Switching Devices - Capacitor Duty Contactors

Soft Switching of Capacitor • Excellent Damping of Inrush • Improved Power Quality • UL Certified

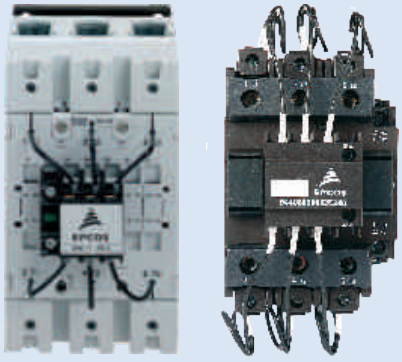
General

When a capacitor is switched to an AC voltage, the result is a resonant circuit damped to a greater or lesser degree. The switching of capacitors can cause high inrush currents, particularly when they are switched in parallel to others already activated in the power line, and if high short-circuit powers are present on the line.

Capacitor contactors with damping resistors make use of pre-switching auxiliary contacts. They close before the main contacts and pre-load the capacitor thus avoiding current peak values.

This influences positively the life expectancy of the capacitor significantly in addition to the positive impact on the power quality (avoiding transients and voltage sags that otherwise may be caused by switching in capacitors).

The capacitor duty contactors are offered in two versions, viz
- Standard series
- Premium series (imported)



Applications
- Damping of inrush current in low-voltage PFC systems
- For PFC systems with and without reactors

Features
- Excellent damping of inrush current
- Improved power quality (e.g. avoidance of voltage sags)
- Longer useful service life of main contacts of capacitor contactor
- Soft switching of capacitor and thus longer useful service life
- Enhanced mean life expectancy of PFC system
- Reduced ohmic losses
- Leading contacts with wiper function
- Tamper-proof and protected resistors
- Easy access for cable connection
- Voltage range: 400…690 V
- Output range: 12.5…100 KVAr
- Series J230 / C240 for all PFC systems
- AC6b utilization category

Approvals
- UL file E224924 NLDX and NLDX 7 for J series
- UL file E334934 NLDX and NLDX 7 for C series

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Technical data : Capacitor duty contactors premium series

Type		B44066*****J230							
Main contacts		**S1811**	**S2411**	**S3211**	**S5011**	**S6211**	**S7411**	**S9011**	**S9911**
Rated insulation voltage V_i V_{is}	[V AC]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]	1,000[1)]	1,000[1)]
Admissible frequency of operation	1/h	120	120	120	120	120	80	80	80
Contact life	million operations	0.25	0.15	0.15	0.15	0.15	0.12	0.12	0.12
Cable cross section									
Solid or standard	[mm^2]	1.5–6	2.5–25	2.5–25	4–50	4–50	4–50	0.5–95/10–120	0.5–95/10–120
Flexible	[mm^2]	1.5–4	2.5–16	2.5–16	10–35	10–35	10–35	0.5–70/10–95	0.5–70/10–95
Flexible with multicore cable end	[mm^2]	1.5–4	2.5–16	2.5–16	6–35	6–35	6–35	0.5–70/10–95	0.5–70/10–95
Cables per clamp		2	1	1	1	1	1	2	2
Operating range of V_s magnet coils in multiples of control voltage		0.85–1.1	0.85–1.1	0.85–1.1	0.85–1.1	0.85–1.1	0.85–1.1	0.85–1.1	0.85–1.1
Auxiliary contacts[1)]									
Rated insulation voltage V_i V_{is}	[V AC]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]
Rated current I_{th} at ambient temperature									
max. 40 °C	I_{coth} [A]	16	10	10	10	10	10	10	10
max. 60 °C	I_{coth} [A]	12	6	6	6	6	6	6	6
Utilization category AC15									
220 to 240 V	I_{coth} [A]	12	3	3	3	3	3	3	3
380 to 440 V	I_{coth} [A]	4	2	2	2	2	2	2	2
Short circuit protection									
Highest fuse rating	I_{coth} [A]	25	20	20	20	20	20	20	20
slow, gL (gG)									
Auxiliary contacts	NO/NC	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

IEC 947-4-1, IEC 947-5-1, EN 60947-4-1, EN 60947-5-1, VDE 0660 Dimensional drawing: see datasheet

1) Applies to networks with grounded star point, overvoltage category I to IV, pollution severity 3 (industrial standard), Vimp = 8 kV. Values for other conditions on request.

