




Emotron AFE drives

Low harmonic drives
Regenerative drives
55-1,100 kW, 380-690 V




Technical catalogue


15 April, 2013

 www.famcocorp.com

 E-mail: info@famcocorp.com

 @famco_group

 Tel: ۰۲۱-۴۸۰۰۰۰۴۹

 Fax: ۰۲۱ - ۴۴۹۹۴۶۴۲

تهران، کیلومتر ۲۱ بزرگراه لشگری (جاده مخصوص کرج)

روبروی پالایشگاه نفت پارس، پلاک ۱۲

Cost-efficient and trouble-free operation with Emotron AFE

Emotron Active Front End drives will save costs and improve reliability in your process. They are available in two versions: Low harmonic drives and Regenerative drives. Both are based on standard Emotron AC drives, providing the same benefits in reliability, easy handling and advanced functionality, as well a wide range of options. Emotron AFE units are delivered as complete solutions in IP54 classified cabinets. Setup is easy thanks to plug-and-play functionality to the mains supply.

Trouble-free operation

State-of-the-art technology make Emotron AFE drives produce extremely low harmonic distortions, thereby reducing power losses in supply equipment. They provide genuine unity power factor, which allows for optimized sizing of the distribution transformer and can lower the electricity transfer tariff. They also offer the possibility of reactive power compensation. The Emotron AFE drives are nonsensitive to voltage dips or harmonics from other equipment, which could cause it to trip or break down. Voltage boosting assures full motor power in case of mains voltage fluctuations.

Emotron AFE drives are delivered as complete solutions, including a robust IP54 classified Rittal cabinet, IGBT power modules, LCL filter, circuit breaker, main contactor, charging circuit and EMC filter.



Network friendly low harmonic drives

The demand for network friendly electronic equipment is continuously increasing. Low harmonic drives are the answer to this challenge, improving reliability and reducing investment costs in applications such as pumps and fans in the mining, marine and process industries.

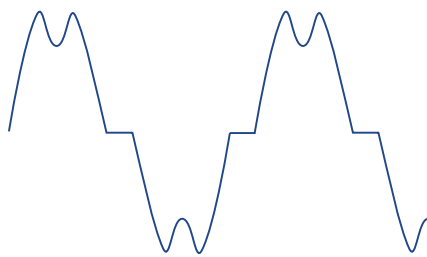
Extremely low harmonic distortions

Emotron Low harmonic drives produce typically less than THDI 5% compared to 30-50% in conventional drives, thereby fulfilling the IEEE-519 standard. Reduced power losses eliminate the need to overdimension cables and transformers. Lower distortions also cause fewer malfunctions in other electronic equipment.

Reactive power compensation

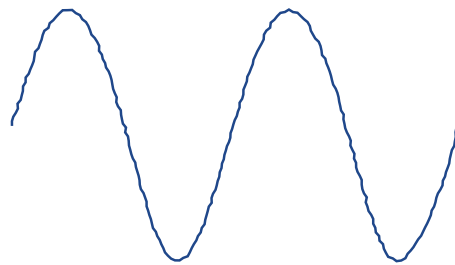
The AC drive is rated for 100% power in both directions. It provides genuine unity power factor, which allows for optimized sizing of the distribution transformer and can lower the electricity transfer tariff. It also provides the possibility of reactive power compensation.

