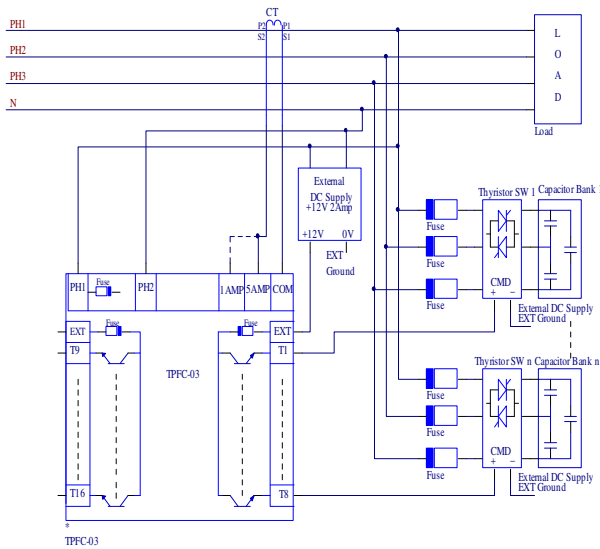


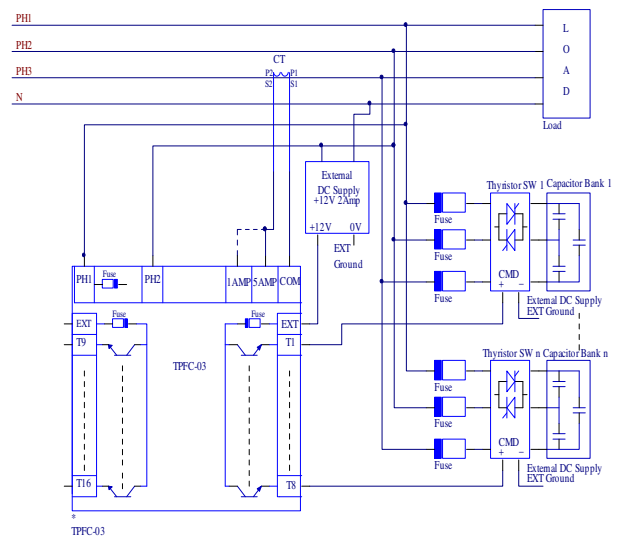


TAS PowerTek
TPFC-03/ (04/08/12/16)
HIGH-SPEED, AUTOMATIC POWER FACTOR
CONTROLLER FOR THYRISTOR SWITCHES
User Operations Guidelines
(Detailed User Manual can be availed from
TAS web-site)

Typical Wiring Scheme:



In-Phase Connection (Expert Mode Configuration) use one phase & neutral for Voltage monitoring. & use same phase for Load current monitoring.



In Quadrature Connection, use any two phases for voltage monitoring & use third phase for the load current monitoring.

Mechanical Dimensions: DIN Standard 144 mm x 144 mm.

Front Height: 144 mm, Front Width: 144 mm, Rear Depth behind the Panel Door: 75 mm

Recommended Panel Cut-out for instrument mounting: 138 mm x 138 mm

Maximum weight: (with clamps and terminals): Approx. 650 gms.

Keyboard in Front:



Up Key



Right Shift Key



Mode Key



Down Key



Left Shift Key



Memory / Save Key



Enter Key

Features:

- * Micro-Controller based Digital Signal processing logic for measurements, monitoring, analysis and controls.
- * Designed for applications in High-Speed, Power Factor Correction required for fast-changing loads such as, Welding Shops, Induction Furnaces, Rolling Mills, Riveting Shops, Large Reciprocating Compressor Lines, etc.
- * Wide AC Volt. I/P Supply Range SMPS, suitable for use on Nominal. 50 Hz or 60 Hz.
- * Active Power Measurement, Class 1 accuracy, Reactive Power Measurement, Class 2 accuracy, in measured phase.
- * Measurement and kVAr compensation are Voltage, Frequency / THD compensated.
- * Load Voltage & Supply (Load) Current THD measurement with Odd Harmonic coefficient up to 15th Harmonic.
- * Mode for switching: User defined.
- * 4 Models, as per Order Code, 04, 08, 12 or 16 Current-Sourcing Transistor Outputs with User Provided External DC Supply of 12 Vdc or 24 Vdc. Suitable for direct interface to Capacitor-Duty Thyristor Switches from TAS, or from other reputed makes.
- * Capable of doing the kVAr measurements by averaging cycle of mains waveform and provide the kVAr compensation.
- * DIN Standard 144 x 144 mm Plastic Cabinet for panel-door flush-mounting. Recommended Panel door cut-out as 138 x 138 mm. Max. Depth of 76 mm on rear side of panel mounting door.
- * Protections provided (user settable):
 - Over / Under Voltage at measurement input.
 - Load Voltage and Load Current Harmonic Overload.
 - Over-Temperature inside the **TPFC-03** Controller Unit.
 - Out of Capacitor Bank steps, Insufficient Total Capacitive kVAr for Compensation (only for indication)
 - Over / Under AC Mains Line Frequency.

