

HIGH AMPERAGE CIRCULAR NON-SEG BUS

“Built Like Iso-Phase; Competitive with Non-Seg”



Crown Electric Engineering and Manufacturing LLC designs, fabricates, and installs Iso Phase Bus and Circular Non-Seg Bus Systems. Crown also maintains and upgrades IPB for most domestic legacy installations.



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Cylindrical Housing Bus Duct was pioneered by Westinghouse Electric's Iso Phase Bus Division Cinn. Ohio in the late 1970's. It is a more rugged, seamless, maintenance lite, environmentally tolerant design that is less costly than traditional non-segregated bus duct when fully evaluated.



Crown Electric Engineering & Mfg LLC's Circular Non-Segregated Phase Bus Duct (CNSB) - is a major advancement over traditional rectangular non-segregated phase bus duct. Crown Electric Engineering & Manufacturing LLC continues to develop and improve upon the "Cylindrical Housing" phase non-segregated metal enclosed bus duct product line developed by Westinghouse Electric Corporation.

Circular Non-Seg exhibits many of the most significant strength's associated with Isolated Phase Bus Duct while meeting competitive market challenges when fully evaluated as installed and ready for operational service.

Highlighting the unique advantages of Crown Electric's Circular Non-Segregated Bus (CNSB) will aid users in evaluating the various costs attributable to procurement, site preparation, support steel minimization, reduced footings requirements, installation costs (man-power, procedures, time and safety), environmental needs, product reliability, warranty, future maintenance and product longevity associated with major bus duct projects.

IEEE / ANSI C 37.23-2003 section 3.10 a - types of ME bus: defines Non-Segregated Phase bus as;

- a) Non-segregated Phase Bus is one in which all phase conductors are in a common metal enclosure without barriers between the phases...

Crown Electric engineers, fabricates and turn-key installs Circular Non-Segregated Phase (a.k.a. Circular Non-Seg) Bus Duct.

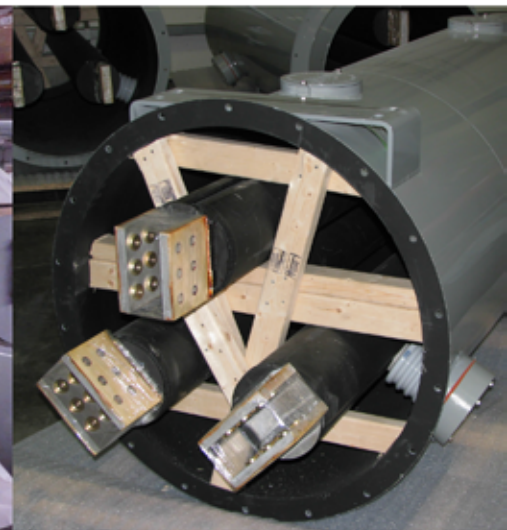
General Description of Circular Non-Seg;

The Circular Non-Segregated phase bus system is one in which the conductors are enclosed by and supported from the enclosure wall of a single continuously welded cylindrical enclosure wall. Dew point rated, post type **porcelain** insulators extend radially toward the center of the cylindrical housing. Each set of **porcelain** insulators is attached to one of the three phase conductors supporting and positioning each conductor 120 degrees apart. This symmetry greatly reduces the mechanical stresses due to certain fault conditions as opposed to other geometries. Air provides the safe, ever-present insulating medium within the housing. The uninsulated conductors are always separated by no less than the rated ANSI BIL standard for air clearance strike distance. Support insulator locations are symmetrically designed both circumferentially and longitudinally for maintaining short circuit strength. Factory pre-fabricated sections of assembled bus are welded end to end as necessary to form the long straight lengths often needed in larger installations. Factory welding of sections to fit specific job-site dimensions with a minimum number of shipping sections is Crown Electric's standard practice. Field welding of shipping sections is simplified through careful factory 3-D modelling by Crown Electric's engineering design department. CNSB layouts are delivered optimized for ease of handling and efficiency in installation.

