy

*A complete range, IP20 - IP54, to suit all needs*



Emotron FDU 2.0 AC drive





# Full control and reliable operation

Emotron FDU 2.0 AC drives offer reliable, cost-efficient and user-friendly operation of your pumps, fans, compressors and blowers. Full control of flow and pressure ensures an optimized operation, with reduced energy consumption and less downtime. The Emotron FDU also protects your equipment from damage and unnecessary wear. With all its functions included in a compact IP54 enclosure, the Emotron FDU is cost efficiently installed close to the application. The complete range covers motor powers from 0.55 to 3,000 kW.

## Protective starts and stops

Emotron FDU AC drives offer soft starts and stops that protect your equipment. Reduced start currents result in smaller fuses, cables and energy bills. Controlled stops of pumps eliminate the risk of water hammer and other costly damage. In addition, you no longer need expensive motor-controlled valves to reduce pressure spikes. Spin start handles a turned-off fan that is rotating in the wrong direction, preventing high current peaks that could result in blown fuses and mechanical stress. The result is reduced installation, energy and maintenance costs.

## Controlled charging for safe start-up

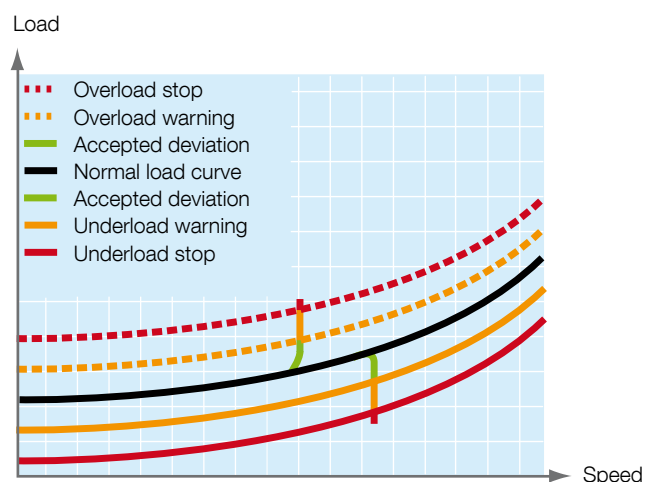
Emotron FDU from 30 kW offers a unique function that protects your equipment by ensuring a controlled ramping up of the DC link voltage. This so called HCB ramping (Half Controlled Bridge) offers a safe start-up, and detects phase failure and asymmetries. As there are no built-in resistors or bulky contactors, both size and maintenance are reduced. You can safely turn the AC drive on and off with an external contactor, as often as needed. In other drives this could cause breakdowns or serious damage.

## 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.

## Protection against damage and downtime

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 an automatic curve identification 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, cavitation, 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. Emotron FDU protects the process and makes sure it works as efficiently as possible.



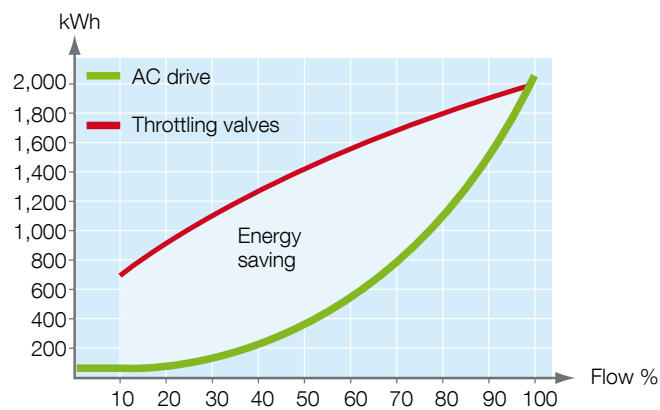
The unique load monitor detects any deviation from normal load across the entire speed range, and sends a warning or stops the process before any damage is done (patent EP 1772960).



# Save energy and optimize operation

## Save energy with speed control

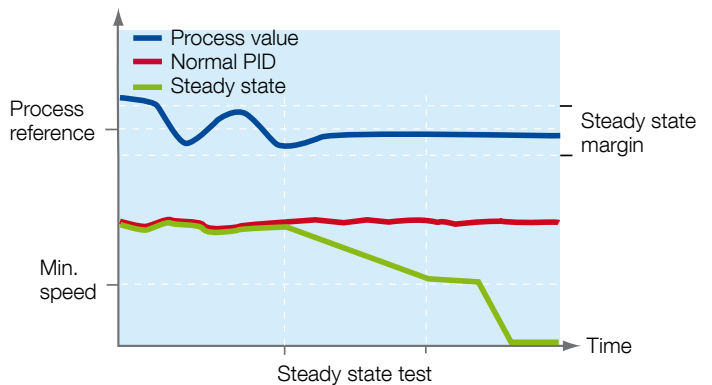
Emotron FDU has been specially developed to regulate flow and pressure. Being able to continuously adapt the operation of your pumps and fans to match demand by controlling motor speed results in considerable energy and maintenance savings, compared to the use of throttling valves or dampers. The latter 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.



