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Installation, Operating and Maintenance Manual
Medium-Voltage, Metal-Enclosed Power Capacitor Banks

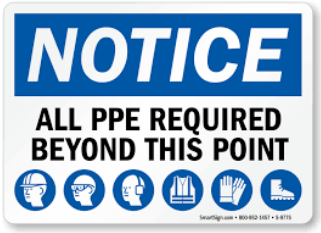
Caution – High Voltage

Warning

The equipment covered by this publication was designed for a very specific application and it must be installed, operated and maintained by qualified personnel who are thoroughly trained to work on medium-voltage electrical equipment and who understand all of the hazards with may exist. This manual has been exclusively written for such qualified personnel and it is not intended to be a substitute for the proper safety training for this type of equipment.

This publication contains information proprietary to Castle Power Solutions, LLC (Castle). By accepting and using this manual, you agree that the information contained in this manual will be used solely for the purpose of operating the equipment.

Always wear proper personal protective equipment (PPE) when working on the equipment.



A. Prior to Installation

This manual is intended to serve the user as a general guide for the installation and maintenance of medium-voltage power capacitor banks.

The instruction manual must be read carefully before unpacking, installation and maintenance.

Power capacitor banks are designed and intended for compensation of reactive current and power demands associated with inductive loads, such as induction motors. The customer is responsible for determining the suitability of the power capacitor bank for their specific application and for installing, connecting, using and maintaining the power capacitor bank in an appropriate manner and within its specifications.

B. Catalog Numbering System

The catalog number consists of the month [MM], day [DD], year [YY] that the quotation for the equipment was published, the quotation number issued on the date [10AA] and if applicable the revision number [BB] of the quotation. The catalog number is quotation number with the Q replaced by an O.

Catalog Number: OMMDDYY-10AA-BB

For example, catalog number O010117-1001-01 is for equipment that was quoted on January 01, 2017 [010117], it was the second quotation published on that day [1001] and it is the first revision of the quotation [01]. The quotation number corresponding to this catalog number is Q010117-1001-01.

C. Serial Numbering System

The serial number consists of the month [MM] and year [YY] that the equipment was manufactured, the fifteen characters of the catalog number [OMMDDYY-10AA-BB] and if applicable the number of units [CC].

Serial Number: OMMYYM-OMMDDYY-10AA-BB-CC

For example, serial number 0217-O010117-1001-01-02 is for the second piece of equipment with a catalog number of O010117-1001-01 that was manufactured in February 2017.

Figure 1 shows a typical equipment nameplate,

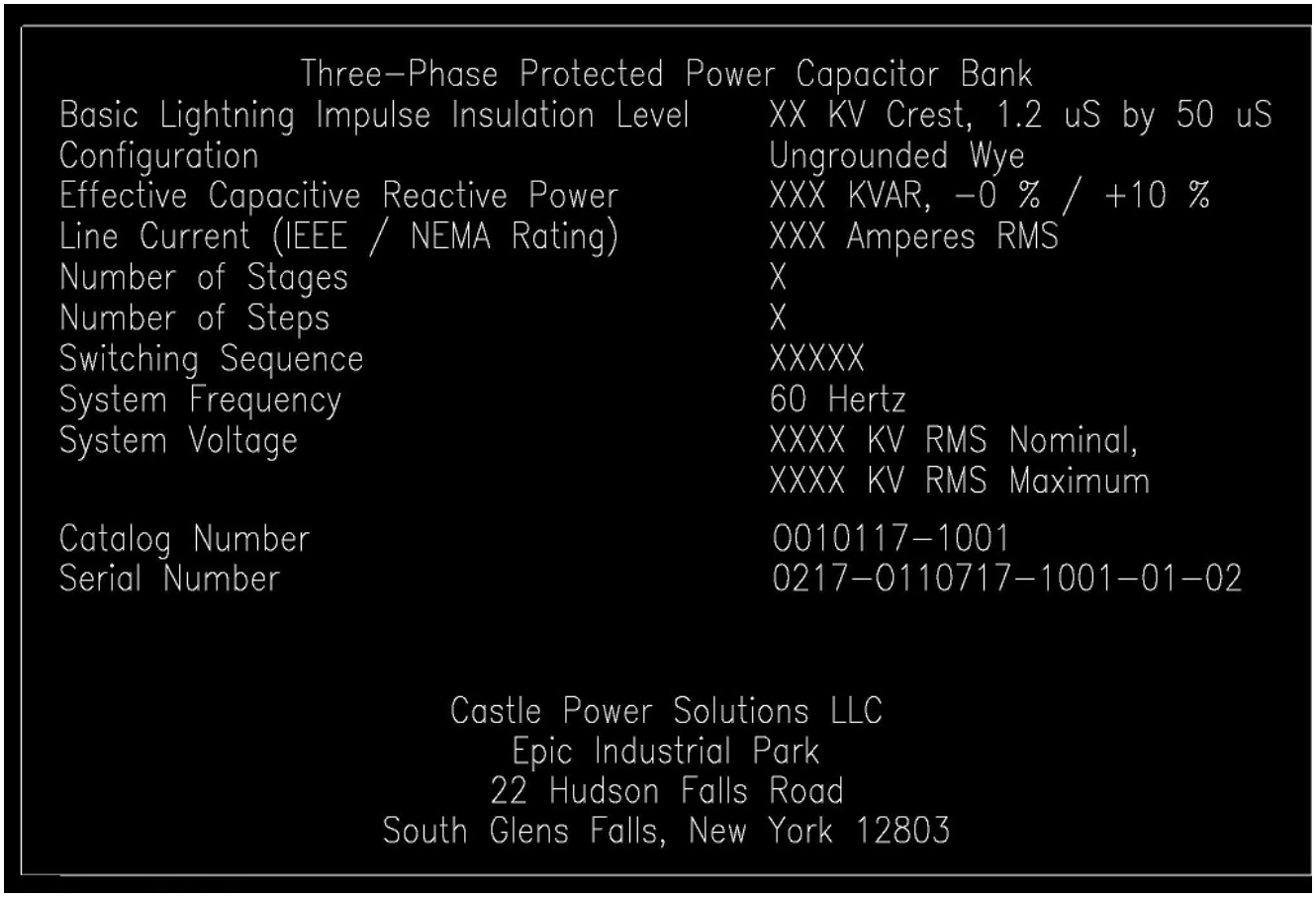


Figure 1: Equipment Nameplate

D. Safety Instructions

Read all safety instructions prior to beginning the installation.

