

**e m o t r o n**

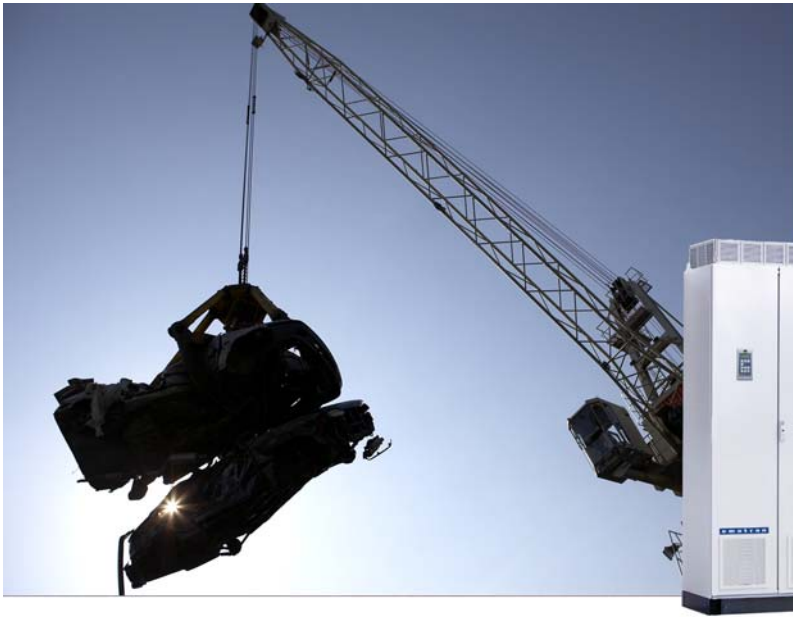
# Technical Catalogue

## AC Drives



Emotron VFX/FDU 2.0  
0.55 - 3000 kW, 230 - 690 V

## Emotron VFX 2.0 / High dynamics for demanding applications



The Emotron VFX 2.0 AC drive optimizes your process and prevents damage and downtime. The combination of direct torque control, accurate speed control and efficient vector braking makes it the ideal solution for all dynamic applications, such as cranes, crushers, mills, mixers and centrifuges.

### Main features

- Robust and certified IP54 metal construction as standard offers cost-efficient installation close to the application.
- All drive sizes are delivered with a built-in Category C3 EMC-filter as standard. C3 requirements are fulfilled with 80 m motor cable.
- Direct torque control reacts extremely quickly and eliminates disturbances due to abrupt load changes.
- Soft starts minimize start currents and full motor overload capacity is available from standstill.
- UL (UL 840) and marine (DNV) approved standard drive.
- Integrated vector braking ensures quick and controlled stops, increasing productivity and safety.
- Speed controlled fans assure less noise, a more even drive temperature and higher drive efficiency.
- Module fuses included as standard for sizes above 300 A at 480 V and above 210 A at 690 V.
- Detachable multilanguage control panel included as standard. Following languages are supported in the control panel: English, Swedish, Dutch, German, French, Spanish, Russian, Italian, Czech and Turkish.
- Operation parameters can be set in your process units, for example m/sec, tons/h or cycles/min.
- Removable control panel with own memory means it is easy to transfer or copy settings.
- Liquid cooled version available for sizes above 90 A.



UL 840



GOST R



## Emotron VFX 2.0

## Typical motor power at mains voltage 400 and 460 V

Model	Max. output current [A]*	Normal duty (120%, 1 min. every 10 min.)			Heavy duty (150%, 1 min. every 10 min.)			Frame size
		Power @ 400 V [kW]	Power @ 460 V [hp]	Rated current [A]	Power @ 400 V [kW]	Power @ 460 V [hp]	Rated current [A]	
VFX48-003	3.8	0.75	1	2.5	0.55	1	2.0	B
VFX48-004	6.0	1.5	2	4.0	1.1	1.5	3.2	
VFX48-006	9.0	2.2	3	6.0	1.5	2	4.8	
VFX48-008	11.3	3	3	7.5	2.2	3	6.0	
VFX48-010	14.3	4	5	9.5	3	3	7.6	
VFX48-013	19.5	5.5	7.5	13.0	4	5	10.4	
VFX48-018	27.0	7.5	10	18.0	5.5	7.5	14.4	
VFX48-026	39	11	15	26	7.5	10	21	C
VFX48-031	46	15	20	31	11	15	25	
VFX48-037	55	18.5	25	37	15	20	29.6	
VFX48-046	69	22	30	46	18.5	25	37	
VFX48-061	92	30	40	61	22	30	49	D
VFX48-074	111	37	50	74	30	40	59	
VFX48-090	108	45	60	90	37	50	72	E
VFX48-109	131	55	75	109	45	60	87	
VFX48-146	175	75	100	146	55	75	117	
VFX48-175	210	90	125	175	75	100	140	
VFX48-210	252	110	150	210	90	125	168	F
VFX48-228	300	110	200	228	90	150	182	
VFX48-250	300	132	200	250	110	150	200	
VFX48-300	360	160	250	300	132	200	240	G
VFX48-375	450	200	300	375	160	250	300	
VFX48-430	516	220	350	430	200	250	344	H
VFX48-500	600	250	400	500	220	350	400	
VFX48-600	720	315	500	600	250	400	480	I
VFX48-650	780	355	550	650	315	400	520	
VFX48-750	900	400	600	750	355	500	600	
VFX48-860	1032	450	700	860	400	550	688	J
VFX48-1000	1200	500	800	1000	450	650	800	
VFX48-1200	1440	630	1000	1200	500	800	960	K
VFX48-1500	1800	800	1250	1500	630	1000	1200	
Sizes 900 kW - 2000 kW available on request								

\* Available for a limited time and as long as drive temperature permits. Rated data at 40 °C ambient temperature

Note: calculate available 230 V motor power by multiplying the 400 V power value (kW) from table above with 0.575 or use motor rated current for drive selection. Example: VFX48-046, 22 kW x 0.575 = 12.6 kW at 230 V

## Emotron VFX 2.0

## Typical motor power at mains voltage 525 V

Model	Max. output current [A]*	Normal duty (120%, 1 min. every 10 min.)		Heavy duty (150%, 1 min. every 10 min.)		Frame size
		Power @ 525 V [kW]	Rated current [A]	Power @ 525 V [kW]	Rated current [A]	
VFX52-003	3.8	1.1	2.5	1.1	2.0	B
VFX52-004	6.0	2.2	4.0	1.5	3.2	
VFX52-006	9.0	3	6.0	2.2	4.8	
VFX52-008	11.3	4	7.5	3	6.0	
VFX52-010	14.3	5.5	9.5	4	7.6	
VFX52-013	19.5	7.5	13.0	5.5	10.4	
VFX52-018	27.0	11	18.0	7.5	14.4	
VFX52-026	39	15	26	11	21	C
VFX52-031	46	18.5	31	15	25	
VFX52-037	55	22	37	18.5	29.6	
VFX52-046	69	30	46	22	37	
VFX52-061	92	37	61	30	49	D
VFX52-074	111	45	74	37	59	
VFX69-090	108	55	90	45	72	F69
VFX69-109	131	75	109	55	87	
VFX69-146	175	90	146	75	117	
VFX69-175	210	110	175	90	140	
VFX69-210	252	132	210	110	168	H69
VFX69-250	300	160	250	132	200	
VFX69-300	360	200	300	160	240	
VFX69-375	450	250	375	200	300	
VFX69-430	516	300	430	250	344	I69
VFX69-500	600	315	500	300	400	
VFX69-600	720	400	600	315	480	J69
VFX69-650	780	450	650	355	520	
VFX69-750	900	500	750	400	600	K69
VFX69-860	1032	560	860	450	688	
VFX69-1000	1200	630	1000	500	800	
Sizes 710 kW - 2200 kW available on request						

\* Available for a limited time and as long as drive temperature permits. Rated data at 40 °C ambient temperature.