Bus Conductor

The phase conductors in the Circular Non-Segregated bus duct are constructed of high conductivity aluminium which is extruded and formed into a custom tubular shape. The selection of the aluminium alloy, the conductor's specified diameter and the conductor's wall thickness are all based on the ampacity and strength requirements of a particular rating. The conductor's custom tubular shape exhibits an inherently high mechanical strength. Further, the custom tubular design has excellent skin effect values as compared to bar or channel (square) geometries.

The number of **porcelain** post insulators required per unit length of high strength tubular bus is much less than that required per unit length of associated flat conductor bus. **Porcelain** being an exceptional insulation and bracing material further reduces the number of required support points due to its own higher strength. This overall weight reduction with fewer possible tracking to ground failure points leads to a lighter bus design with higher reliability, longevity and drastically reduced maintenance.

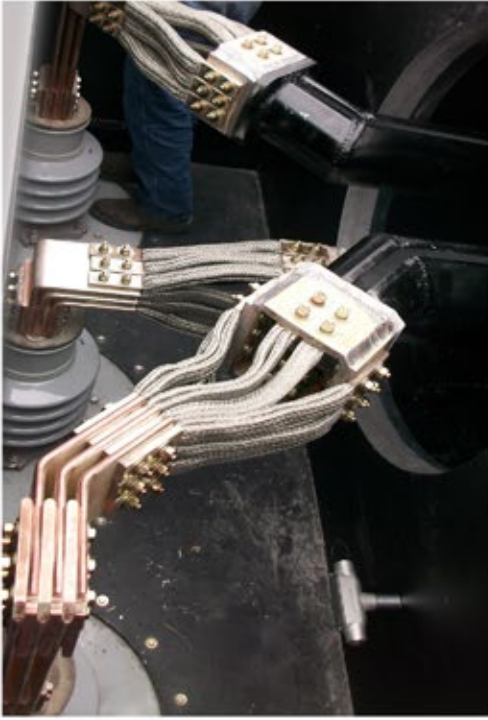


Crown Electric takes great care in it packing for shipping



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The rubbing, tracking and failure problems that exist with clamping boards found in traditional bus duct have been engineered out of the Circular Non-Seg design.



Consideration for conductor expansion / contraction is designed into the Circular Non-Segregated Bus Duct by incorporating appropriately located laminated shunts.

Laminated shunts are custom formed sinusoidally shaped aluminium strips welded together into assemblies.

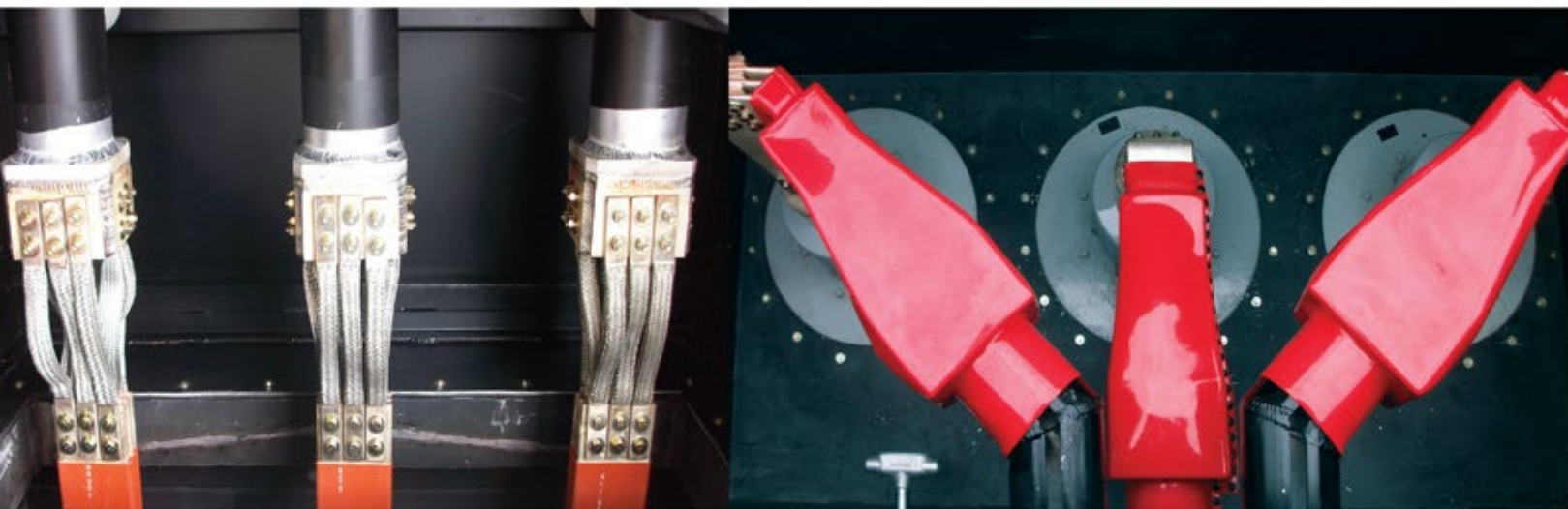
Housing enclosures and conductors are internally / externally coated with a black finish to increase emissivity - improving the heat dissipation of the assembly.

