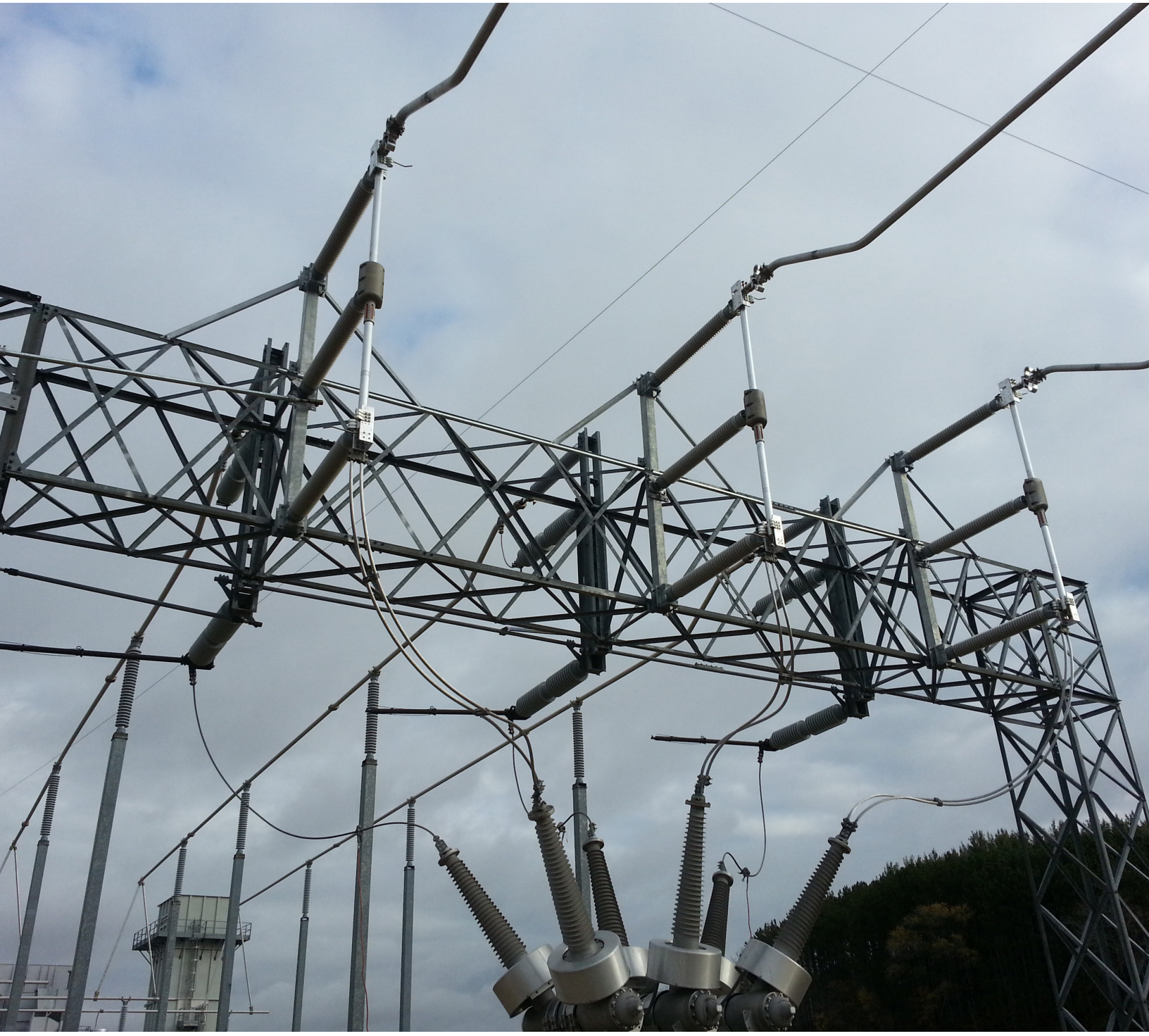
TURNER ELECTRIC

Substation Catalog

HUBBELL



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TMX VERTICAL BREAK SWITCH...FIELD-UPGRADABLE, UTILITY EXTREME PERFORMANCE

Vertical Break Switches perform a basic function for the utility designer. They are the visible break necessary to satisfy safety regulations while working on de-energized lines. When equipped with current-interrupting enhancements, they provide full load-break capability.

Turner's TMX aluminum vertical air break switch is a rear rotating stack, group operated, heavy duty switch. Turner's TMX switch also sets the quality and performance standard that other switch manufacturer's try to attain.

Vertical Break switch requirements are simple:

- Meet rating requirements.
- Operate easily regardless of conditions.
- Operate for the lifetime of the installation

Turner has added one more:

- Be easily upgradeable in the field, without removing the switch from its mounting.

Utilities may increase the current carrying capacity of their TMX switches from 1200A to 2000A or 3000A in minutes by simply adding contacts and changing the switch blade.

The TMX family of switches uses common components throughout the switch to minimize customer's inventory requirements and decrease production lead times.

Blade Action

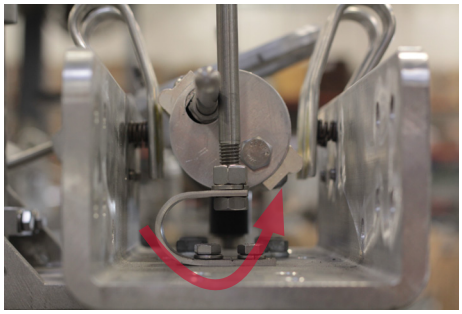
Rotating blade open and close action breaks the switch contacts free of ice and other environmental contaminants, without damaging the contact surfaces or switch blade.

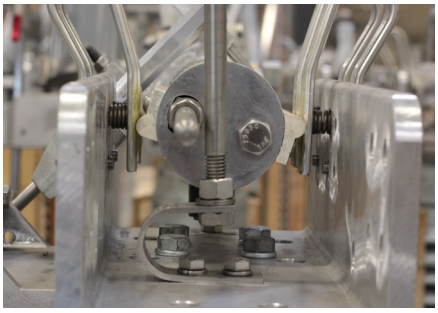
The blade counterbalance spring is incorporated within the tubular housing, virtually eliminating environmental concerns and improving safety.

It is field-adjustable and available for vertical, horizontal, and underhung mounting configurations. All current carrying components are either silver-plated copper alloy or high conductivity aluminum alloy.

Factory set blade stops assure proper positioning of blades in both the open and closed positions. The perfectly counterbalanced blade can be stopped in any intermediate position, from fully closed to fully open, without danger of the blade falling into the closed position.

The entire drive mechanism is factory sealed against the elements, assuring permanent adjustments and eliminating time-consuming maintenance in that area.





Turner TMX vertical break switches employ reverse-loop contacts and patented rotating blade technology to securely close into and hold the blade in the switch jaws.

Hinge Mechanism

Turner's method of enclosing the hinge mechanism protects the threaded, silver-to-silver contact surfaces from environmental concerns, which minimizes maintenance requirements.

Reverse-Loop Contact Design

The field-proven, reverse-loop contacts employ the natural repulsion of magnetic fields moving in opposite directions to increase the holding force against the blade contact surface.

Increasing current flow, such as in fault conditions, increases the magnetic repulsion, which creates a high pressure force on the blade tip, holding the blade in the jaw.

Blade and Jaw Contacts

TMX switch contacts feature high-conductivity, tin-plated copper fingers with silver-plated current carrying mating surfaces. Contacts are reinforced with non-current carrying stainless steel back up springs. Blade tips are silver-plated copper that are easily replaced.

Control Mechanism

TMX switches are operated with universal control mechanisms that adapt to any type of structure.

Manual swing handle controls are furnished as standard equipment with each switch unit. Manual worm gear operators are also available.

TMX switches can be remotely controlled using motor operators. The operators provide high-torque electro-mechanical operation with 10,000 inch/pounds or 20,000 inch/pounds as required by the switch size. Motors are available in 24VDC, 48VDC, 125VDC and 120VAC.

Leveling

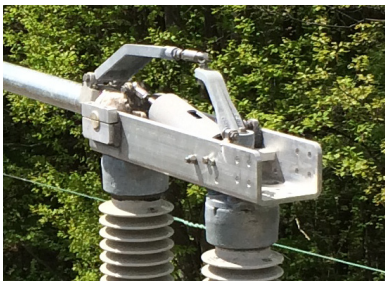
Jacking bolts are provided on all insulators to meet any special leveling needs.

Bearings

The main pivot bearing assembly consists of two tapered roller bearings, which are adjusted and factory lubricated. They require no further attention for the life of the switch. These bearings are protected with a permanent o-ring seal and plug.

Terminal Pads

Connections are predrilled, 4-hole NEMA mounting points, integral to the extruded aluminum frame. The design easily accommodates dual conductor or heavy bus loading on each end. We exceed ANSI standards, supplying three mounting surfaces.