Warnings

- Only qualified electricians should handle the installation of this power capacitor bank, otherwise loss of life, personal injury and property damage may occur.
- Disconnect all electrical power from the circuit into which the power capacitor bank is being installed. Extreme caution must be taken to prevent contact with medium voltage during

installation, operation and maintenance of this equipment. Accidental contact with medium voltage can result in loss of life or personal injury.

- The power capacitor bank must be fully discharged prior to performing any service, maintenance, or replacement of any part of the power capacitor bank. Power capacitor units will store voltage for up to five minutes. Using a suitable device, confirm that the power capacitor units are completely discharged prior to performing installation, operation or service procedures. Accidental contact with energized parts may cause loss of life or personal injury.
- Observe the torque requirements for all electrical connections. When making connections using crimp terminals, be sure to use the crimping tool recommended by the terminal manufacturer. Conductor connections having improper torque may cause a fire.
- The ground terminal should always be connected to the ground using a conductor that is the same diameter (gauge) as the phase conductor. Lack of ground connection or improper grounding may result in electric shock or fire.
- Install the power capacitor bank in accordance with all applicable local electrical standards (NEC NFPA 70, etc.). Failure to properly install power capacitor bank in accordance with local electrical safety standards may cause electric shock, fire or service disruption.

Cautions

- Improper handling may cause the power capacitor bank to not operate properly and this will reduce the life of the power capacitor bank.
- This manual should be given to the user of this product and should be kept in a safe place until the power capacitor bank is removed from service.
- The power capacitor bank should be installed in an environment that is consistent with the NEMA rating of the enclosure. Failure to do this may result in equipment damage, loss of life or personal injury.

We strongly recommend that the installation, operation and maintenance of this equipment be handled by an electrician, engineer or technically qualified person with experience in electrical power equipment.

E. Handling, Storage and Transportation

- Power capacitor banks are packed to offer maximum protection during shipment. Handling and transporting power capacitor banks must always be done with the power capacitor bank in a vertical position.
- Upon arrival, the packing list and shipment should be carefully checked for completeness.
- Power capacitor banks that are equipped with a time-delay key interlock require either AC or DC control power in order to open the medium-voltage compartment doors.
  - Referring to the appropriate electrical schematic; if AC control power is required to operate the time-delay key interlock and the power capacitor bank is equipped with a medium-voltage control power transformer, remove the conductor from the line-side of the circuit breaker that is connected to the time-delay key interlock**.**
    This will prevent back-feeding AC voltage to the medium-voltage control power transformer. Failure to do this may result in loss of life or personal injury.
    Connect the hot conductor of a suitable AC power source to the line side of the circuit breaker.
    Connect the neutral conductor of the AC source to the low-voltage control power ground circuit.
    The AC power source should not be equipped with ground fault interruption.

The AC power source can be turned off once the appropriate key has been removed from the time-delay key interlock.

- Referring to the appropriate electrical schematic; if DC control power is required to operate the time-delay key interlock and the power capacitor bank is equipped with a 24 Volt DC uninterruptable power supply (UPS), turn on the UPS.
  The UPS can be turned off once the appropriate key has been removed from the time-delay key interlock.
- Referring to the appropriate electrical schematic; if DC control power is required to operate the time-delay key interlock and the power capacitor bank is not equipped with a 24 Volt DC (UPS), connect a suitable DC power source to the circuit that contains the time-delay key interlock.
  The DC power source can be turned off once the appropriate key has been removed from the time-delay key interlock.

- The power capacitor bank and packing material must be examined for transit damage. In the event of visible transit damage, a claim must be filed immediately with the carrier.
- In the event that the power capacitor bank is not installed immediately after arrival, it should be placed in storage without removing the packing. In this case, the power capacitor bank should be stored on a level area of sufficient strength to bear the weight and in a clean and non-corrosive atmosphere.
- If the power capacitor bank is stored outdoors the period of storage must be limited to approximately six (6) months, depending on the atmospheric conditions. The storage time limit is governed by the life of the packing materials.
  - If the power capacitor bank is equipped with power bushings and / or a roof-top ventilator these items should be installed.
  - The line side conductor should be removed from the circuit breaker that is connected to the low-voltage and if applicable the medium-voltage compartment heater(s). The line side terminal of this circuit breaker should be connected to a suitable source of AC power. This will allow the heater circuits to operate which in turn, will prevent condensation from forming in the non-ventilated compartments.

F. Installation

Mechanical Installation

- The power capacitor bank should be located in a well-ventilated area. The place selected for the installation should allow air to circulate freely around the power capacitor bank.
- Metal-enclosed power capacitor banks without floors, must be placed on suitable concrete pads.
- Metal-enclosed power capacitor banks with floors can be mounted on piers, rail road ties or any suitable surface.
- Unless specifically asked to design the surface that the metal-enclosed power capacitor bank will be placed on, it is the customer’s responsibility to design a suitable surface.
- Place the metal-enclosed power capacitor bank on the surface using a suitable lifting device.
- On metal-enclosed power capacitor banks without floors, Castle recommends that a high-grade silicone caulk compound be applied at the enclosure base-to-concrete interface.
- If mounting tabs or mounting plates are used to secure the enclosure to its mounting surface, install the hardware that is required to complete this step now.