STANDARD 6-PULSE AC DRIVE



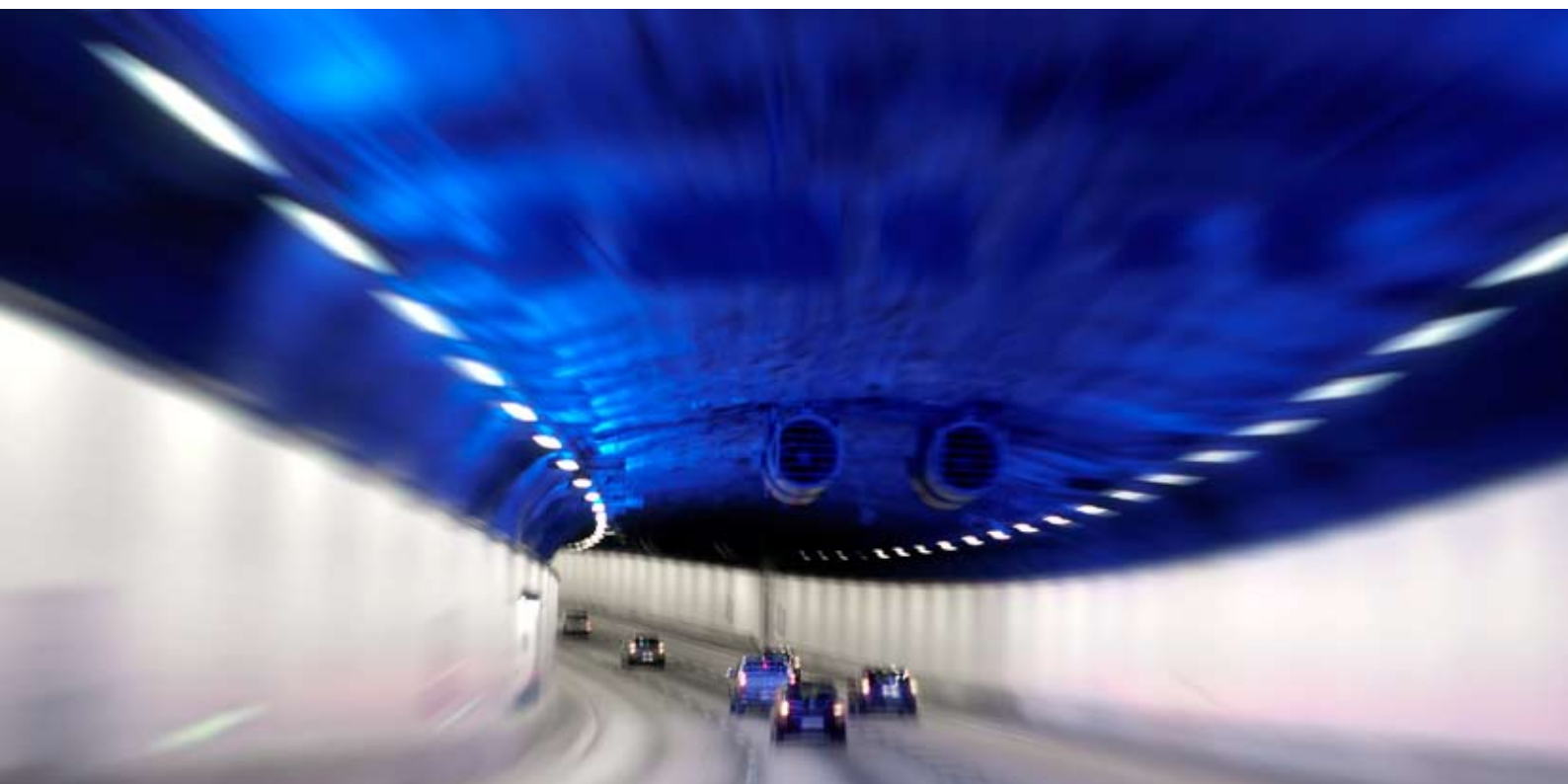
High current distortion: THDI 30-50%

EMOTRON AFE DRIVE



Low current distortion: THDI <5%

Low harmonic drives are the answer for applications demanding extremely low harmonic distortions. The results are improved reliability and reduced investment costs.



Energy saving regenerative drives

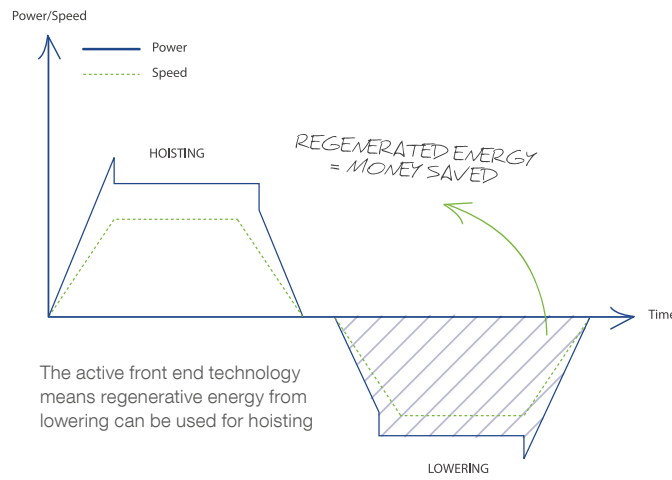
Emotron Regenerative drives, in addition to low harmonics, offer energy savings in applications with frequent braking, such as cranes, centrifuges, test benches, winders and ski lifts. They provide robust yet fast and smooth control, and allow uninterrupted power flow to and from the mains supply. Regenerative units can also be supplied as DC-bus feeder units.

Regenerative braking

Emotron Regenerative drives offer the option of feeding braking energy back to the mains instead of dissipating it via brake resistors. This will save considerable energy costs as well as the cost of investing in brake resistors, equipment that has limited lifetime and require cooling or external installation. The regenerative drives are rated for four quadrant operation with 100% power in both directions, ensuring continuous full braking power.

Trouble-free operation

The regenerative drive is nonsensitive to voltage drops or harmonics from other equipment which otherwise could cause it to trip or break down. Voltage boosting also assures full motor power in case of mains voltage fluctuations.