## Emotron VFX 2.0

## Typical motor power at mains voltage 575 and 690 V

Model	Max. output current [A]*	Normal duty (120%, 1 min. every 10 min.)			Heavy duty (150%, 1 min. every 10 min.)			Frame size
		Power @ 575 V [hp]	Power @ 690 V [kW]	Rated current [A]	Power @ 575 V [hp]	Power @ 690 V [kW]	Rated current [A]	
VFX69-090	108	75	90	90	60	75	72	F69
VFX69-109	131	100	110	109	75	90	87	
VFX69-146	175	125	132	146	100	110	117	
VFX69-175	210	150	160	175	125	132	140	
VFX69-210	252	200	200	210	150	160	168	H69
VFX69-250	300	250	250	250	200	200	200	
VFX69-300	360	300	315	300	250	250	240	
VFX69-375	450	350	355	375	300	315	300	
VFX69-430	516	400	450	430	350	315	344	I69
VFX69-500	600	500	500	500	400	355	400	J69
VFX69-600	720	600	600	600	500	450	480	
VFX69-650	780	650	630	650	550	500	520	K69
VFX69-750	900	750	710	750	600	600	600	
VFX69-860	1032	850	800	860	700	650	688	
VFX69-900	1080	900	900	900	750	710	720	
VFX69-1000	1200	1000	1000	1000	850	800	800	

Sizes 1100 kW - 3000 kW available on request

\* Available for a limited time and as long as drive temperature permits. Rated data at 40 °C ambient temperature



## Emotron FDU 2.0 / Secure the flow and save energy



The Emotron FDU 2.0 AC drive is specially developed for regulating flow and pressure. It continuously adapts motor speed to the level required, minimizing energy consumption and wear. A unique monitoring functionality protects your process from damage and unplanned downtime. Typical applications are pumps, fans, compressors and blowers.

### Main features

- Robust and certified IP54 metal construction as standard offers costefficient installation close to the application.
- All drive sizes are delivered with built-in Category C3 EMC-filter as standard. C3 requirements are fulfilled with 80 m motor cable.
- Soft starts minimize start currents and linear stops prevent water hammer.
- One Emotron FDU can control up to seven units without external control systems.
- Energy saving function pauses the motor when it is not required to run to maintain pressure.
- Efficiency is increased by setting the pump to run at full speed at certain intervals to rinse out sludge.
- Speed controlled fans assures less noise, a more even drive temperature and higher efficiency.
- Module fuses included as standard for sizes above 300 A at 480 V and above 210 A at 690 V.
- Detachable multilanguage control panel included as standard. Following languages are supported in the control panel: English, Swedish, Dutch, German, French, Spanish, Russian, Italian, Czech and Turkish.
- Operation parameters can be set in your process units, for example m<sup>3</sup>/min. and bar.
- Removable control panel with own memory means it is easy to transfer or copy settings.
- UL (UL 840) and marine (DNV) approved standard drive.
- Liquid cooled version available for sizes above 90 A.



UL 840



GOST R



## Emotron FDU 2.0

## Typical motor power at mains voltage 400 and 460 V

Model	Max. output current [A]*	Normal duty (120%, 1 min. every 10 min.)			Heavy duty (150%, 1 min. every 10 min.)			Frame size
		Power @ 400 V [kW]	Power @ 460 V [hp]	Rated current [A]	Power @ 400 V [kW]	Power @ 460 V [hp]	Rated current [A]	
FDU48-003	3.0	0.75	1	2.5	0.55	1	2.0	B
FDU48-004	4.8	1.5	2	4.0	1.1	1.5	3.2	
FDU48-006	7.2	2.2	3	6.0	1.5	2	4.8	
FDU48-008	9.0	3	3	7.5	2.2	3	6.0	
FDU48-010	11.4	4	5	9.5	3	3	7.6	
FDU48-013	15.6	5.5	7.5	13.0	4	5	10.4	
FDU48-018	21.6	7.5	10	18.0	5.5	7.5	14.4	
FDU48-026	31	11	15	26	7.5	10	21	C
FDU48-031	37	15	20	31	11	15	25	
FDU48-037	44	18.5	25	37	15	20	29.6	
FDU48-046	55	22	30	46	18.5	25	37	
FDU48-061	73	30	40	61	22	30	49	D
FDU48-074	89	37	50	74	30	40	59	
FDU48-090	108	45	60	90	37	50	72	E
FDU48-109	131	55	75	109	45	60	87	
FDU48-146	175	75	100	146	55	75	117	
FDU48-175	210	90	125	175	75	100	140	
FDU48-210	252	110	150	210	90	125	168	F
FDU48-228	300	110	200	228	90	150	182	
FDU48-250	300	132	200	250	110	150	200	
FDU48-300	360	160	250	300	132	200	240	G
FDU48-375	450	200	300	375	160	250	300	
FDU48-430	516	220	350	430	200	250	344	H
FDU48-500	600	250	400	500	220	350	400	
FDU48-600	720	315	500	600	250	400	480	I
FDU48-650	780	355	550	650	315	400	520	
FDU48-750	900	400	600	750	355	500	600	
FDU48-860	1032	450	700	860	400	550	688	J
FDU48-1000	1200	500	800	1000	450	650	800	
FDU48-1200	1440	630	1000	1200	500	800	960	K
FDU48-1500	1800	800	1250	1500	630	1000	1200	
Sizes 900 - 2000 kW available on request								

\* Available for a limited time and as long as drive temperature permits. Rated data at 40 °C ambient temperature.