Bases

Standard 115kV and above bases are constructed from one-piece extruded, square tube. Under 115kV, bases are constructed from single channel. Bases are hot-dipped, galvanized steel; easily adaptable for mounting on steel or wood structures.

Mounting

Turner Electric's TMX switch's extreme duty construction, ease of operation, and installation make it perfect for demanding substation and line operations such as line dropping, isolating breakers, and demagnetizing transformers.

No matter what the application, these switches can be mounted upright, vertically, or underhung.

Accessories

Operating Mechanism complete with any of the following:

- Swing Handle (standard)
- Worm Gear (25:1)
- Motor Operator

TECO-Rupter (see pages 29 to 32)

- Full Load Break
- Loop Split
- Line Charging

Arcing Horns (standard)

Quick Break Whip

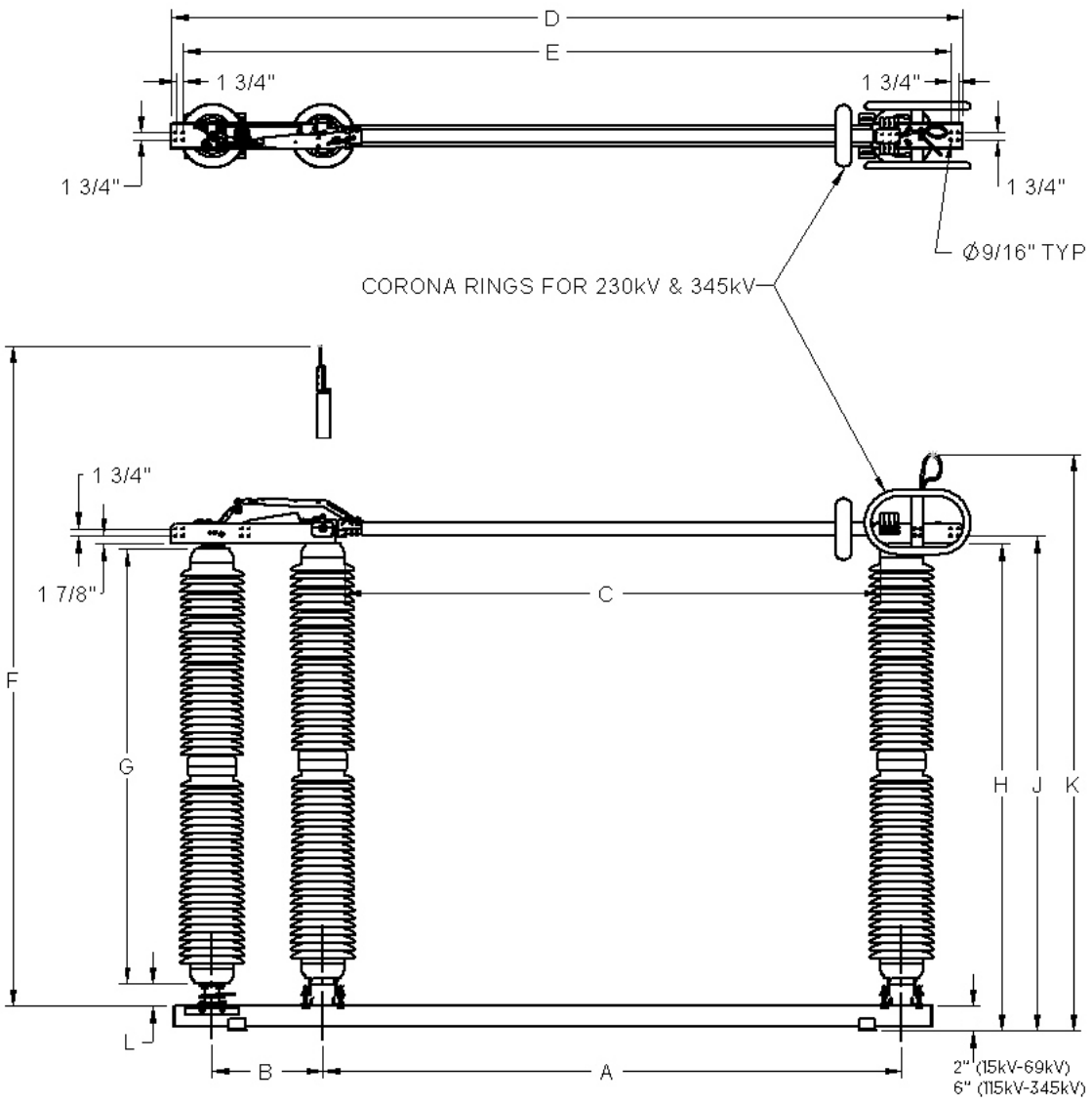
Pole Mounted Galvanized Steel Platforms

Pipe Mounted Rod Insulators

Outriggers and Wire Guides

Vertical Operating Shaft Auxiliary Switches

Ground (Earth) Switches



Dimensions in Inches

kV	A	B	C	D	E	F	G	H	J	K	L
15	18	18	10-7/8	53-7/8	48-1/8	43	10	16-1/2	17	30-3/4	3-1/4
23	21	18	13-7/8	56-7/8	51-1/8	50	14	20-1/2	21	34-3/4	3-1/4
34	27	18	19-7/8	62-7/8	57-1/8	60	18	24-1/2	25	38-3/4	3-1/4
46	33	18	25-7/8	68-7/8	63-1/8	78-1/4	22	28-1/2	29	42-3/4	3-1/4
69	45	18	37-7/8	80-7/8	75-1/8	94-1/4	30	36-1/2	37	50-3/4	3-1/4
115	60	18	51-1/2	95-7/8	90-1/8	122-1/4	45	57-3/4	58-1/4	68	5-1/2
138	72	18	63-1/2	107-7/8	102-1/8	143-1/4	54	66-3/4	67-1/4	77	5-1/2
161	84	18	75-1/2	119-7/8	114-1/8	163-1/4	62	74-3/4	75-1/4	85	5-1/2
230	96	18	87-1/2	131-7/8	126-1/8	193-1/4	80	92-3/4	93-1/4	103	5-1/2
345	141	27	130-1/2	195-7/16	189-11/16	272-1/2	106	119-1/4	120-3/4	140-1/2	5-1/2

Ordering Information

Switch Rating			Station Post Insulators	Catalog Number	
Voltage	BIL	Continuous Current (Amp)	Technical Reference Number	Horizontal Mounting	Vertical Mounting
15KV	110KV	600	TR205	TMX01506	TMXV01506
		1200		TMX01512	TMXV01512
		2000		TMX01520	TMXV01520
		3000		TMX01530	TMXV01530
23KV	150KV	600	TR208	TMX02306	TMXV02306
		1200		TMX02312	TMXV02312
		2000		TMX02320	TMXV02320
		3000		TMX02330	TMXV02330
34KV	200KV	600	TR210	TMX03406	TMXV03406
		1200		TMX03412	TMXV03412
		2000		TMX03420	TMXV03420
		3000		TMX03430	TMXV03430
46KV	250KV	600	TR214	TMX04606	TMXV04606
		1200		TMX04612	TMXV04612
		2000		TMX04620	TMXV04620
		3000		TMX04630	TMXV04630
69KV	350KV	600	TR216	TMX06906	TMXV06906
		1200		TMX06912	TMXV06912
		2000		TMX06920	TMXV06920
		3000		TMX06930	TMXV06930
115KV	550KV	600	TR286	TMX11506	TMXV11506
		1200		TMX11512	TMXV11512
		2000		TMX11520	TMXV11520
		3000		TMX11530	TMXV11530
138KV	650KV	600	TR288	TMX13806	TMXV13806
		1200		TMX13812	TMXV13812
		2000		TMX13820	TMXV13820
		3000		TMX13830	TMXV13830
161KV	750KV	600	TR291	TMX16106	TMXV16106
		1200		TMX16112	TMXV16112
		2000		TMX16120	TMXV16120
		3000		TMX16130	TMXV16130
230KV	900KV	600	TR304	TMX23006	TMXV23006
		1200		TMX23012	TMXV23012
		2000		TMX23020	TMXV23020
		3000		TMX23030	TMXV23030
345KV	1300KV	600	TR312	TMX34506	TMXV34506
		1200		TMX34512	TMXV34512
		2000		TMX34520	TMXV34520
		3000		TMX34530	TMXV34530

Rated Continuous Current (Amp)	Short-time Withstand (kA)	Peak Withstand (kA)
600	25	65
1200	38	99
2000	63	164
3000	75	195

TMX BLADE POSITION INDICATOR
VERTICAL BREAK SWITCH WITH VISUAL INDICATOR

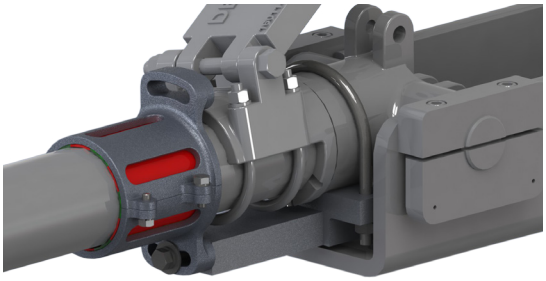
Features

Visual indication that the switch is CLOSED (red) or OPEN (green), allowing switch operators to know the blade position at any time during the operation.

