

BTPC

bypass isolation transfer switch
open or closed transition
150 – 4000 amps

BTPC bypass isolation transfer switches combine a drawout automatic transfer switch with isolation mechanism and a manual bypass switch, to provide redundant power transfer and re-transfer capability for critical-need applications requiring a reliable power supply to the load. BTPC switches are available with closed transition for transferring critical loads without interruption.

Like conventional transfer switches, BTPC transfer switches are designed for operation and switching of electrical loads between primary power and standby generator sets. The switch monitors both power sources, signals generator set startup, automatically transfers power and returns the load to the primary power source when the utility returns and stabilizes.

Features

- **PowerCommand® control:** A fully featured microprocessor-based control with digital display. Controls allow operator to enter settings and make adjustments to software-enabled features easily and accurately. Accommodates up to 8 event schedules.
- **Closed transition available:** By briefly connecting the two sources (for 100 msec or less), the transfer from the alternate source back to the normal source occurs without interruption in the power supply to loads.
- **Programmed transition:** Open transition timing can be adjusted to completely disconnect the load from both sources for a programmed time period, as recommended by NEMA MG-1 for transfer of inductive loads.
- **Closed door drawout operation:** Bypass and total isolation of the automatic transfer switch occurs behind closed doors, to provide arc flash protection for operator.
- **For critical loads:** Suitable for use in emergency, legally required and optional standby applications.

BTPC bypass-isolation transfer switch

- **Advanced transfer switch mechanism:** Unique bi-directional linear actuator provides smooth, continuous transfer switch action during automatic operation.
- **Robust control system design:** Optically isolated logic inputs and isolation transformers for AC power inputs provide high-voltage surge protection.
- **Main contacts:** Heavy-duty silver alloy contacts with multi-leaf arc chutes are rated for 100% load interruption. They require no routine contact maintenance and provide 100% continuous current ratings.
- **Communications capability:** The transfer switch is capable of communicating with other transfer switches, SCADA networked accessories, or Cummins Power Generation generators utilizing LonWorks® protocol.
- **Easy service/access:** Single-plug harness connection and compatible terminal markings simplify servicing. Access space is ample. Door-mounted controls are field-programmable; no tool is required.
- **Complete product line:** Cummins Power Generation offers a wide range of equipment, accessories and services to suit virtually any backup power application.
- **Warranty and service:** Products are backed by a comprehensive warranty and a worldwide network of distributors with factory-trained service technicians.



Transfer switch mechanism

- Transfer switch mechanism is electrically operated and mechanically held in the Source 1 and Source 2 positions. The transfer switch incorporates electrical and mechanical interlocks to prevent inadvertent interconnection of the sources.
- Independent break-before-make action is used for both 3-pole and 4-pole/switched neutral switches. This design allows use of sync check operation when required, or control of the operating speed of the transfer switch for proper transfer of motor and rectifier-based loads (programmed transition feature).
- True 4-pole switching allows for proper ground (earth) fault sensing and consistent, reliable operation for the life of the transfer switch. The neutral poles of the transfer switch have the same ratings as the phase poles and are operated by a common crossbar mechanism, eliminating the possibility of incorrect neutral operation at any point in the operating cycle, or due to failure of a neutral operator.
- High pressure silver alloy contacts resist burning and pitting. Separate arcing surfaces further protect the main contacts. Contact wear is reduced by multiple leaf arc chutes that cool and quench the arcs. Barriers separate the phases to prevent interphase flashover. A transparent protective cover allows visual inspection while inhibiting inadvertent contact with energized components.
- Switch mechanism, including contact assemblies, is third party certified to verify suitability for applications requiring high endurance switching capability for the life of the transfer switch. Withstand and closing ratings are validated using the same set of contacts, further demonstrating the robust nature of the design.

