



Technical Catalogue Softstarters



Emotron TSA
4 - 1000 kW, 200 - 690 V

Emotron TSA softstarter - with built-in bypass



Emotron TSA softstarters take motor control to a new level. Soft torque starting, intelligent load monitoring and smart stops are all included and accompanied by a robust and compact design. By developing the Emotron TSA range of electronic softstarters CG has taken a major step towards the ideal motor controller for applications where variable speed is not required. You simply get everything except variable speed!

Main features

- Compact and robust softstarter with wide power range: 4kW - 1000 kW, 200 - 690V, 3 ph.
- Integrated bypass with proven contactor technology (TSA sizes 1 - 5).
- 3-phase torque control for optimal performance.
- Torque control start and stop modes for smooth low-current starts and pump stops without water hammering.
- High capacity dynamic vector braking available for high inertia stopping.
- Coated boards as standard extends lifetime in harsh environments.
- Real-time clock.
- Multilingual control panel. Supports parameter copying between units.
- Jog forward/reverse with adjustable speed.
- Motor I²t protection and isolated thermistor input as standard. PT100 inputs as option.
- Load monitor function for protection of your load machinery.
- Logic and timer programming blocks available.
- IP20 protection for sizes 16-960 A.
- Fulfills EMC First environment-category C2.
- UL/cUL approvals.
- DNV-GL marine approval.

Emotron TSA softstarter

Typical motor power at mains voltage 400 V and 460 V

Rating according to AC53b / AC3A norm.

Model	Normal duty (Start curr= $3 \times I_{n_soft}$ ⁽¹⁾⁽⁴⁾)			Heavy duty (Start curr= $5 \times I_{n_soft}$ ⁽²⁾⁽⁵⁾)			Frame size - Dimensions H1/H2 x W x D [mm] ⁽³⁾
	Power @ 400V [kW]	Power @ 460V [hp]	Rated current [A]	Power @ 400V [kW]	Power @ 460V [hp]	Rated current [A]	
TSA52-016	7.5	10	16	4	5	10	Frame size 1 246/340 x 126 x 188
TSA52-022	11	15	22	5.5	7.5	12	
TSA52-030	15	20	30	7.5	10	18	
TSA52-036	18.5	25	36	7.5	15	21	
TSA52-042	22	30	42	11	20	25	
TSA52-056	30	40	56	15	25	33	
TSA52-070	37	50	70	22	30	42	Frame size 2 246/340 x 126 x 188
TSA52-085	45	60	85	22	40	51	
TSA52-100	55	75	100	30	40	60	
TSA52-140	75	100	140	45	60	84	Frame size 3 285/380 x 196 x 235
TSA52-170	90	125	170	55	75	102	
TSA52-200	110	150	200	55	100	120	
TSA52-240	132	200	240	75	100	144	Frame size 4 378/514 x 254 x 260
TSA52-300	160	250	300	90	125	180	
TSA52-360	200	300	360	110	150	216	
TSA52-450	250	350	450	160	200	270	
TSA52-470	250	350	470	160	250	320	Frame size 5 -/750 x 550 x 350
TSA52-580	315	500	580	200	300	380	
TSA52-730	400	600	730	250	350	450	
TSA52-820	450	700	820	315	450	560	

Model	Normal duty with bypass (Start curr= $3 \times I_{n_soft}$ ⁽⁴⁾)			Normal duty without bypass (Start curr= $3 \times I_{n_soft}$ ⁽⁴⁾)			Heavy duty without bypass (Start curr= $5 \times I_{n_soft}$ ⁽⁵⁾)			Frame size - Dimensions H2 x W x D [mm] ⁽³⁾
	Power @ 400V [kW]	Power @ 460V [hp]	Rated current [A]	Power @ 400V [kW]	Power @ 460V [hp]	Rated current [A]	Power @ 400V [kW]	Power @ 460V [hp]	Rated current [A]	
TSA52-835	500	800	960 ⁽⁶⁾	450	700	835	400	600	710	Frame size 6 900 x 640 x 360
TSA52-960	630	900	1125 ⁽⁶⁾	500	800	960	450	700	835	

(1) Normal duty: Start current = $3 \times I_{n_soft}$, Start time = 15 s (size 1) or 30 s (Size 2 - 4), 10 starts / hour.

(2) Heavy duty: Start current = $5 \times I_{n_soft}$, Start time = 15 s (size 1) or 30 s (Size 2 - 4), 10 starts / hour.