Specifications:

- * Balanced 3-Ph Reactive Power Compensation uses 3-Phase Power Capacitor Banks, thru' High-Speed Thyristor Switches.
- * Operating Aux. & Measurement voltage: 100V to 500V AC Line-to-Line or 100 Vac to 300 Vac Line-to-Neutral
- * AC Mains Supply Frequency: Nominal 50 Hz (+/-3 Hz) or 60 Hz (+/-3 Hz).
- * Single Supply (Load) Current Input from C.T. (from C.T. secondary): 1A or 5A, selectable at the terminal block at the rear.
- * Auxiliary Operating Input Supply: Line-to-Line from 100 Vac to 500 Vac or Line-to-Neutral from 100 Vac to 300 Vac.
- * P.F. Correction time: Selectable from 3 to 3000 Line Frequency Cycles.
- * Capacitor Bank Discharge Time: Selectable from 1 to 60 seconds.
- * Interleaving delay: Instantaneous switching (No Bank Health Check) or fixed 1 second.
- * O/P Commands: Max. 20 mA Current-Sourcing Transistor O/Ps, Use ext. DC Supply of 12 or 24 V, Protected O/Ps.
- * Operating Ambient Temperature Range: 0 to +55° C. Storage Temperature Range: 0 to +65° C.
- * Relative Humidity Range: 10% to 95%. (Non-Condensing).
- * Un-packed Net weight of the Unit: 650 grams.

LCD Display:

Contrast of LCD: LCD Contrast can be adjusted 'Darker' by repetitive pressing of Left Shift Key & 'Lighter' by repetitive pressing of Right Shift Key. To save the new LCD Contrast settings, Press Memory/ Save Key.

The Powered-On Unit shows factory set default screen. First line of LCD Display indicates P.F. value, inductive / capacitive PF, mode of operation, and fault /OK status.

"PF=" part is to indicate value that is "Power Factor". The PF is with "+ (Inductive-Lagging)" OR "- (Capacitive-Leading)" sign. Refer Indian Standard IS 14697: 1999, for Direction and Sign of Active & Reactive Power, PF, Annex F (Clause 3.1.8), for interpretations for a Four-Quadrant Operation of PF Controller.

The next LCD Display Character indicates "operating configuration", i.e. Expert Configuration indicated by "E".

The next LCD Display Character on the upper line of display shows the operational mode, Auto (A) or Manual (M) mode.

Last 2 characters on the upper line of display show the Health status of TPFC-03. OK indicates normal operation.

"I AM OK" (Health Monitor) LED flashing (Amber colour LED) indicates the controller health status is Healthy.

The last two characters on the LCD Display 1st Line represent one of the following status:

OK = Controller status is okay, OV = Over-Voltage Fault, UV = Under-Voltage Fault, VH = Voltage Harmonics High Fault

IH = Current Harmonics High Fault, OT = Over-Temperature (inside **TPFC-03** unit),

OB = Out of Banks (Insufficient Total Capacitive kVAr), OF = Over-Frequency Fault, UF = Under-Frequency Fault

The bottom line of the LCD Display shows the Capacitor Bank status. The numbers 1 to 16 below the LCD display are for specific outputs (Capacitor Bank number that is controlled by **TPFC-03**). The LCD display above this number indicates the status of that specific Relay Output / Capacitor Bank.

A dash (-) symbol = Bank is connected, but is in OFF state. A Capacitor symbol = Bank is connected & it is in ON state. A BOLD Capacitor symbol = Bank is declared as fixed bank & is ON. A X symbol = Bank is declared faulty and is OFF. A D symbol = Capacitor Bank has just turned off and it is in discharging state.

During Power Up, till the time all Banks are showing D status, the keyboard would not be operational. This is to ensure that at Power-Up, all the Capacitors Banks are allowed to be discharged first.

Operational Modes: Modes of operations for **TPFC-03** are Auto Mode, Manual Mode, Program Mode –where system parameter can be done, Test Mode – where system supply inputs & Phase/ Polarity can be set for manual phase sequence synchronization.

Expert Configuration menu: In program mode, the system parameter settings are user settable. Entering in the TEST Mode of Expert Configuration menu allows the user to carry out synchronization manually. For this, first select the mode of operation, Line-to-Neutral (In-Phase) or Line-to-Line (Quadrature) Mode. The next screen is the selection of Phase. According to the selected phase, the user can see all the kW and kVAr values of the selected phase for getting judgment of right selection of Phase sequence & polarity. After selection, Save key is to be pressed.

All Capacitor Banks kVAr values are to be entered in the Controller in their absolute values. kW and kVAr values can be seen in their absolute engineering units.

Various real, instantaneous values of electrical parameters measured/computed can be viewed on the LCD Display.

