

# Emotron MSF 2.0 Softstarter



Data sheet  
English

# Technical data

## Electrical specifications

Table 1 Typical motor power at mains voltage 400 V

MSF model	Heavy AC-53a 5.0-30:50-10		Normal AC-53a 3.0-30:50-10		Normal with bypass AC-53b 3.0-30:300	
	Power @400V [kW]	Rated current [A]	Power @400V [kW]	Rated current [A]	Power @400V [kW]	Rated current [A]
MSF-017	7.5	17	11	22	11	25
-030	15	30	18.5	37	22	45
-045	22	45	30	60	37	67
-060	30	60	37	72	45	85
-075	37	75	45	85	55	103
-085	45	85	45	96	55	120
-110	55	110	75	134	90	165
-145	75	145	75	156	110	210
-170	90	170	110	210	132	255
-210	110	210	132	250	160	300
-250	132	250	132	262	200	360
-310	160	310	200	370	250	450
-370	200	370	250	450	315	555
-450	250	450	315	549	355	675
-570	315	570	400	710	450	820
-710	400	710	450	835	500	945
-835	450	835	500	960	630	1125
-1000	560	1 000	630	1125	800	1400
-1400	800	1 400	900	1650	1000	1800

Table 2 Typical motor power at mains voltage 460 V

MSF model	Heavy AC-53a 5.0-30:50-10		Normal AC-53a 3.0-30:50-10		Normal with bypass AC-53b 3.0-30:300	
	Power @460V [hp]	Rated current [A]	Power @460V [hp]	Rated current [A]	Power @460V [hp]	Rated current [A]
MSF-017	10	17	15	22	20	25
-030	20	30	25	37	30	45
-045	30	45	40	60	50	68
-060	40	60	50	72	60	85
-075	60	75	60	85	75	103
-085	60	85	75	96	100	120
-110	75	110	100	134	125	165
-145	100	145	125	156	150	210
-170	125	170	150	210	200	255
-210	150	210	200	250	250	300
-250	200	250	200	262	300	360
-310	250	310	300	370	350	450
-370	300	370	350	450	450	555
-450	350	450	450	549	500	675
-570	500	570	600	710	650	820
-710	600	710	700	835	800	945
-835	700	835	800	960	900	1125
-1000	800	1 000	900	1125	1000	1400
-1400	1000	1 400	1250	1650	1500	1800

Table 3 Typical motor power at mains voltage 525 V

MSF model	Heavy AC-53a 5.0-30:50-10		Normal AC-53a 3.0-30:50-10		Normal with bypass AC-53b 3.0-30:300	
	Power @525V [kW]	Rated current [A]	Power @525V [kW]	Rated current [A]	Power @525V [kW]	Rated current [A]
MSF-017	11	17	15	22	15	25
-030	18,5	30	22	37	30	45
-045	30	45	37	60	45	68
-060	37	60	45	72	55	85
-075	45	75	55	85	75	103
-085	55	85	55	96	75	120
-110	75	110	90	134	110	165
-145	90	145	110	156	132	210
-170	110	170	132	210	160	255
-210	132	210	160	250	200	300
-250	160	250	160	262	250	360
-310	200	310	250	370	315	450
-370	250	370	315	450	355	555
-450	315	450	400	549	450	675
-570	400	570	500	710	560	820
-710	500	710	560	835	630	945
-835	560	835	710	960	800	1125
-1000	710	1 000	800	1125	1000	1400
-1400	1000	1 400	1250	1650	1400	1800