(3) H1= Height of enclosure, H2=Total height

(4) Normal duty: Start current = $3 \times I_{n_soft}$, Start time = 30 s, 4 starts / hour, utilization=80 % - size 5, 70 % - size 6.

(5) Heavy duty: Start current = $5 \times I_{n_soft}$, Start time = 30 s, 4 starts / hour, utilization=80 % - size 5, 70 % - size 6.

(6) With external bypass contactor.

Typical motor power at mains voltage 525 V

Rating according to AC53b / AC3A norm.

Model	Normal duty (Start curr= $3 \times I_{n_soft}$ ⁽¹⁾⁽⁴⁾)		Heavy duty (Start curr= $5 \times I_{n_soft}$ ⁽²⁾⁽⁵⁾)		Frame size - Dimensions H1/H2 x W x D [mm] ⁽³⁾
	Power @ 525V [kW]	Rated current [A]	Power @ 525V [kW]	Rated current [A]	
TSA52-016	11	16	5.5	10	Frame size 1 246/340 x 126 x 188
TSA52-022	15	22	7.5	12	
TSA52-030	18.5	30	11	18	
TSA52-036	22	36	11	21	
TSA52-042	30	42	15	25	
TSA52-056	37	56	22	33	
TSA52-070	45	70	22	42	Frame size 2 246/340 x 126 x 188
TSA52-085	55	85	30	51	
TSA52-100	75	100	37	60	
TSA52-140	90	140	55	84	Frame size 3 285/380 x 196 x 235
TSA52-170	110	170	75	102	
TSA52-200	132	200	75	120	
TSA52-240	160	240	90	144	Frame size 4 378/514 x 254 x 260
TSA52-300	200	300	132	180	
TSA52-360	250	360	160	216	
TSA52-450	315	450	180	270	
TSA52-470	315	470	200	320	Frame size 5 -/750 x 550 x 350
TSA52-580	400	580	250	380	
TSA52-730	500	730	315	450	
TSA52-820	560	820	400	560	

Model	Normal duty with bypass (Start curr= $3 \times I_{n_soft}$ ⁽⁴⁾)		Normal duty without bypass (Start curr= $3 \times I_{n_soft}$ ⁽⁴⁾)		Heavy duty without bypass (Start curr= $5 \times I_{n_soft}$ ⁽⁵⁾)		Frame size - Dimensions H2 x W x D [mm] ⁽³⁾
	Power @ 525V [kW]	Rated current [A]	Power @ 525V [kW]	Rated current [A]	Power @ 525V [kW]	Rated current [A]	
TSA52-835	710	960 ⁽⁶⁾	560	835	500	710	Frame size 6 900 x 640 x 360
TSA52-960	800	1125 ⁽⁶⁾	710	960	560	835	

(1) Normal duty: Start current = $3 \times I_{n_soft}$, Start time = 15 s (size 1) or 30 s (Size 2 - 4), 10 starts / hour.

(2) Heavy duty: Start current = $5 \times I_{n_soft}$, Start time = 15 s (size 1) or 30 s (Size 2 - 4), 10 starts / hour.

(3) H1= Height of enclosure, H2=Total height

(4) Normal duty: Start current = $3 \times I_{n_soft}$, Start time = 30 s, 4 starts / hour, utilization=80 % - size 5, 70 % - size 6.

(5) Heavy duty: Start current = $5 \times I_{n_soft}$, Start time = 30 s, 4 starts / hour, utilization=80 % - size 5, 70 % - size 6.

(6) With external bypass contactor.

Typical motor power at mains voltage 575 V and 690 V

Rating according to AC53b / AC3A norm.