Note: calculate available 230 V motor power by multiplying the 400 V power value (kW) from table above with 0.575 or use motor rated current for drive selection. Example: FDU48-046, 22 kW x 0.575 = 12.6 kW at 230 V

## Emotron FDU 2.0

## Typical motor power at mains voltage 525 V

Model	Max. output current [A]*	Normal duty (120%, 1 min. every 10 min.)		Heavy duty (150%, 1 min. every 10 min.)		Frame size
		Power @ 525 V [kW]	Rated current [A]	Power @ 525 V [kW]	Rated current [A]	
FDU52-003	3.0	1.1	2.5	1.1	2.0	B
FDU52-004	4.8	2.2	4.0	1.5	3.2	
FDU52-006	7.2	3	6.0	2.2	4.8	
FDU52-008	9.0	4	7.5	3	6.0	
FDU52-010	11.4	5.5	9.5	4	7.6	
FDU52-013	15.6	7.5	13.0	5.5	10.4	
FDU52-018	21.6	11	18.0	7.5	14.4	
FDU52-019	22	11	18	7.5	14.4	C
FDU52-026	31	15	26	11	21	
FDU52-031	37	18.5	31	15	25	
FDU52-037	44	22	37	18.5	29.6	
FDU52-046	55	30	46	22	37	
FDU52-061	73	37	61	30	49	D
FDU52-074	89	45	74	37	59	
FDU69-090	108	55	90	45	72	F69
FDU69-109	131	75	109	55	87	
FDU69-146	175	90	146	75	117	
FDU69-175	210	110	175	90	140	
FDU69-210	252	132	210	110	168	H69
FDU69-250	300	160	250	132	200	
FDU69-300	360	200	300	160	240	
FDU69-375	450	250	375	200	300	
FDU69-430	516	300	430	250	344	I69
FDU69-500	600	315	500	300	400	
FDU69-600	720	400	600	315	480	J69
FDU69-650	780	450	650	355	520	
FDU69-750	900	500	750	400	600	K69
FDU69-860	1032	560	860	450	688	
FDU69-1000	1200	630	1000	500	800	
Sizes 710 - 2200 kW available on request						

\* Available for a limited time and as long as drive temperature permits. Rated data at 40 °C ambient temperature.

## Emotron FDU 2.0

Typical motor power at mains voltage 575 and 690 V

Model	Max. output current [A]*	Normal duty (120%, 1 min. every 10 min.)			Heavy duty (150%, 1 min. every 10 min.)			Frame size
		Power @ 575 V [hp]	Power @ 690 V [kW]	Rated current [A]	Power @ 575 V [hp]	Power @ 690 V [kW]	Rated current [A]	
FDU69-090	108	75	90	90	60	75	72	F69
FDU69-109	131	100	110	109	75	90	87	
FDU69-146	175	125	132	146	100	110	117	
FDU69-175	210	150	160	175	125	132	140	
FDU69-210	252	200	200	210	150	160	168	H69
FDU69-250	300	250	250	250	200	200	200	
FDU69-300	360	300	315	300	250	250	240	
FDU69-375	450	350	355	375	300	315	300	
FDU69-430	516	400	450	430	350	315	344	I69
FDU69-500	600	500	500	500	400	355	400	J69
FDU69-600	720	600	600	600	500	450	480	
FDU69-650	780	650	630	650	550	500	520	K69
FDU69-750	900	750	710	750	600	600	600	
FDU69-860	1032	850	800	860	700	650	688	
FDU69-900	1080	900	900	900	750	710	720	
FDU69-1000	1200	1000	1000	1000	850	800	800	

Sizes 1100 - 3000 kW available on request

\* Available for a limited time and as long as drive temperature permits. Rated data at 40 °C ambient temperature.



# General specifications for Emotron VFX/FDU 2.0

## General

Mains voltage: *	VFX/FDU48	230-480 V** +10 %/-15 % (-10 % at 230 V)
	VFX/FDU52	440-525 V** +10 %/-15 %
	VFX/FDU69	500-690 V** +10 %/-15 %
Mains frequency		45 to 65 Hz
Input total power factor		0.95
Output voltage		0–Mains supply voltage:
Output frequency		0–400 Hz
Output switching frequency		3 kHz (FDU adjustable 1.5-6 kHz)
Efficiency at nominal load		97 % for models 003 to 018 98 % for models 026 to 1500

\* Available for both grounded and isolated supply (TN and IT nets).

\*\* Nominal voltage selected with parameter.

## Dimensions, weights and cooling air flow

The table below gives an overview of the dimensions, weights and requirements for air flow if mounted in cabinet. The models 300 to 1500 consist of 2, 3, 4 or 6 paralleled power modules (PEBB-s) built into a standard enclosure.

Models	Frame size	Dim. H x W x D [mm] IP20	Dim. H x W x D [mm] IP54	Weight IP20/IP54 [kg]	Air flow [m <sup>3</sup> /hour]
003 to 018	B	-	350(416) x 203 x 200	-/12.5	75
026 to 046	C	-	440(512) x 178 x 292	-/24	026-031=120, 037-046=170
061 to 074	D	-	545(590) x 220 x 295	-/32	175
90 to 109	E	-	950 x 285 x 314	-/56	510
146 to 175	E	-	950 x 285 x 314	-/60	510
210 to 250	F	-	950 x 345 x 314	-/74	800
300 to 375	G (2xE)	1036 x 500 x 390	2250 x 600 x 600	140/350	1020
430 to 500	H (2xF)	1036 x 500 x 450	2250 x 600 x 600	170/380	1600
600 to 750	I (3xF)	1036 x 730 x 450	2250 x 900 x 600	248/506	2400
860 to 1000	J (2xH)	1036 x 1100 x 450	2250 x 1200 x 600	340/697	3200
1200 to 1500	K (2xI)	1036 x 1560 x 450	2250 x 1800 x 600	496/987	4800

Models	Frame size	Dim. H x W x D [mm] IP20	Dim. H x W x D [mm] IP54	Weight IP20/IP54 [kg]	Air flow [m <sup>3</sup> /hour]
90 to 175	F69	-	1090 x 345 x 314	-/77	800
210 to 375	H69 (2xF69)	1176 x 500 x 450	2250 x 600 x 600	176/399	1600
430 to 500	I69 (3xF69)	1176 x 730 x 450	2250 x 900 x 600	257/563	2400
600 to 650	J69 (2xH69)	1176 x 1100 x 450	2250 x 1200 x 600	352/773	3200
750 to 1000	K69 (2xI69)	1176 x 1560 x 450	2250 x 1800 x 600	514/1100	4800

## Environmental conditions

Parameter	Normal operation
Nominal ambient temperature	0°C–40°C
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 Size B, C & D: IEC 60721-3-3 3M4 (2 - 9 Hz, 3.0mm and 9 - 20Hz, acc. 1g (10m/s <sup>2</sup> ))
Altitude	0–1000 m 480V AC drives, with derating 1%/100 m of rated current up to 4000 m 690V AC drives, with derating 1%/100 m of rated current up to 2000 m Coated boards required for 2000 - 4000m.

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

## Operation at higher temperatures

Most Emotron AC drives are designed for operation at maximum of 40 °C ambient temperature.

However, for most models, it is possible to use the AC drive at higher temperatures with little loss in performance.

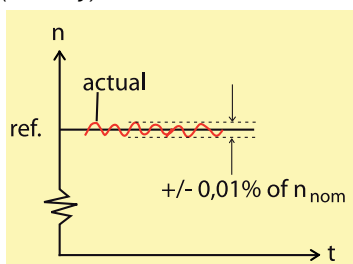
Table 1 shows ambient temperatures as well as derating for higher temperatures.