Regenerative drives save energy in, for example, crane operation, by feeding the braking energy back to the mains instead of dissipating it via brake resistors.



Technical data

Emotron VFXR - Regenerative drives

Emotron FDUL - Low harmonic drives

Typical motor power at mains voltage 400 V

VFXR/ FDUL model	Max output current I _{max} [A] *	Normal duty 120%, 1 min every 10 min		Heavy duty 150%, 1 min every 10 min		Frame	Dimensions Height = 2,250 mm Depth = 600 mm Width [mm]	Weight [kg]
		Rated current I _{nom} [A]	Power @400 V [kW]	Rated current I _{nom} [A]	Power @400 V [kW]			
46-109	131	109	55	87	45	E46+E=G	800	380
46-146	175	146	75	117	55	E46+E=G	800	400
46-175	210	175	90	140	75	E46+E=G	900	480
46-210	252	210	110	168	90	F46+F=H	900	500
46-250	300	250	132	200	110	F46+F=H	900	500
46-300	360	300	160	240	132	F46+H=I	1,300	700
46-375	450	375	200	300	160	G46+G	1,500	750
46-430	516	430	220	344	200	G46+H	1,500	830
46-500	600	500	250	400	220	H46+H	1,500	880
46-600	720	600	315	480	250	H46+I	1,900	1,040
46-650	780	650	355	520	315	I46+I	2,200	1,210
46-750	900	750	400	600	355	I46+I	2,200	1,210
46-860	1,032	860	450	688	400	I46+J	2,500	1,370
46-1K0	1,200	1,000	560	800	450	J46+J	3,000	1,600
46-1K2	1,440	1,200	630	960	500	J46+KA	3,300	1,700
46-1K5	1,800	1,500	800	1,200	630	K46+K	4,500	2,250
46-1K75	2,100	1,750	900	1,400	800	K46+L	On request	

Emotron VFXR/FDUL typical motor power at mains voltage 690 V

VFXR/ FDUL model	Max output current I _{max} [A] *	Normal duty 120%, 1 min every 10 min		Heavy duty 150%, 1 min every 10 min		Frame	Dimensions Height = 2,250 mm Depth = 600 mm Width [mm]	Weight [kg]
		Rated current I _{nom} [A]	Power @690 V [kW]	Rated current I _{nom} [A]	Power @690 V [kW]			
69-109	131	109	110	87	90	F69+F69=H69	800	410
69-146	175	146	132	117	110	F69+F69=H69	800	430
69-185	222	185	160	148	132	F69+F69=H69	900	540
69-250	300	250	250	200	200	H69+H69	1,800	870
69-300	360	300	315	240	250	H69+H69	1,800	870
69-375	450	375	355	300	315	H69+H69	1,800	910
69-430	516	430	450	344	355	I69+I69	2,800	1,350
69-560	672	560	560	448	450	I69+I69	2,800	1,390
69-749	900	750	710	600	600	J69+J69	On request	
69-995	1,200	1,000	1,000	800	800	K69+KA69	On request	
69-1K12	1,344	1,120	1,100	896	900	K69+K69	On request	

* Available for a limited time and as long as drive temperature permits.

Emotron AFR - Regenerative DC-bus supply unit

Emotron AFR46 output DC power at mains voltage 400 V

Model	Max Input current I _{max} [A] *	Normal duty 120%, 1 min every 10 min		Frame	Dimensions Height = 2,250 mm Depth = 600 mm Width [mm]	Weight [kg]
		Rated Input current I _{nom} [A]	Output DC power @400 V AC [kW]			
AFR46-175	210	175	115	E46	600	290
AFR46-250	300	250	165	F46	800	400
AFR46-375	450	375	250	G46	1,000	560
AFR46-500	600	500	330	H46	1,200	660
AFR46-750	900	750	500	I46	1,500	830
AFR46-1K0	1,200	1,000	660	J46	1,800	1,100
AFR46-1K5	1,800	1,500	1,000	K46	2,700	1,600

Emotron AFR69 output DC power at mains voltage 690 V

Model	Max Input current I _{max} [A] *	Normal duty 120%, 1 min every 10 min		Frame	Dimensions Height = 2,250 mm Depth = 600 mm Width [mm]	Weight [kg]
		Rated Input current I _{nom} [A]	Output DC power @690 V AC [kW]			
AFR69-175	210	175	200	F69	800	320
AFR69-350	420	350	400	H69	1,200	590
AFR69-525	630	525	600	I69	1,700	860
AFR69-700	840	700	800	J69	On request	
AFR69-1K05	1,260	1,050	1,200	K69	On request	

* Available for a limited time and as long as drive temperature permits.