Model	Normal duty (Start curr= $3 \times I_{n_soft}^{(1)(4)}$)			Heavy duty (Start curr= $5 \times I_{n_soft}^{(2)(5)}$)			Frame size - Dimensions H1/H2 x W x D [mm] ⁽³⁾
	Power @ 575V [hp]	Power @ 690V [kW]	Rated current [A]	Power @ 575V [hp]	Power @ 690V [kW]	Rated current [A]	
TSA69-016	15	11	16	7.5	7.5	10	Frame size 1 246/340 x 126 x 188
TSA69-022	20	18.5	22	10	11	12	
TSA69-030	25	22	30	15	15	18	
TSA69-036	30	30	36	20	18.5	21	
TSA69-042	40	37	42	25	22	25	
TSA69-056	50	45	56	30	30	33	
TSA69-070	60	55	70	40	37	42	Frame size 2 246/340 x 126 x 188
TSA69-085	75	75	85	50	45	51	
TSA69-100	100	90	100	60	55	60	
TSA69-140	125	132	140	75	75	84	Frame size 3 285/380 x 196 x 235
TSA69-170	150	160	170	100	90	102	
TSA69-200	200	200	200	125	110	120	
TSA69-240	250	250	240	150	132	144	Frame size 4 378/514 x 254 x 260
TSA69-300	300	315	300	150	160	180	
TSA69-360	350	355	360	200	200	216	
TSA69-450	450	450	450	250	250	270	
TSA69-470	500	450	470	300	315	320	Frame size 5 -/750 x 550 x 350
TSA69-580	600	560	580	400	355	380	
TSA69-730	800	710	730	500	500	450	
TSA69-820	900	800	820	600	600	560	

Model	Normal duty with bypass (Start curr= $3 \times I_{n_soft}^{(4)}$)			Normal duty without bypass (Start curr= $3 \times I_{n_soft}^{(4)}$)			Heavy duty without bypass (Start curr= $5 \times I_{n_soft}^{(5)}$)			Frame size - Dimensions H2 x W x D [mm] ⁽³⁾
	Power @ 575V [hp]	Power @ 690V [kW]	Rated current [A]	Power @ 575V [hp]	Power @ 690V [kW]	Rated current [A]	Power @ 575V [hp]	Power @ 690V [kW]	Rated current [A]	
TSA69-835	1000	900	960 ⁽⁶⁾	900	800	835	750	710	710	Frame size 6 900 x 640 x 360
TSA69-960	1200	1000	1125 ⁽⁶⁾	1000	900	960	900	800	835	

(1) Normal duty: Start current = $3 \times I_{n_soft}$, Start time = 15 s (size 1) or 30 s (Size 2 - 4), 10 starts / hour.

(2) Heavy duty: Start current = $5 \times I_{n_soft}$, Start time = 15 s (size 1) or 30 s (Size 2 - 4), 10 starts / hour.

(3) H1= Height of enclosure, H2=Total height

(4) Normal duty: Start current = $3 \times I_{n_soft}$, Start time = 30 s, 4 starts / hour, utilization=80 % - size 5, 70 % - size 6.

(5) Heavy duty: Start current = $5 \times I_{n_soft}$, Start time = 30 s, 4 starts / hour, utilization=80 % - size 5, 70 % - size 6.

(6) With external bypass contactor.

General specifications

General

Model TSA	
Mains voltage	200-525 V, +10%/-15%, 3-phase 200-690 V, +10%/-15%, 3-phase
Control supply voltage	100-240 V +10%/-15%, Single phase
Number of fully controlled phases	3
Mains and control frequency	50/60 Hz, $\pm 10\%$
Power loss (% of P _{mot})	0.2 % (sizes 1-5)*

* see Emotron TSA instruction manual chapter 13 for details.

Environmental conditions

Parameter	Normal operation
Nominal ambient temperature	0 °C–40 °C (see Table 1)
Atmospheric pressure	86–106 kPa
Relative humidity, non-condensing	Max 95%, non-condensing
Contamination, according to IEC 60721-3-3	Chemically active substances, class 3C3 (conformal coating - all printed circuit boards are coated in Emotron TSA). Mechanically active substances, class 3S1 (no sand; dust <0.01 mg/m ³ , deposited <0.4 mg/(m ² *h)). Biological conditions, class 3B1 (no risk for harmful biological attacks - mould, fungus, animals, etc).
Vibrations	According to IEC 60721-3-3: Mechanical conditions, class 3M4 (2 - 9 Hz, 3.0 mm and 9 - 20 Hz, acc. 1 g (10 m/s ²))
Altitude	0–1,000 m Max 4,000 m by derating 1%/100 m in excess of 1,000 m.

Parameter	Storage operation
Temperature	-25 to +70 °C
Atmospheric pressure	86 –106 kPa
Relative humidity, non-condensing	Max 95%, non-condensing

Operation at higher temperatures

The Emotron softstarter is made for operating at maximum 40 °C ambient temperature.

However, it is possible to use Emotron softstarter at higher temperatures with reduced output current rating (derating).