Table 4 Typical motor power at mains voltage 575 V

MSF model	Heavy AC-53a 5.0-30:50-10		Normal AC-53a 3.0-30:50-10		Normal with bypass AC-53b 3.0-30:300	
	Power @575V [hp]	Rated current [A]	Power @575V [hp]	Rated current [A]	Power @575V [hp]	Rated current [A]
MSF-017	15	17	20	22	25	25
-030	25	30	30	37	40	45
-045	40	45	50	60	60	68
-060	50	60	60	72	75	85
-075	75	75	75	85	100	103
-085	75	85	75	90	125	120
-110	100	110	125	134	150	165
-145	150	145	150	156	200	210
-170	150	170	200	210	250	255
-210	200	210	250	250	300	300
-250	250	250	250	262	350	360
-310	300	310	400	370	450	450
-370	400	370	500	450	600	555
-450	500	450	600	549	700	675
-570	600	570	700	640	800	820
-710	700	710	800	835	1000	945
-835	800	835	900	880	1250	1125
-1000	1000	1 000	1250	1125	1500	1400
-1400	1500	1 400	1500	1524	2000	1800

Table 5 Typical motor power at mains voltage 690 V

MSF model	Heavy AC-53a 5.0-30:50-10		Normal AC-53a 3.0-30:50-10		Normal with bypass AC-53b 3.0-30:300	
	Power @690V [kW]	Rated current [A]	Power @690V [kW]	Rated current [A]	Power @690V [kW]	Rated current [A]
MSF-017	15	17	18,5	22	22	25
-030	22	30	30	37	37	45
-045	37	45	55	60	55	68
-060	55	60	55	72	75	85
-075	55	75	75	85	90	103
-085	75	85	90	90	110	120
-110	90	110	110	134	160	165
-145	132	145	132	156	200	210
-170	160	170	200	210	250	255
-210	200	210	250	250	250	300
-250	250	250	250	262	355	360
-310	315	310	355	370	400	450
-370	355	370	400	450	500	555
-450	400	450	560	549	630	675
-570	560	570	630	640	800	820
-710	710	710	800	835	900	945
-835	800	835	900	880	1120	1125
-1000	1000	1 000	1120	1125	1400	1400
-1400	1400	1 400	1600	1524	1800	1800

## General electrical specifications

Table 6 General electrical specifications

Parameter	Description
<b>General</b>	
Mains supply voltage	200-525 V $\pm$ 10% 200-690 V +5%, -10%
Control supply voltage	100-240 V $\pm$ 10% 380-500 V $\pm$ 10%
Mains and Control supply frequency	50/60 Hz $\pm$ 10%
Number of fully controlled phases	3
Recommended fuse for control supply	Max 10 A
<b>Control signal inputs</b>	
Digital input voltage	0-3 V $\rightarrow$ 0, 8-27 V $\rightarrow$ 1. Max 37 V for 10 sec.
Digital input impedance to GND (0 VDC)	2.2 k $\Omega$
Analogue input voltage/current	0-10 V, 2-10 V, 0-20 mA, 4-20 mA
Analogue input impedance to GND (0 VDC)	Voltage signal 125 k $\Omega$ , current signal 100 $\Omega$
<b>Control signal outputs</b>	
Output relays contact	8 A, 250 VAC or 24 VDC resistive load; 3 A, 250 VAC inductive load (PF 0.4)
Analogue output voltage/current	0-10 V, 2-10 V, 0-20 mA, 4-20 mA
Analogue output load impedance	Voltage signal min load 700 $\Omega$ , current signal max load 750 $\Omega$
<b>Control signal supply</b>	
+12 VDC	+12 VDC $\pm$ 5%. Max current 50 mA. Short circuit proof.