Bypass mechanism

- Manual bypass switch mechanism allows the operator to select either the normal or emergency source by closing the bypass contacts. Visual indicators show bypass "source selected", bypass "closed" or "open" to either source, and automatic transfer switch isolation or "disable." Bypass of the automatic switch is accomplished with permanently mounted, mechanically operated devices without disturbing the power supply to system loads, and without opening enclosure door.
- Isolation contacts allow the automatic transfer switch and the bypass switch to be separated electrically and mechanically. The automatic transfer switch is isolated by a drawout mechanism similar to that used on power circuit breakers on transfer switches rated 1200 amps and less. On 1600-4000 amp models the drawout carriage is wheel-mounted.
- Protective safety shutters, provided on switches up to and including 1200 amps, cover the stationary power terminals on the bypass switch when the automatic transfer switch is isolated and removed.
- The drawout mechanism can be latched in one of three positions: "connected", "test", and "isolated". In the connected position the mechanism is locked. In the test position, the automatic switch is isolated but the controls receive power. In the isolated position, the automatic switch is completely isolated.
- The bypass switch mechanism is identical to the automatic switch except it is mechanically operated rather than electrically operated. Mechanical interlocks prevent operation of the bypass or automatic switches in any mode that would result in the interconnection of the sources.

Power command control

PowerCommand controls are microprocessor based and developed specifically for automatic transfer switch operation. The control includes the features and options required for most applications.

- Flash memory stores the control settings.
- Contents of the memory are not lost even if power to the controller is lost.
- On-board battery maintains the real-time clock setting and the engine start time delay.

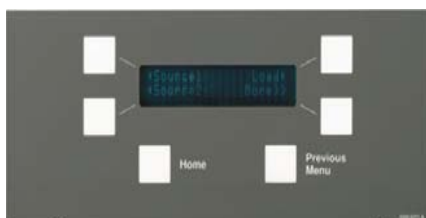
Panels

Basic indicator panel:

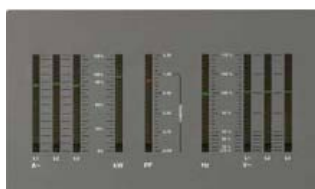
Source available/connected LED indicators
Test/exercise/bypass buttons



Digital display: Standard



Analog bar graph meter display: optional (D009)



Control functions: Level 2 control

Open transition (in-phase)

Open transition (programmed)

Closed transition: Includes fail-to-disconnect timer to prevent extended paralleling with the utility

Utility-to-genset applications

Utility-to-utility applications

Genset-to-genset applications

Software adjustable time delays:

Engine start: 0 to 120 sec

Transfer normal to emergency: 0 to 120 sec

Re-transfer emergency to normal: 0 to 30 min

Engine stop: 0 to 30 min

Programmed transition: 0 to 60 sec

Undervoltage sensing: 3-phase normal, 3-phase emergency

Accuracy: $\pm 2\%$

Pickup: 85% to 98% of nominal voltage

Dropout: 75% to 98% of pickup setting

Dropout time delay: 0.1 to 1.0 sec

Overvoltage sensing: 3-phase normal, 3-phase emergency

Accuracy: $\pm 2\%$

Pickup: 95% to 99% of dropout setting

Dropout: 105% to 135% of nominal voltage

Dropout time delay: 0.5 to 120 sec

Over/under frequency sensing: Normal and emergency

Accuracy: $\pm 0.05\text{Hz}$

Pickup: $\pm 5\%$ to $\pm 20\%$ of nominal frequency

Dropout: $\pm 1\%$ beyond pickup

Dropout time delay: 0.1 to 15.0 sec

Voltage imbalance sensing:

Dropout: 2% to 10%

Pickup: 90% of dropout

Time delay: 2.0 to 20.0 sec

Phase rotation sensing:

Time delay: 100 msec

Loss of single phase detection

Time delay: 100 msec

Loss of single phase detection:

Time delay: 100 msec

Programmable genset exerciser: Eight events/schedules with or without load

PowerCommand control (continued)

Time-delay functions

Engine start: Prevents nuisance genset starts due to momentary power variation or loss. Not included in utility-to-utility systems.

Transfer normal to emergency: Allows genset to stabilize before application of load. Prevents power interruption if normal source variation or loss is momentary. Allows staggered transfer of loads in multiple transfer switch systems. For genset-to-genset applications, delays transfer of load from lead to secondary generator.

Re-transfer emergency to normal: Allows the utility to stabilize before re-transfer of load. Prevents needless power interruption if return of normal source is momentary. Allows staggered transfer of loads in multiple transfer switch systems. For genset-to-genset applications, delays re-transfer of load from secondary back to lead generator.

Engine stop: Maintains availability of the genset for immediate reconnection if the normal source fails shortly after transfer. Allows gradual genset cool-down by running unloaded. Not included in utility-to-utility applications.

Elevator pre-transfer signal: Requires optional relay signal module (M023). Delays transfer for pre-set interval of 0-60 seconds to prevent a power interruption during elevator operation.