Custom designed solidly welded termination pads are located at the end of run point(s) where the Circular Non-Segregated Phase Bus Duct's conductors connect to their respective capital equipment (such as generators, transformers and switchgear). Flexible copper braids are used to make up the electrical connections between conductor termination pads and the associated capital equipment. Flexible braid connections provide full three (3) axis variability and mitigate any vibration transmitted from the connected equipment. This three (3) axis flexibility provides a degree of "forgiveness" allowing bus conductor length and position to vary slightly due to thermal cycling, field variances, settling etc...

Silver plating is standard on all contact surfaces associated with the conductor's termination pads.

Support Insulators and Bushings

Insulating material used in the construction of Circular Non-Segregated Phase Bus is high strength wet process porcelain similar to that used in Crown Electric's more expensive isolated phase bus systems. The **porcelain** post type insulators used to support the phase conductors are indoor class A-20 with dew and dry voltage withstand and resistance ratings conforming to ANSI C29.10-2012 and NEMA SG6 standards.



Placement of the conductor support insulators is dictated by a number of factors with the specified short circuit withstand requirements often controlling. The inherent stiffness of the tubular shaped conductor(s) minimizes the number of supports needed to achieve a given short circuit withstand-ability. These design benefits favourably impact shipping section length, per foot weight and reduce the need for steel supports.

Crown Electric's unique Insul-Mount™ System allows each **porcelain** insulator to capture, support and adjoin the conductor to a specific access port in the Circular Non-Segregated Phase Bus Duct's outer housing. A gasketed cover is used to seal each access port. Crown Electric's unique Insul-Mount™ System provides operations and maintenance personnel with a simple, easy to remove and re-install mechanism. The Insul-Mount™ customized design eliminates the need for any unbolting and rebolting of insulator hardware. Insulator inspection and wipe-down of Crown Electric's Circular Non-Segregated Phase Bus Duct takes a small fraction of the time and effort required by traditional bus duct designs.

External Housing

The Circular Non-Segregated Bus Duct's outer housing is fabricated from high conductivity aluminium sheet. The enclosure's aluminium sheet is sheared to size and then form rolled and welded into cylinders whose diameters are consistent with the internal conductor size and air clearance spacing requirements. As in the case of the conductors, the cylindrical shape of the housing contributes to the high rigidity of the Circular Non-Seg's design as compared to other constructions. This natural longitudinal rigidity allows several lengths of assembled bus to be welded together at the factory. Pre-fabrication produces shipping split lengths limited in size only by transportability or the capability of the jobsite to handle the equipment. Thirty (30) to fifty (50) foot linear shipping sections are the norm. This unique factory pre-assembly, inspection and testing ability of Circular Non-Seg results in higher overall reliability, fewer shipping sections, fewer bus joints to be made in the field and much quicker on-site installation.

The safe to touch welded aluminium housing is at ground potential and serves as a continuous low impedance ground bus. The assembled bus is corrosion resistant, water tight and can be pressurized if desired.