## Fuses and power losses

Table 7 Fuses

Model	Fusing for UL		Fusing for cUL	
	Fuse type	Rating	Fuse type	Rating
MSF-017	Any UL listed fuse	max 80 A	Bussmann, FWP	max 80 A
-030	Any UL listed fuse	max 125 A	Bussmann, FWP	max 125 A
-045	Any UL listed fuse	max 225 A	Bussmann, FWP	max 150 A
-060	Any UL listed fuse	max 250 A	Bussmann, FWP	max 175 A
-075	Any UL listed fuse	max 300 A	Bussmann, FWP	max 250 A
-085	Any UL listed fuse	max 350 A	Bussmann, FWP	max 300 A
-110	Any UL listed fuse	max 500 A	Bussmann, FWP	max 350 A
-145	Any UL listed fuse	max 600 A	Bussmann, FWP	max 450 A
-170	Any UL listed fuse	max 800 A	Bussmann, FWP	max 700 A
-210	Any UL listed fuse	max 1000 A	Bussmann, FWP	max 700 A
-250	Any UL listed fuse	max 1000 A	Bussmann, FWP	max 800 A
-310	Any UL listed fuse or circuit breaker	max 1200 A	-	-
-370	Any UL listed fuse or circuit breaker	max 1400 A	-	-
-450	Any UL listed fuse or circuit breaker	max 1800 A	-	-
-570	Any UL listed fuse or circuit breaker	max 2200 A	-	-
-710	Any UL listed fuse or circuit breaker	max 2800 A	-	-
-835	Any UL listed fuse or circuit breaker	max 3300 A	-	-
-1000	-	-	-	-
-1400	-	-	-	-

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**NOTE: Short circuit withstand:**  
**MSF-017-MSF-060 5000 rms A when used with K5 or RK5 fuses**  
**MSF-075 - MSF-145 10000 rms A when used with K5 or RK5 fuses**  
**MSF-170 - MSF-250 18000 rms A when used with K5 or RK5 fuses**  
**MSF-310 18000 rms A**  
**MSF-370 and MSF-450 30000 rms A**  
**MSF-570, MSF-710 and MSF-835 42000 rms A**

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Table 8 Power losses

Model	Power loss at rated motor load [W] No losses with bypass		Power consumption control card [VA]
	Heavy	Normal	
MSF-017	50	70	20
-030	90	120	20
-045	140	180	25
-060	180	215	25
-075	230	260	25
-085	260	290	25
-110	330	400	25
-145	440	470	25
-170	510	630	35
-210	630	750	35
-250	750	750	35
-310	930	1100	35
-370	1100	1535	35
-450	1400	1730	35
-570	1700	2100	35
-710	2100	2500	35
-835	2500	2875	35
-1000	3000	3375	35
-1400	4200	4950	35

## Mechanical specifications including mechanical drawings

MSF Model	Dimensions H*W*D [mm]	Mounting position [Vertical/Horizontal]	Weight [kg]	Connection busbars [mm]	PE screw	Cooling system	Protection class
-017, -030	320*126*260	Vertical	6.7	15*4, Cu (M6)	M6	Convection	IP20
-045	320*126*260	Vert. or Horiz.	6.9	15*4, Cu (M6)	M6	Fan	IP20
-060, -075, -085	320*126*260	Vert. or Horiz.	6.9	15*4, Cu (M8)	M6	Fan	IP20
-110, -145	400*176*260	Vert. or Horiz.	12	20*4, Cu (M10)	M8	Fan	IP20
-170, -210, -250	500*260*260	Vert. or Horiz.	20	30*4, Cu (M10)	M8	Fan	IP20
-310, -370, -450	532*547*278	Vert. or Horiz.	46	40*8, Al (M12)	M8	Fan	IP20
-570, -710, -835	687*640*302	Vert. or Horiz.	80	40*10, Al (M12)	M8	Fan	IP20
-1000, -1400	900*875*336	Vert. or Horiz.	175	75*10, Al (M12)		Fan	IP00