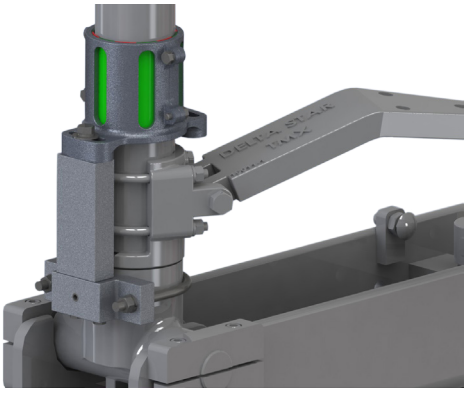
Visual indication confirms that all three blades have rolled past center and properly engaged the contacts when closing a switch.

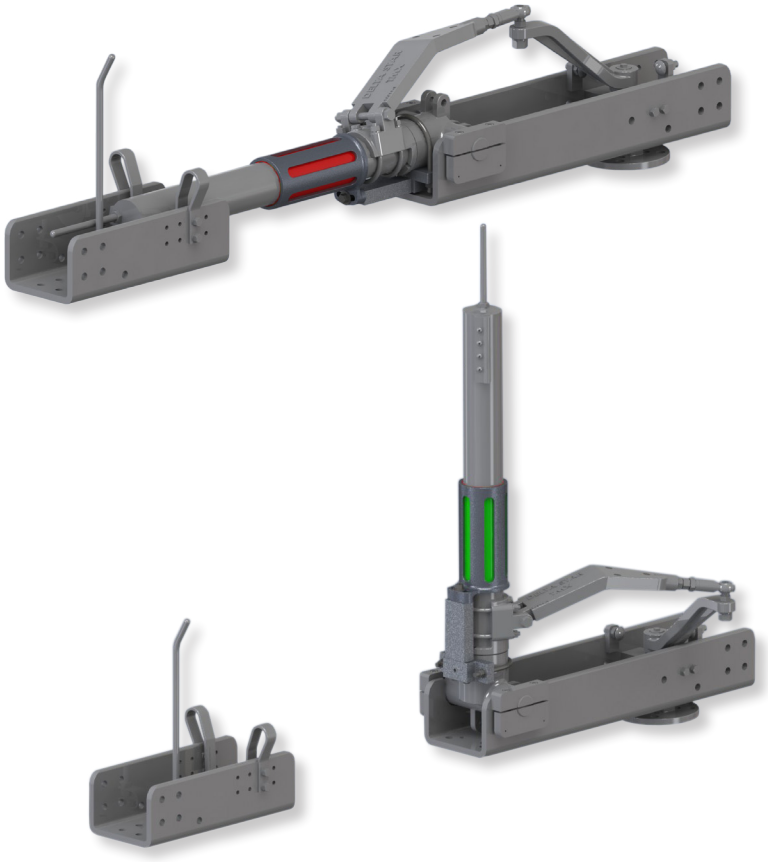
Eliminates guess work of whether or not the switch is closed when the operator leaves the site.

Available for retrofit on existing Turner TMX Vertical Break Switches. Similar device available on Turner TSB Side Break and Turner TDEB Double End Break Switches.



Retrofit versions available





DELTA STAR TMK40A VERTICAL BREAK SWITCHES PROVIDE RELIABILITY ON DEMAND

Standards

TMK40A aluminum EHV vertical break switches are rated 345kV through 800kV at amperage ratings of 2000, 3000, and 4000. These switches have been tested to meet the requirements of the latest revisions of ANSI and NEMA standards. It is recognized that, over the past several decades, these switches have undergone design variations intended to meet a different set of criteria, particularly temperature rise requirements. Some system requirements include adherence to earlier standards for the purposes of uniformity of equipment. Whenever possible, every effort will be made to provide switches adhering to those earlier standards.

Turner TMK40A vertical break switches have found a home on electrical systems around the world. In recent years, international practice has been to use IEC Standards for electrical systems. Our TMK40A air break switches meet or exceed applicable IEC Standards.

Design Features

Live parts for the TMK40A vertical air break switches are fabricated from aluminum alloys with tinned copper moving contact interchanges. These switches are designed for upright mounting.

Our construction results in a perfectly counterbalanced blade that can be stopped in any intermediate position from fully closed to fully open without danger of the blade falling into the closed position.

Fully Controlled Blade Mechanism

The fully controlled blade mechanism of the switches is simple in construction and extremely rugged. It consists of three moving parts that keep the blade under positive control during the entire operating cycle. Double rows of stainless steel balls running on machined races are used throughout to assure ease of operation.

Factory sealing of the entire drive mechanism assures permanent adjustments and eliminates maintenance for the life of the switch.

High Pressure Contacts

The switches utilize the same type of contacts at both the hinge end and the jaw ends. They are of the high pressure point design and are fully accessible for easy inspection and maintenance. Contact shoes are constructed of hard drawn copper with heavy silver inlays, fully tinned after fabrication. Inlays are brazed in position to assure a permanent high conductivity bond. Point contact is established at the interface of the round surface of the blade and silver inlay.

Contact Pressure is provided by stainless steel, multiple leaf springs located outside the current path. Stainless steel bolts and lock washers are used to bolt the contact shoes and springs to the castings.

Positive Closed Position Lock

A closed position lock is provided to eliminate blade movement even during severe short circuit conditions. As the blade enters the contact jaws and rotates, the blade edges engage the offset in the contact shoes, locking the blade in position. A positive engagement of the blade and contact shoe offset is accomplished by a disc attached to the contact spreader pin. On opening, the blade is rotated away from the contact shoe offset, leaving the blade free to rise.

Accessories

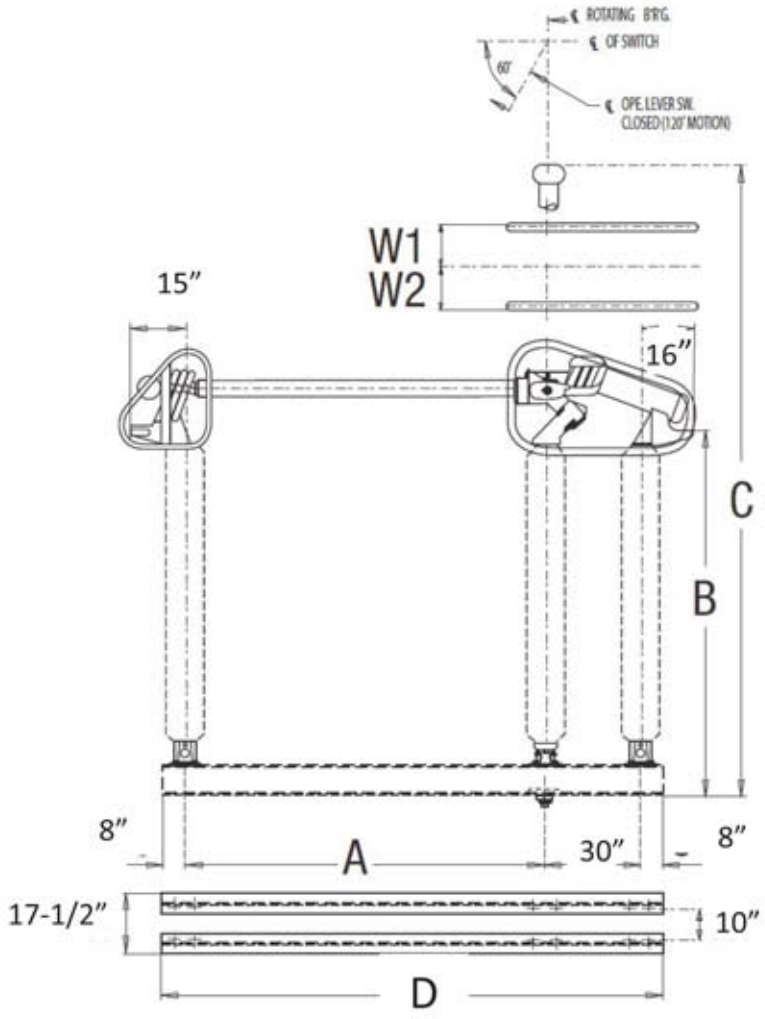
Operating Mechanism complete with any of the following:

- Worm Gear (standard)
- Motor Operator

Arcing Horns (standard)

Outriggers and Wire Guides

Vertical Operating Shaft Auxiliary Switches



Rated Continuous Current (Amp)	Short-time Withstand (kA)	Peak Withstand (kA)
2000	63	164
3000	75	195
4000	75	195

Switch Rating		Catalog Number
Voltage	Continuous Current (Amp)	Horizontal Mounting
345KV	2000	TMK40A34520
	3000	TMK40A34530
500KV	3000	TMK40A50030
	4000	TMK40A50040
765KV	3000	TMK40A76530
	4000	TMK40A76540

Dimensions in Inches

kV	A	B	C	D	W1	W2
345KV	132	124	279	178	10	10
500KV	210	179	403	256	15	15
765KV	276	209	499	322	18	18

1TSB ALUMINUM SIDE BREAK SWITCH...JAWS OF STEEL

Like the Silvertip Shark's double row of teeth, Turner's TSB switch jaw contacts increase their holding power under resistance.