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.

## Sleep function optimizes operation

A built-in sleep function optimizes the process by lowering the motor speed to zero when it does not need to be run in order to keep up the required pressure. The motor is restarted when the need occurs again. 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.



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.

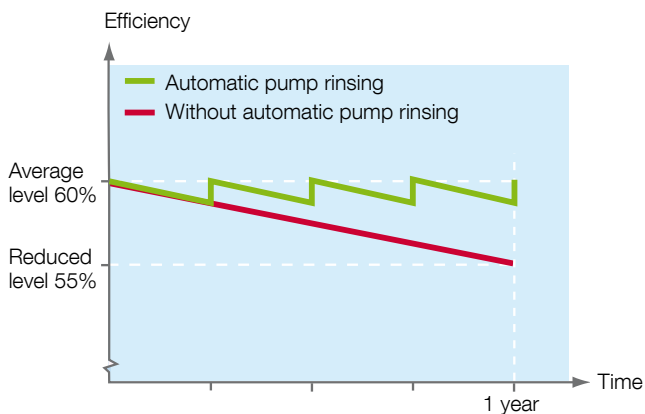


## Multiple control for efficiency and reliability

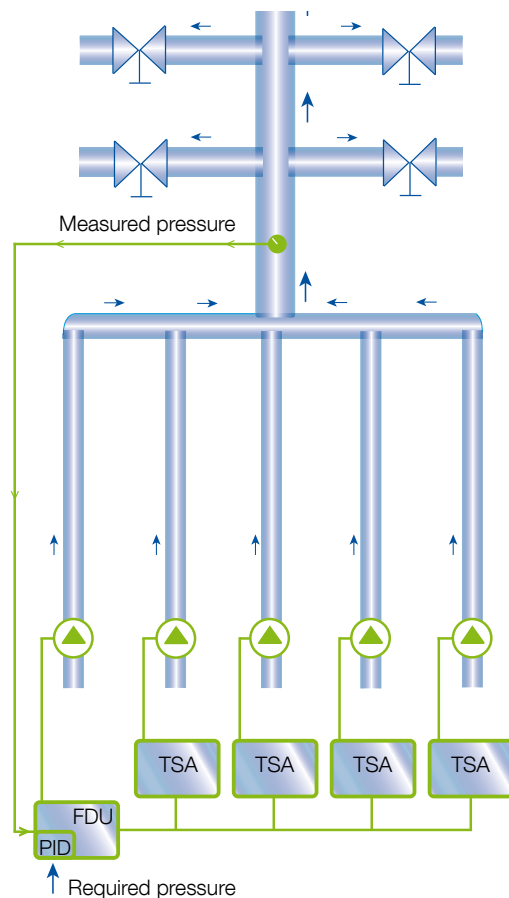
Using multiple pumps or compressors to keep a constant flow or pressure despite varying demands is a flexible, reliable and cost-efficient method. At all times you only use the number of pumps or compressors needed and thus the amount of energy required. An Emotron FDU controls up to seven drives without PLCs or other external equipment. When, for example, one pump reaches its limit, or when the demand decreases, the Emotron FDU starts or stops more pumps. The pressure control is done using the built-in PID process regulator. Which pumps to start or stop is decided by the AC drive, 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.

## Automatic pump rinsing increases efficiency

Emotron FDU 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 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.



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.



Multiple pump or compressor control is a reliable and cost-efficient method of keeping a constant flow/pressure despite varying demands. One Emotron FDU can control up to seven units in a master/slave solution, with, for example, Emotron MSF softstarters working as slaves.



## User-friendly and reliable operation

Emotron FDU 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  $\text{m}^3/\text{s}$ , bar or Pascal. No confusion, no time spent on translation and no risk of mistakes. The result is easier and more reliable monitoring of your process.



Operation parameters can be set in your own process units – m³/s, bar, Pascal, etc. This makes monitoring easier and more reliable.



Built-in programming blocks such as timers and comparators allow you to customize functionality.



## Customized functionality

Emotron FDU 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. The pump is run at full speed for a certain time to rinse out sludge.

## Flexible and easy setup

Emotron AC 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.

## Full process control – local or remote

All the data available in the AC drive can be used for your process control via fieldbus communication. You can easily switch between local and remote control of the AC 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 AC 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.

