Technical Data **TD02607012E**

Effective July 2011
Supersedes December 2008

Transient-free statically switched capacitor bank

Product description

The Eaton transient-free statically switched capacitor systems represent the "next level" of power system enhancements by using semi-conductor devices to switch capacitors at the same potential or zero potential difference, thereby eliminating the possible problem of transients caused by capacitor switching and increasing the speed of capacitive VAR compensation. This level of performance is needed when high-current loads rapidly switch on and off and require power factor, voltage flicker, sag or harmonic correction. These disturbances can be found in many industries, including rock crushing, arc-welding, plastic injection molding and crane applications.

Transient-free statically switched capacitor units are available in two broader models.

The FTE model is a real-time transient-free system, used to compensate extremely rapid loads within one cycle of operation (typically 5–20 msec).

The FTA model is a fast transient-free system, used to compensate any loads within 3–4 seconds.

Units are available in a variety of tuning orders/ percentage reactor combinations.

Applications

- Flicker reduction
- Motor starting
- Bus voltage stabilization
- Grid fault ride-through

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Features and benefits

- Transient-free capacitor group switching, using electronic switching elements
- Simultaneous connection/disconnection of all required steps
- Consistent capacitor values and stable filter characteristics
- Harmonic filtration
- Smaller footprints for larger capacitor banks
- Reduced maintenance cost
- Ultra-fast compensation of reactive power with response time as quick as 2–4 ms
- Three independent control modes:
  - Power factor control
  - Voltage control
  - Load sharing with another compensation system connected to the same transformer
- Unique SCAN feature reduces capacitor duty cycles
- Remote control of compensation systems available via LAN or Ethernet
- Integrated three-phase network analyzer:
  - Measures all power parameters on each phase (V, I, kW, kVAR, kVA)
  - Measures voltage and current harmonics to the 63rd harmonic

FTE unit includes all of the above, and:

- Reduces voltage flicker and voltage sag
- Provides network reactive power support
- Offers voltage control options
- Base product is three-phase balanced delta connected. For unbalanced single-phase system, please consult factory

Product configurations

Network voltage

- 210–690V
- Engineered solutions up to 35 kV

Frequency

- 45–55 Hz for 50 Hz network
- 55–65 Hz for 60 Hz network

Capacitor group configurations

- Up to 12 groups per one controller
- Switching sequence:
  - 1:1:1:1 (all equal)
  - 1:2:2:2 (half group)
  - 1:2:4:4 (quarter, half groups)

Response time

- FTE—5–20 ms for a 50 Hz network
- FTE—4–16 ms for a 60 Hz network
- FTA—1–4 second maximum

Enclosure

Applicable standards

- EMC—EN50081-2, EN50082-2, EN55011, EN61000-4-2/3/4/5, ENV50204, ENV50141
- CE Mark—73/23/EEC am 93/68, 98/37/EC Article 4(2)
- Safety—EN61010-1, EN60439-1, EN60204
- UL® 508
- CSA®

Applications to correct power factor and/or provide voltage support can include:

- Motor starting
- On-site generation support
- Spot welding
- Wind turbines
- Other dynamic loads

Three current transformers with a 5A secondary are required for proper operation of a TFSS system. Primary CT current rating is based on service entrance ampacity.

Startup and commissioning by factory-trained personnel is required for proper operation and warranty of a TFSS system.