Reverse-loop, silver plated copper jaw contacts employ the natural repulsion of magnetic fields moving in opposite directions to exert holding forces against the blade edges.

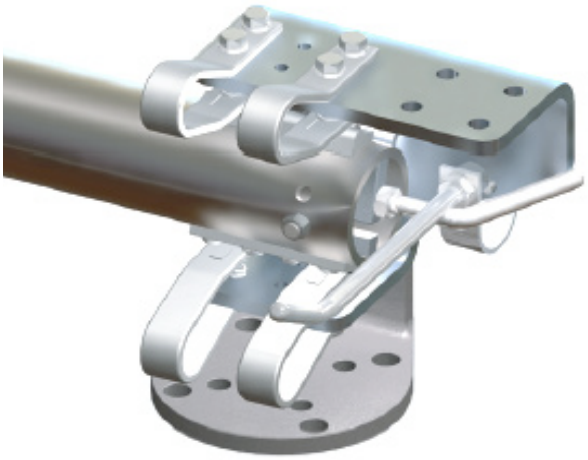
In fault conditions, the increased current flow increases the magnetic repulsion, which creates a high pressure force on the blade tip, holding the blade in the jaw.

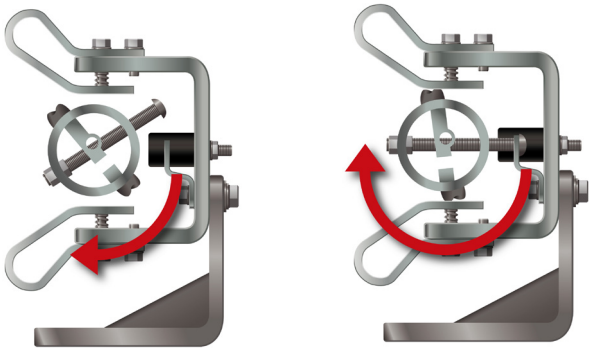
The aluminum tubular blade design provides the proper combination of current carrying capacity and rigidity. Silver-plated copper blade tips are easily field-replaceable, as are the stationary and moving arcing horns.

The gentle ways of the Silvertip shark earned it the name of the "gentleman shark." TSB switches gently close into position, with the blade tip engaging in the jaws at a 30 degree angle, then rotating to engage the jaw contacts. They are not "slammed" under force into the contacts.

Both the blade and jaw contacts are wiped clean during the closing action to ensure a low resistance current transfer. A heavy-duty static blade-locking device keeps the blade closed despite temporary faults or surge currents.

The static lock is released during the switch opening sequence, as the blade rotates 30 degrees in the jaw. This action, exclusive to Turner's TSB switches, breaks up contamination and ice up to 3/4", and releases the contact friction, allowing the blade to easily be removed from the contacts.





The TSB switch from Turner uses reverse-loop contacts and rotating blade technology to securely close into and hold the blade in the switch jaws.

Hinge Mechanism

The hinge end of the switch is enclosed to permanently protect it from the elements and offers a continuous current carrying path. There are only two current transfer points in the hinge. The terminal pad is threaded to a stationary contact block creating a spring loaded, silver to silver connection.

Upgrade-Ability

Switch current rating upgrades are easily and economically accomplished in minutes by even inexperienced line crews. Ratings can be increased from 600 amps to 1200 amps to 2000 amps simply by changing the blade tube and adding bolt-on contact fingers to the jaw.

Bearings

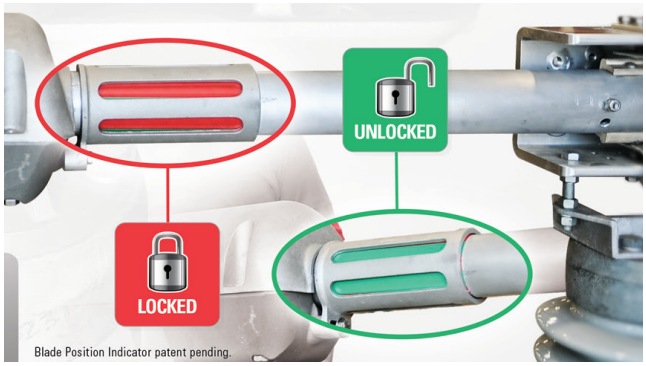
The main pivot bearing assembly consists of two tapered roller bearings, which are adjusted and factory lubricated. They require no further attention for the life of the switch. These bearings are protected with a permanent o-ring seal and plug.

Leveling

Leveling screws are provided on the moveable and stationary insulator mounting flange to facilitate easy alignment of the insulator stacks. Adjusting the moveable mount leveling screws raises or lowers the end of the switch blade allowing simple, correct blade to jaw contact interface

Blade Position Indicator

Utilities need to know when a switch is closed correctly. As an optional feature, Turner developed a new blade position indicator. The indicator is fully integrated in the True Turn Technology and provides positive visual confirmation that the blade contacts are securely locked in the jaw contacts.



Accessories

Operating Mechanism complete with any of the following:

- Swing Handle (standard)
- Worm Gear (25:1)
- Motor Operator

TECO-Rupter (see pages 28 to 31)

- Full Load Break
- Loop Split
- Line Charging

Arcing Horns (standard)