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Seal Offs and Pressurization

CNSB is fully welded and shares many features with Iso Phase Bus. Therefore CNSB can be provided with seal off bushings, through wall bushings, through floor transitions, high grade fire stops and pressurization systems as desired and specified.



Space Heaters

Circular Non-Seg Bus Duct uses high strength dew point rated **porcelain** stand-off insulators. CNSB therefore does NOT require space heaters as do other designs. However should a user wish to employ space heaters, Crown Electric has created custom casting extensions that mount simply and securely to the InsulMount™ support location. Properly rated heater elements are housed in this custom extension casting. The casting has a molded pre-tapped connection for control power conduit.

Angle – Shapes and Geometry

The cylindrical geometry of Crown Electric's Circular Non-Segregated phase bus is particularly well suited for bus runs which have odd configurations so that footage savings can be realized by taking short cuts in optimized directions between connection points. This flexibility is taken from techniques used in isolated phase bus design in which any elbow or angle can be supplied. These zero-maintenance fully welded joints and angles come factory pre-fabricated - ready to install.

Termination Enclosures

Due to its symmetrical cross section, Circular Non-Segregated phase bus can be easily connected to equipment without complex adaptor brackets and transition conductors. A project specific transition enclosure is generally provided to terminate the cylindrical housing at conventional power transformers, generators and switchgear flanges.

Removable covers are furnished on transition enclosures to facilitate installation of flex braids between the CNSB and the equipment's termination points. Transition enclosures are factory designed with internal mechanical supports for the bus and any adaptor assemblies.



Custom Bus boots are optionally provided for increased dielectric integrity with ease of removal for inspection access.

Steel Supports

Every bus run requires its own unique foundation and structural support layout dictated by the connected equipment placement and local site conditions. The rigidity and high strength of Crown Electric's Circular Non-Segregated Phase Bus duct allows civil designers to greatly reduce the number of footings and steel column supports needed to run Circular Non-Seg from Point A to Point B. That very same strength of Circular Non-Segregated Bus duct likewise reduces the number of support hangers needed for indoor suspended applications.