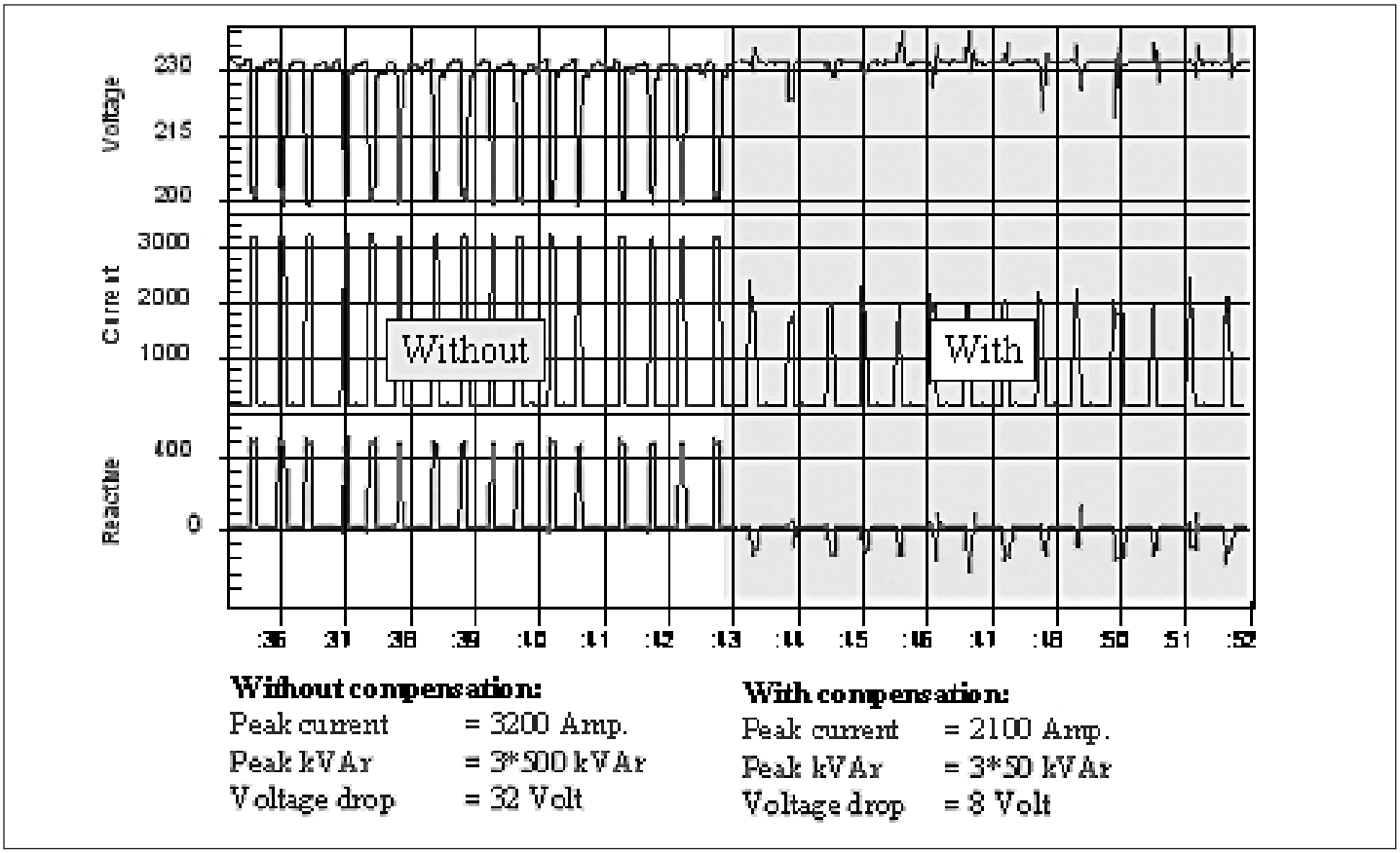

Figure 1. Application Example—Spot Welding

Product selection

Table 1. TFSS Part Numbering System

FTx SZ G SW U P N M L? COM

Type
- **FTE** = Real time balanced
- **FTEU** = Real time unbalanced
- **FTEW** = Voltage control option
- **FTA** = Fast acting

kVAR
Total power in kVAR
(Typically in steps of 50 kVAR beginning with 100 kVAR)

Number of Groups
Maximum 12

Switching Sequence
- **1** = 1:1:1:1
- **2** = 1:2:2:2
- **4** = 1:2:4:4

System Voltage
- **480** = 480V
- **600** = 600V
- **690 or above** = MV ①

Percent Reactor (Turning)
- **P14** = 14% (2.67th order)
- **P7** = 7% (3.8th order)
- **P567** = 5.67% (4.2nd order)
- **P49** = 4.9% (4.5th order)

Enclosure
- **N1** = NEMA® 1
- **N12** = NEMA 12
- **N3R** = NEMA 3R

Circuit Breaker

Optional Measurement Levels ②
- **L1** = Default (includes f, I,V, Power)
- **L2** = L1 + Harmonics
- **L3** = L2+ Waveform

Optional Communications Card
RS-485/Modbus®

① MV units require a correctly sized and specified step-up transformer, as well as MV and LV interconnection, switching, and protection.