Quick Break Whips

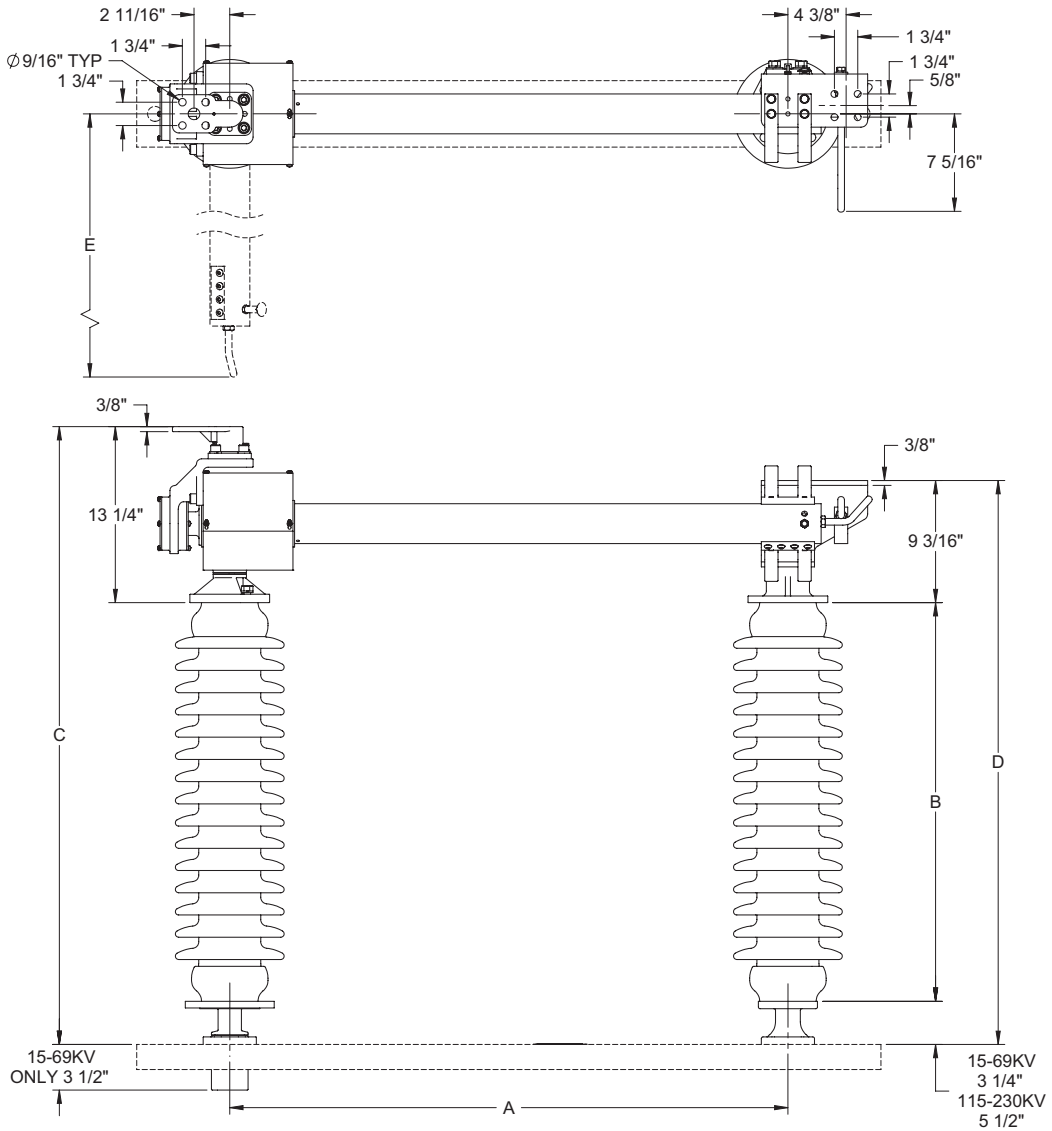
Pole Mounted Galvanized Steel Platforms

Pipe Mounted Rod Insulators

Outriggers and Wire Guides

Vertical Operating Shaft Auxiliary Switches

Ground (Earth) Switches


2 11/16"
1 3/4"
Ø9/16" TYP
1 3/4"
4 3/8"
1 3/4"
1 3/4"
5/8"
7 5/16"
E
3/8"
13 1/4"
3/8"
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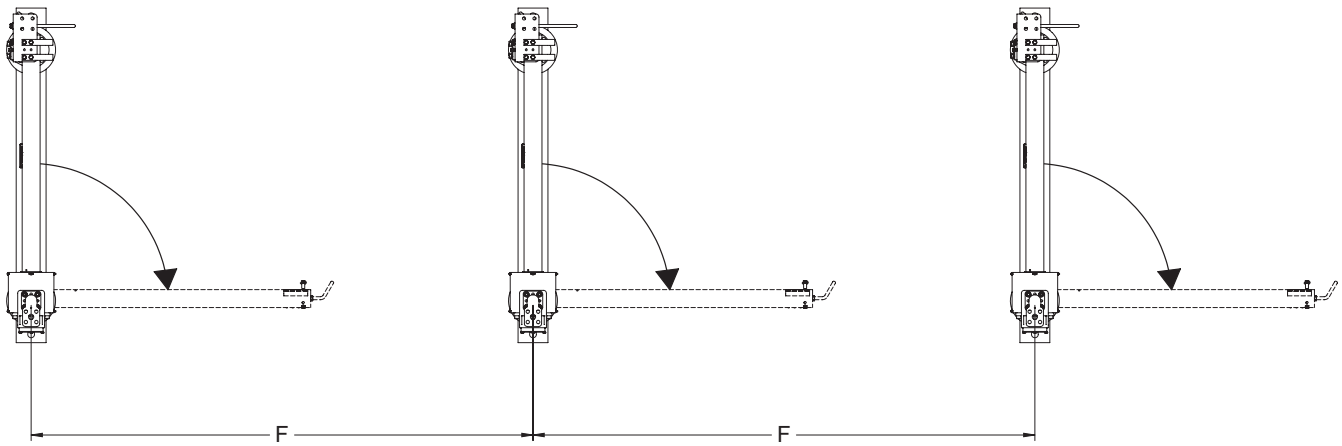
115-230KV
5 1/2"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Ordering Information

Switch Rating			Station Post Insulators	Catalog Number	
Voltage	BIL	Continuous Current (Amp)	Technical Reference Number	Horizontal Mounting	Vertical Mounting
15KV	110KV	600	TR205	1TSB01506	1TSBV01506
		1200		1TSB01512	1TSBV01512
		2000		1TSB01520	1TSBV01520
23KV	150KV	600	TR208	1TSB02306	1TSBV02306
		1200		1TSB02312	1TSBV02312
		2000		1TSB02320	1TSBV02320
34KV	200KV	600	TR210	1TSB03406	1TSBV03406
		1200		1TSB03412	1TSBV03412
		2000		1TSB03420	1TSBV03420
46KV	250KV	600	TR214	1TSB04606	1TSBV04606
		1200		1TSB04612	1TSBV04612
		2000		1TSB04620	1TSBV04620
69KV	350KV	600	TR216	1TSB06906	1TSBV06906
		1200		1TSB06912	1TSBV06912
		2000		1TSB06920	1TSBV06920
115KV	550KV	600	TR286	1TSB11506	1TSBV11506
		1200		1TSB11512	1TSBV11512
		2000		1TSB11520	1TSBV11520
138KV	650KV	600	TR288	1TSB13806	1TSBV13806
		1200		1TSB13812	1TSBV13812
		2000		1TSB13820	1TSBV13820
161KV	750KV	600	TR291	1TSB16106	1TSBV16106
		1200		1TSB16112	1TSBV16112
		2000		1TSB16120	1TSBV16120

Rated Continuous Current (Amp)	Short-time Withstand (kA)	Peak Withstand (kA)
600	25	65
1200	38	99
2000	63	164

Dimensions in Inches

kV	A	B	C	D	E	F
15kV	19”	10”	26-1/2”	22-7/16”	25-1/8”	48”
23kV	22”	14”	30-1/2”	26-7/16”	28-1/8”	54”
34kV	25”	18”	34-1/2”	30-7/16”	31-1/8”	60”
46kV	30”	22”	38-1/2”	34-7/16”	36-1/8”	78”
69kV	42”	30”	46-1/2”	42-7/16”	48-1/8”	90”
115kV	60”	45”	63-3/4”	59-11/16”	66-1/8”	126”
138kV	72”	54”	72-3/4”	68-11/16”	78-1/8”	150”
161kV	84”	62”	80-3/4”	76-11/16”	90-1/8”	168”

1D SWITCHES...COPPER CONSTRUCTION, FIELD PROVEN PERFORMANCE

Turner "D" switches are one of the most versatile, severe-duty, switching products available. The flexible mounting ability makes it ideal in phase-over-phase, delta and phase-next-to-phase configurations on poles, platforms, and substation structures. Transmission, substation, and platform mounted switches are extremely difficult and costly to remove and service, so turner's philosophy is to design in reliability.

Its simplistic, easily-mounted construction and flexible configurations make it truly a switch for all reasons. A rigid, hard drawn copper blade with patented locking devise, silver-to-copper contacts, double spring arcing horns and sealed hinge contacts provide heavy-duty construction. Add to this Turner's 60 plus years of field proven experience in air break switches and you have maximum switching reliability. Two insulator stack construction instead of the traditional three reduces the cost of material, assembly and installation. This all adds up to what we call Switchability!

Turner Type "D" switches can be used for station isolating and bypassing, distribution and transmission line sectionalizing or isolating arrestors, metering equipment and other apparatus. Right hand or left hand opening can be specified at time of order. They are easily upgraded for automatic operation and load breaking. Several factory designs and fabricated steel and aluminum switch mounting platforms are available for various line designs, custom designs are also available.

Type "D" Operating Features

Type "D" switches are operated from ground level with a standard 2" IPS steel vertical operating pipe assembly with a manual swing handle lever. The control lever incorporates a ground shunt, is padlockable and can be supplied for clockwise or counterclockwise operation. A steel shaft with self piercing set screw clevises is used for coupling and pinning the switch. Electric motor operators are available for remote, automatic or SCADA control. Turning the operating lever rotates the main vertical operating shaft which moves the insulator stack with the main contact blade. The turning motion rotates the contact blade to facilitate a smooth, effortless positive opening motion. This action releases contact pressure within the spring jaw assembly which helps maintain a clean contact surface, and enhances ice or contamination breaking action.

During closing, the main blade contacts remain in the straight or "cammed up" position, allowing effective contact cleaning. A locking devise holds the blade securely in the jaw.

Double spring quick-whips interrupt limited amounts of charging or load currents when opening. Arcing is kept away from main contact surfaces. If the magnitude of the current exceeds the quick-whip capability, a TECO-Rupter full load break vacuum interrupter is available.

Hinge Mechanism

The current carrying path on the hinge end of the switch is continuous and enclosed to permanently project if from the elements. The terminal pad is threaded to a stationary contact block; the connection is spring loaded, silver to silver. As the switch rotates during the opening and closing cycle, the terminal pad is held in place by the conductor and the switch can move without restriction. Inside the hinge housing, current transfer from the stationary block to the moveable blade is through a series of silver contact fringes. Beryllium Copper backing springs apply continuous pressure around the contact shoes. This hinge configuration assures maximum service life and minimum maintenance.