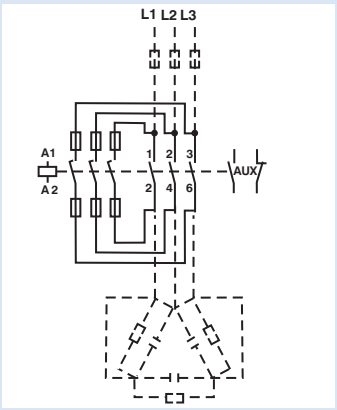
Main technical parameters 230V coil:

Capacitor power at ambient temperature,voltage, 50/60 Hz						Rated current		Weight	Ordering code
380 – 400 V		**415 – 440 V**		**660 – 690 V**					
50°C KVAr	**60°C KVAr**	**50°C KVAr**	**60°C KVAr**	**50°C KVAr**	**60°C KVAr**	**50°C A**	**60°C A**	**kg**	
0–12.5	0–12.5	0–13	0–13	0–20	0–20	18	18	0.34	B44066S1811J230
10–20	10–20	10.5–22	10.5–22	17–33	17–33	28	28	0.60	B44066S2411J230
10–25	10–25	10.5–27	10.5–27	17–41	17–41	36	36	0.60	B44066S3211J230
20–33.3	20–33.3	23–36	23–36	36–55	36–55	48	48	1.10	B44066S5011J230
20–50	20–50	23–53	23–53	36–82	36–82	72	72	1.10	B44066S6211J230
20–75	20–60	23–75	23–64	36–120	36–100	108	87	1.10	B44066S7411J230
33–80	33–75	36–82	36–77	57–120	57–120	115	108	2.30	B44066S9011J230*
33–100	33–90	36–103	36–93	57–148	57–148	144	130	2.30	B44066S9911J230*

* without CCC

Connection diagram

All types B44066S****J230 (with preload resistors),
B44066S1811J230 with wires on the bottom,
B44066S9911J230 with resistors inside housing.



Switching Devices - Capacitor Duty Contactors

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Technical data : Capacitor duty contactors standard series

Type	B44066*****C240							
Main contacts		**C1011**	**C1211**	**C1611**	**C2011**	**C2511**	**C3312**	**C4012**	**C6012**
Rated insulation voltage V_i V_{is}	[V AC]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]
Admissible frequency of operation	1/h	240	240	240	240	240	240	240	100
Contact life	million operations	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Cable cross section									
Flexible with cable end sleeve -	[mm^2]	2.5	2.5	4	4	6	16	16	50
1 conductor Flexible with cable end sleeve - 2 conductors	[mm^2]	1.5	1.5	2.5	4	4	6	6	25
Solid without cable end sleeve -	[mm^2]	4	4	6	10	16	25	25	50
1 conductor Solid without cable end sleeve - 2 conductors	[mm^2]	4	4	6	6	10	16	16	35
Operating range of magnet coils in multiples of control voltage V_s		0.78-1.1	0.78-1.1	0.78-1.1	0.78-1.1	0.78-1.1	0.78-1.1	0.78-1.1	0.78-1.1
Auxiliary contacts[1)]									
Rated insulation voltage V_i V_{is}	[V AC]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]	690[1)]
Rated current I_{th}									
at ambient temperature: 40° C	I_{coth}[A]	10	10	10	10	10	10	10	10
60° C	I_{coth}[A]	8	8	8	8	8	8	8	8
Utilization category AC15									
220 ... 240 V	I_{coth}[A]	3	3	3	3	3	3	3	3
380 ... 440 V	I_{coth}[A]	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Short circuit protection Highest fuse size, slow, gL (gG)	I_{coth}[A]	10	10	10	10	10	10	10	10
Auxiliary contacts	NO	1	1	1	1	1	1	1	1
	NC	1	1	1	1	1	2	2	2

IEC 947-4-1, IEC 947-5-1, EN 60947-4-1, EN 60947-5-1, VDE 0660 Dimensional drawing: see datasheet

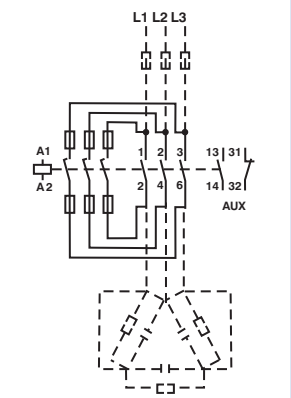
1) Applies to networks with grounded star point, overvoltage category I to IV, pollution severity 3 (industrial standard), Vimp = 8 kV. Values for other conditions on request.