User interfaces

Basic interface panel: LED indicators provide at-a-glance source and transfer switch status for quick summary of system conditions. Test and override buttons allow delays to be bypassed for rapid system checkout.

Digital display: The digital display provides a convenient method for monitoring load power conditions, adjusting transfer switch parameters, monitoring PowerCommand network status or reviewing transfer switch events. Password protection limits access to adjustments to authorized personnel. The digital display (M018) is standard on the BTPC.

User interface options

Bar graph meter display (D009): An LED bar graph display provides an easy-to-read indicator of the level of power being supplied to the load. Information displayed includes: 3-phase voltage and current, power factor, and kilowatts. Green, amber and red LEDs provide at-a-glance indication of system acceptability.

Front panel security key (M017): Locks front panel to prevent access to digital control settings. Prevents unauthorized activation of transfer or test functions.

Control options

Relay signal module (M023): Provides relay output contacts for sending information to the building monitoring and control system. Relay outputs include: Source 1 connected/available, Source 2 connected/available, not in auto, test/exercise active, failed to disconnect, failed to synchronize, failed to transfer/re-transfer, and elevator control pre-transfer signal.

Loadshed (M007): Removes the load from the emergency power source by driving the transfer switch to the neutral position when signaled remotely. Transfers load back to the emergency source when the signal contacts open. Immediately re-transfers back to the primary source when available. For utility-to-generator applications only.

PowerCommand network interface (M031): Provides connection to the PowerCommand network. LonWorks compatible for integration with building monitoring and control system.

Load power and load current monitoring (M022): Measures load phase and neutral, current, power factor, real power (kW) and apparent power (kVA). Warns of excessive neutral current resulting from unbalanced or nonlinear loads. Minimum current level detection is 3%.

Specifications

Voltage rating	600 VAC, 50 or 60 Hz
Arc interruption	Multiple leaf arc chutes provide dependable arc interruption.
Neutral bar	A full current-rated neutral bar with lugs is standard on enclosed 3-pole transfer switches.
Auxiliary contacts	Two isolated contacts (one for each source) indicating switch position are provided for customer use. Contacts are normally open, and close to indicate connection to the source. Wired to terminal block for easy access. Rated at 10 amps continuous at 250VAC maximum. UL recognized and CSA-certified.
Operating temperature	-40 °F (-40 °C) to 140 °F (60 °C)
Storage temperature	-40 °F (-40 °C) to 140 °F (60 °C)
Humidity	Up to 95% relative, non-condensing
Altitude	Up to 10,000 ft (3,000 m) without de-rating
Surge withstand ratings	Voltage surge performance and testing in compliance with the requirements of IEEE C62.41 (Category B3) and IEEE C62.45. Will not exceed 6 cycles at 60 Hz with normal voltage applied to the actuator and without programmed transition enabled.
Total transfer time (source-to-source)	External manual operator is provided via the bypass and isolation mechanism, providing quickmake/quick-break operation under load.
Manual operation	

Certifications



All switches are UL 1008 listed and labeled, with UL-type rated cabinets and UL-listed CU-AL terminals.



All switches comply with NFPA 70, 99 and 110 (Level 1 systems).



All switches are certified to CSA 178.1-07 Requirements for Transfer Switches.



All switches comply with NEMA ICS 10.



Suitable for use in emergency, legally required and standby applications per NEC 700, 701 and 702.



All switches comply with IEEE 446 Recommended Practice for Emergency and Standby Power Systems.



This transfer switch is designed and manufactured in facilities certified to ISO9001.

Transition modes

Open transition/programmed: Controls the time required for the device to switch from source to source, so that the load-generated voltages decay to a safe level before connecting to an energized source. Recommended by NEMA MG1 to prevent nuisance-tripping breakers and load damage. Adjustable 0-10 seconds, default 0 seconds. Programmed transition is standard on 150-1000 amp switches, and optional on 1200-4000 amps.

Open transition/in-phase: Initiates open transition transfer when in-phase monitor senses both sources are in phase. Operates in a break-before-make sequence. Includes ability to enable programmed transition as a back-up on 150 – 1000 amp switches and 1200 – 4000 amp switches that support programmed or closed transition. If sources are not in phase within 120 seconds, the system will transfer using programmed transition.