Electrical Installation

Warning
Disconnect all electrical power from the circuit into which the power capacitor bank is being installed. Extreme caution must be taken to prevent contact with medium voltage during installation, operation and service of this equipment. Accidental contact with medium voltage can result in personal injury or death.

- **Cable ampacity, conductor ampacity, cable tray size and conduit size must be according to National Electrical Code and all applicable electrical codes in your area.**
- **At a minimum, the power system conductors must be rated for the IEEE / NEMA Line Current listed on the power capacitor bank nameplate at the maximum operating ambient temperature of the power capacitor bank.**
- The base of the enclosure is equipped with four (4) externally-mounted, stainless-steel ground pads. Using a conductor of the same gauge as the power system conductors, ground the enclosure to a suitable earth ground using a minimum of two (2) diagonally located, externally-mounted ground pads.
- The electrical schematics contain a key interlock diagram and the manual contains key interlock procedures, please have these documents available before proceeding to the next step.
- The key interlock on the door of the incoming compartment is not part of the power capacitor bank key interlock system. This key interlock along with the key interlock on the upstream disconnect form a key interlock system that is independent of the power capacitor bank key interlock system. This system will deny access to the incoming compartment unless the upstream disconnect is locked open.
- Unlock the door to the incoming compartment and inspect the components for signs of damage.
- Referring to the key interlock drawing and key interlock procedures, unlock and open the doors to the medium voltage compartments on the power capacitor bank.
- Inspect the components for damage.
- Inspect the black polypropylene cable spacers to make sure they have not shifted during shipping.
- Pay particular attention to the torque stripes on the hardware used to make electrical connections to the components and the hardware used to secure components to the enclosure members. If a torque strip is unbroken, then the bolted connection is properly tightened. If the torque stripe is broken, then remove the broken torque stripe with a suitable solvent, apply the proper torque to the bolted connection and then apply a new torque stripe to the bolted connection.
- If the power capacitor bank is equipped with power capacitor unit fuses and/or main fuses and/or stage fuses install them now. The end of the fuse that is covered with paper must face the plunger on the micro-switch. Push the fuse into the fuse clip such that the fuse label is located in either the 3 o'clock or 9 o'clock position. Close the bails, this will require a decent amount of force. With the bails closed rotate the fuse such that the label is facing you.
- If the power capacitor bank is equipped with a roof-top-mounted ventilator(s); refer to the appropriate electrical schematics and mechanical drawings for the power capacitor bank and install the ventilator now. The roof-top-mounted ventilator(s) is (are) equipped with an off-on switch, turn on this switch. Failure to do this will cause the power capacitor bank to trip on over-temperature.

- If the power capacitor bank is equipped with roof-top-mounted bushings; refer to the appropriate electrical schematics and mechanical drawings for the power capacitor bank and install the roof-top-mounted bushings now.
- If a remote AC source was connected to the low-voltage control circuit turn off the source and remove the conductors that were used to connect the source to the power capacitor bank. Reconnect the conductor that was originally connected to the circuit breaker.
- Open the low-voltage circuit breaker(s).
- Connect the power system conductors to the power input terminals. Phase A of the power system should be connected to phase A of the power capacitor bank. Repeat this process for the two remaining phases.
- If shield power system conductors are being used, connect the shield drain wires of these conductors to the stainless-steel ground pad that is located inside the base of the incoming compartment.
- If a shielded power system conductor passes through the window of 600 Volt class current transformer before being terminated on the power input terminal; the current transformer must be located on the shielded portion of the power system conductor. Failure to do this may result in loss of life, personal injury and property damage. The shield drain conductor of the power system conductor that passes through the window, must pass back through the window of the current transformer before being connected to the stainless-steel ground pad. See Figure 2.
- Lock the incoming compartment door. Do not remove the key from the interlock at this time.

Table 1

Torque Specifications

Dry Threads

Bolt Material	Stainless Steel	Type: 18-8
Nut Material	Silicon Bronze	
Bolt Number	**Threads Per Inch**	**Torque Inch-Pounds**
4	40	4.3
6	32	7.9
8	32	16.2
10	24	18.6
10	32	25.9

Bolt Diameter	Threads Per Inch	Torque	
		Inch-Pounds	Foot-Pounds
1/4	20	61.5	
1/4	28	77	
5/16	18	107	
5/16	24	116	
3/8	16	192	16
3/8	24	212	18
1/2	13	422	35
1/2	20	443	37
5/8	11	970	81
3/4	10	1,249	104
7/8	9	1,905	159
1	8	2,185	182
1-1/8	7		337
1-1/4	7		428
1-1/2	6		727