② All systems are offered with Measurement Level 1 and no communications card. The measurement levels can be upgraded to higher measurement options as well as for communications.

Note: Balanced system employs two-phase switching; unbalanced system employs individual three-phase switching.

Dimensions

Typical modular section is 31.50 W x 23.50 D x 82.70 H inches (800.1 W x 596.9 D x 2100.6 H mm) for up to 400 kVAR at 480V. An integral breaker can add a 25.00 inch (635.0 mm) width section to the enclosure.

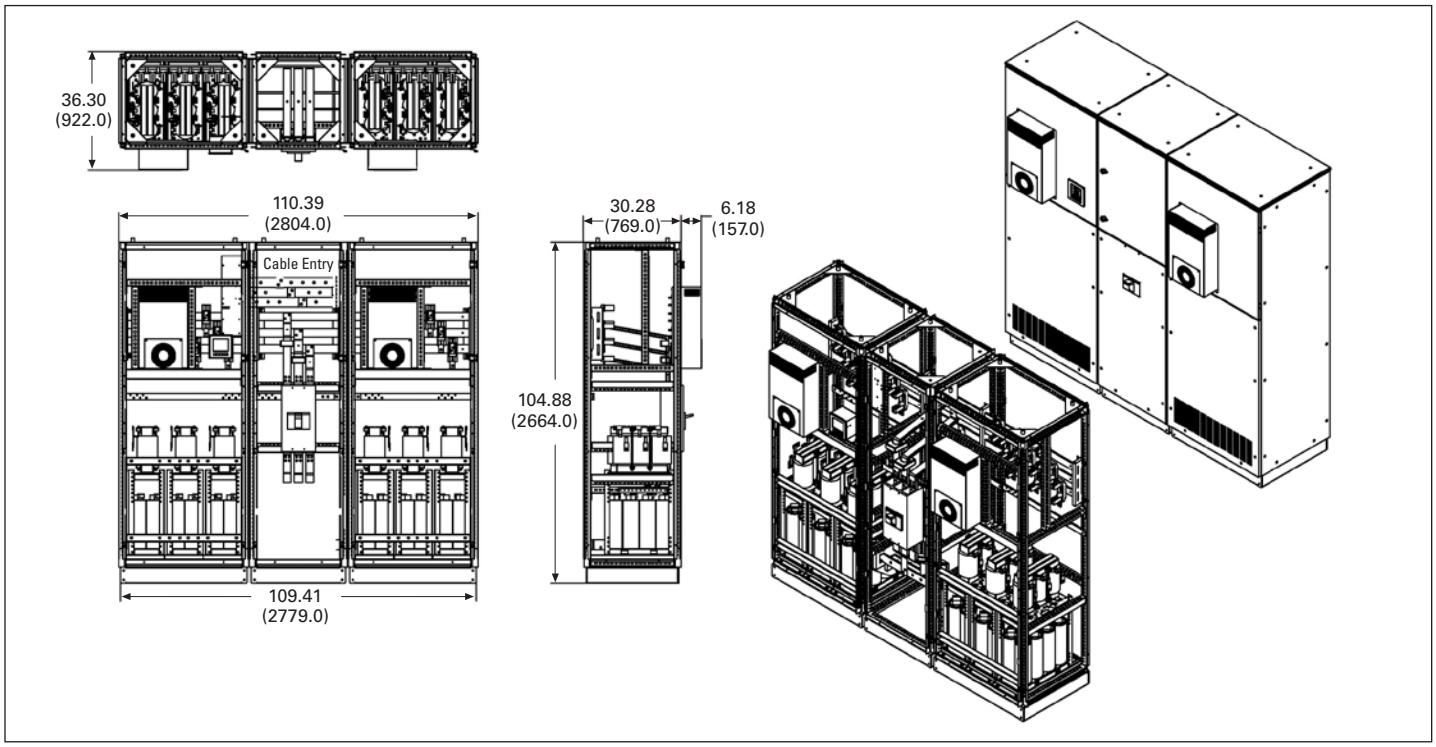

Figure 2. 900 kVAR Fast Transient Free Switching System, Inches (mm)

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Printed in USA
Publication No. TD02607012E / Z10885
July 2011

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