Closed transition: Used in applications where loads are sensitive to the momentary power interruption that occurs when performing open transition between sources. Closed transition is accomplished by briefly (<100 msec) paralleling two good sources to eliminate the momentary break in the power supply.

Genset-to-genset: Either genset can be designated as the lead genset. If the lead genset goes down or is taken offline, the transfer switch starts the second genset and transfers the load. The control can be programmed to alternate between the two gensets at a set interval up to 336 hours (2 weeks).

UL withstand and closing ratings

The transfer switches listed below must be protected by circuit breakers or fuses. Referenced drawings include detailed listings of specific breakers or fuse types that must be used with the respective transfer switches. Consult with your distributor/dealer to obtain the necessary drawings. Withstand and Closing Ratings (WCR) are stated in symmetrical RMS amperes.

Transfer switch ampere	MCCB protection			Current limited breaker protection		
	WCR at volts max with specific manufacturers MCCBs	Max MCCB rating	Drawing reference	With specific current limiting breakers (CLB)	Max CLB rating	Drawing reference
150, 225, 260	30,000 at 480 25,000 at 600	400 A	0098-6889	200,000 at 480	400 A	0098-6919
				100,000 at 600	100,000 at 600	
300, 400, 600	65,000 at 480 65,000 at 600	1200 A	0098-6887	200,000 at 480	1200 A	0098-6923
				100,000 at 600	100,000 at 600	
800, 1000	65,000 at 480 65,000 at 600	1400 A	0098-6891	200,000 at 480	1400 A	0098-6924
				100,000 at 600	100,000 at 600	
1000, 1200 (closed transition)	85,000 at 480 65,000 at 600	1600 A	0098-7312	85,000 at 480	1600 A	Use MCCB ratings
				65,000 at 600	65,000 at 600	
1600, 2000	100,000 at 480	2500 A	Use 3 Cycle Ratings	100,000 at 480	2500 A	Use 3 Cycle Ratings
3000	100,000 at 480	4000 A	Use 3 Cycle Ratings	100,000 at 480	4000 A	Use 3 Cycle Ratings
4000	100,000 at 480 85,000 at 600	5000 A	0098-8576	100,000 at 480	5000 A	Use MCCB ratings
				85,000 at 600	85,000 at 600	

Fuse protection

Transfer switch ampere	WCR at volts max. with current limiting fuses	Max fuse, size and type	Drawing reference
150, 225, 260	200,000 at 600	600 A Class J, RK1, RK5 or 1200 A Class L, T	0098-6889
300, 400, 600	200,000 at 600	600 A Class J, RK1, RK5 or 1200 A Class L, T	0098-6887
800, 1000	200,000 at 600	600 A Class J, RK1, RK5, 1200 A Class T, or 2000 A Class L	0098-6891
1200	200,000 at 480	2000 A Class L	0098-7312
	150,000 at 600		
1600, 2000	200,000 at 480	2500 A Class L	NA
3000	200,000 at 480	4000 A Class L	NA
4000	200,000 at 480	6000 A Class L	0098-8576
	150,000 at 600		

3-cycle ratings

Transfer switch ampere	WCR at volts max 3-cycle rating	Max MCCB rating	Drawing reference
1200	50,000 at 480	1600 A	0098-7312
	42,000 at 600		
1600, 2000	100,000 at 480	4000 A	N/A
3000	100,000 at 480	4000 A	N/A
4000	100,000 at 480	5000 A	0098-8576
	85,000 at 600		

Transfer switch lug capacities

All lugs accept copper or aluminum wire unless indicated otherwise.

Amp rating	Cables per phase	Size
150, 225	1	#6 AWG to 300 MCM
260	1	#6 AWG to 400 MCM
150, 225, 260 ¹	1	#4 AWG to 500 MCM
300, 400	1	#3/0 AWG to 600 MCM
300, 400	2	#3/0 AWG to 250 MCM
300, 400 ¹	2	#2 AWG to 600 MCM
600	2	250 MCM to 500 MCM
600 ¹	2	#2 AWG to 600 MCM
800, 1000	4 ²	250 MCM to 500 MCM
800, 1000 ¹	3	300 MCM to 750 MCM
1200	4	#2 AWG to 600 MCM
1600, 2000	8	#2 AWG to 750 MCM (lugs optional)
3000	8	#2 AWG to 750 MCM (lugs optional)
4000	12	#2 AWG to 600 MCM (lugs optional)

Note 1: Optional lug capacities on accessories spec sheet AC-166.