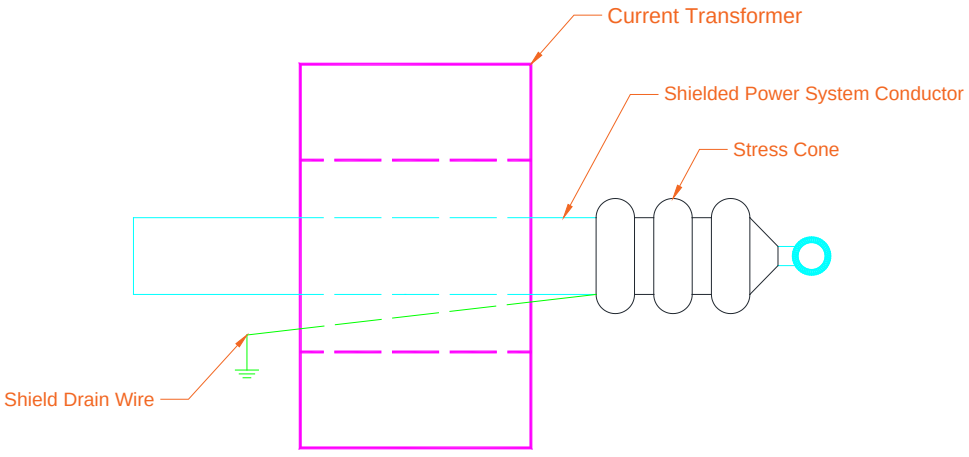


Figure 2

A Shielded Power System Conductor Passing Through
The Window Of A 600 Volt Class Current Transformer

- **If the control circuit requires an AC power source confirm that the AC voltage of the power source is within ±10% of the AC voltage listed on the appropriate electrical schematic for the power capacitor bank. Connect the AC power source to the power capacitor bank control circuit using 600 Volts RMS rated insulated conductors. The conductors should have a current rating that equals the current rating of the circuit breaker or fuse that protects the circuit, at the maximum operational ambient temperature of the power capacitor bank.**

- **If the control circuit requires a DC power source confirm that the DC voltage of the power source is within ±10% of the DC voltage listed on the appropriate electrical schematic for the power capacitor bank. Connect the DC power source to the power capacitor bank control circuit using 600 Volts RMS rated insulated conductors. The conductors should have a current rating that equals the current rating of the circuit breaker or fuse that protects the circuit, at the maximum operational ambient temperature of the power capacitor bank.**

Warning
When using current transformers, never energize the circuit if the secondary leads of the current transformer are not connected to a suitable load or they are adequately short-circuited.

- If the power capacitor bank is equipped with a capacitor bank control, then a current transformer or a line post sensor will be required.
  - The current transformer or line post sensor must be located electrically ahead of the load and the power capacitor bank; i.e., it must see the load current and the power capacitor bank current.
  - If a current transformer is required, the power capacitor bank will be equipped with a shorting terminal block.
  - Suitably sized shielded tray cable should be used to connect the current transformer or line post sensor to the power capacitor bank. The shield drain conductor should only be grounded at the power capacitor bank.
  - It is imperative that the current transformer or line post sensor be connected such that the dot or H1 marking faces the utility.
  - It is also imperative that the current transformer or line post sensor be installed on the proper phase.
  - The phase and polarity are indicated on the electrical schematics for the power capacitor bank.
  - Refer to the appropriate component manuals and electrical schematics for the power capacitor bank and connect the communication cable(s), if applicable; remote alarm shielded tray cable, if applicable and the remote close-open command signal(s) shielded tray cable. The shield drain conductor(s) should only be grounded at the power capacitor bank.
- Refer to the key interlock drawing and key interlock procedures and perform the following operations.
  - Close and lock the doors to the medium voltage compartments on the power capacitor bank.
  - Unlock and open the stage grounding switches, if applicable.
  - Unlock and open the main grounding switch, if applicable.
  - Do not close the main disconnect switch at this time.

G. Start-Up

- Remove the key from the key interlock on the incoming compartment door.
- Insert this key into the interlock that locks the upstream disconnect in the open position.
- Rotate this key clockwise and close and lock the upstream disconnect switch that supplies AC power to the power capacitor bank.
- If the power capacitor bank is equipped with a control power transformer and/or a voltage transformer(s) then, using a digital voltmeter (DVM) measure the voltage (s) from the line side(s) of the low-voltage circuit breaker(s) to ground. The voltage should be 120 Volts RMS ±10%. If this is not the case do not close the low-voltage circuit breakers and contact Castle Power Solutions, LLC.
- Close the low-voltage circuit breaker(s).
- If the low-voltage control system is equipped with a UPS, energize the UPS after closing the low-voltage circuit breaker(s).
- If the power capacitor bank is equipped with vacuum switches; the vacuum switches are shipped in the closed position as required by the manufacturer. The vacuum switches will open automatically after the low-voltage control system is energized.
- If the power capacitor bank is equipped with a vacuum contactor(s); the vacuum contactor(s) is (are) shipped in the open position and they are electrically-held in the closed position.
- I**f the power capacitor bank is equipped with a protective relay, please read the manual.**
- If the power capacitor bank is equipped with a protective relay then the line currents displayed by this relay should be zero (0), the system voltages displayed by this relay should be within ±10% of the nominal system voltage and the relay should neither be in the alarmed or tripped state. If any of these conditions are not met, do not proceed to the next step and contact Castle Power Solutions, LLC.
- If the power capacitor bank is not equipped with a capacitor bank control confirm that the stage switches are open before proceeding to the next step.
  - Close and lock the main disconnect switch.
  - Refer to the key interlock diagram and key interlock procedures and follow the remaining steps of the key sequence to place the power capacitor bank into service.
  - If the low-voltage control system is equipped with a key interlock mounted on the control panel, insert the key into this key interlock, but do not rotate it clockwise at this time.
  - If the low-voltage control system is equipped with an emergency stop, make sure it is released.
  - If the low-voltage control system is equipped with a local-remote control station selector switch, select the control station that will be used to operate the power capacitor bank.
  - If the low-voltage control system is equipped with a key interlock mounted on the control panel, rotate it clockwise at this time.
  - If the local control station has been selected, set the local stage control to on and when the close prohibit pilot light is not illuminated on that stage, the stage should close.
  - If the local control station has been selected, set the local stage control to off to open a stage that is closed.
  - If the remote control station has been selected, issue a remote close command to a stage and when the close prohibit pilot light is not illuminated on that stage, the stage should close.
  - If the remote control station has been selected, issue a remote open command to open a stage that is closed.
  - When changing the control station selection any stages that are closed will be opened.
- **If the power capacitor bank is equipped with a capacitor bank control, please read the manual.**