Table 1 Ambient temperature and derating 400–690 V types

Model	IP20		IP54	
	Max temp.	Derating: possible	Max temp.	Derating: possible
VFXFDU**-003 to VFXFDU**-074	–	–	40 °C	-2.5 %/°C to max +10 °C (50 °C)
VFXFDU48-090 to VFXFDU48-250 VFXFDU69-090 to VFXFDU69-175	–	–	40 °C	-2.5 %/°C to max +5 °C (45 °C)
VFXFDU48-300 to VFXFDU48-1500 VFXFDU69-210 to VFXFDU69-1000	40 °C	-2.5 %/°C to max +5 °C (45 °C)	40 °C	-2.5 %/°C to max +5 °C (45 °C)

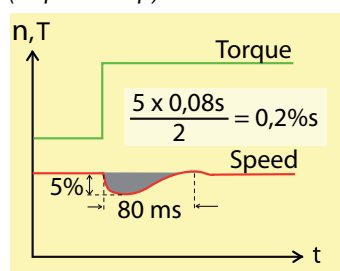
## Control performance for Emotron VFX 2.0 (Speed)

Speed control static accuracy (linearity):



Closed loop = 0.01 % of  $n_{nom}$   
Open loop = 0.1 % of  $n_{nom}$

Speed Control dynamic accuracy (impact drop):

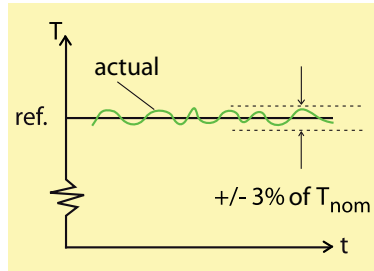


Closed loop = 0.2 %sec (100 % load step)

Open loop = 0.4 %sec (100 % load step)

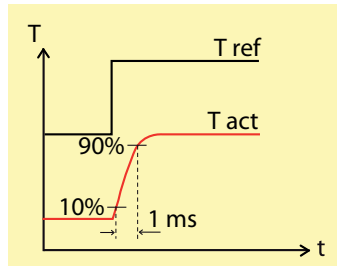
### Control performance for Emotron VFX 2.0 (Torque)

Torque control static accuracy (linearity):



Closed loop: <3 % of  $T_{nom}$   
 Open loop: <3 % for speeds 10 - 100% of rated and <10 % at zero speed (% of  $n_{nom}$ )

Torque control dynamic accuracy:



Closed & open loop : 100 % torque  
 step rise time = 1 ms.

### Control performance for Emotron FDU 2.0 (V/Hz)

Speed control accuracy = approx. 1 % of  $n_{nom}$  (slip frequency).  
 Torque accuracy = approx. 5 % of  $T_{nom}$  (20 - 100% speed).

### Basic I/O Data

<b>Control signal inputs: Analogue (differential), 4 channels</b>	
Analogue voltage/current Max. input voltage Input impedance Resolution Hardware accuracy Non-linearity	0-±10 V/0-20 mA via software setting +30 V 20 kΩ (voltage) 250 Ω (current) 11 bits + sign 0.5 % type + 1 ½ LSB fsd 1½ LSB
<b>Digital: 8 channels</b>	
Input voltage Max. input voltage Input impedance Signal delay	High > 9 V <sub>DC</sub> Low < 4 V <sub>DC</sub> +30 V <sub>DC</sub> < 3.3 V <sub>DC</sub> : 4.7 kΩ , ≥ 3.3 V <sub>DC</sub> : 3.6 kΩ ≤ 8 ms
<b>Control signal outputs: Analogue, 2 channels</b>	
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 switch +15 V @ 5 mA cont. +15 mA (voltage) +140 mA (current) 10 Ω (voltage) 10 bit 500 Ω 1.9 % type fsd (voltage), 2.4 % type fsd (current) 3 LSB 2 LSB
<b>Digital, 2 channels</b>	
Output voltage Short-circuit current(∞)	High > 20 V <sub>DC</sub> @ 50 mA, > 23 V <sub>DC</sub> open Low < 1 V <sub>DC</sub> @ 50 mA 100 mA max (together with +24 V <sub>DC</sub> )
<b>Relays, 3 pcs</b>	
Contacts	0.1 - 2 A/U <sub>max</sub> 250 V <sub>AC</sub> or 42 V <sub>DC</sub>
<b>Reference voltages</b>	
+10V <sub>DC</sub> -10V <sub>DC</sub> +24V <sub>DC</sub>	+10 V <sub>DC</sub> @ 10 mA short-circuit current +30 mA max -10 V <sub>DC</sub> @ 10 mA +24 V <sub>DC</sub> short-circuit current +100 mA max (together with Digital Outputs)

See "User interface data" on page 15 for connection data and default settings.

Photo gallery



VFX/FDU48/52: Model 003 - 018 (B)



VFX/FDU48/52: Model 026 - 046 (C)



VFX/FDU48/52: Model 061 - 074 (D)



VFX/FDU48: Model 090 - 175 (E)



VFX/FDU48: Model 210 - 250 (F)  
VFX/FDU69: Model 090 - 175 (F69)



VFX/FDU: Model 600 - 750 (I) IP20 module



VFX/FDU48: Model 300 - 500 (G and H)  
VFX/FDU69: Model 210 - 375 (H69)



VFX/FDU48: Model 600 - 750 (I)  
VFX/FDU69: Model 430 - 500 (I69)

## Fuses, cable dimensions and glands according IEC ratings

Use mains fuses of type gL/gG conforming to IEC 269 or circuit breaker with similar characteristics. Check the equipment first before installing the glands. In due time only metric glands will be used.  
Max. fuse = maximum fuse value that still protects the AC drive and upholds warranty.

NOTE: The dimensions of fuse and cable cross-section are dependent on the application and must be determined in accordance with local regulations.

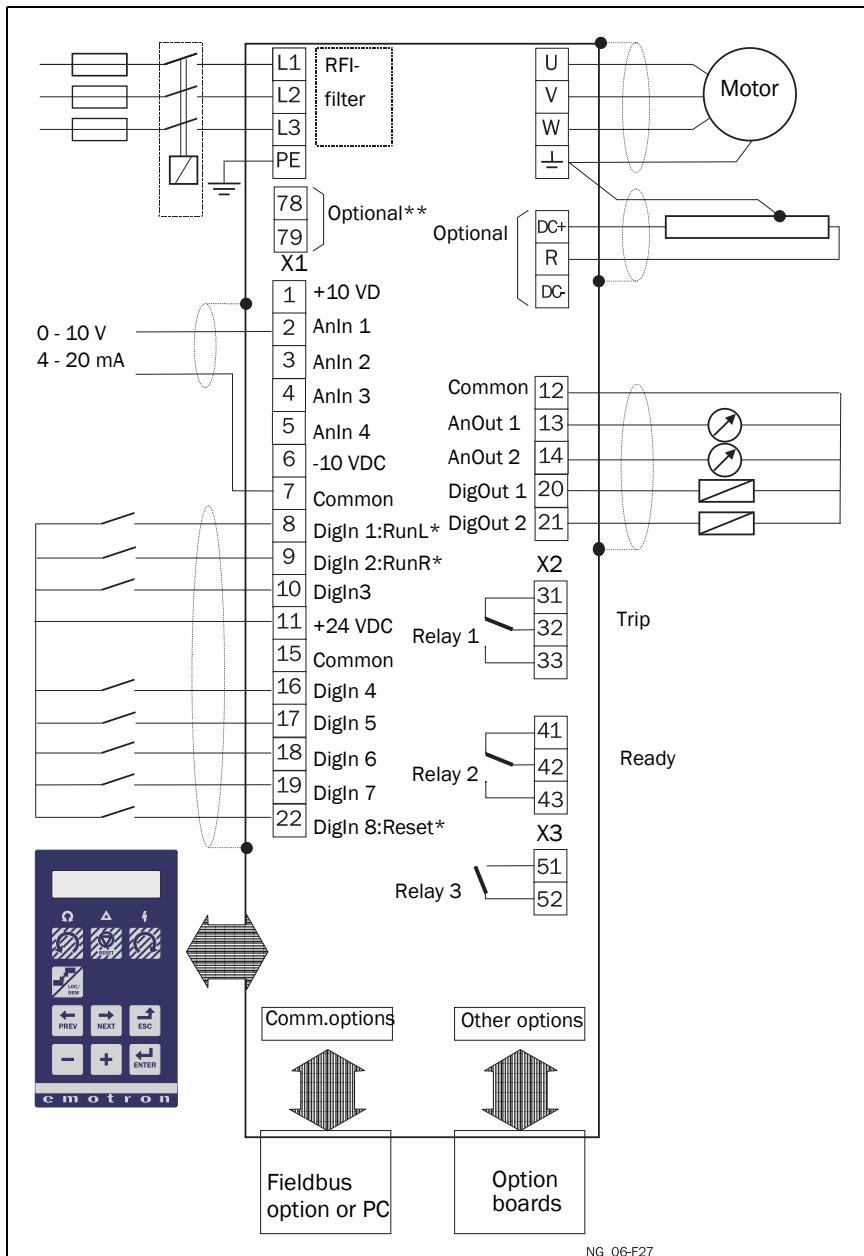
NOTE: The dimensions of the power terminals used in models 300 to 1500 can differ depending on customer specification.