VT TAP Connection

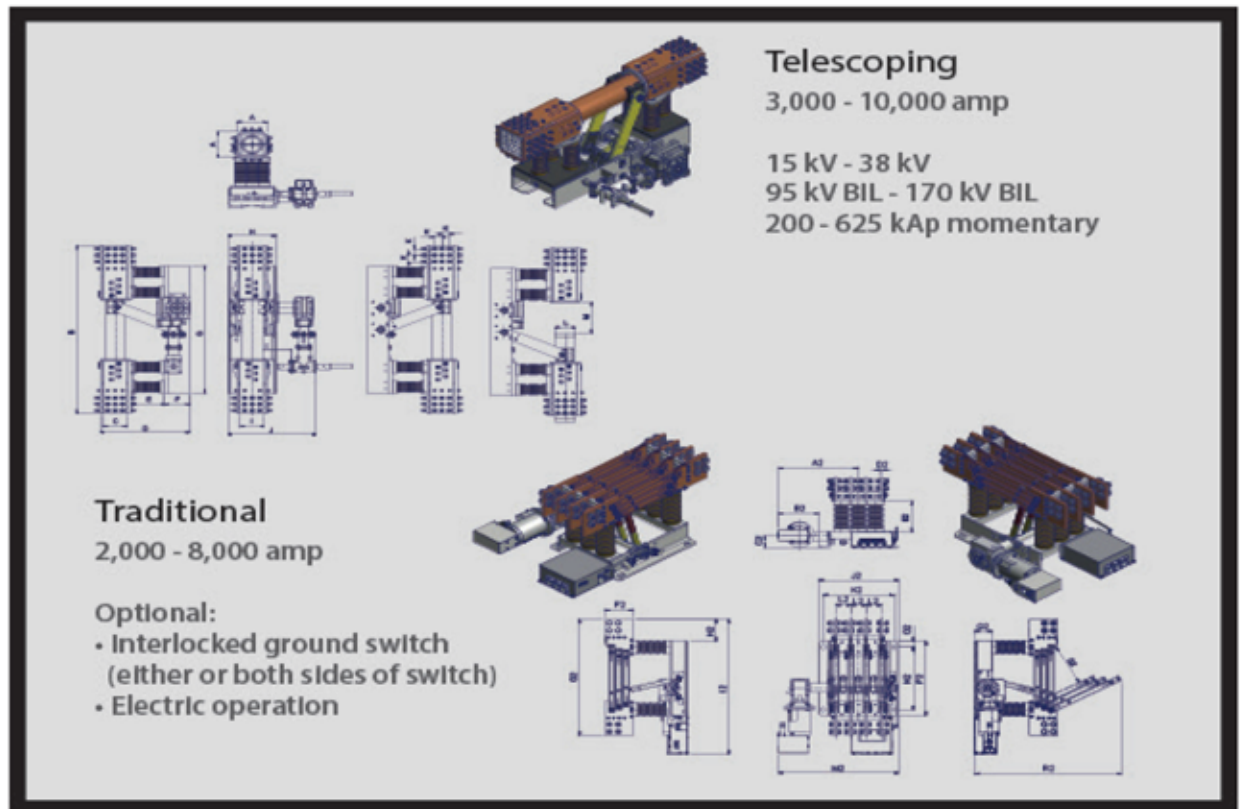




HIGH AMPERAGE CIRCULAR NON-SEG BUS

"Built Like Iso-Phase: Competitive with Non-Seg"

High Amperage Iso Phase Disconnect Switches



Crown Electric offers a full line of High Amperage Disconnect Switches to improve the safety and operability of your Bust Duct

Standards and Ratings

Circular Non-Segregated Phase Bus Assembly: Meets ANSI C37.23- 2003

Porcelain Insulators meets ANSI C 29.10 - 2012 – Class A-20

Maximum Voltages: 5KV 7.5kV 15KV

Insulation Withstand Levels: 60kV 95kV 95/110kV (for higher voltages – consult factory)

Rated Momentary Withstand - up to 100kA RMS		
System Volt Class	5kV	7.5kV
		15kV
Basic Impulse (B.I.L.)	60kV	95kV 110kV
Power Frequency Withstand		
1 Min. Dry	19kV	36kV 50kV
10 Sec. Dew	15kV	24kV 30kV

		Enclosure-OD			
Rated KV		4.76	8.25	15.00	15.00
BIL-KV		60	75	95	110
Ln-#	Amperes	Col-1	Col-2	Col-3	Col-4
1	2500	21.00	25.00	30.00	35.00
2	3000	24.00	27.00	31.00	36.00
3	4000	27.00	30.00	34.00	39.00
4	5000	31.00	34.00	38.00	41.00
5	6000	35.00	37.00	41.00	44.00
6	7000	40.00	40.00	44.00	48.00
8	7500	43.00	45.00	47.00	49.00

* The measurements are rounded to the nearest inch

Advantages

- The continuous solidly welded aluminium housing offer an exceptional degree of protection against environmental degradations such as moisture, salt, dust and particulate. Welded construction does not leak or require gasketing.
- Extremely high level of rigidity due to the cylindrical shape of the rolled, continuously welded housing.
- All joints and section connections are fully welded requiring no future maintenance.
- Ends can be sealed off and have firestops and through bushings.
- Circular Non-Segregated Phase Bus fully welded conductor and enclosure design means no field bolting for faster installation, fewer connections points with an overall lower cost.
- No need to torque, micro-ohm test, hash mark each bolt and boot each joint.
- The solidly welded aluminium enclosures create a high conductivity, safe to touch ground path.
- Crown Electric's Circular Non-Segregated Phase Bus design reduces the number of steel columns and footings as compared to traditional bolted joint bus designs by up to 30 %*.
- * Ratings and site topology of bus run will affect percentage difference.
- Reduced need for steel columns means reduced footings.
- Greater level of factory pre-fabrication reduces the on-site staging requirements. (Up to 50 foot shipping sections).
- Greater level of factory pre-fabrication reduces the number shipping of sections and number of joints.
- Longer sections with reduced numbers of joints drastically reduce installation man-hours.
- Reduced number of crane "picks" enhances installation schedules. (Up to 50 foot shipping splits).
- Lower overall weight with higher amperage to weight per foot ratio, minimizes structural needs.
- Crown Electric's Circular Non-Segregated Phase Bus employ bushings and stand-off support insulators made of high strength ANSI rated **porcelain**. Crown Electric's Circular Non-Seg exhibits high momentary strength and excellent dielectric to ground characteristics.
- Crown Electric's custom Insul-Mount™ design provides easy access for removing, inspecting, cleaning and re-installation of support insulators.
- Crown Electric's porcelain insulators are designed for "Dew Withstand Ratings".
- Crown Electric's dew rated porcelain design means no space heaters are necessary. (Optional space heaters are available to meet customer's specification requirements.)
- 120° conductor geometry reduces fault forces.
- The rigid, lightweight, continuously welded design requires fewer hanger supports.