Note 2: Four-wire for neutral bar is 3-pole only.

Note 3: Mechanical and compression lugs are available as options

Enclosures

The transfer switch and control are floor-mounted in a key-locking enclosure. Wire bend space complies with 2008 NEC.

Dimensions - transfer switch in UL Type 1 enclosure

Amp rating	Height		Width		Depth				Weight 3-pole type		Outline drawing
					Door closed		Door open		lb	kg	
	in	mm	in	mm	in	mm	in	mm			
150, 225, 260	71.75	1822	36.00	915	22.75	578	55.2	1402	564	256	310-0538
300, 400, 600	83.25	2115	36.00	914	22.75	578	55.2	1403	639	291	500-4726
800, 1000	90.00	2290	48.00	1219	27.75	705	62.5	1588	1097	499	310-0570
1200 3-pole ¹	90.00	2290	40.00	1016	27.00	686	67.0	1702	1980	898	310-0566
1200 4-pole ¹	90.00	2290	46.00	1168	27.00	686	73.0	1854	2185	991	310-0566
1600, 2000 3-pole ²	79.64	2023	40.76	1035	63.00	1600	102.1	2593	3139	1424	A030s193
1600, 2000 4-pole ²	79.64	2023	46.26	1175	63.00	1600	107.6	2733	3538	1605	A030x111
3000 3-pole ²	79.64	2023	40.76	1035	63.00	1600	102.1	2593	3513	1594	A030s195
3000 4-pole ²	79.64	2023	46.26	1175	63.00	1600	107.6	2733	4081	1851	A030x113
4000 3-pole ²	90.00	2290	47.50	1210	81.00	2060	128.5	3270	4730	2145	500-4488
4000 4-pole ²	90.00	2290	54.00	1370	81.00	2060	135.0	3430	5930	2689	500-4488

Note 1: Dimensions shown for Type 1 are for top entry only. If bottom or side entry is required, an adapter bay is required and the depth increases by 14 in (356 mm). See outline drawing. Adapter needs to be part of the original order.

Note 2: 1600-4000 amp switches are rear-connected. Rear or side access is required for cabling.

Dimensions - transfer switch in UL Type 3R, 4, 4X or 12 enclosure

Amp rating	Height		Width		Depth				Weight		Cabinet type	Outline drawing
	in	mm	in	mm	Door closed		Door open		lb	kg		
					in	mm	in	mm				
150, 225, 260	71.75	1822	36.00	915	22.75	578	55.20	1402	564	256	3R, 12	310-0651
	71.75	1822	36.00	915	22.75	578	55.20	1402	564	256	4, 4x	310-0652
300, 400, 600	83.25	2115	36.00	915	22.75	578	55.20	1402	639	290	3R, 12	500-4726
	83.25	2115	36.00	915	22.75	578	55.20	1402	639	290	4, 4x	500-4727
800,1000	90.00	2290	48.00	1214	27.75	705	62.50	1534	1097	498	3R	310-0711
	90.00	2290	48.00	1214	27.75	705	62.50	1534	1097	498	4, 4x, 12	310-0712
1200 3-pole ¹ 1200 4-pole ¹	90.00	2290	40.00	1016	28.25	718	65.50	1654	1980	748	3R, 12, 4, 4x	310-0734
	90.00	2290	46.00	1168	28.25	718	71.69	1821	2185	991	3R, 12, 4, 4x	310-0734
1600, 2000 3-pole ²	79.64	2023	40.76	1035	63.00	1600	102.1	2593	3139	1424	3R	A030s193
1600, 2000 4-pole ²	79.64	2023	46.26	1175	63.00	1600	107.6	2733	3538	1605	3R	A030x111
3000 3-pole ²	79.64	2023	40.76	1035	63.00	1600	102.1	2593	3513	1594	3R	A030s195
3000 4-pole ²	79.64	2023	46.26	1175	63.00	1600	107.6	2733	4081	1851	3R	A030x113
4000 3-pole ²	90.00	2290	48.50	1232	81.75	2076	131.00	3308	4730	2145	3R	500-4489
4000 4-pole ²	90.00	2290	55.00	1397	81.75	2076	137.00	3473	5930	2689	3R	500-4489

Note 1: 1200 amp switches are top entry only.

Note 2: 1600-4000 amp switches are rear-connected. Rear or side access is required for cabling.