General electrical specifications

General		
Mains voltage:	AFR46/VFXR46/FDUL46 AFR69/VFXR69/FDUL69	380 - 460V +10%/-15% 480 - 690V +10%/-15%
Mains frequency:		48 to 52Hz and 58 to 62Hz
Input total power factor:		1.0
Output DC voltage:	AFR46/AFR69	(1.0 - 1.2) * $\sqrt{2}$ * Mains supply voltage
Output AC voltage:	VFXR/FDUL46/69	(0 - 1.2) * Mains supply voltage
Output frequency:	VFXR/FDUL46/69	0-400 Hz
Switching frequency:	AFR46/AFR69	3 kHz (adjustable 3-6 kHz)
	VFXR/FDUL46/69	3 kHz (adjustable 1.5 - 6 kHz, FDUL only)
Efficiency at nominal load:	AFR46/AFR69	98%
	VFXR/FDUL46/69	97%
Harmonics to supply, THDI		< 5%

All units assembled in an IP54 cabinet including main switch + main contactor or motorized circuit breaker, LCL filter, charging unit, and output chokes (VFXR/FDUL 46-300 / 69-250 and up).

Environmental conditions

Operation

Parameter	Normal operation
Nominal ambient temperature	0 °C–40 °C. For operation at higher temperatures, see below.
Atmospheric pressure	86–106 kPa
Relative humidity, non-condensing	0–90%
Contamination, according to IEC 60721-3-3	No electrically conductive dust allowed. Cooling air must be clean and free from corrosive materials. Chemical gases, class 3C2 (Coated boards 3C3). Solid particles, class 3S2.
Vibrations	According to IEC 60068-2-6, Sinusoidal vibrations: 10<f<57 Hz, 0.075 mm 57<f<150 Hz, 1g
Altitude	0–1,000 m, 460 V AFE units, with derating 1%/100m of rated current up to 4,000 m. Coated boards recommended > 2,000m 690 V AFE units, with derating 1%/100m of rated current up to 2,000 m.

Storage

Parameter	Storage
Temperature	-20 to +60 °C
Atmoapheric pressure	86-106 kPa
Relative humidity, non-condensing	0-90%

Operation at higher temperatures


All Emotron AFE units are made for operation at maximum of 40°C ambient temperature. However it is possible to use the AFE units at higher temperatures with some loss in performance, using derating.
Derating: - 2,5 % per degree Celsius. Maximum is +5 °C (45 °C).

Basic I/O Data

Control signal inputs - Analogue (differential), 4 channels	
Analogue Voltage/current: Max. input voltage: Input impedance: Resolution: Hardware accuracy: Non-linearity	0-±10 V/0-20 mA via switch +30 V/30 mA 20 kΩ (voltage) / 250 Ω (current) 11 bits + sign 1% type + 1 ½ LSB (Least Significant Bit) fsd (full scale deflection) 1½ LSB
Control signal inputs - Digital, 8 channels	
Input voltage: Max. input voltage: Input impedance: Signal delay:	High: >9 VDC, Low: <4 VDC +30 VDC <3.3 VDC: 4.7 kΩ / ≥3.3 VDC: 3.6 kΩ ≤8 ms
Control signal outputs - Analogue, 2 channels	
Output voltage/current: Max. output voltage: Short-circuit current (∞): Output impedance: Resolution: Maximum load impedance for current Hardware accuracy: Offset: Non-linearity:	0-10 V/0-20 mA via parameter setting +15 V @5 mA cont. +15 mA (voltage), +140 mA (current) 10 Ω (voltage) 10 bit 500 Ω 1.9% of full scale deflection (voltage), 2.4% of full scale deflection (current) 3 LSB 2 LSB
Control signal outputs - Digital, 2 channels	
Output voltage: Shortcircuit current(∞):	High: >20 VDC @50 mA, >23 VDC open Low: <1 VDC @50 mA 100 mA max (together with +24 VDC)
Relays, 3 pcs	
Contacts	0.1 – 2 A/U _{max} 250 VAC or 42 VDC
Reference voltages	
+10VDC -10VDC +24VDC	+10 VDC @10 mA Short-circuit current +30 mA max - 10 VDC @10 mA +24 VDC Short-circuit current +100 mA max (together with Digital Outputs)


CG Drives & Automation


Mörsaregatan 12
Box 222 25
SE-250 24 Helsingborg
T +46 42 16 99 00
F +46 42 19 99 49
www.cgglobal.com / www.emotron.com

 www.famcocorp.com

 E-mail: info@famcocorp.com

 [@famco_group](https://www.instagram.com/famco_group)

 Tel: ۰۲۱-۴۸۰۰۰۰۴۹

 Fax: ۰۲۱ - ۴۴۹۹۴۶۴۲

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روبروی پالایشگاه نفت پارس، پلاک ۱۲