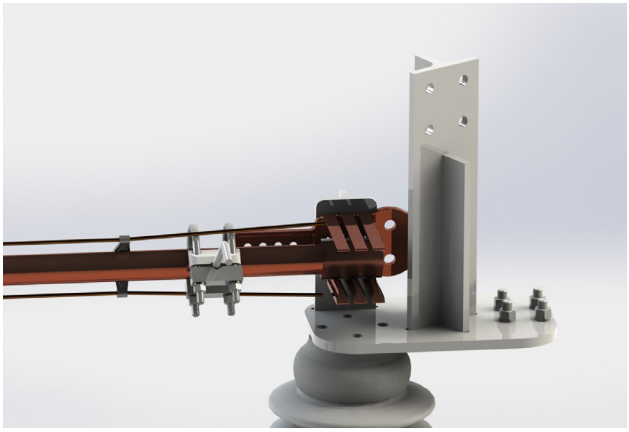
Jaw Contacts and Blade

The high constant pressure contact shoes are of cast, heat-treated, high conductivity Beryllium Copper. Although contact pressure is factory adjusted, should field adjustment ever be necessary, it can easily be made. In addition, contact replacement is fast and easy.

The tubular blade is designed of hard-drawn copper to provide the proper combination of current-carrying capacity and rigidity. The blade tip is Beryllium Copper, heat-treated and strato-milled to provide a machined current transfer surface. The coin silver overlays provide high pressure, silver to copper contact with the Beryllium Copper jaw surfaces when the tip is in the jaw.

The blade tip engages the jaw contacts in an upright position to form a high-pressure contact. The blade and jaw contacts are wiped clean during the closing action to assure a low resistance current transfer. A blade locking device keeps the blade closed despite temporary faults, surges, twisting structures or galloping conductors. Double spring type quick whips provide interruption of limited amounts of charging and load currents.

The opening action of the Turner D Style Transmission switch is unique. Prior to the blade disengaging from the jaw contact, the blade contact rotates 22 degrees in the jaw. This exclusive Turner Action releases all contact friction and breaks any ice or contamination in the jaw area which may impede an easy opening cycle. The Turner switch provides effortless switch opening regardless of environmental or time effects.



Main Bearing Assembly

The main pivot bearing assembly consists of two tapered roller bearings, which are adjusted and lubricated at the factory and require no further attention for the life of the switch. These bearings are protected with a permanent o-ring seal and plug.

Four leveling screws are provided on the base of each insulator stack to facilitate easy alignment after assembling the insulators on the switch. Adjusting the screws raises or lowers the end of the switch blade and orients the blade for correct interface.

Tightening the insulator bolts holds the alignment fast. Leveling screws are also provided on all stationary insulator pedestals.

Mounting Flexibility

To accommodate the variety of substation structures and locations, Turner offers a variety of operating and mounting configurations. Controls can be supplied for clockwise or counterclockwise opening if required, or may be changed in the field as required.

Turner's standard operating mechanism for side break switches consists of vertical steel operating pipe, with or without an 8 foot fiberglass insulating section, and a steel or fiberglass interphase shaft with self-piercing set screw clevises for coupling and pinning the switch crank arm and vertical pipe guides.

Accessories

Operating Mechanism complete with any of the following:

- Swing Handle (standard)
- Motor Operator

TECO-Rupter (see pages 28 to 31)

- Full Load Break
- Loop Split
- Line Charging

Quick Break Whips

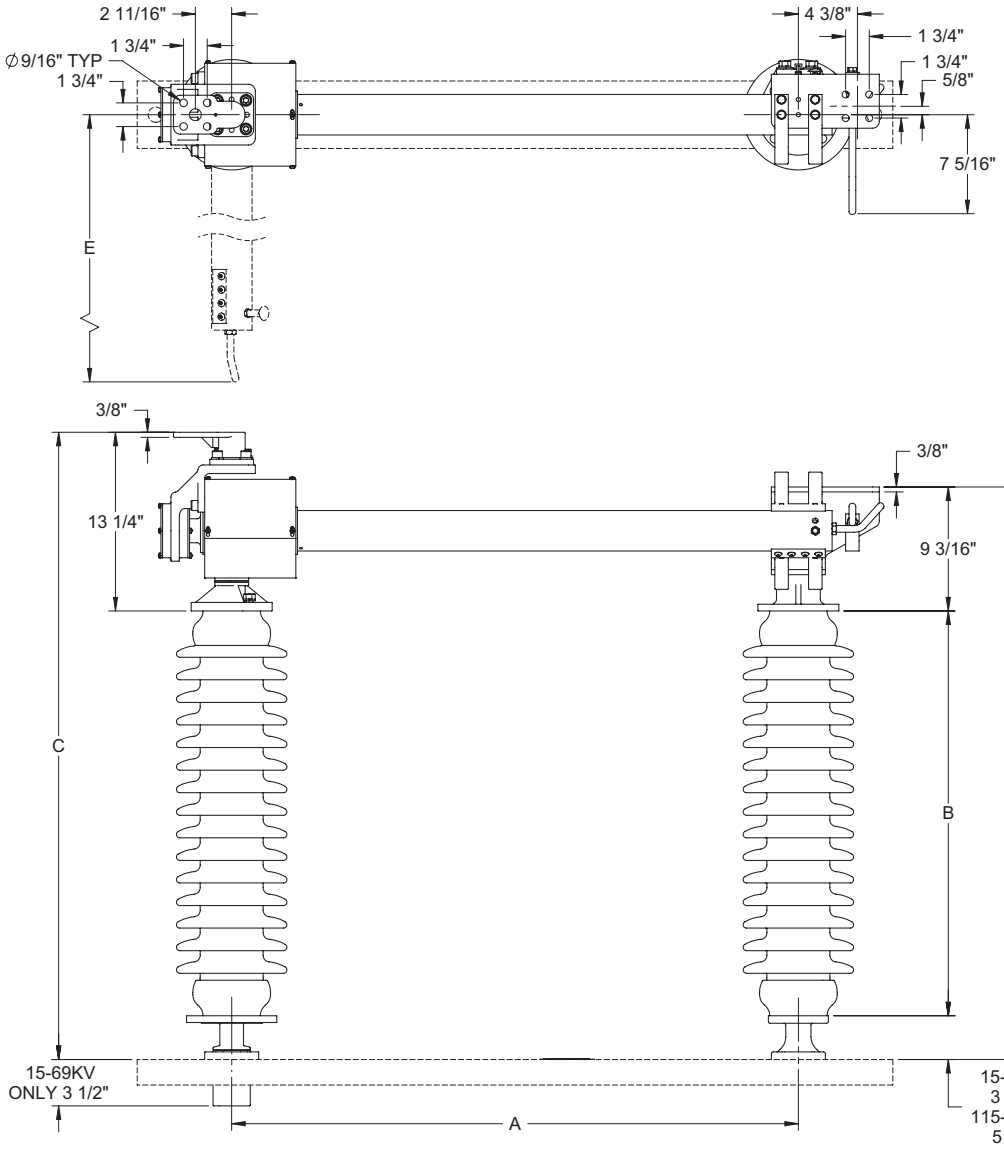
Pole Mounted Galvanized Steel Platforms

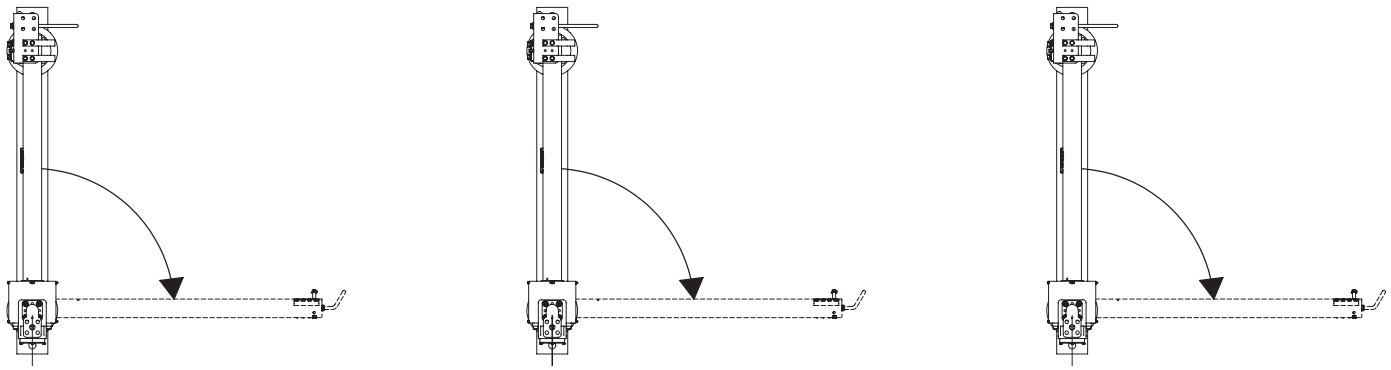
Pipe Mounted Rod Insulators

Outriggers and Wire Guides

Vertical Operating Shaft Auxiliary Switches

Ground (Earth) Switches


2 11/16"
1 3/4"
Ø9/16" TYP
1 3/4"
4 3/8"
1 3/4"
1 3/4"
5/8"
7 5/16"
E
3/8"
13 1/4"
3/8"
9 3/16"
C
D
B
15-69KV
ONLY 3 1/2"
A
15-69KV
3 1/4"
115-230KV
5 1/2"