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

Table 1 Ambient temperature and possible derating

Model	Rated max. temp.	Possible output current derating
Emotron TSA	40 °C	-2%/°C to max +15 °C (55 °C)

Dimensions and weights

The table below gives an overview of the dimensions, weights, cooling and mounting.

Emotron TSA Model	Frame size	Dim. H1/H2 x W x D [mm]	Weight [kg]	Cooling/ Mounting
TSA -016 to -056	1	246/340 x 126 x 188	5.5	Convection / Vertical
TSA -070 to -100	2	246/340 x 126 x 188	5.7	Fan / Vertical & Horizontal
TSA -140 to -200	3	285/380 x 196 x 235	13	Fan / Vertical & Horizontal
TSA -240 to -450	4	378/514 x 254 x 260	23,5	Fan / Vertical & Horizontal
TSA-470 to -820	5	-/750 x 550 x 350	60	Fan / Vertical & Horizontal
TSA-835 to -960	6	-/900 x 640 x360	90	Fan / Vertical & Horizontal

H1 = Enclosure height

H2 = Total height including cable interface

Basic I/O data

Control signal inputs:	
Analogue (differential), 1 input	
Analogue voltage/current	0-10V, 2-10V / 0-20 mA, 4-20 mA
Resolution	12 bit
Input impedance	Volt signal 20 k Ω . Current signal 250 Ω .
Digital: 4 inputs	
Input voltage	0-4 V \rightarrow 0; 8-27 V \rightarrow 1.
Max. input voltage	Max. 37 V for 10 sec.
Input impedance	\leq 3.3 VDC: 4.7 k Ω . - \geq 3.3 VDC: 3.6 k Ω
Control signal outputs:	
Analogue, 1 channel	
Output voltage/current	0-10 V, 2-10 V / 0-20 mA, 4-20 mA
Min. load impedance for voltage signal 1)	700 Ω
Maximum load impedance for current signal 1)	700 Ω
Resolution	12 bit
Relays, 3 pcs	
Contacts	Relay 1 and 2: 1-pole closing contact (NO). Relay 3: 1-pole change-over contact (NO/NC). 250 VAC 8A or 24 VDC 8A resistive. 250 VAC, 3A inductive. Min. 100 mA.
Reference voltages	
Output voltage	+24 VDC+5%
Short-circuit current (∞)	Max current 50 mA
Output voltage (for AnIn)	+10VDC \pm 5%
Short-circuit current (∞)	Max 10 mA short circuit and overload proof.

1) For max 1 % inaccuracy.

See "User interface data" on page 9 for connection data and default settings.

Recommended load fuse

Recommended slow fuses (type gG) for protection against overload.

TSA model	Fuse [A]
-016	25
-022	35
-030	40
-036	50
-042	63
-056	80
-070	100
-085	125

TSA model	Fuse [A]
-100	160
-140	200
-170	224
-200	250
-240	315
-300	355
-360	400
-450	500