Main technical parameters 240 V coil:

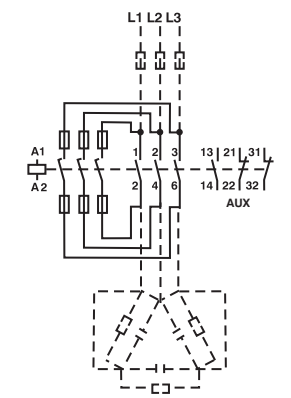
Capacitor power at ambient temperature, voltage, 50 / 60 Hz Rated current				Weight	Ordering code
380 - 400 V	**415 - 440 V 660 - 690 V**				
55 °C KVAr	**55 °C KVAr**	**55 °C KVAr**	**55 °C A**	**kg**	
0-10	0-10	0-12.5	14	0.43	B44066S1011C240
0-12.5	0-12.5	0-18	18	0.43	B44066S1211C240
0-16.7	0-16.7	0-24	24	0.43	B44066S1611C240
0-20	0-20	0-30	29	0.43	B44066S2011C240
0-25	0-25	0-36	36	0.43	B44066S2511C240
0-33.3	0-33.3	0-48	48	0.43	B44066S3312C240
0-40	0-40	0-58	58	0.43	B44066S4012C240
0-60	0-60	0-92	92	0.43	B44066S6012C240

Connection diagrams

Types B44066S...1C240



Types B44066S...2C240



Switching Devices - Thyristor Modules for Dynamic PFC TSM Series

Ultrafast Smooth Switching • Natural Cooled • Compact Design • Enhanced Life of System

EPCOS

General

Conventional systems for power factor correction are used to optimize the power factor and reduce the level of harmonics in the grid. The usage of new technologies in modern industry has negative impacts on electric power quality of the main supply networks, e.g. frequent high load fluctuations and harmonic oscillation.

Excessive currents, increased losses and flickering will not only influence the supply capacity but will also have a significant impact on the operation of sensitive electronic devices.

The solution for this are dynamic power factor correction systems. With the thyristor module series TSM-LC and TSM-HV, we provide the main component – "the electronic switch" – for dynamic power factor correction.
The TSM module series offers fast electronically controlled, self-observing thyristor switches for capacitive loads up to 50 KVAr, that are capable to switch PFC capacitors within a few milliseconds nearly without a limitation to the number of switchings during the capacitor lifetime.

Applications

- Main supply networks with high load fluctuations for dynamic PFC systems
- Presses
- Welding machines
- Elevators
- Cranes
- Wind turbines

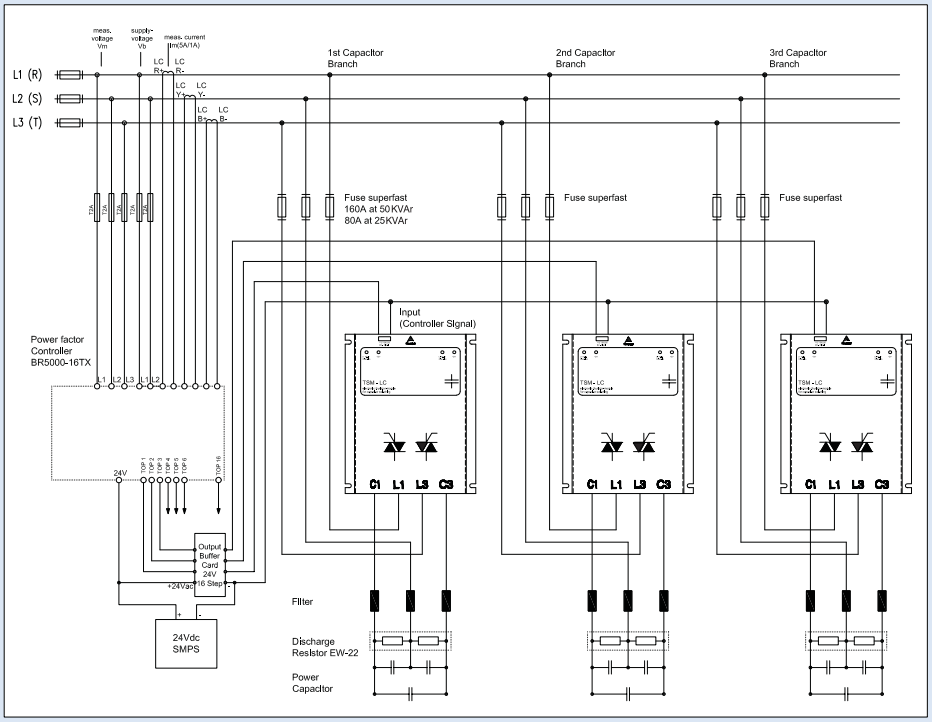
Features

- Easy installation: it can be used similar to a contactor
- All the intelligence needed is offered within the thyristor module itself
- Reaction time: 5 milliseconds only
  Permanent self-controlling of:
  – voltage parameter
  – phase sequence
  – capacitor output
- Display of
  – operation
  – faults
  – activation
- Voltage range: 440 V and 690 V
  Output range:
  440 V: 10, 25 and 50 KVAr
  690 V: 50 KVAr

