



***Low Voltage Automatic Capacitor Banks  
Power Factor Correction Solutions***

# NUCO Control's Compact Automatic Capacitor Banks

## Intelligent and Compact Solutions for Power Factor Correction

### Intelligent

NUCO utilizes the latest technology in power factor controllers. From touch screen to common communications protocols, the RVT controller meets the most demanding user requirements and the need to provide critical diagnostics.

### Compact

NUCO's automatic capacitor banks up to 400 KVAR are one of the most compact on the market. Footprints as small as 36"H x 36"W x 12"D. All standard automatic capacitor banks rated 400KVAR and lower can either be wall mounted or floor mounted with optional floor mounting stands.

### Flexible

NUCO offers many options for our power factor correction solutions, including:

- Main lug only, circuit breaker, disconnect switch
- UL Type 1, 12, 3R, 4, and 4X enclosures (contact factory for Type 4 and 4X requirements)
- Blown Fuse Indication
- Tuning reactors for harmonic environments
- Customer specified options

### Easy Installation

All of NUCO's automatic power factor correction equipment is UL listed and follow applicable rules of the 2014 National Electric Code.

The advanced RVT controller allows complete automatic commissioning that takes just minutes to get the equipment on line and operating.

### Modular Design

Each enclosure size is designed for a specific amount of KVAR with the idea to allow easy addition of steps when the full capacity of the design is not first utilized or to allow the user to select an enclosure size to allow for future expansion.

### Low Losses

Individual capacitor elements have total losses less than 0.5W per KVAR. Total automatic bank losses including all accessories are less than 1.5W per KVAR.

### Safety Features

NUCO incorporates proven capacitor element technology in it's systems. The unique three level protection for our capacitor elements ensures long capacitor life and maximum safety. The three level protection includes the following:

- Self healing metallized polypropylene film
- Segmented metallization
- True disconnect of all three phases when capacitor has reached the end of its lifetime or sever overload condition

### Standards

- CSA
- IEC
- UL

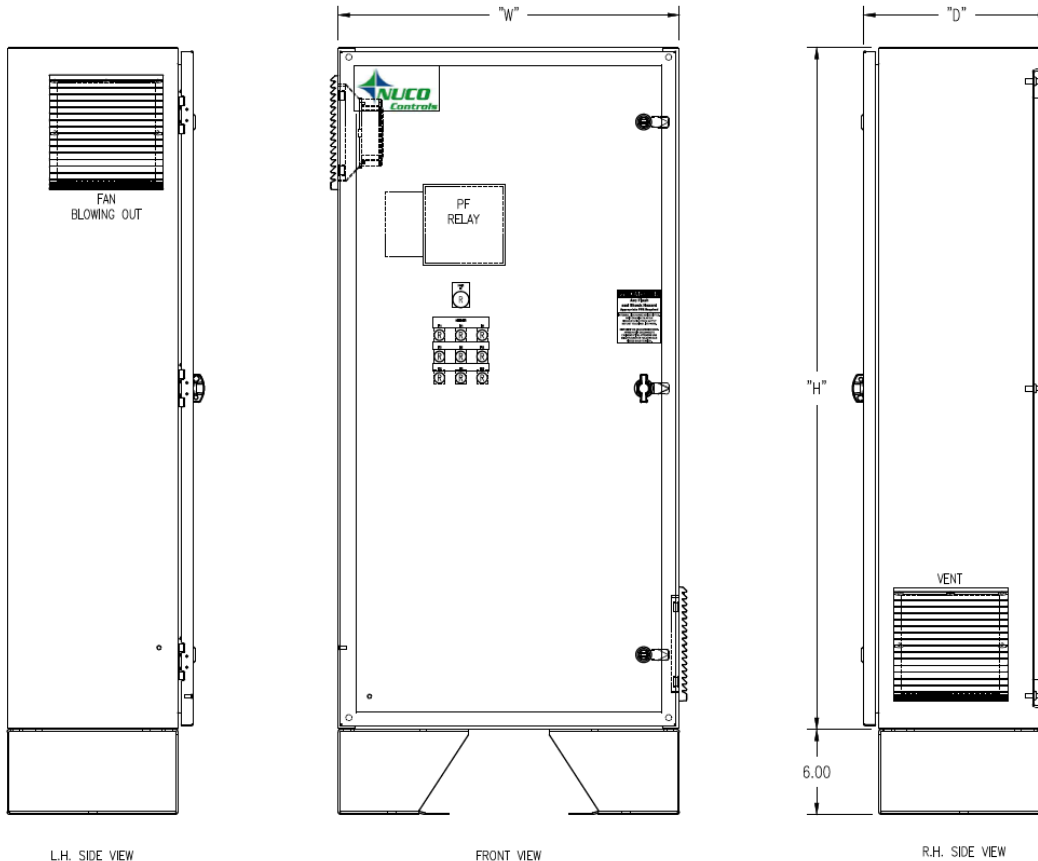
# NUCO Controls Compact Automatic Capacitor Banks