Submittal detail

Amperage ratings

- 150
- 225
- 260
- 300
- 400
- 600
- 800
- 1000
- 1200
- 1600
- 2000
- 3000
- 4000

Voltage ratings

- R038 190
- R021 208
- R022 220
- R023 240
- R024 380
- R025 416
- R035 440
- R026 480
- R027 600

Pole configuration

- A028 Poles - 3 (solid neutral)
- A029 Poles - 4 (switched neutral)

Frequency

- A044 60 Hertz
- A045 50 Hertz

Transfer mode

- A077 Open transition/in-phase
- A078 Open transition/programmed
- A079 Closed transition

Application

- A035 Utility-to-genset
- A036 Utility-to-utility
- A037 Genset-to-genset

System options

- A041 Single phase, 2-wire or 3-wire
- A042 Three phase, 3-wire or 4-wire

Enclosure

- B001 Type 1: Indoor use, provides some protection against dirt (similar to IEC type IP30)
- B002 Type 3R: Intended for outdoor use, provides some protection from dirt, rain and snow (similar to IEC type IP34)
- B003 Type 4: Indoor or outdoor use, provides some protection from wind-blown dust and water spray (similar to IEC type IP65)
- B004 Open Construction: No enclosure - includes automatic transfer switch and controls (call factory for dimensions)
- B010 Type 12: Indoor use, some protection from dust (similar to IEC type IP61)
- B025 Type 4X: Stainless steel, indoor or outdoor use, provides some protection from corrosion (similar to IEC Type IP65)

Standards

- A046 UL 1008/CSA certification
- A064 NFPA 20 compliant (not available 1200-4000 amp switches)
- A080 Seismic certification

Control options

- M017 Security key - front panel
- M022 Load monitoring (min current level 3%)
- M023 Relay signal module. Includes pre-transfer module for elevator control
- M031 LonWorks Network Communications Module FTT-10

Meter

- D009 Analog bar graph meter

Battery chargers

- K001 2 A, 12/24 V
- KB59 15 A, 12 V
- KB60 12 A, 24 V

Protective relays

- M045 Paralleling timer and lockout relays, ANSI/IEEE 62PL and 86
- M046 Paralleling timer and lockout and reverse power relays, single phase, ANSI/IEEE 62PL, 86 and 32R
- M047 Paralleling timer and lockout and reverse power relays, three phase, ANSI/IEEE 62PL, 86 and 32R

Auxiliary relays

Relays are UL listed and factory installed. All relays provide two normally closed isolated contacts rated 10 amps at 600 VAC. Relay terminals accept from one 18 gauge to two 12 gauge wires per terminal.

- L101 24 VDC coil - installed, not wired (for customer use)
- L102 24 VDC coil - emergency position - relay energized when switch in source 2 (emergency) position
- L103 24 VDC coil - normal position - relay energized when switch in source 1 (normal) position
- L201 12 VDC coil - installed, not wired (for customer use)
- L202 12 VDC coil - emergency position - relay energized when switch in source 2 (emergency) position
- L203 12 VDC coil - normal position - relay energized when switch in source 1 (normal) position

Miscellaneous options

- M003 Terminal block - 30 points (not wired)
- M007 Loadshed - from emergency - drives switch to neutral position when remote signal contact closes (utility-to-genset only)
- N009 Power connect - bus stabs (150-1000 amp open construction only)

Optional lug kits

- N046 Mechanical lugs – accept up to 8 #2 - 600 MCM cables per phase (1600-3000 amps only)
- N047 Mechanical lugs – accept up to 8 750 MCM cables per phase (1600-3000 amps only)
- N050 Compression lugs – accept up to 8 500 MCM cables per phase (1600-3000 amps only)
- N051 Compression lugs – accept up to 8 600 MCM cables per phase (1600-3000 amps only)
- N052 Compression lugs – accept up to 8 750 MCM cables per phase (1600-3000 amps only)
- N056 Mechanical lugs – accept up to 12 750 MCM cables per phase (4000 amps only)

Warranty

- G010 Years 0-2: Parts, labor and travel
Years 3-5: Parts only
Years 6-10: Main contacts only
- G013 Years 0-5: Parts, labor and travel
Years 6-10: Main contacts only

Shipping

- A051 Packing - export box

Accessories

- AC-166 Accessories specification sheet



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s-1271u (5/11)