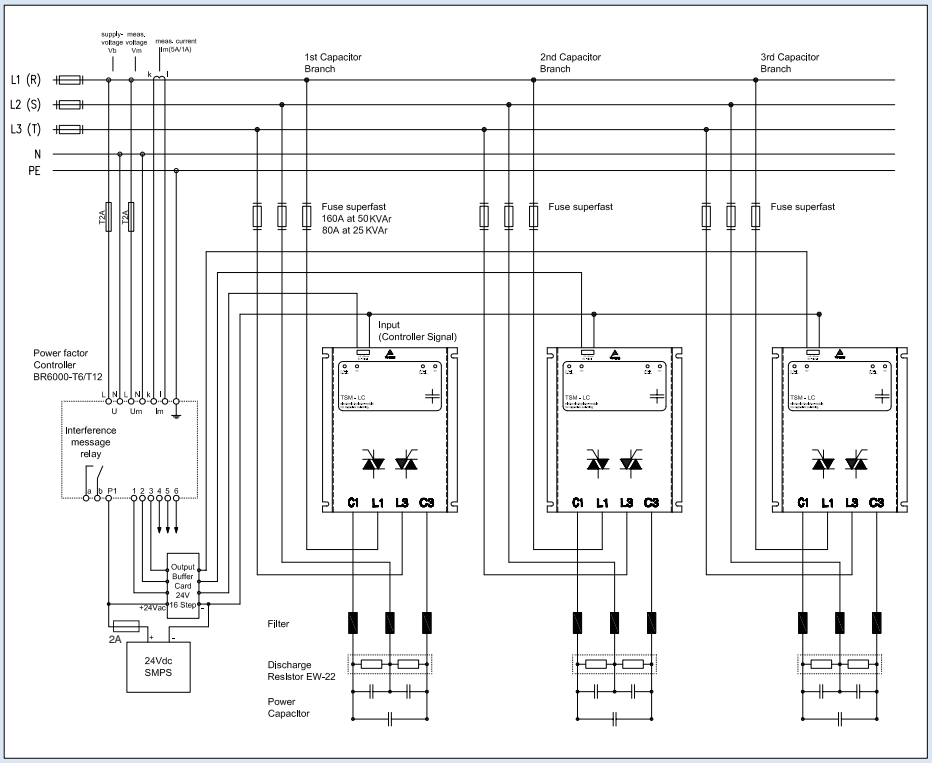
Switching Devices - Thyristor Modules for Dynamic PFC TSM Series

Ultrafast Smooth Switching • Natural Cooled • Compact Design • Enhanced Life of System

Dynamic PFC network BR5000-T multiple stages



Dynamic PFC network BR6000-T multiple stages



Switching Devices - Thyristor Modules for Dynamic PFC TSM Series

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Selection table TSM series

	TSM-LC 10	TSM-LC 25	TSM-LC 50	TSM-HV 50
Ordering code	B44066T0010R440	B44066T0025R440	B44066T0050R440	B44066T0050R690
Rated voltage	380 … 440 V	380 … 440 V	380 … 440 V	690 V
Max. grid voltage: – in conventional PFC systems(without reactors)	440 V	440 V	440 V	690 V
– in detuned PFC system (7% detuning)	440 V (no upwards tolerance)	440 V (no upwards tolerance)	440 V (no upwards tolerance)	690 V
– in detuned PFC system (14% detuning)	400 V	400 V	400 V	690 V
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Maximum power / at nominal voltage	10 KVAr	25 KVAr	50 KVAr	50 KVAr
Power circuit	Direct connection 4 pole via terminal clamps (D = 6 mm^2 resp. 4 mm^2)	Direct connection 4 pole via busbar (cable lug 25mm^2 D =8 mm)	Direct connection 4 pole via busbar (cable lug 25mm^2 D =8 mm)	Direct connection 4 pole via busbar (cable lug 25mm^2 D =8 mm)
Neutral required	No*	No*	No*	Yes**
Aux. supply voltage required	No	No	No	230 V AC
Connection	from bottom	from bottom	from bottom	from bottom
Losses (PD in W)	2.0 x I (in A) typical; 35 W (thermal)	2.0 x I (in A) typical; 75 W (thermal)	2.0 x I (in A) typical; 150 W (thermal)	3.0 x I (in A) typical; at 690 V/ 50 KVAr approx. 125 W (thermal)
Recommended fuses "superfast"	3 x BS Type (AC 690 V) 40 A	3 x BS Type (AC 690 V) 80 A	3 x BS Type (AC 690 V) 160 A	3 x BS Type (AC 690 V)
Dimensions in mm (w x h x d)	163 x 150 x 75	157 x 200 x 180	157 x 200 x 180	157 x 200 x 195
Weight	1.75 kg	4.8 kg	4.8 kg	5 kg
LED display per phase	2	2	2	1
Cascading	yes	yes	yes	yes
Ambient temperature	–10 °C ... 55 °C	–10 °C ... 55 °C	–10 °C ... 55 °C	–10 °C ... 55 °C
Discharge resistors EW-22 needed	1	1	1	Standard resistor sufficient
Three phase current limitation reactor needed* **	1	1	1	1