Model	Nominal input current [A]	Maximum value fuse [A]	Maximum cable cross section range supported [mm <sup>2</sup> ]	Clamping range glands [mm]		
			Mains and motor	Mains	Motor	
VFX/FDU48-003 VFX/FDU48-004 VFX/FDU48-006	2.2 3.5 5.2	4 4 6	0.5 - 10	M32 opening M20 +reducer (6-12)		
VFX/FDU48-008 VFX/FDU48-010	6.9 8.7	8 10		M32 (12-20)	M32 opening M25+reducer (10-14)	
VFX/FDU48-013 VFX/FDU48-018	11.3 15.6	16 20		M32 (16-25)	M32 (13-18)	
VFX/FDU**-026 VFX/FDU**-031	22 26	25 35		2.5-16	M32 (15-21)	M32 (13 - 18)
VFX/FDU**-037 VFX/FDU**-046	31 38	35 50			M40 (19-28)	M40 (18 - 25)
VFX/FDU**-061 VFX/FDU**-074	52 64	63 80			1 - 35 stranded wire 1 - 50 solid wire	M50 (27-35)
VFX/FDU**-090 VFX/FDU**-109	78 94	100 100	16-95	VFXFDU48: Ø17-42 cable flexible leadthrough or M50 opening. VFXFDU69: Ø23-55 Cable flexible leadthrough or M63 opening.		
VFX/FDU**-146 VFX/FDU**-175	126 152	160 160	35-150			
VFX/FDU**-210 VFX/FDU**-228 VFX/FDU**-250	182 197 216	200 250 250	VFX/FDU48: 35-240 VFX/FDU69: 35-150	Ø23-55 cable flexible leadthrough or M63 opening.		
VFX/FDU**-300 VFX/FDU**-375	260 324	300 355	VFX/FDU48: (2x) 35-240 VFX/FDU69: (2x) 35-150	-	-	
VFX/FDU**-430 VFX/FDU**-500	372 432	400 500	VFX/FDU48: (2x) 35-240 VFX/FDU69: (3x) 35-150	-	-	
VFX/FDU**-600 VFX/FDU**-650	520 562	630 630	VFX/FDU48: (3x) 35-240 VFX/FDU69: (4x) 35-150	-	-	
VFX/FDU**-750	648	710	VFX/FDU48: (3x) 35-240 VFX/FDU69: (6x) 35-150			
VFX/FDU**-860 VFX/FDU**-900 VFX/FDU**-1000	744 795 864	800 900 1000	VFX/FDU48: (4x) 35-240 VFX/FDU69: (6x) 35-150	-	-	
VFX/FDU**-1200 VFX/FDU**-1500	1037 1296	1250 1500	VFX/FDU48: (6x) 35-240	-	-	

## Fuses and cable dimensions according NEMA ratings

Model	Input current [Arms]	Mains input fuses		Cable cross section range supported
		UL Class J TD (A)	Ferraz-Shawmut type	Mains and motor
VFX/FDU48-003	2.2	6	AJT6	AWG 20 - AWG 6
VFX/FDU48-004	3.5	6	AJT6	
VFX/FDU48-006	5.2	6	AJT6	
VFX/FDU48-008	6.9	10	AJT10	
VFX/FDU48-010	8.7	10	AJT10	
VFX/FDU48-013	11.3	15	AJT15	
VFX/FDU48-018	16	20	AJT20	AWG 12 - AWG 4
VFX/FDU48-026	22	25	AJT25	
VFX/FDU48-031	26	30	AJT30	
VFX/FDU48-037	31	35	AJT35	
VFX/FDU48-046	38	45	AJT45	
VFXFDU48-061	52	60	AJT60	
VFXFDU48-074	65	80	AJT80	AWG 10- AWG 0
VFX/FDU48-090	78	100	AJT100	AWG 4 - AWG 3/0
VFX/FDU48-109	94	110	AJT110	
VFX/FDU48-146	126	150	AJT150	AWG 1 - AWG 3/0 AWG 4/0 - 300 kcmil
VFX/FDU48-175	152	175	AJT175	
VFX/FDU48-210	182	200	AJT200	AWG 3/0 - 400 kcmil
VFX/FDU48-228	197	250	AJT250	
VFX/FDU48-250	216	250	AJT250	
VFX/FDU48-300	260	300	AJT300	
VFX/FDU48-375	324	350	AJT350	2 x AWG 4/0 - 2 x 300 kcmil
VFX/FDU48-430	372	400	AJT400	2 x AWG 3/0 - 2 x 400 kcmil
VFX/FDU48-500	432	500	AJT500	
VFX/FDU48-600	520	600	AJT600	3 x AWG 4/0 - 3 x 300 kcmil
VFX/FDU48-650	562	600	AJT600	
VFX/FDU48-750	648	700	A4BQ700	
VFX/FDU48-860	744	800	A4BQ800	4 x AWG 4/0 - 4 x 300 kcmil
VFX/FDU48-1000	864	1000	A4BQ1000	
VFX/FDU48-1200	1037	1200	A4BQ1200	6 x AWG 4/0 - 6 x 300 kcmil
VFX/FDU48-1500	1296	1500	A4BQ1500	

User interface data



- \* = Default selection
- \*\* = Optional terminals X1: 78 - 79 for connection of Motor-PTC on sizes B, C and D.