Ordering Information

Switch Rating			Station Post Insulators	Catalog Number	
Voltage	BIL	Continuous Current (Amp)	Technical Reference Number	Horizontal Mounting	Vertical Mounting
15KV	110KV	600	TR205	1D01506	1DV01506
		1200		1D01512	1DV01512
		2000		1D01520	1DV01520
23KV	150KV	600	TR208	1D02306	1DV02306
		1200		1D02312	1DV02312
		2000		1D02320	1DV02320
34KV	200KV	600	TR210	1D03406	1DV03406
		1200		1D03412	1DV03412
		2000		1D03420	1DV03420
46KV	250KV	600	TR214	1D04606	1DV04606
		1200		1D04612	1DV04612
		2000		1D04620	1DV04620
69KV	350KV	600	TR216	1D06906	1DV06906
		1200		1D06912	1DV06912
		2000		1D06920	1DV06920
115KV	550KV	600	TR286	1D11506	1DV11506
		1200		1D11512	1DV11512
		2000		1D11520	1DV11520
138KV	650KV	600	TR288	1D13806	1DV13806
		1200		1D13812	1DV13812
		2000		1D13820	1DV13820
161KV	750KV	600	TR291	1D16106	1DV16106
		1200		1D16112	1DV16112
		2000		1D16120	1DV16120

Rated Continuous Current (Amp)	Short-time Withstand (kA)	Peak Withstand (kA)
600	25	65
1200	38	99
2000	63	164
3000	75	196

Dimensions in Inches

kV	A	B	C	D	E	F
15kV	18”	10”	21-3/4”	17-1/4”	19-3/8”	36”
23kV	18”	14”	25-3/4”	21-1/4”	19-3/8”	48”
34kV	24”	18”	29-3/4”	25-1/4”	25-3/8”	60”
46kV	30”	22”	33-3/4”	29-1/4”	31-3/8”	72”
69kV	42”	30”	41-3/4”	37-1/4”	43-3/8”	84”
115kV	60”	45”	59”	54-1/2”	61-3/8”	120”
138kV	72”	54”	68”	63-1/2”	73-3/8”	144”
161kV	84”	62”	79”	72-1/4”	85-3/8”	180”

TDEB DOUBLE END BREAK SWITCH WITH TRUE TURN TECHNOLOGY

The Turner Double End Break (TDEB) switch design addresses many of the shortcomings of existing product offerings. Many current designs allow the switch blades to roll over from the open to the closed position prematurely, prior to being firmly seated into the jaw contacts. With Turner's True Turn Technology, the switch blade design will not rotate prematurely during the open or close operation. No matter how the switch is adjusted or operated, the blade tips will always remain rotated in the open position until the blade tips are fully engaged in the jaw contacts, delivering unmatched performance and reliability. The Turner TDEB is available from 34kV to 345kV and up to 3000 amperes. Its ease of installation and operation, combined with the True Turn Technology make it the Double End Break of choice.

Since the blade potential is about 40 percent of the normal line-to-ground voltage when the blades are open, the TDEB switch can be used at the same phase spacing as the vertical break switch. As a result, structure width can be minimized and overhead clearance is diminished due to the side blade opening characteristics.

Construction

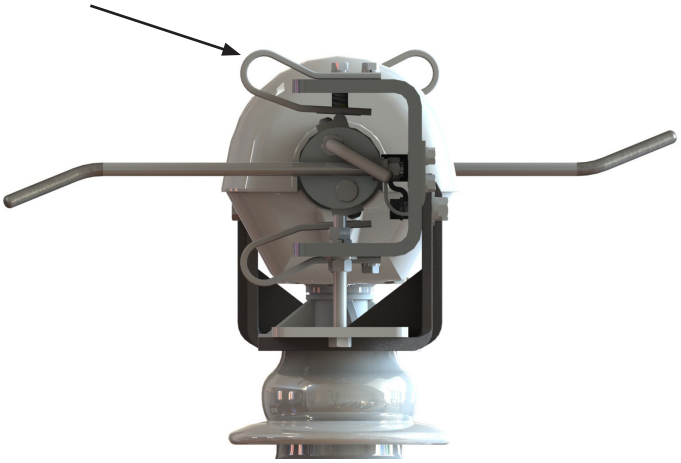
Heavy-duty construction, proven reliability and ease of operation, make the family of TDEB switches perfect for demanding substation and line operations requiring breaker isolation and bypassing; transmission line and bus sectionalizing; and isolating arrestors, metering equipment and other apparatus.

Internal construction is simple. The blade is the current path; no need to worry about complex hinge transfer points. The maintenance free bearing assembly on the rotating center stack provides smooth, easy operation in either the horizontal or vertical mounting configuration.

Group operation is accomplished with an interphase pipe, group operated control pipe, outboard bearing, vertical operating pipe and swing handle as standard. Worm gear operators and motor operators are also available.

Simple Construction: the blade is the current path, no complex hinge transfer points.

Reverse Loop Contacts



Reverse Loop Contacts

Reverse loop, silver-plated copper jaw contacts employ the natural repulsion of magnetic fields moving in opposite directions to exert holding forces against the blade edges. In fault conditions, the increased current flow increases the pressure, retaining the blade in the jaw.

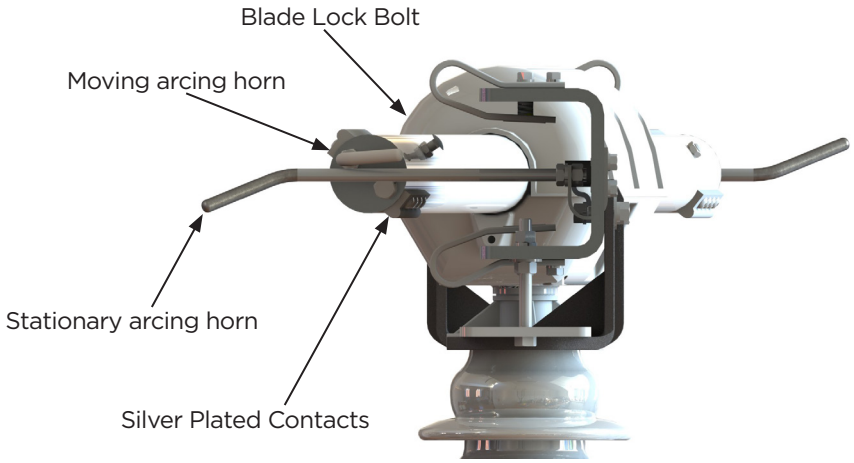
Blade

The aluminum tubular blade design provides the perfect combination of current carrying capacity and rigidity. Silver-plated blade tips are easily field replaceable, as are the stationary and moving arcing horns.

TDEB switches gently close into position, with the blade tip engaging the jaws at a 30 degree angle, then rotating to engage the jaw contacts. The True Turn Technology prevents the blades from prematurely rolling over to the closed position prior to being seated securely in the jaw contacts. No slamming action is required to force the blades closed. Both the blade and the jaw contacts are wiped clean during the closing action to ensure a low resistance current transfer.

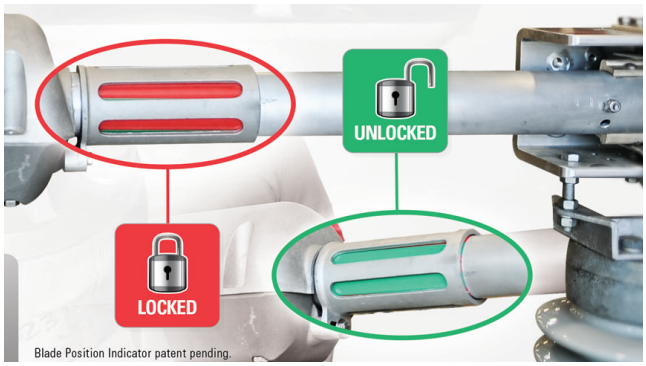
Blade Lock

As an added safety measure, a heavy-duty blade lock keeps the blade closed despite temporary faults, surge currents, twisting structures, or galloping conductors. It serves as a discrete adjustment point ensuring a secure closure. The lock is released only during the switch opening sequence as the blade rotates 30 degrees in the jaw. This action breaks up any ice or contamination and releases the contact friction, allowing the blades to easily be removed from the jaw contacts.