- If the power capacitor bank is equipped with a capacitor bank control confirm that the stage switches are open before proceeding to the next step.
  - Close and lock the main disconnect switch.
  - Refer to the key interlock diagram and key interlock procedures and follow the remaining steps of the key sequence to place the power capacitor bank into service.
  - If the low-voltage control system is equipped with a key interlock that is mounted on the control panel, insert the key into this key interlock, but do not rotate it clockwise at this time.
  - If the power capacitor bank control displays the actual system voltage confirm that the value displayed is within ±10% of the nominal system voltage. If the system voltage(s) is (are) not within ±10% of the nominal system voltage, call Castle Power Solutions, LLC.
  - The active power and reactive power displayed by the capacitor bank control should both be positive. Contact Castle Power Solutions, LLC if this is not the case.
  - If the low-voltage control system is equipped with an emergency stop, make sure it is released.
  - If the low-voltage control system is equipped with a key interlock mounted on the control panel, rotate it clockwise at this time.
  - If the low-voltage control system is equipped with an auto-manual control mode selector switch, select the control station mode that will be used to operate the power capacitor bank.
  - If the auto control mode is selected the capacitor bank control will energize or trip stage(s) in an attempt to maintain a user selected displacement power factor.
  - If the manual control mode has been selected, set the manual stage control to on and when the close prohibit pilot light is not illuminated on that stage, the stage should close.
  - If the manual control mode is selected set the manual stage control to off to open a stage that is closed.
  - When changing the control mode selection any stages that are closed will be opened.

H. Shut-Down

- If the low-voltage control system is equipped with a key interlock that is mounted on the control panel; rotate this key counterclockwise and any power capacitor stage that is closed will open and all commands to close any power capacitor stage will be ignored.
- If the low-voltage control system is equipped with an emergency stop; push the emergency stop button and any power capacitor stage that is closed will open and all commands to close any power capacitor stage will be ignored.
- If the low-voltage control system is equipped with only a capacitor bank control; refer to the manual and open any power capacitor stage that is closed.
- If the power capacitor bank is not equipped with a capacitor bank control, emergency stop or key interlock that is mounted on the control panel then either remotely open or manually open any power capacitor stage that is closed.
- Refer to the key interlock diagram and key interlock procedures to take the power capacitor bank out of service.

I. Trip Conditions

- Emergency Stop

  If the low-voltage control system is equipped with an emergency stop; push the emergency stop button and any power capacitor stage that is closed will open and all commands to close any power capacitor stage will be ignored.

- Enclosure Over-Temperature

  If the power capacitor bank is equipped with either air conditioning or forced convection cooling, fans or roof-top-mounted ventilator, then it is also equipped with a normally-closed temperature switch. If this switch should open for thirty (30) seconds any power capacitor stage that is closed will open and all commands to close any power capacitor stage will be ignored. To reset this alarm condition the alarm reset button must be pushed.

- Key Interlock

  If the low-voltage control system is equipped with a key interlock mounted on the control panel, rotate this key counterclockwise and any power capacitor stage that is closed will open and all commands to close any power capacitor stage will be ignored.

- Main Fuse Operation

  If the power capacitor bank is equipped with main fuses and one or more of these fuses operates, the main fuse operation detector will trip the power capacitor bank if it is closed and inhibit the closing of any power capacitor stage.

- Neutral Imbalance

  If the power capacitor bank is a multi-stage power capacitor bank and it is equipped with one (1) neutral imbalance relay, then the neutral imbalance relay will trip the entire power capacitor bank when a neutral imbalance of sufficient magnitude to cause damage exists. It will also inhibit the power capacitor bank from being closed.

  If the power capacitor bank is a multi-stage power capacitor bank and each power capacitor stage is equipped with a neutral imbalance relay, then the neutral imbalance relay will trip a power capacitor stage when a neutral imbalance of sufficient magnitude to cause damage exists.

  To reset this alarm condition the alarm reset button must be pushed.

- Power Capacitor Unit Fuse Operation

  If the power capacitor bank is equipped with power capacitor unit fuses and one or more of these fuses operates the power capacitor unit fuse operation detector will trip the power capacitor stage if it is closed and inhibit the closing of the power capacitor stage.

- Power Quality Issue

  If the power capacitor bank is equipped with a protection relay the relay will trip the power capacitor bank if a power quality issue exists with the power

capacitor bank. An example of a power quality issue would be excessive fifth harmonic current distortion.

- Stage Fuse Operation

If the power capacitor bank is equipped with stage fuses and one or more of these fuses operates the stage fuse operation detector will trip the power capacitor stage if it is closed and inhibit the closing of the power capacitor stage.

J. Maintenance

Warning

Disconnect all electrical power from the circuit into which the power capacitor bank is being installed. Extreme caution must be taken to prevent contact with medium voltage during installation, operation and service of this equipment. Accidental contact with medium voltage can result in loss of life or personal injury.