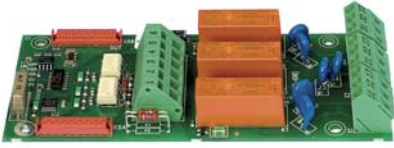
X1	Name:	Function (Default):
1	+10 V	+10 VDC Supply voltage
2	AnIn1	Speed reference
3	AnIn2	Not used
4	AnIn3	Not used
5	AnIn4	Not used
6	-10 V	-10VDC Supply voltage
7	Common	Signal ground
8	DigIn 1	RunL
9	DigIn 2	RunR
10	DigIn 3	Not used
11	+24 V	+24VDC Supply voltage
12	Common	Signal ground
13	AnOut 1	Min speed to max speed
14	AnOut 2	0 to max torque
15	Common	Signal ground
16	DigIn 4	Not used
17	DigIn 5	Not used
18	DigIn 6	Not used
19	DigIn 7	Not used
20	DigOut 1	Ready
21	DigOut 2	Brake/No trip
22	DigIn 8	Reset
X2		
31	N/C 1	Relay 1 output=Trip Active when the AC drive is in a TRIP condition. N/C is opened when the relay is active (valid for all relays) N/O is closed when the relay is active (valid for all relays)
32	COM 1	
33	N/O 1	
41	N/C 2	Relay 2 Output=Ready Active when the AC drive is ready to start
42	COM 2	
43	N/O 2	
X3		
51	COM 3	Relay 3 Output=Not used
52	N/O 3	

All inputs and outputs are programmable.

## Standard options for Emotron FDU/VFX 2.0

Support for 3 option boards plus 1 communication option.

### I/O board



3 extra relay outputs (230 V<sub>AC</sub>/5 A NO/NC). 3 extra 24 V /3.2 k $\Omega$  (AC or DC) differential digital inputs, all programmable. Inputs providing 50 Vac,dc isolation between channels.

Maximum 3 I/O boards can be built -in per AC drive.

Part no. 01-3876-01

### Encoder board



Differential encoder input suitable for 5 V (TTL) or 24 V (HTL) incremental encoders, range 5-16384 pulses/revolution. Inputs min 9 k $\Omega$ . Max frequency = 100 kHz. For single

ended or differential type of encoders (A/B, A'/B'). Selectable encoder supply voltage output 5 V<sub>DC</sub> or 24 V<sub>DC</sub>.

Part no. 01-3876-03

### PTC/PT100 board



1 PTC isolated input conforming DIN 44081/44082. Max 6 PTC thermistors can be connected in series to PTC input. Also including 3 PT100 inputs, 2/3/4-wire, conforming EN 60751.

Part no. 01-3876-08

### CRIO board (VFX)

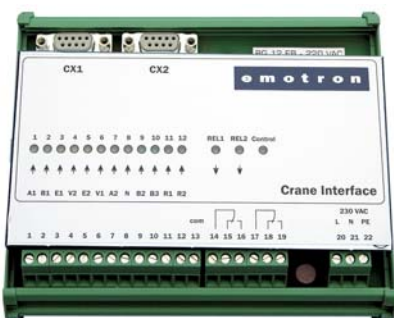


Crane option board to control hoist or travel motions. Inputs for joystick control: supporting 4-step, motor potentiometer or analog reference joystick types. Inputs for slow down and end limits switches (2+2). All 12 digital inputs 24 V/5 k $\Omega$  (8 - 24V) DC.

2 relay outputs 250 V/2A<sub>AC</sub>, for mechanical brake and load deviation protection. Load dependent field weakening operation of hoists also supported.

Part no. 01-3876-07

### Crane interface (VFX)



Isolated I/O interface for control signals between (existing) crane controls and crane option board (CRIO).

• HxWxD = 125 x 150 x 50 mm

- Available for 230 V/27 k $\Omega$  (120 - 250V) AC or 24 V /2.7 k $\Omega$  (15 - 36 V) DC input signals.
- LED indications for all inputs and outputs.
- For DIN-rail mounting.

Part no. 590059 (230 V<sub>AC</sub>)  
590060 (24 V<sub>DC</sub>)

### Fieldbus - Profibus



Fieldbus option module for Profibus DP or DP V1 communication. Use 9-pin D-sub connector. Baud rates: 9.6 kbits/s - 12 Mbits/s supported. Typical drive response time = 10 ms

(not including any fieldbus delays).  
Part no. 01-3876-05

### Fieldbus - DeviceNet



Fieldbus option module for DeviceNet communication. Baud rates: 125 - 500 kbits/s supported.

Typical drive response time = 10 ms (not including any fieldbus delays).  
Part no. 01-3876-06

### Ethernet - Modbus/TCP



Industrial Ethernet option module for Modbus/TCP protocol. RJ45 type connector. Baud rates: 10 or 100 Mbits/s supported.

Typical drive response time = 10 ms (not including any fieldbus delays).  
Part no. 01-3876-09

### RS232/RS485 isolated



Isolated RS232/RS485 serial communication board. For Modbus/RTU communication protocol. Baud rates: 2400 - 38400 bits/s supported.

Typical drive response time = 10 ms (not including any fieldbus delays).  
Part no. 01-3876-04

### Coated boards



All drive boards are also available as coated, recommended e.g. for sewer pump applications (chlorine gases) or installations with occasional high humidity (if machine room installation or tropical climate). IEC60721-3-3 gases class 3C3, solid particles class 3S2.

## Control panel kit, incl. blank panel



External control panel IP54 suitable for mounting on a cabinet door. This option is to be used in combination with a AC drive module ordered with a built-in control panel.

Part no. 01-3957-01

## Control panel kit, incl. control panel



External control panel IP54 suitable for mounting on a panel door. This option is to be used in combination with a AC drive module ordered with a blank control panel.

Part no. 01-3957-00

## Handheld Control Panel 2.0



Handheld Control Panel - HCP 2.0 is a complete control panel, easy to connect to the AC drive, for temporary use during e.g. commissioning and service.

The HCP has full functionality. It is possible to set parameters, view actual values and fault logger. It is

also possible to copy parameter data from one AC drive to the HCP and then load this data to other AC drives.

Part no. 01-5039-00  
Complete with cable.

## Glands for frame sizes B, C and D



Gland kits are available for size B, C and size D. Metal EMC glands are used for motor and brake resistor cables.

Part No	Current	Frame size
01-4601-21	3 - 6A (M16 - M20)	B
01-4601-22	8 - 10A (M16 - M25)	
01-4601-23	13 - 18A (M16 - M32)	
01-4399-01	26 - 31A (M12 - M32)	C
01-4399-00	37 - 46A (M12 - M40)	
01-4833-00	61 - 74A (M20 - M50)	D

## EmoSoftCom



Connect a PC with a standard RS232 cable under the control panel on the front. EmoSoftCom PC software makes it possible to perform signal recordings and save/load parameter backup data, for example during service & maintenance.

# Factory mounted options for Emotron FDU/VFX 2.0

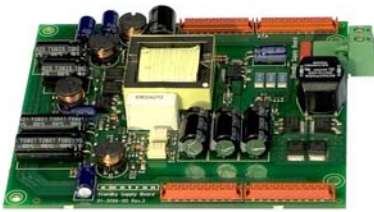
## Brake chopper

All Emotron VFX/FDU drives can be fitted with an optional built-in brake chopper. Brake choppers are rated for continuous braking at drive rated load. This option can not be after mounted. The brake resistor must be mounted outside the AC drive (see page 23 for Brake resistor option).

## DC+/DC- connection

DC+/DC- terminals for external connection of the Emotron VFX/FDU drive DC link. This option is required if using the Overshoot clamp.