*For operation with three-phase capacitor or three single-phase capacitors. **Only for and compulsorily for operation with single-phase capacitors. ***For PFC systems without detuning reactors mandatory.

Accessories for TSM-LC modules

Type/Description
Discharge resistors EW-22 at least 1 piece per step to be used for all types of TSM-LC if fast re-switching time is required. For higher rated steps please contact your local sales office.

Ordering Code
B44066T0022S400

EW-22:

Dimensions (w x d x h)	: 90 x 50 x 100 mm
Weight (approx.)	: 0.3 kg
Design panel	: for mounting on heat sink/fitting
Connection	: wago terminal, ready for three-phase connection to the capacitor

Note :
Three phase current limitation reactor for thyristor modules TSM-series in conventional dynamic PFC-systems without reactor is a must
Used for limitation of the pace of current increase di/dT in the thyristors to the maximum permissible value

Buffer Card

Current amplifier for TSM application • Short circuit protected

Output Buffer card

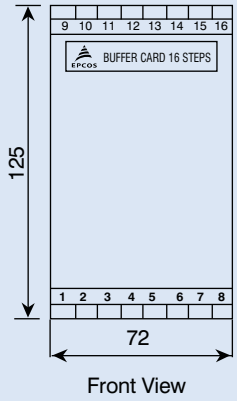
Features

- Transistorised output for fast switching
- Short circuit protection for outputs
- Standard DIN rail mount design provides for easy mounting

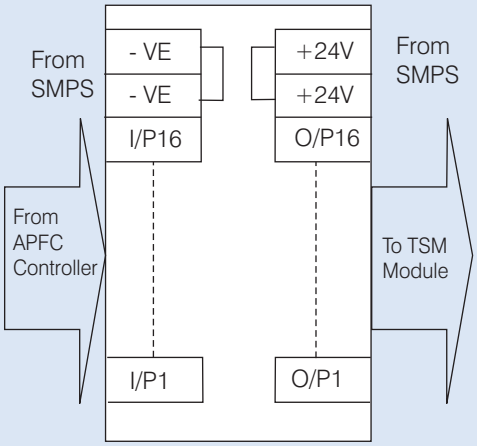
Technical Data

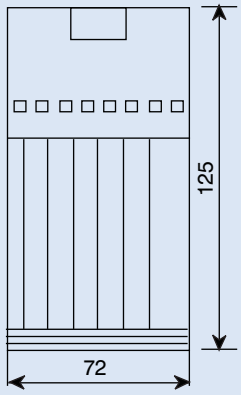
Input signal	24 VDC ± 3V, 15mA
Output voltage	Maximum 1V drop on input signal
Output current	100mA max.
Output type	Transistor output
Number of inputs	16
Number of outputs	16
Temperature range	0°C to 60°C
Mounting	Din Rail mounting
Dimensions (L x W x H)	72 x 125 x 125 mm
Total weight (kG)	0.4 kG (approx)

Dimensions and Connection

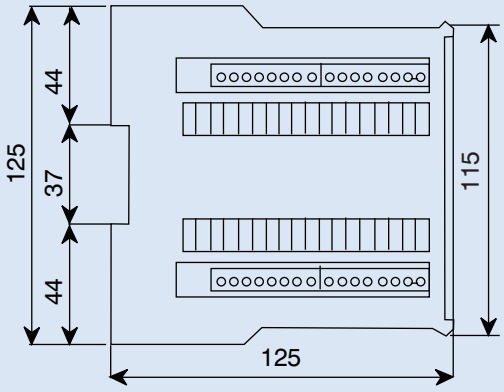


Front View





Top View



Side View