## Product Offering

KVAR	Voltage*	Maximum # of Steps	KVAR/Step	Switching Scheme	Dimensions (H x W x D)	Estimated Weight (lbs)	Enclosure Type**
100	480	4	25	1:1:2	48 x 24 x 12	205	1, 12, 3R
125	480	5	25	1:2:2	48 x 24 x 12		1, 12, 3R
150	480	3	50	1:1:1	48 x 24 x 12		1, 12, 3R
175	480	7	25	1:2:2:2	48 x 36 x 12		1, 12, 3R
200	480	4	50	1:1:1:1	48 x 36 x 12	215	1, 12, 3R
225	480	9	25	1:2:2:2:2	60 x 36 x 12		1, 12, 3R
250	480	5	50	1:1:1:1:1	60 x 36 x 12		1, 12, 3R
275	480	11	25	1:2:2:2:2:2	60 x 36 x 12		1, 12, 3R
300	480	6	50	1:1:1:1:1:1	60 x 36 x 12	295	1, 12, 3R
350	480	7	50	1:1:1:1:1:1:1	60 x 36 x 12		1, 12, 3R
400	480	8	50	1:1:1:1:1:1:1:1	60 x 36 x 12		1, 12, 3R

\*Other voltages are available up to 600V, contact NUCO Controls for details

\*\* Add 9" to W dimension for Type 3R applications (additional dimension affects ventilation areas only). Contact factory for Type 4 and 4X requirements.



# NUCO Controls Compact Automatic Capacitor Banks

## Capacitor Element Technical Data

### Capacitor Elements

The capacitor elements NUCO incorporates into the automatic capacitor systems utilize unique and exclusive triple safety features. The capacitor design incorporates the first ever segmented capacitor film that combines with traditional self-healing features.

The capacitor elements also incorporate true three phase over-pressure disconnection to safely isolate the capacitor at the end of its lifetime or when it experiences a severe overload. Most other capacitor products only disconnect two phases.

Capacitor elements are compliant with the following standard:

- UL 810
- CSA C22.2 No. 190
- IEC 60831



Self-healing segmented capacitor film

### High Current Capability

The capacitor elements are designed with the ability to carry high currents well beyond those required by traditional electrical standards for capacitor elements.

This high current carrying capability designed into the capacitor from the onset at the capacitors rated voltage eliminates the need to de-rate a capacitor's voltage rating to address the need for higher current carrying capability.

Eliminating the need to de-rate the capacitor voltage rating saves both money and space.

NUCO's capacitors have the following characteristics:

- Maximum continuous current up to 2.25 times rated current. Standard capacitor banks utilize elements capable of carrying 1.5 times rated current continuously.
- Withstand inrush current up to 375 times rated current

### Temperature Ratings

The capacitor elements are capable of operating continuously in an ambient temperature range up to 68°C. This ensures long life expectancy without the need to de-rate the capacitors.

### Exceeding Industry Standards

NUCO's capacitor elements exceed all known industry standards, surpassing the requirements of UL, CSA, and IEC standards. This ensures a world leading capacitor of the highest durability.

### Quality

The capacitor elements incorporate a proprietary mineral filler and stabilizer that minimizes partial discharges within the dielectric material.

The vacuum drying process takes place under temperature controlled conditions for several days to eliminate humidity within the capacitor which, if present, would accelerate the aging process of the capacitor (reducing its life).

In addition, the capacitors incorporate a patented terminal design that provides maintenance free, anti-vibration lifetime connections.

# NUCO Controls Compact Automatic Capacitor Banks

## Capacitor Element Technical Data

### Safety Features

The exclusive Triple Safety feature includes the following:

- Self healing at over-voltage
- Segmented film removes small segments of film to increase capacitor integrity and life expectancy
- Complete three phase disconnect through an over-pressure disconnect system when the capacitor has reached the end of its life or when the capacitor experiences a severe overload condition

### Capacitor Tolerance

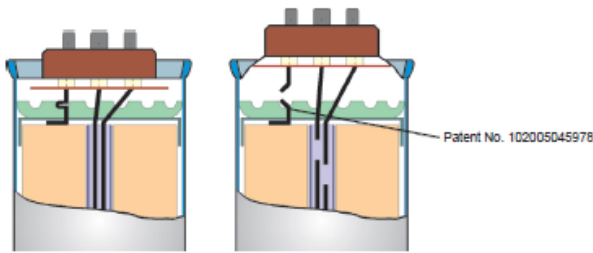
- 5% to +5%
- 1% to +1% available for tuning applications

### Power Loss

Less than 0.5W per KVAR including the discharge resistor

### Ambient Temperature

- UL/IEC:  $-40^{\circ}\text{C}$  to  $+68^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$  to  $154^{\circ}\text{F}$ )
- CSA:  $-40^{\circ}\text{C}$  to  $+46^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$  to  $+114^{\circ}\text{F}$ )



The principle of the overpressure disconnector

Samples are regularly checked from the production line and tests performed on the samples to confirm proper operation of the safety system and to ensure the highest level of quality throughout each production run.