## Standby power supply



Built-in standby power supply board. To be connected to external 24 V AC/DC supply voltage. If the main power is switched off, the control board, control panel and the connected options, for example

fieldbus communication, will continue to operate.

Part no: 01-3954-00

## Safe stop



Safe stop for size B, C and D (uses 1 of the 3 option positions)



Safe stop for size E and up

Extra built-in inputs and outputs for emergency stop circuit conforming with the norms EN-IEC 62061:2005 SIL2 and EN-ISO 13849-1:2006.

## Blank control panel



Blank panel instead of control panel (to maintain IP54). Indication LED's for Power, Run and Trip available.

## PTC



Factory mounted, isolated motor PTC input conforming to DIN44081/44082, available with size B, C and D. Use PTC/PT100 option board if additional inputs are needed.

## EMC filter class C2



EMC filter according to EN61800-3:2004 class C2 - 1st environment restricted distribution. For sizes B, C and D. Integrated inside the drive module.

**Note:** EMC filter acc. to class C3 - 2nd environment included as standard in all drive units.

## Extended options for Emotron FDU/VFX 2.0

### Extended EMC filter 90-650A



EMC filter according to EN61800-3:2004 class C2 - 1st environment, restricted distribution. From frame size E. Rated voltage=480 V, 50/60 Hz. Max. 40 °C ambient temperature.

Drive model	Filter type	Dimensions HxWxD [mm]	Weight [kg]	Enclosure
VFX/FDU48-090	3F480-100.230	325x150x107	7.1	IP20 <sup>1</sup>
VFX/FDU48-109	3F480-125.230	345x175x127	10	IP20 <sup>1</sup>
VFX/FDU48-146	3F480-150.230	375x175x135	10	IP20 <sup>1</sup>
VFX/FDU48-175	3F480-180.230	490x170x158	13.5	IP00 <sup>2</sup>
VFX/FDU48-210	3F480-220.230	490x170x158	13.5	IP00 <sup>2</sup>
VFX/FDU48-250	3F480-250.230	490x230x158	18.2	IP00 <sup>2</sup>
VFX/FDU48-300	3F480300.230	490x230x158	18.2	IP00 <sup>2</sup>
VFX/FDU48-375	3F480-400.230	580x230x158	22	IP00 <sup>2</sup>
VFX/FDU48-430	3F480-500.230	630x345x158	37.5	IP00 <sup>2</sup>
VFX/FDU48-500	3F480-500.230	630x345x158	37.5	IP00 <sup>2</sup>
VFX/FDU48-600	3F480-600.230	660x375x187	42	IP00 <sup>2</sup>
VFX/FDU48-650	3F480-700.230	865x345x157	42	IP00 <sup>2</sup>

1=Screw terminal (protected)

2=Busbar terminals

## Output choke (dU/dt)



Output chokes (supplied separately) are recommended above app. 100 m cable length for all single drives. Consult your supplier in case of paralleled drives. Due to the switching of output voltage, high capacitive peak currents will run through the parasitic capacitances between the phases and to earth. Screened cables have more parasitic capacitances. Output chokes should be installed as close as possible to the drive output. Output chokes also

limits voltage peaks at motor winding.  
 Rated voltage = 800 V, IP00 units.  
 Suitable for up to IP23 cabinet installation. Max. 40 °C ambient temperature.  
 Parallel connection of output coils possible if higher current rating required (e.g. one filter per PEBB).  
 For further advice when to use output options see filter selection guide, page 24

Nominal current ( $I_N$ ) A/Phase	L [mH]	Weight [kg]	Dimensions HxWxD [mm]	Part no.
2.8	1.5	0.6	60x78x95	473160 00
4.4	1	0.6	60x78x95	473161 00
6.6	0.65	0.6	60x78x95	473162 00
11	0.4	1	65x96x105	473163 00
14.3	0.3	1	65x96x105	473164 00
18.2	0.25	1.2	74x96x105	473165 00
26.4	0.175	1.2	74x96x105	473166 00
32	0.15	1.7	84x125x140	473167 00
65	0.1	4	105x155x205	473168 00
90	0.1	8.4	120x90x235	473169 00
146	0.05	10.2	140x190x260	473170 00
175	0.05	13.4	160x210x180	473171 00
275	0.032	18.4	170x230x200	473172 00
320	0.025	18.9	170x230x200	473173 00
410	0.021	22.6	180x240x210	473174 00

## Overshoot clamp



Together with the output choke, the overshoot clamp restricts the voltage and the dV/dt on the motor winding. For rated voltages 380 - 690 V.  
 H x W x D = 250 x 145 x 95 mm

Part no. 052163 (size B-F)  
 052220 (size G-K)

NOTE: AC drive, frame sizes B up to F(69), must be ordered including the option DC+/DC-connections.

## Sine wave filter



Only for use with FDU drives. Rated voltage= 400 V  $\pm$ 25 %, 50/60 Hz (690 V on request).

Max. 40 °C ambient temperature. IP20= with enclosure and screw terminals.

IPO0=no enclosure and busbar connections.

Voltage drop approximately 25 V at rated current, 50 Hz.

Overload: 110 % for 5 min, 150 % for 2 min or 200 % for 30 s.

For further information see filter selection guide, page 24

Filter type 3AFS400-	Protection class	Power [kW]	Nom. current ( $I_N$ ) A/Phase	Power loss [W]	Weight [kg]	Dimensions HxWxD [mm]
002.5	IP20	0.75	2.5	75	5	190x165x160
004	IP20	1.5	4	90	5	190x165x160
007	IP20	2.2	7	125	7	250x162x162
010	IP20	4	10	165	9	250x162x162
013	IP20	5.5	13	190	12	250x162x162
016	IP20	7.5	16	220	13	300x210x180
025	IP20	11	25	250	18	300x250x210
035	IP20	15	35	275	25	300x270x235
010	IPO0	4	10	165	9	195x200x115
013	IPO0	5.5	13	190	12	225x200x115
016	IPO0	7.5	16	220	13	225x240x135
025	IPO0	11	25	250	18	270x250x160
035	IPO0	15	35	275	25	270x250x160
050	IPO0	22	50	320	45	280x300x250
063	IPO0	30	63	550	49	270x300x370
080	IPO0	37	80	380	65	324x360x320
100	IPO0	45	100	530	65	324x360x320
125	IPO0	55	125	650	85	335x390x320
150	IPO0	75	150	580	119	440x480x340
180	IPO0	90	180	760	131	440x480x340
250	IPO0	132	250	600	135	420x420x390
300	IPO0	160	300	1000	140	420x420x390
400	IPO0	200	400	1100	320	440x500x400
500	IPO0	250	500	1250	335	470x500x400

## Common mode filter



Common mode filters are mainly used to reduce common mode currents in motors (typically used with motors >size 280). Common mode filters can prevent damage of motor bearings. All three motor phases are to be routed through common mode filter rings. These filter can also be used to reduce EMC emissions in supply cables.

Part no. 052213

(size G - K69 require one Common mode filter per PEBB).

## Brake resistors



VPR= Compact – IP54 with 0.75 m shielded cable.  
 BEGT= Steel grid resistor – IP20 or IP23 with thermo contact.  
 For dynamic braking by connection to the drive brake chopper output (optional).