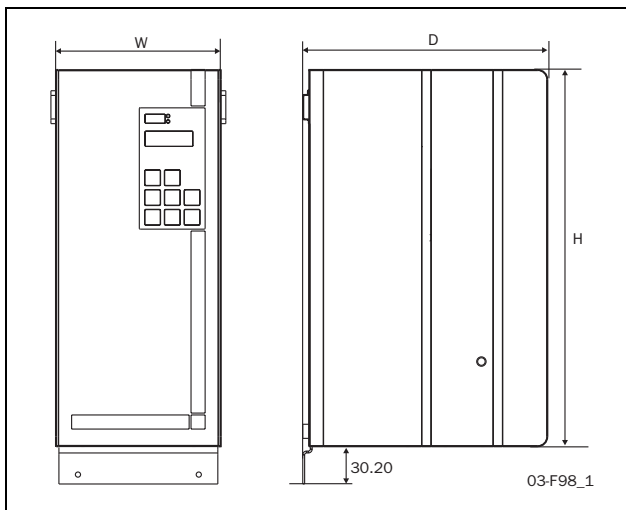


Fig. 1 MSF -017 to MSF -250.

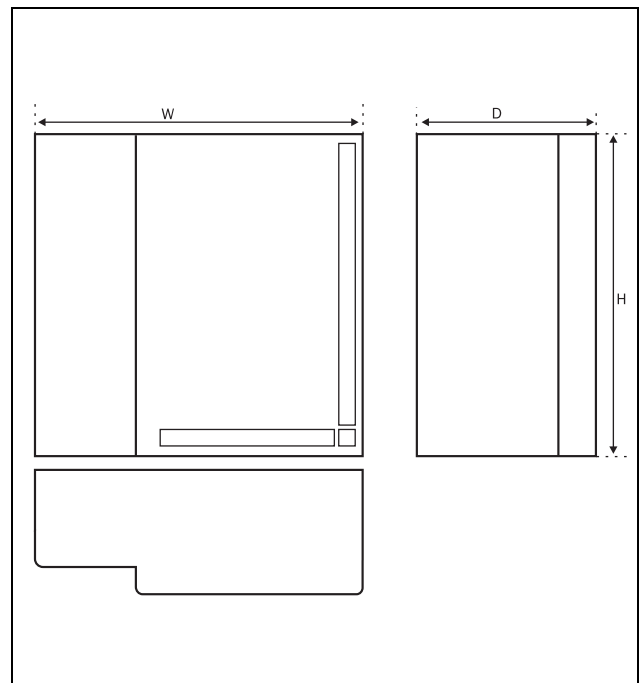


Fig. 2 MSF -310 to MSF -835.

## Derating at higher temperature

By derating the current to 80% of nominal current, the MSF can be operated at an ambient temperature of up to 50 °C. E.g. a MSF-045 can operate a heavy load of 36 A (45 A\*0.8).

## Environmental conditions

### Normal operation

Temperature	0 - 40°C
Relative humidity	95%, non-condensing
Max altitude without derating	1000 m

### Storage

Temperature	-25 - +70°C
Relative humidity	95%, non-condensing

## Standards

Market	Standard	Description
All	IEC 60947-1	Low voltage switch gear and control gear - Part 1: General rules.
	IEC 60947-4-2	Low voltage switch gear and control gear - Part 4-2: Contactors and motor starters - AC semiconductor motor controllers and starters
European	EMC Directive	2004/108/EC
	Low Voltage Directive	2006/95/EC
Russian	GOST R	Russian certificate of conformity
American	UL 508 CSA 22.2 No. 14-05	Industrial control equipment. UL: Models MSF-017 to MSF-835 up to 600 VAC cUL: Models MSF-017 to MSF-250 up to 600 VAC

Radiated and conducted emission: Class A (industrial environment). For class B (public environment) an external bypass has to be used.