TSA model	Fuse [A]
-470	630
-580	800
-730	1000
-820	1250
-835	1250
-960	1250

Semiconductor fuses, TSA frame sizes 1 - 4

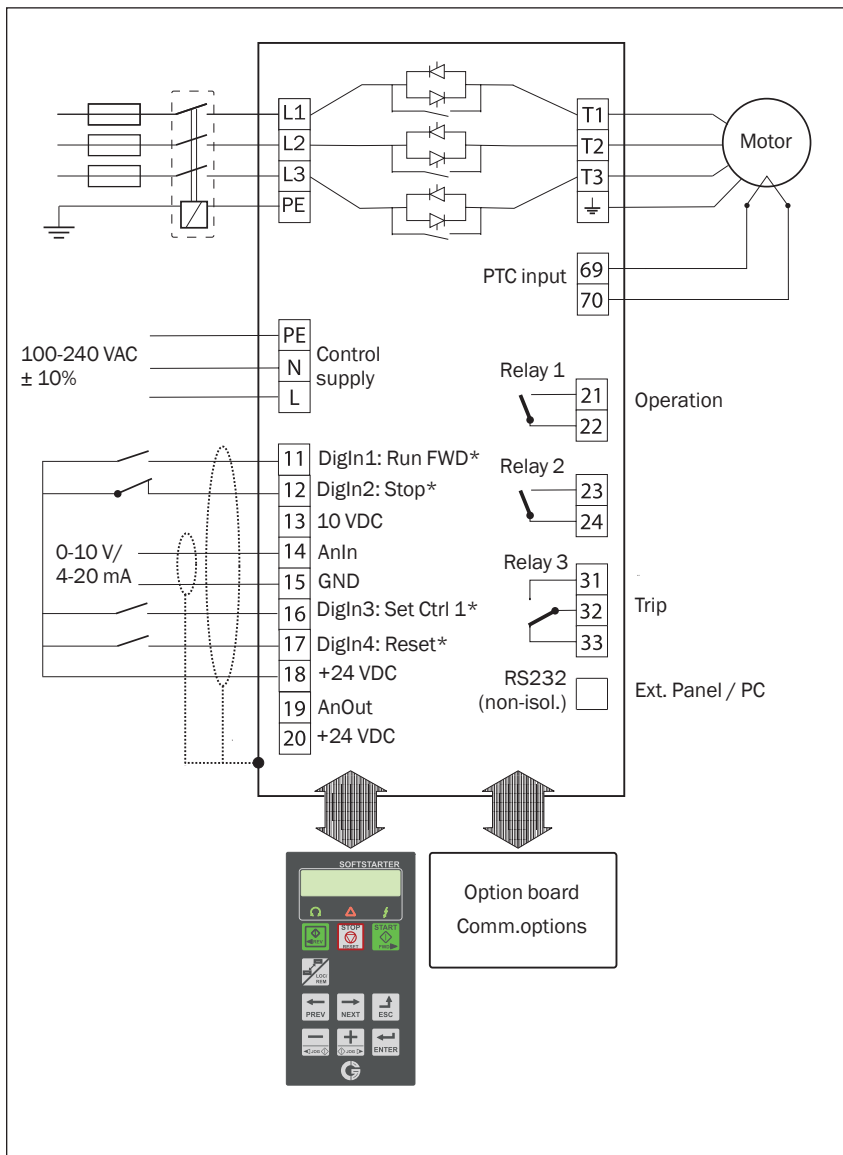
TSA model	Maximum value fuse [A]	I ² t fuse at 700V [A ² s]
-016	50	1 500
-022	70	2 800
-030	100	3 600
-036	125	6 900
-042	150	11 000
-056	175	14 000
-070	250	42 000
-085	300	55 000
-100	400	99 000
-140	500	160 000
-170	600	222 000
-200	700	332 000
-240	800	433 000
-300	1 000	950 000
-360	1 200	1 470 000
-450	1 400	1 890 000

Ultrarapid fuses, TSA frame sizes 5 - 6

TSA model	Fuse rated [A]	Bussman type
-470	800	170M6812
-580	1000	170M6814
-730	1250	170M6116
-820	1500	170M6118
-835	1500	170M6118
-960	1600	170M6119

User interface data

Emotron TSA



*) Default selection

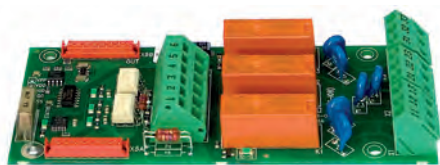
	Name	Function (Default)	
Control board terminals			
11	DigIn 1	Run FWD	
12	DigIn 2	Stop	
13	10 VDC	Supply voltage for analogue input	
14	AnIn	Process value	
15	GND	Signal ground (Common)	
16	DigIn 3	Set Ctrl 1	
17	DigIn 4	Reset	
18	+24 V	+24 VDC Supply voltage	
19	AnOut	0 to motor nom. current	
20	+24 V	+24 VDC Supply voltage	
Power board terminals			
PE		Protective Earth	
N		Control supply voltage	
L		100 - 240 VAC ± 10%	
21	Relay 1	NO	Operation
22		C	
23	Relay 2	NO	Not used
24		C	
31	Relay 3	NO	Trip
32		C	
33		NC	
69		PTC thermistor input	
70		(isolated)	

All analogue and digital inputs and outputs are programmable.

Standard options for Emotron TSA

Support for 2 option boards plus 1 communication option.

I/O board



3 extra relay outputs (230 VAC/5 A NO/NC). 3 extra 24 V /3.2 kΩ (AC or DC) differential digital inputs, all programmable. Inputs providing 50 VAC/DC isolation between channels.

Maximum 2 I/O boards can be built -in per TSA softstarter.