### Mechanical Construction

Capacitor elements are made from a cylindrical aluminum case with a threaded M12 mounting stud. Capacitors are dry-type constructed from a low loss metallized polypropylene film. Terminals are touch safe.

Discharge resistors are permanently connected at the capacitor terminals to discharge the voltage to 50V or less within one minute after disconnected from power source.



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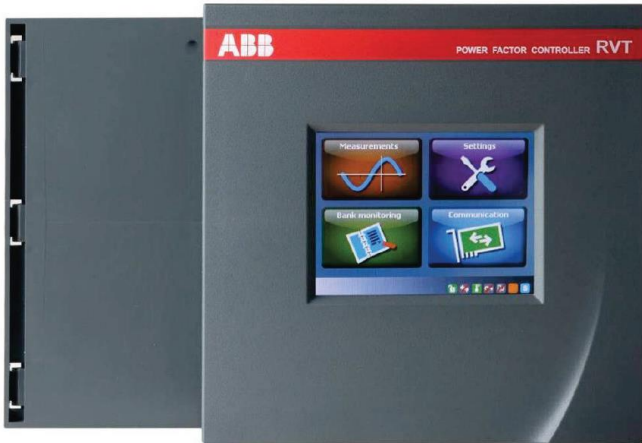


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Capacitor Element

# NUCO Controls Compact Automatic Capacitor Banks

## Power Factor Controller



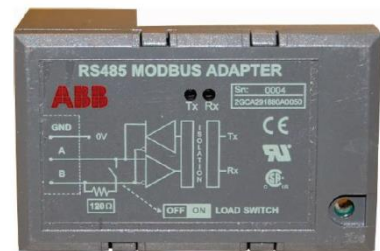
Power Factor Controller

Touch Screen Display with Indication of:

- Full graphics display
- Inductive/Capacitive Power Factor
- Active Outputs
- Demand for switching on/off a capacitor step
- Alarm conditions
- Over-temperature condition
- Phase shift
- C/k
- Number of outputs
- Type of switching sequence
- Alarm
- KVA, KW, KVAR
- Voltage, Current
- Harmonic voltage and current distortion levels
- Bar graph of current and voltage individual harmonics up to the 49<sup>th</sup> harmonic

### Additional Features

- Programmable protection thresholds for under voltage, over temperature, excessive harmonic distortion
- Guided navigation and programming
- Multi-language support
- Help guide
- Input for both day and night time power factor correction targets
- External alarm input
- Output contacts for alarm and fan relays
- Backlit display
- Optional RS-485 Modbus adapter
- Real time clock to provide time and date stamps for alarms and events



RS-485 Modbus Adapter

# NUCO Controls Compact Automatic Capacitor Banks

## Components

### Contactors

Contactors are specially designed for capacitive switching. All contactors include a damping resistor to minimize the effects of peak capacitive switching currents and to maximize the life of the equipment. Benefits include:

- Significant damping of in-rush current
- Improvement of the voltage quality during the switching process
- Increased contactor life
- High operation reliability of the automatic capacitor bank system
- Longer periods between maintenance periods



Contactor

### Reactors

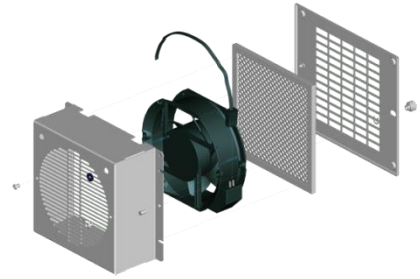
When harmonic distortion levels are too high in the electrical system, tuning reactors may be required. NUCO incorporates high quality reactors manufactured by suppliers with over 70 years experience in this field.

Our reactors uses an exclusive PolyGap core construction where many tiny air gaps are used to construct the reactor instead of the typical single or double air gaps. Using many smaller air gaps, the power losses are reduced, audible noise is reduced, and stray magnetic fields outside of the reactor are virtually eliminated.

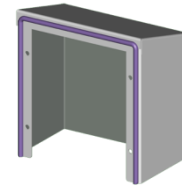
In order to ensure precise and controlled tuning, reactors are designed with a  $\pm 3\%$  tolerance.

### Ventilation

All automatic capacitor banks rated larger than 100KVAR at 480V include forced air ventilation with thermostat control.



Fan Kit



Rain Hood for Vents and Fans  
(Type 3R Enclosures Only)



Tuning Reactor