- **Where available, installation, operating and maintenance manual are provided for the components used in the power capacitor bank. Please read these manuals.**
- The following inspections and service should be performed on the power capacitor bank one (1) month, six (6) months and twelve (12) months after being placed into service for the first time and then once a year after the first year of service**. Failure to perform inspections and service at the recommended time intervals will void the warranty.**
  - All of the components and the conductors should be checked for signs of electrical discharges and over-heating. If evidence of either is found do not place the power capacitor bank into service and immediately notify Castle Power Solutions, LLC.
  - If the power capacitor bank is located outdoors and the enclosure NEMA rating is 3R or 3S, water or snow can enter the enclosure provided it does not hit the electrical components. Inspect the components and conductors for water spots. If water spots are found on either the components or the conductors do not place the power capacitor bank into service and immediately notify Castle Power Solutions, LLC.
  - If the power capacitor bank is located outdoors and the enclosure NEMA rating is 4 or 4X, water cannot enter the enclosure. Inspect the components, conductors and interior surfaces of the enclosure for water spots. If water spots are found do not place the power capacitor bank into service and immediately notify Castle Power Solutions, LLC.
  - The components and the interior surfaces of the enclosure should be vacuumed. Never use compressed air to clean; loose material can be inadvertently pushed into areas that could cause failure.
  - The bushings and insulators should be cleaned with lint-free cloths wetted with isopropanol and then dried using lint-free cloths.
  - Graphite should be applied to the inside of the cylinders on all key interlocks.
  - The heating thermostat located in the low-voltage controls compartment should be raised to 140°F and using a suitable clamp on ammeter confirm the heater(s) are operating. Adjust the set-point temperature of the heating thermostat to its original value after this test has been completed. This test should be performed on a day when the ambient temperature is less than 110°F.
  - If the power capacitor bank is equipped with either a fan(s), air conditioner(s) or a roof-top-mounted ventilator(s) then the cooling thermostat(s) located in the medium-voltage compartment(s) should be lowered to 30°F and the fan(s), air conditioner(s) or roof-top-mounted ventilator(s) should be operating. Adjust the set-point temperature of the cooling

thermostat to its original value after this test has been completed. This test should be performed on a day when the ambient temperature is greater than 40°F.

- If the power capacitor bank is equipped with either a fan(s) or a roof-top-mounted ventilator(s) then the air intake louvers are fitted with reusable electrostatically-charged reusable air intake filters. Failure to clean the air intake filters will cause the power capacitor bank to trip on over-temperature. The air intake filters need to be cleaned. If after the first three (3) months the air filters were not found to be dirty, the time period between cleanings can be extended to six (6) months. Follow the procedure below for correct cleaning of air intake filters:
  - Take air intake filters out of enclosure and vacuum both sides.
  - Rinse the air intake filter under warm water until the water runs clear.
  - Shake the air intake filters to remove excess water.
  - Allow the air intake filters to completely dry; approximately twenty-four (24) hours, before reinserting them
- Castle Power Solutions, LLC suggests purchasing an extra set of air intake filters so that a clean set of air intake filters can be installed while a set of air intake filter is being cleaned. If you are interested in doing this, please call or email us and we would be happy to provide a quotation for a set of air intake filters.

General Terms and Conditions of Sale for Equipment and Products

The Terms and Conditions of Sale set forth herein, including any supplements which may be attached hereto, constitute the full and final expressions of contract for equipment, products [hereinafter, collectively, "Equipment"], as described in any quotations between Castle Power Solutions, LLC ***Seller*** and the Buyer. Purchases involving technical and engineering services are governed by Castle Power Solutions, LLC General Terms and Conditions of Sale for Engineering and Technical services". These Terms and Conditions of Sale supersede all prior quotations, purchase orders, correspondence or communications, whether written or oral, between Seller and Buyer. Buyer shall be bound by these Terms and Conditions of Sale when it [a] delivers its purchase order for Equipment to Seller, [b] accepts delivery of Equipment, or [c] otherwise indicates acceptance of this contract. Such acceptance shall bind Buyer to these Terms and Conditions, notwithstanding any contrary language in Buyer's purchase order or other expression of acceptance.

SELLER'S QUOTATION OR OFFER IS EXPRESSLY LIMITED TO, AND CONDITIONED UPON, BUYER'S ACCEPTANCE OF THESE TERMS AND CONDITIONS OF SALE. DIFFERENT AND ADDITIONAL TERMS AND CONDITIONS PROPOSED BY BUYER ARE REJECTED UNLESS EXPRESSLY AGREED TO IN WRITING BY SELLER.

No contract between Seller and Buyer shall exist except as provided herein. No statement, representation or warranty not contained herein shall be binding upon Seller unless made in writing by an officer or other authorized representative of Seller. Prior dealings, usage of the trade and a prior course of performance shall not be relevant to determine the meaning of these Terms and Conditions of Sale. Whenever a term defined by the Uniform Commercial Code is used herein, the definition contained in the Code shall apply.

1. **Orders:** All orders of Equipment or expressions of acceptance of Seller's quotation or offer are subject to final approval and acceptance by an authorized representative of Seller at its Corporate Headquarters. Such final approval and acceptance by Seller need not be conveyed or otherwise delivered to Buyer to take effect.

2. **Warranty:** Seller warrants that the Equipment delivered by it will be of the kind and quality described in the order or contract and will be free of defects in design, workmanship and material. Should any failure to conform to this warranty appear within the earlier of; five (5) years after the date of installation, or sixty-six (66) months from the date of shipment, Seller shall, upon prompt notification thereof correct such non-conformities, either by repairing any defective part[s] or by supplying a repaired or replacement part[s]. This warranty shall not apply to any Equipment wherein the defect is due to a failure by the Buyer to ensure that Equipment has been stored, installed, operated, electrically protected, or maintained in accordance with Seller's recommendations. Seller shall be responsible for, and bear the costs of, delivering non-conforming equipment or parts to Seller. After Seller has corrected any non-conformity, Seller shall bear the costs of delivering the corrected Equipment or parts to Buyer.

In no event shall Seller be responsible for, or bear the costs of; providing working access to any defect in the Equipment, including the removal, disassembly, replacement or reinstallation of any equipment, materials or structures to the extent necessary to permit Seller to perform its warranty obligations. The conditions of any test for a defect in the Equipment shall be agreed upon by the parties hereto and Seller shall be notified of, and be accorded a reasonable opportunity to be present at, any such test that is conducted.