Part no. 01-3876-51

PTC/PT100 board



1 PTC isolated input conforming DIN 44081/44082.

Maximum 2 PTC/PT100 boards can be built -in per TSA softstarter

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. 01-3876-58

Fieldbus - Profibus



Fieldbus option module for Profibus DP or DP V1 communication. Use 9-pin D-sub connector.

Typical TSA response time = 10 ms (not including any fieldbus delays).

Baud rates: 9.6 kbits/s - 12 Mbits/s supported.

Part no. 01-5385-55

Fieldbus - DeviceNet



Fieldbus option module for DeviceNet communication.

Part no. 01-5385-56

Baud rates: 125 - 500 kbits/s supported.

Typical TSA response time = 10 ms (not including any fieldbus delays).

Ethernet - Modbus / TCP



Industrial Ethernet option module for Modbus/TCP protocol. RJ45 type connector.

Typical TSA response time = 10 ms (not including any ethernet delays).

Baud rates: 10 or 100 Mbits/s supported.

Part no. 01-5385-59

Ethernet - EtherCAT



Industrial Ethernet option module for EtherCAT protocol.
 Baud rate: 100 Mbits/s
 Typical TSA response time = 10 ms (not including any Ethernet delays).

Part no. 01-5385-60

Ethernet - Profinet IO 1-port



Industrial Ethernet option module for Profinet IO (RT) protocol.
 Baud rate: 100 Mbits/s
 Typical TSA response time = 10 ms (not including any Ethernet delays).

Part no. 01-5385-61

Ethernet - Profinet IO 2-port



Industrial Ethernet option module for Profinet IO (RT) protocol.
 Baud rate: 100 Mbits/s
 Typical TSA response time = 10 ms (not including any Ethernet delays).

Part no. 01-5385-62

USB isolated



Isolated USB serial communication module. For Modbus RTU comm. protocol.
 Baude rates: 2.4 - 115.2 kbits/s supported.
 Typical TSA response time = 10 ms

Part no. 01-5385-63

RS485 isolated



Isolated RS485 serial communication module. For Modbus RTU comm. protocol.
 Baude rate: 2.4 - 115.2 kbits/s supported.
 Typical TSA response time = 10 ms

Part no. 01-5385-54

Fieldbus - EtherNet/IP



Industrial Ethernet option module for Profinet IO (RT) protocol. 1 x RJ45 type connector.

Baud rate: 100 Mbits/s

Typical TSA response time = 10 ms (not including any fieldbus delays).

Part no. 01-5385-64

Fieldbus - CANopen



Fieldbus option module for CANopen communication. Use 9-pin D-sub connector.

Baud rates 10 kbit/s - 1 Mbits/s

Part no. 01-5385-65

External control panel



External control panel IP54 suitable for mounting on a cabinet door.

Kit complete with control panel, mounting frame and 3 m cable.

Part no. 01-5406-00

EmoSoftCom



Connect a PC with a standard RS232 cable to D-sub on top of TSA unit or via USB/RS485 /Modbus - TCP Comm. modules (Optional). EmoSoftCom PC software makes it possible to perform signal recordings

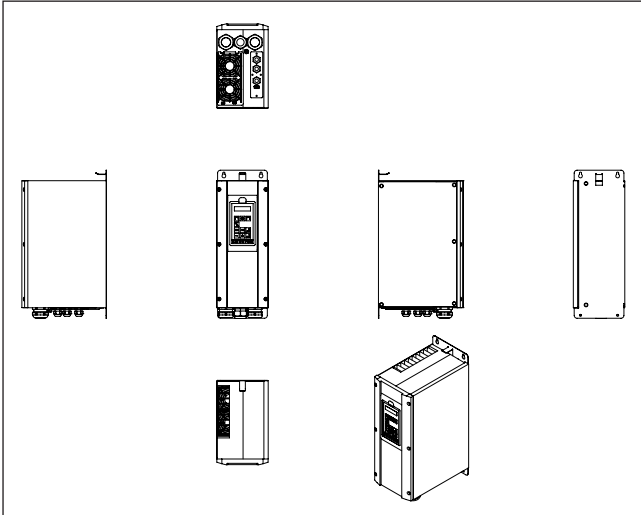
and save/load parameter backup data, for example during service & maintenance.

Kit of external current transducers and cables for TSA size 6

Set of 2 current transducers for TSA size 6, if using external bypass contactor. Also includes extension cables for CT connection to TSA unit.

Part no. 01-7802-00

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 for direct access to all CAD documents.

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