Type	Resistor power [kW] in % duty cycle					Dimensions H x W x D [mm]	
	100	60	40	25	6	IP54	IP20
VPR 200-__R	0.2		0.47	0.74	3.6	200x60x31	-
VPR 300-__R	0.3		0.705	1.11	5.4	250x60x31	-
VPR 400-__R	0.4		0.94	1.48	7.2	301x60x31	-
VPR 500-__R	0.5		1.175	1.85	9.0	370x60x31	-
DEGT1VPR1000S_R-S	1		2.0	3.7	13.0	542x98x170	-
						<b>IP20</b>	<b>IP23</b>
BEGT 13#05-__R	2.5	3.25	4.25	6.25	21.0	301x483x326	500x483x326
BEGT 13#08-__R	4.0	5.2	6.8	10.0	34.0	301x483x326	500x483x326
BEGT 13#10-__R	5.0	6.5	8.5	12.5	42.5	301x483x326	500x483x326
BEGT 14#15-__R	7.5	9.8	12.7	18.7	64.0	301x483x426	500x483x426
BEGT 15#20-__R	10.0	13.0	17.0	25.0	85.0	301x483x526	500x483x526
BEGT 17#30-__R	15.0	19.5	25.5	37.5	127.0	301x483x740	500x483x740
BEGT 25#40-__R	20.0	26.0	34.0	50.0	170.0	601x484x526	800x484x526
BEGT 27#60-__R	30.0	39.0	51.0	75.0	255.0	601x484x736	800x484x736
BEGT 37#90-__R	40.0	52.0	68.0	100.0	340.0	1021x484x736	1181x484x736
BEGT 47#120-__R	50.0	65.0	85.0	125.0	425.0	1321x483x736	301x483x736
2xBEGT 27#60-__R	60.0	78.0	102.0	150.0	510.0	2x(601x484x736)	2x(800x484x736)
2xBEGT 37#78-__R	70.0	91.0	119.0	175.0	600.0	2x(1021x484x736)	2x(1181x484x736)
2xBEGT 37#90-__R	80.0	104.0	136.0	200.0	680.0	2x(1021x484x736)	2x(1181x484x736)
2xBEGT 47#120-__R	100.0	130.0	170.0	250.0	850.0	2x(1321x483x736)	2x(1481x483x736)

#=2: IP20, example BEGT 13205

#=4: IP23, example BEGT 13405

\_\_R: resistance in ohm, example 26R=26 ohm

\_R\_: resistance in ohm, example 6R5=6.5 ohm

## Liquid cooling



Drive modules in frame sizes E - K and F69 - K69 are available in a liquid cooled version. These units are designed for connection to a liquid cooling system, normally a heat exchanger of liquid-liquid or liquid-air type. Heat exchanger is not part of the liquid cooling option. Drive units with parallel power modules (frame size G - K69) are delivered with a dividing unit for connection of the cooling system. The drive units are equipped with rubber hoses with leak-proof quick couplings.

## Filter selection guide

Filters	Common mode filter	Output choke	Output choke & overshoot clamp	Sine wave filter	All-pole sine wave filter
<b>Phenomenon</b>					
Common mode currents	Effective	Limited effect	Limited effect	Effective	Very effective
Bearing currents	Effective				Very effective
Voltage spikes U-V-W		Limited effect	Very effective	Very effective	Very effective
Voltage spikes U-PE		Limited effect	Effective	Limited effect	Very effective
dU/dt		Effective	Effective	Very effective	Very effective
Minimize motor audible noise		Limited effect	Limited effect	Effective	Effective
EMC conducted emission	Limited effective	Limited effect	Limited effect	Effective	Very effective

### Recommendations with the different supply voltages up to and including 480 V

Filters	Common mode filter	Output choke	Output choke & overshoot clamp	Sine wave filter	All-pole sine wave filter
<b>Situation</b>					
Not rated, delicate or difficult positioned motors	X			X	
Motor in frame size >280	X				
IEC 60034-17 motor		X			
IEC 60034-25 curve A motor		Cable lengths 0-100m**			
		Cable lengths 100-200m	X		
		Cable lengths 200-500m			X
Dynamic use with frequently raised DC voltage (braking)			X		
Unshielded cables *					X

X = advised solution for this setup

### Recommendations with the different supply voltages from 500 V - 690 V

Filters	Common mode filter	Output choke	Output choke & overshoot clamp	Sine wave filter	All-pole sine wave filter
<b>Situation</b>					
Not rated, delicate or difficult positioned motors	X			X	
Motor in frame size >280	X				
3 kV isolation windings **					
IEC 60034-25 curve B motor		Cable lengths 0-100m**			
		Cable lengths 100-200m		X	
		Cable lengths 200-500m			X
Dynamic use with frequently raised DC voltage (braking)			X		
Unshielded cables *					X

X = advised solution for this setup

### Remarks

Cable lengths should always be as short as possible.

The table is based on correct EMC wiring with shielded cable and proper EMC installation.

For powers below 7.5 kW and long motor cables please contact Emotron.

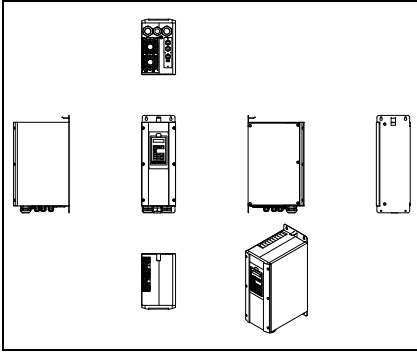
Voltage drop over the complete system must be less than 10% of the main supply.

Sine wave filters are only for use with Emotron FDU.

\* Conducted interference limits on unshielded motor - lines according to EN61800-3, table 16.

\*\* No marks in a row, means that there is no need to take precautions.

## CAD drawings available on the web



2D and 3D CAD drawings for Emotron AC drives, softstarters and monitors are available via our website. These will assist anyone working with our products, for example, consultants, installers or machine builders. Visit [www.emotron.com](http://www.emotron.com) for direct access to all CAD documents.

# Service and support secure the value of your investment

We provide service and support through all phases of the product life cycle in order to optimize your investment in Emotron products and systems.

## Emotron services

- Consultation and engineering during the planning and conceptual phases of your project.
- Training for you to fully benefit from the Emotron products. Good user knowledge results in reduced operating costs, extended product lifetime and fewer process interruptions.
- Technical support from qualified technicians. In most markets we offer a 24-hour call service.
- Service on site including anything from commissioning to maintenance, fault remedy and repairs.
- Minimized downtime thanks to quick and reliable delivery of spare-parts and replacement equipment.
- Qualified workshop repairs at our repair centres.
- Local and global service and support provided by Emotron technical centres.
- Local and global service and support provided by Emotron authorized service partners with fully trained and certified technicians.

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Yes, it's possible to save operating costs while also improving process performance. We have been doing that for customers around the world for 35 years, by supplying solutions for efficient and reliable control of machines and processes driven by electric motors.

Simplicity, reliability and robustness are keywords for our products as well as our company. We use our know-how to create the technical solutions, and our personal commitment to make them work according to your requirements.

Our AC drives and softstarters are optimized for specific applications such as pumps, fans, cranes and crushers. Among our customers are end-users as well as OEMs and system integrators working in, for example, power generation, water/wastewater, process industries and mining.

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