THE WARRANTY IN THESE TERMS AND CONDITIONS OF SALE IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER STATUTORY, EXPRESSED OR IMPLIED [INCLUDING ALL

WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE], EXCEPT OF TITLE AND AGAINST PATENT INFRINGEMENT.

The remedies provided herein are Buyer's sole remedies for any failure of Seller to comply with its obligations. Correction of any nonconformity in the manner and for the period of time provided herein shall constitute complete fulfillment of all the obligations and liabilities of Seller, regardless of whether the claims of Buyer are based in contract, warranty, and tort [including negligence] or otherwise with respect to, or arising out of, Equipment furnished hereunder.

3. Limitations of Liability and Indemnities: In no event, whether as a result of breach of contract, warranty, tort [including negligence] or otherwise, shall Seller or its employees, agents, representatives or suppliers be liable for any special, consequential, incidental, penal or punitive damages including, but not limited to, loss of profit or revenues, loss of use of the Equipment or any associated equipment, damage to associated equipment, cost of capital, cost of substitute products, facilities, services or replacement power, down time costs, or claims of any third parties for such damages. In no event, whether as a result of breach of contract, warranty, tort [including negligence] or otherwise, shall Seller's liability to Buyer for any loss or damage arising out of, or resulting from, any contract between Seller and Buyer, or from such contract's performance or breach, or from the Equipment furnished hereunder, exceed the price of the specific Equipment which gives rise to the claim. Except as to title, any such liability shall terminate upon the expiration of the warranty period specified herein.

If Seller furnishes Buyer with advice or other assistance which concerns Equipment furnished hereunder, or any system or equipment in which any such Equipment may be installed, and/or which is not required pursuant to these Terms and Conditions of Sale, the furnishing of such advice or assistance will not subject Seller to any liability, whether in contract, warranty, tort [including negligence] or otherwise.

The invalidity, in whole or part, of any of the foregoing paragraphs will not affect the remainder of such paragraph or any other paragraph in this article. These limitations shall remain in effect if Buyer transfers title to or leases Equipment sold hereunder to any third party and shall be binding upon such third party. If such a transfer or lease of the Equipment occurs, Buyer shall obtain from said third party a written statement acknowledging the effectiveness of these Terms and Conditions of Sale and Buyer shall defend and indemnify Seller against any actions commenced by the third party in contravention of these Terms and Conditions of Sale.

4. Penalty or Liquidated Damages: Contracts which include penalty or liquidated damage clauses for failure to meet shipping promises are not acceptable to, or binding upon, Seller, unless such clauses are specifically accepted in writing by an officer of Seller at its corporate headquarters.

5. Disclosure of Information: Any information, suggestions or ideas transmitted by Buyer to Seller in connection with performance hereunder are not be regarded as secret, proprietary or submitted in confidence, except as may otherwise be acknowledged in writing by a duly authorized representative of Seller.

6. Taxes: In addition to the price agreed to by Buyer, Buyer shall pay the gross amount of any present or future sales, use, excise, value-added, or other tax applicable to the price, sale or delivery of any Equipment furnished hereunder or to its use, or Buyer shall furnish Seller with evidence of exemption from such tax [es] acceptable to the taxing authorities.

7. **Modification, Cancellation or Deferment by Purchaser:** Orders or purchase contracts may be modified or canceled, and scheduled shipments may be deferred, only upon Buyer's prior written notice to Seller and upon confirmation by Seller's revised acknowledgment and upon terms, satisfactory to Seller, which compensate Seller for all damages suffered by reason of such modification, cancellation or deferment. Any modification, cancellation or deferment hereunder shall become effective no earlier than fifteen (15) days after receipt of such notice.

8. **Drawing Approval:** Drawing approval assures Buyer that Seller has designed Equipment as described and detailed in Buyer's specification. If at drawing approval Seller has failed to design Equipment in conformance with Buyer's written specification, Seller shall make the appropriate changes at no charge to Buyer. Where Buyer's specifications are not definitive, Seller reserves the right to design the Equipment in line with, in Seller's judgment, good commercial practice. If at drawing approval Buyer makes changes outside of the design as covered in its specifications, Buyer shall reimburse Seller for reasonable charges based on the changes involved and Seller also shall be granted a commensurate delay in the shipping date.

9. **Delivery, Title and Risk of Loss:** Delivery dates are approximate and are based upon prompt receipt of all necessary information from Buyer. Unless otherwise specified by Seller in writing, delivery will be made and title will pass F.O.B. point of shipment to Buyer. Risk of loss and damage pass to Buyer at the point of shipment. Such risks include, but are not limited to, risk of damage to Equipment during shipping.

10. **Excusable Delays:** Seller shall not be liable for delays in delivery or performance, or failure to manufacture, deliver or perform, due to: [a] causes beyond its reasonable control; [b] an act of God, act of Buyer, act of civil or military authority, Governmental priority, strike, or other labor disturbance, flood, epidemic, war, riot, delay in transportation or car shortage; or [c] inability on account of a cause beyond the reasonable control of Seller to obtain necessary materials, components, services or facilities. Seller shall notify Buyer of any material delay excused by this article and shall specify the revised delivery dates as soon as reasonably practicable. In the event of any such delay, there will be no termination and the date of delivery or of performance shall be extended for period equal to the time lost by reason of the delay.