## Power- and signal connectors

Table 9 PCB Terminals

Terminal	Function	Electrical characteristics
01	Supply voltage	100-240 VAC $\pm 10\%$ alternative 380-500 VAC $\pm 10\%$ see rating plate
02		
PE	Protective Earth	Protective Earth
<b>11-19</b>		
11	Digital input 1	0-3 V $\rightarrow$ 0; 8-27 V $\rightarrow$ 1. Max. 37 V for 10 sec. Impedance to 0 VDC: 2.2 k $\Omega$ .
12	Digital input 2	
13	Control supply voltage to PCB terminal 11 and 12, 10 k $\Omega$ potentiometer, etc.	+12 VDC $\pm 5\%$ . Max. current from +12 VDC: 50 mA. Short circuit-proof but not overloadproof.
14	Analogue input, 0-10 V, 2-10 V, 0-20 mA and 4-20 mA/digital input.	Impedance to terminal 15 (0 VDC) voltage signal: 125 k $\Omega$ , current signal: 100 $\Omega$ .
15	GND (common)	0 VDC
16	Digital input 3	0-3 V $\rightarrow$ 0; 8-27 V $\rightarrow$ 1. Max. 37 V for 10 sec. Impedance to 0 VDC: 2.2 k $\Omega$ .
17	Digital input 4	
18	Control supply voltage to PCB terminal 16 and 17, 10 k $\Omega$ potentiometer, etc.	+12 VDC $\pm 5\%$ . Max. current from +12 VDC = 50 mA. Short circuit-proof but not overload-proof.
19	Analogue output	Analogue output contact: 0-10 V, 2-10 V; min load impedance 700 $\Omega$ 0-20 mA and 4-20 mA; max load impedance 750 $\Omega$
<b>21-24</b>		
21	Programmable relay K1. Factory setting is "Operation" with indication by closing terminal 21 to 22.	1-pole closing contact, 250 VAC 8 A or 24 VDC 8 A resistive, 250 VAC, 3 A inductive.
22		
23	Programmable relay K2. Factory setting is "Full voltage" with indication by closing terminal 23 to 24.	1-pole closing contact, 250 VAC 8 A or 24 VDC 8 A resistive, 250 VAC, 3 A inductive.
24		
<b>31-33</b>		
31	Programmable relay K3. Factory setting is "All alarms". Indication by closing terminal 31 to 33 and opening terminal 32 to 33.	1-pole change-over contact, 250 VAC 8A or 24 VDC 8A resistive, 250 VAC, 3A inductive.
32		
33		
<b>69-70</b>		
69-70	PTC Thermistor input	Alarm level 2.4 k $\Omega$ Switch back level 2.2 k $\Omega$ .
<b>71-79*</b>		
71-72*	Clickson thermistor	Controlling softstarter cooling fin temperature MSF-310 - MSF-1400
73-74*	NTC thermistor	Temperature measuring of softstarter cooling fin
75	Current transformer input, cable S1 (blue)	Connection of L1 or T1 phase current transformer
76	Current transformer input, cable S1 (blue)	Connection of L3, T3 phase (MSF 017 to MSF 250) or L2, T2 phase (MSF 310 to MSF 1400)
77	Current transformer input, cable S2 (brown)	Common connection for terminals 75 and 76
78*	Fan connection	24 VDC
79*	Fan connection	0 VDC

\* Internal connection, no customer use.

## Semi-conductor fuses

Always use standard commercial fuses to protect the wiring and prevent short circuiting. To protect the thyristors against short-circuit currents, superfast semiconductor fuses can be used if preferred (e.g. Bussmann type FWP or similar, see table below).

Type	FWP/FWJ Bussmann fuse	
	$I^2t$ (fuse) at 700 V	
MSF-017	FWP-80A	2400
MSF-030	FWP-125A	7300
MSF-045	FWP-150A	11700
MSF-060	FWP-175A	16700
MSF-075	FWP-250A	42500
MSF-085	FWP-300A	71200
MSF-110	FWP-350A	95600
MSF-145	FWP-450A	250000
MSF-170	FWP-700A	300000
MSF-210	FWP-700A	300000
MSF-250	FWP-800A	450000
MSF-310	FWP-800A	450000
MSF-370	FWP-1000A	600000
MSF-450	FWJ-1200A	1470000
MSF-570	FWJ-1400A	1890000
MSF-710	FWJ-1800A	37100000
MSF-835	FWJ-2000A	5320000
MSF-1000	FWJ-2000A	5320000
MSF-1400		<12000000



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