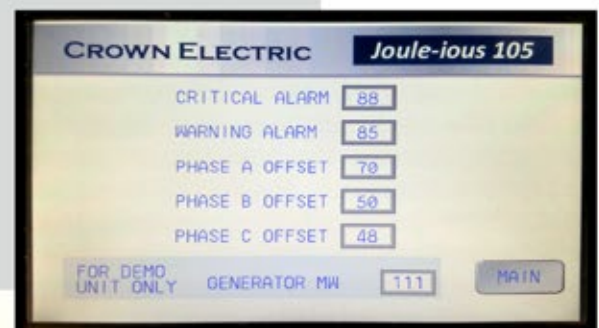
Joule-ious 105

Iso Phase Bus - On-Line Thermal Monitor

Protect Your Assets

Iso Phase Bus - Real Time Monitoring
Includes generator and GSU Tx
bushing connections

- 24/7 monitoring, data logging, annunciation and alarming.
- Infrared temperature sensor provides accurate "no touch" temperature readings.
- Visual indication for critical alarm levels on each phase.
- 15 minute data point trending with 1 year of data storage.
- Wide angular eyeball mounting bracket allows for easy installation and positioning.
- Analog and digital communication available.



Joule-ious 105 - Spec chart

Power Supply: 2A at 120V

Temperature Rating 45C

IR Sensor:

Monitoring Range: 0 – 200C

Accuracy: 2%

Spot Size: 12:1

Options:

- 65C Temperature Rating
- Additional 3 temperature sensors
- Generator MW input (4-20mA)
- Alarm Output



Custom high angular ball mount

Crown Electric offers the ***Joule-ious 105*** On Line thermal monitoring system for both new and retrofit IPB applications.

The ***Joule-ious 105*** is a ruggedized, high accuracy infrared, touch-less thermal sensing system.

Joule-ious 105 sensors are mounted on the Iso Phase Bus enclosures pointing at the conductor where it adjoins with the major capital equipment (Generators and GSU transformers).

The ***Joule-ious 105*** continuously monitors, logs, reports and annunciates IPB temperature at each surveillance point.

Multiple pre-alarms and alarm levels are fully programmable.

Reporting and alarming can be local, remote, wired or wireless.

**Now IPB Temperature Monitoring
is easy and in your hands.**



Rugged and easy
to install sensors

CROWN ELECTRIC ENG. & MFG. LLC

IPB and More



- Disconnect Switches
- Generator Breakers
- Full Turn-key Installation
- On-Line Thermal Monitoring
- Engineering Upgrade Studies
- Replacement and Upgraded IPB Coolers

"We thank you for the opportunity to serve your company, colleagues, clients and facilities"

Benefits of Circular Non-Seg over Traditional non-seg

- Less expensive when fully evaluated (furnish and installed including structural)
- Less expensive to install
- Less costly structural supports
- Lower life maintenance costs
- Easier to maintain
- More reliable
- Safer
- More environmentally resilient

Benefits of Circular Non-segregated Bus Duct compared to traditional non-seg are over whelming

Cost
Safety
Reliability
Environmental
Reduced Install Time
Reduced Maintenance Needs

Specify Crown Electric Circular Non-Seg



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