## Easy copying of settings

When settings have been made for one Emotron FDU via the control panel they can easily be copied to other Emotron FDU 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. A PC serial communication connection is available behind the control panel.



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



## Cost-efficient and flexible installation

Installing Emotron FDU 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 FDUs in the 0.55-132 kW range are compact wall-mounted units, all IP54 classified and just as protected against dust and water as an electric motor. They have a robust metal 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 160-3,000 kW units can be mounted in compact Emotron-designed IP54 or IP23 cabinets. This makes the Emotron FDU easier to handle and more cost-efficient to install compared to other AC drives in the same range. The cabinet has a programmable control panel on the front for easy access.





The 160-3,000 kW Emotron FDU models can be mounted in compact Emotron IP54 or IP23 cabinets with the control panel easily accessible on the front. The modular design offers redundancy and easy servicing.

## Modular design

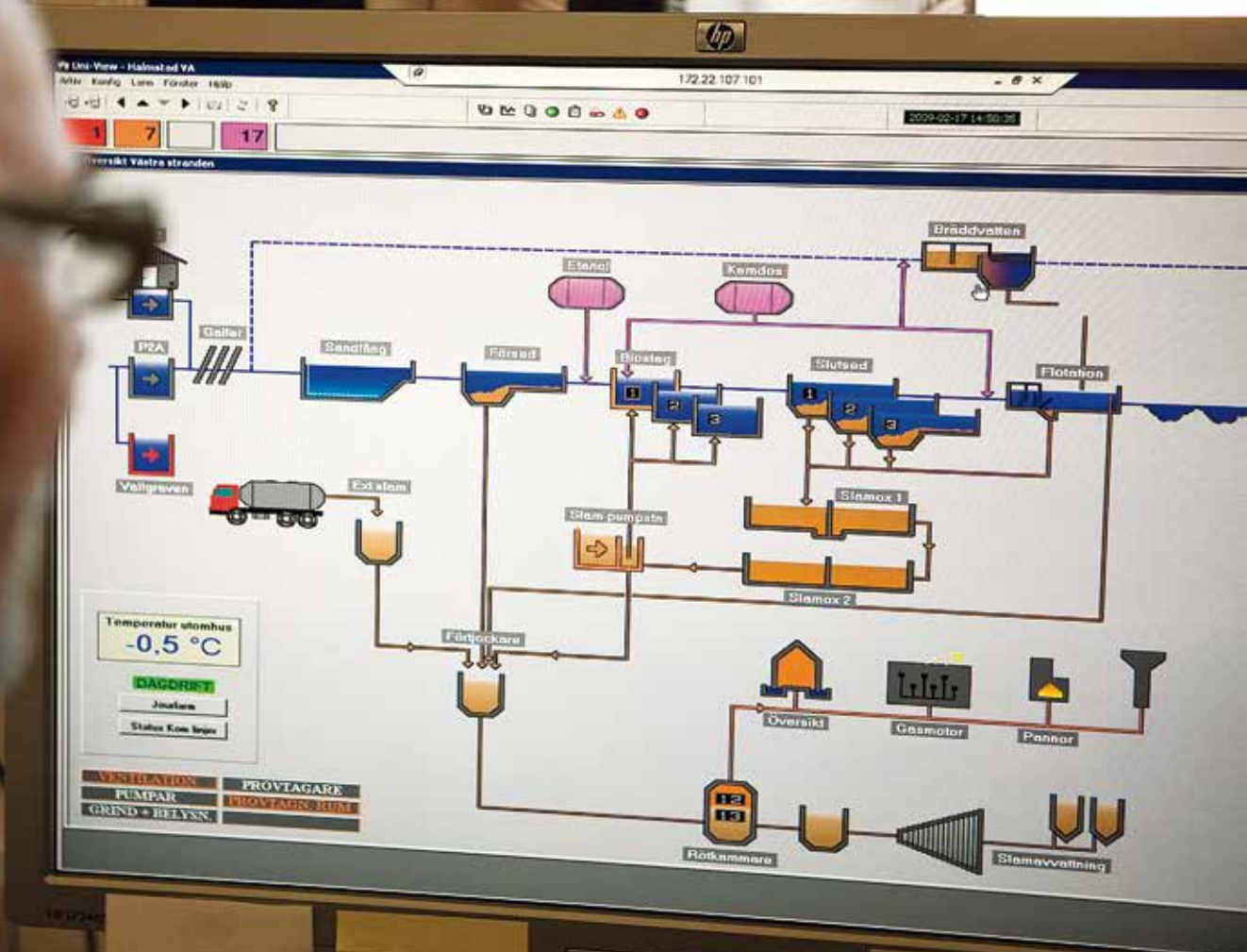
The 160 to 3,000 kW Emotron AC drives are built-up with parallel connected 3-phase power modules. The modular design offers the possibility of redundancy operation. Operation can continue by temporarily running with reduced power capacity while one of the modules is out of operation. For very critical processes, you can even equip the system with an extra power module, to ensure full capacity at all times.