11. **Payments and Financial Condition:** Except as otherwise specified by Seller in its quotation, pro rata payments shall become due without setoff as shipments are made. If Seller consents to delay shipments after completion of any Equipment, payment shall become due on the date when Seller is prepared to make shipment. In the event of any such delay, title shall pass and products shall be held at Buyer's risk and expense. Any order for Equipment by Buyer shall constitute a representation that Buyer is solvent. At Seller's request, Buyer shall furnish a written representation concerning its solvency at any time prior to shipment. If, in Seller's opinion, Buyer's financial condition at any time does not justify continuance of work to be performed hereunder, Seller may require full or partial payment in advance. In the event of Buyer's bankruptcy or insolvency, or in the event any proceeding is brought against Buyer, voluntarily or involuntarily, under the bankruptcy or any insolvency laws, Seller shall be entitled to cancel any order then outstanding at any time during the period allowed for filing claims against the estate and shall receive reimbursement for its proper cancellation charges. Seller's rights under this article are in addition to all rights available to it at law or in equity.

12. **Terms of Payment:** Standard payment terms are net within 30 days from date of invoice, unless otherwise stated in Seller's written quotation or agreed to by Seller in writing.

13. Accelerated and Delayed Payments: There will be no reduction in price for payments more favorable to Seller than the aforementioned standard payment terms unless otherwise expressly agreed to by Seller in writing. If payments are not made in conformance with the standard terms, the quoted price shall, without prejudice to Seller's right for immediate payment, be increased by an amount equal to the lesser of 1.5% per month on the unpaid balance or the highest legal interest rate.

14. Prices: All published prices and discounts are subject to change without notice. Written quotations expire thirty (30) calendar days from the date of quotation, unless withdrawn sooner. Verbal quotations expire twenty-four (24) hours after they are made. Seller assumes no liability for import duties or other taxes imposed by any foreign country.

15. Shipment and Risk of Loss: All shipments are F.O.B. point of shipment, unless otherwise agreed to in writing by Seller. Risk of loss and damage to Equipment shall pass to Buyer at the point of shipment, unless otherwise agreed to in writing by Seller.

16. Returns: Authorization for the return of any Equipment, including warranty items, must be obtained from Seller in the form of written return authorization papers. Returned Equipment not so identified shall be returned to Buyer at Buyer's expense. Full credit will be issued for all returned Equipment, authorized in advance, which has been accepted under warranty or returned as a result of Seller shipping incorrect Equipment or quantities of Equipment. In the case of Seller's error, return must be requested within thirty (30) days of the date of the invoice covering the original shipment. Credit will be issued on return of Equipment with transportation charges paid by Buyer. Return of Equipment for repair must be authorized by Seller. Arrangements for such return must be made prior to the actual return to determine reparability, procedures and pricing.

17. Weights and Dimensions: Published and quoted weights are actual weights or careful estimates, but are not guaranteed. The dimensions in quotations are estimates and are subject to change on final approval of drawings and designs. If approval drawings are waived by the customer, Castle Circuit Assembly shall not be held liable weight or dimensional changes.

18. Waiver: The failure of Seller to insist, in any one or more instances, upon the performance of any of the terms and conditions set forth herein and/or the failure of Seller to exercise any of its rights hereunder shall not be construed as a waiver or relinquishment of any such term, condition or right and shall not effect Seller's right to insist upon strict performance and compliance with regard to any un-excused portions of the contract or future performance of these Terms and Conditions of Sale.

19. Choice of Law, Venue and Limitations on Actions: These Terms and Conditions of Sale shall be governed by and construed in accordance with the laws of the State of New York, excluding any laws thereof which would direct application of the laws of another jurisdiction. The exclusive venue for any action commenced by Buyer against Seller shall be in the state or federal courts in the State of New York and the county or district in which Seller's corporate headquarters is located. If Seller commences an action against Buyer, the venue for such action shall be, at Seller's choice, [a] the state or federal courts in the State of New York and the county or district in which Seller's corporate headquarters is located, or [b] the state or federal courts in the state in which the Equipment was delivered.

ANY CAUSE OF ACTION AGAINST SELLER ARISING OUT OF OR RELATING TO THE EQUIPMENT OR THESE TERMS AND CONDITIONS OF SALE SHALL EXPIRE UNLESS BROUGHT WITHIN ONE (1) YEAR OF THE TIME OF ACCRUAL THEREOF, ANY CONTRARY STATUTE OR LAW TO THE CONTRARY NOTWITHSTANDING. FURTHERMORE, NOTICE OF CLAIMS AGAINST SELLER FOR ANY REASON, INCLUDING BREACH OF WARRANTY, MUST BE MADE TO SELLER

IN WRITING WITHIN FORTY-EIGHT (48) HOURS OF DISCOVERY TO AFFORD SELLER AN OPPORTUNITY TO CONDUCT A PROMPT INVESTIGATION OF THE SURROUNDING FACTS AND MITIGATE ANY DAMAGE THAT MIGHT ENSUE, SHOULD IT BE DETERMINED TO BE SELLER'S RESPONSIBILITY. FAILURE TO GIVE SUCH NOTICE TO SELLER SHALL CONSTITUTE A WAIVER BY BUYER OF ANY RIGHT LATER TO ASSERT SUCH A CLAIM.

20. Severability: If any portion of these Terms and Conditions of Sale shall for any reason be held or adjudged to be invalid or illegal or unenforceable by any court of competent jurisdiction, such portion so adjudged will be deemed separate, distinct and independent, and the remainder of these Terms and Conditions of Sale will be and remain in full force and effect and will not be invalidated or rendered illegal or unenforceable or otherwise affected by such holding or adjudication.

For technical support, please contact:

Castle Power Solutions
22 Hudson Falls Road, Bay 56
South Glens Falls, New York 12803
Facsimile Number: (518) 743-1001, Telephone Number: (518) 743-1000

Please have the nameplate information when calling for service.
Visit our website www.castlepowersolutions.biz