Display of Electrical Parameters:

- **MAIN SCREEN:** This is factory set default screen, indicating information on PF, functionality mode, operating mode and controller health status.
- **MEASURED VALUES:** Indicates the measured values of the system parameters like V, I, kW, kVAr, kVA, capacitive kVAr and AC Mains Line Frequency.
- **MAX VALUES:** Indicates the maximum values of V, I, kW, kVAr and kVA, detected after the last reset. This also has the facility of resetting the maximum values manually which after resetting would be the actual instantaneous values and not zero.
- **Display THD%:** THD% for voltage and current. Also displays odd harmonics up to 15th level.
- **DISPLAY STEP:** The measured kVAr values of each connected output capacitor bank step.
- **DISPLAY AUX FUNC:** The APFC Unit’s internal temperature in degree Celsius and auxiliary digital outputs such as trip fault, over-temperature, etc. are displayed.
- **DISPLAY UTILIZATION CNTR:** The bank utilization counter, i.e. number of times the bank is utilized and also displays the cleared bank counter to 0. This helps in proper maintenance of the contactors.
- **DISPLAY SR NO.:** The unique serial number of the particular **TPFC** Controller.
- **DISPLAY UNIT DETAILS:** the name and version of software. The firmware version number may be different, dependent on date of design update.

MEASURED VALUES	MAX VALUES	HARMONICS	STEP kVAr	DISPLAY AUX-FUNCTION	DISPLAY UTILIZATION CNTR
MEASURED VOLTAGE	MAX-VOLTAGE	V-THD-F	STEP[01]kVAr		UTILIZATION CNTR
MEASURED CURRENT	MAX -CURRENT	I-THD-F	.	AUX OP1: TRIP FLT	BANK[1]:0000000000
ACTIVE POWER	MAX-KW		.	AUX OP2: OVR TEMP	.
REACTIVE POWER	MAX-kVAr		STEP[16]kVAr	INT-TEMPERATURE	BANK[16]:0000000000
APPARENT POWER	MAX-KVA				CLR BANK[1] CNTR
C-kVAr	RESET MAX-VALUES				-
FREQUENCY					CLR BANK[16] CNTR

Programming Parameters (user editable) :

Parameter	Min.	Max.	Factory Default
General I/O			
Mode password (Basic or Expert)	0000	9999	0001
Program password (Only for Expert configuration)	0000	9999	0002
Load default (Yes/No)	-	-	No
Aux OP 1: NONE TRIP FLT OVER TEMP OUT OF BANK	-	-	TRIP FLT
Aux OP 2: NONE TRIP FLT OVER TEMP OUT OF BANK	-	-	OVER TEMP
System			
Volt meas. Mode (Line-to-Neutral/Line-to-Line)	-	-	L-to-L
Rated Supply Voltage (Line-to-Line) / (Line-to-Neutral)	110 110	500 288.5	415 240
CT ratio Primary	1	6500	1000
PF Target (Ind / Cap)	-	-	Ind
PF Target	0.700	0.999	0.999
Faults			
Over voltage fault (Fast OFF /Disable)	-	-	Fast OFF
Over voltage limit (%)	105	125	110
Under voltage fault (Fast OFF: /Disable:)	-	-	Fast OFF
Under voltage limit (%)	70	95	85
Temperature fault (Fast OFF /Disable)	-	-	Fast OFF
Temperature limit (Deg. Celsius)	50	65	60
Harmonic overload(Enable /Disable)	-	-	Enable
V-THD threshold limit (%)	1	20	5
I-THD threshold limit (%)	3	150	25
HAR FLT AUTO – RST (Enable /Disable)	--	-	Enable
STEP HEALTH CHK (Enable /Disable)	-	-	Disable
Out of BANKS FLT (Enable /Disable)	-	-	Enable
Step			
P. F. Correction time (seconds)	1	1200	00120
Capacitor Bank Discharging time (seconds)	1	1200	00060
Inter-Leaving Delay (seconds)	1	1	00001
Smallest kVAr Safety Factor	1.1	1.9	1.5
COMP No Action Band Offset in %	0	100	50
Number of Capacitor Bank Steps connected	1	16	16
Fixed Bank setting (Capacitor Bank(s) Number(s))	-	-	-
Capacitor Bank Voltage (Line-to-Line)	110	600	00440
Bank [1] kVAr...	1	65535	1
Bank[2] kVAr	1	65535	2
Bank[3] kVAr	1	65535	4
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Bank [16] kVAr	1	65535	180

For other details, Installation, Commissioning and Fault-Finding instructions, refer to the detailed User Manual of this product, which can be availed from **TAS PowerTek**, on request, or down-loaded it from our website:
<http://www.taspowertek.com>

Note: The Product Features, Specifications etc. are subject to change, without any prior notice.

Document Revision Dated: **25th Jan. 2017.**

To Learn in-depth on the subject, buy e-Book “Reactive Power Compensation on LV Supply”, Author: Mr. Tushar P. Mogre, C.E.O., Director, **TAS PowerTek Pvt. Ltd.**,
 Web link: <http://www.amazon.com/gp/aw/d/B00o7YLLYY>