## Flexible cable connections

Emotron FDU 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.



The compact wall-mounted units of 0.55-132 kW are IP54 classified, which eliminates the need for costly cabinets and long motor cables.



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

## Options to customize your AC drive

A number of options are available to let you customize Emotron FDU 2.0 functionality and fully utilize the product according to your needs. The compact option boards increase flexibility and cost-efficiency. They are easy to mount and up to four options can be combined. Up to three I/O boards can be mounted, each providing three relays and three digital inputs.

### Versatile communication options

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

- Industrial Ethernet communication via Modbus/TCP, Profinet, EtherCAT and Ethernet/IP.
- Fieldbus communication via Profibus DP and DeviceNet
- 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.

### Standby supply

This option makes it possible to supply the control circuits of the Emotron FDU 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.

### Motor temperature protection

An internal intelligent temperature control offers improved motor protection and ensures a stable temperature that extends equipment life. Up to six PTC sensors, via a single isolated input, and up to three PT100 sensors can be con-

nected 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 transducer. 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.

### Motor filters

A selection of motor filters is available for improved protection of motor windings, for example, when long motor cables are used. Options include output chokes, overshoot clamps and sine wave filters. Filters are also available for protecting motor bearings from common mode currents.

### Safe stop without a contactor

A safe stop option board provides protection from 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

Emotron FDU models from 90 A can be provided with liquid cooling, offering a robust solution for harsh environments. The cabinet can have a protection class higher than IP54 since no ventilation openings are required. Operating and maintenance costs are lower since 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 AC drive. You will also reduce noise and heat in the electrical room.

### Extended EMC protection

The Emotron FDU 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 FDU is then delivered with the filter built into the housing, (< 45 kW) which means the protection class of the unit is not affected.

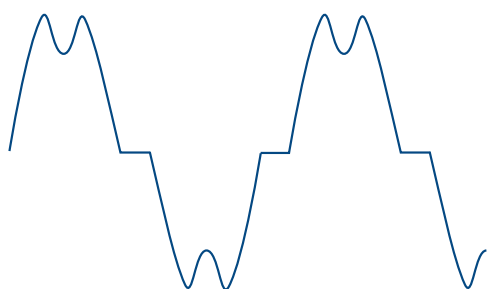
### Reduced harmonic distortions

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. The 55–1,000 kW Emotron AC drives are available with active front end technology (AFE) for applications demanding extremely low harmonic distortions. They produce typically less than THDI 5% compared to 30-50% in conventional drives.

### Synchronized bypass

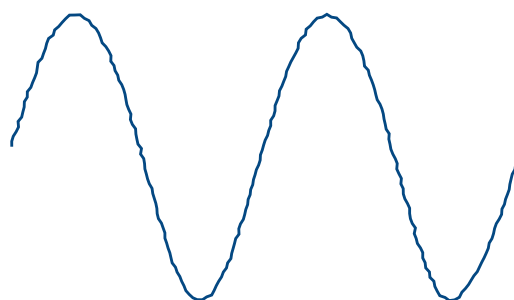
Synchronized bypass is used for switching motors over to mains supply after starting to full speed with an AC drive. The function can be used with fully loaded high power motors, even in low-inertia systems.

STANDARD 6-PULSE AC DRIVE



High current distortion: TDHI 30-50 %

EMOTRON AFE DRIVE



Low current distortion: TDHI 5%



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.

## 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.

### Full status reports make troubleshooting easier

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



### Fan control extends equipment lifetime

Emotron FDU 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. In addition, Emotron FDU has fewer and more accessible boards than most other AC drives. This increases reliability, facilitates maintenance and reduces downtime.

### Fold out for easy access

The modular design of the 160 to 3,000 kW Emotron AC drives gives easy access for servicing. The power modules can be folded out, which means repairs can be done without taking the whole drive apart. A complete power module can be kept as a spare part for maximum security.



APPLICATIONS  
Pumps  
Fans  
Compressors  
Blowers



# A wide and complete range to suit your needs

## TECHNICAL DATA

Emotron FDU 2.0 AC drives are available  
in the following range:

Rated power	0.55-3,000 kW
Supply voltage	230-690 V, 3-phase
Rated current	2.5-3,000 A
Protection class	IP20, IP21, IP54
Approvals	CE, UL/cUL (some IP20 sizes pending) DNV-GL (IP20 pending), GOST R

For further technical information, please see  
the Emotron FDU 2.0 technical catalogue.



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