Blade Position Indicator

Utilities need to know when a switch is closed correctly. As an optional feature, Turner developed a new blade position indicator. The indicator is fully integrated in the True Turn Technology and provides positive visual confirmation that the blade contacts are securely locked in the jaw contacts.



Accessories

Operating Mechanism complete with any of the following:

- Swing Handle (standard)
- Worm Gear (25:1)
- Motor Operator

TECO-Rupter (see pages 28 to 31)

- Full Load Break
- Loop Split
- Line Charging

Arcing Horns (standard)

Quick Break Whips

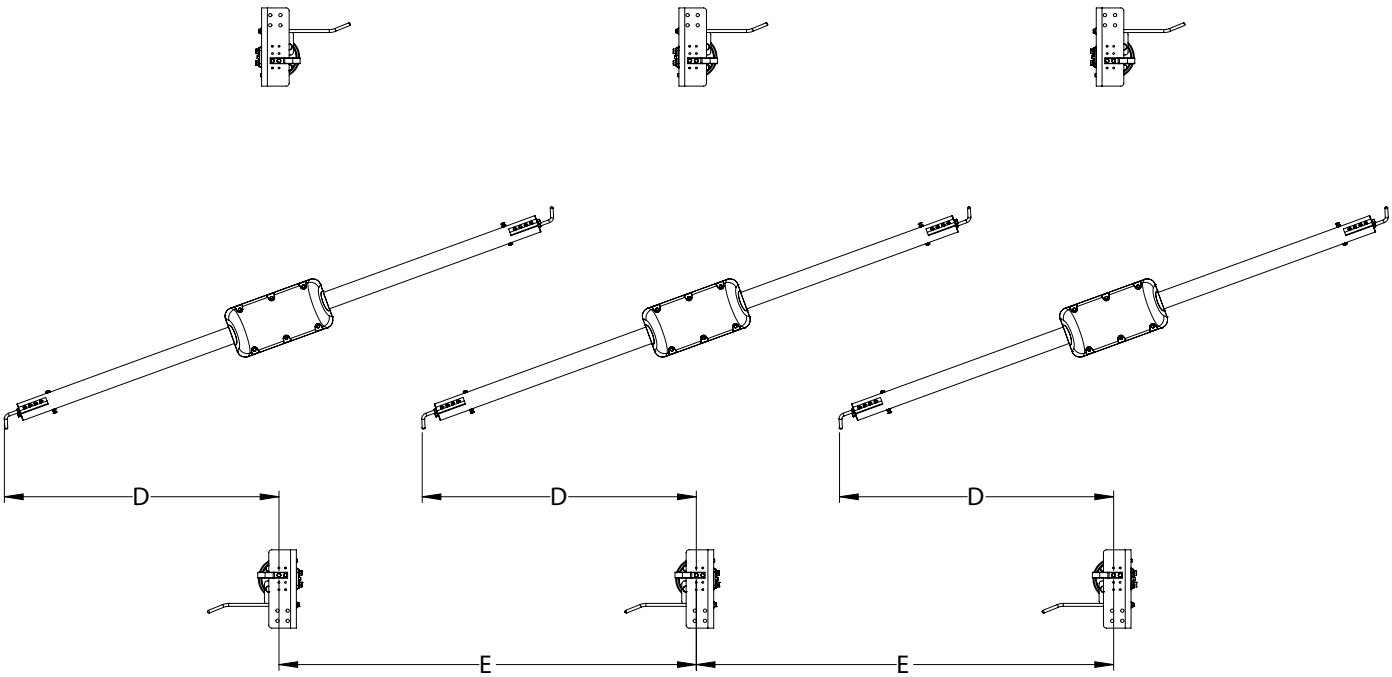
Pole Mounted Galvanized Steel Platforms

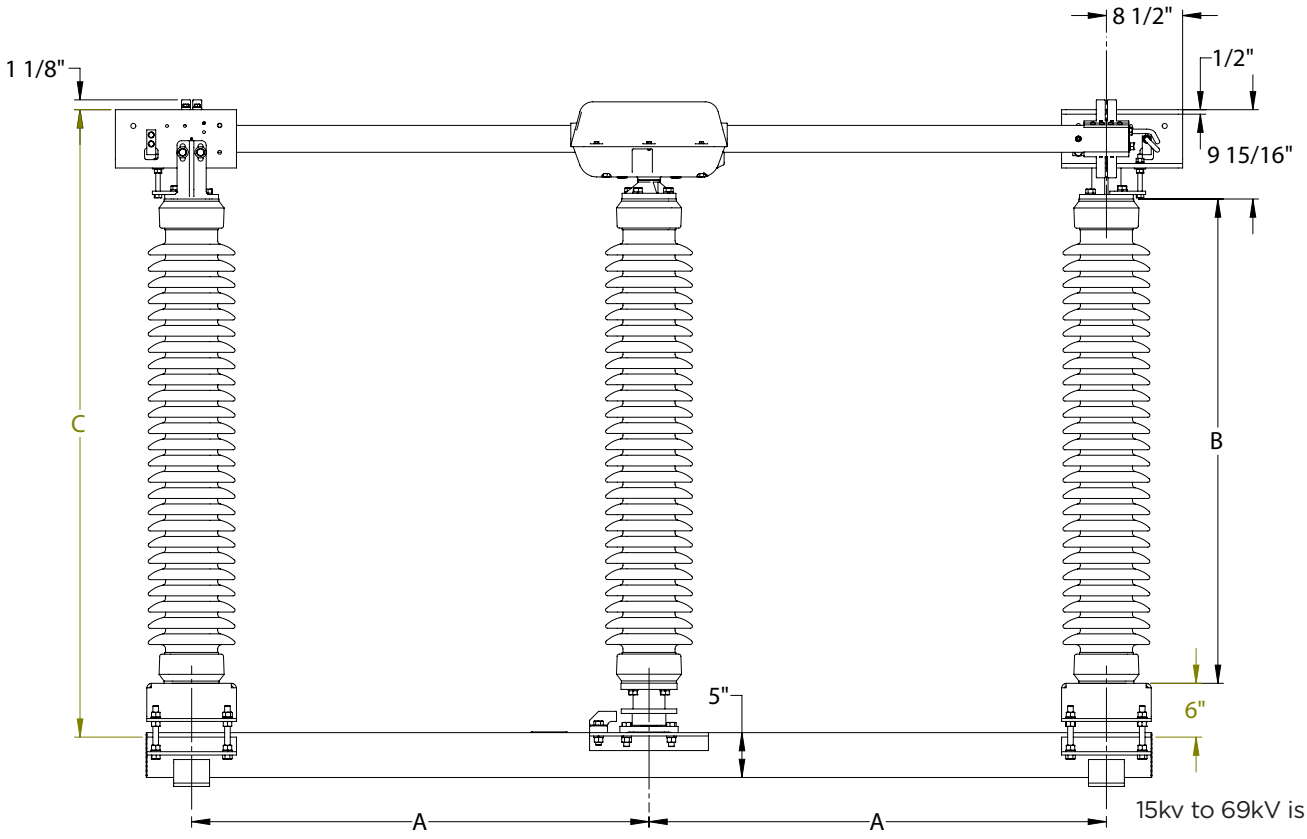
Pipe Mounted Rod Insulators

Outriggers and Wire Guides

Vertical Operating Shaft Auxiliary Switches

Ground (Earth) Switches





15kv to 69kV is 3-1/4”

115kV to 230kV is 6”

345kV is 6-15/16”

Ordering Information

Switch Rating			Station Post Insulators	Catalog Number
Voltage	BIL	Continuous Current (Amp)	Technical Reference Number	Horizontal Mounting
34kV	110kV	600	TR210	TDEB03406
		1200		TDEB03412
		2000		TDEB03420
		3000		TDEB03430
46kV	150kV	600	TR214	TDEB04606
		1200		TDEB04612
		2000		TDEB04620
		3000		TDEB04630
69kV	200kV	600	TR216	TDEB06906
		1200		TDEB06912
		2000		TDEB06920
		3000		TDEB06930
115kV	350kV	600	TR286	TDEB11506
		1200		TDEB11512
		2000		TDEB11520
		3000		TDEB11530
138kV	550kV	600	TR288	TDEB13806
		1200		TDEB13812
		2000		TDEB13820
		3000		TDEB13830
161kV	650kV	600	TR291	TDEB16106
		1200		TDEB16112
		2000		TDEB16120
		3000		TDEB16130
230kV	900kV	600	TR304	TDEB23006
		1200		TDEB23012
		2000		TDEB23020
		3000		TDEB23030
345kV	1300kV	6000	TR367	TDEB34506
		1200		TDEB34512
		2000		TDEB34520
		3000		TDEB34530

Dimensions in Inches

kV	A	B	C	D	E
34kV	24”	18”	31-1/4”	26”	36”
46kV	27”	22”	35-1/4”	30”	48”
69kV	36”	30”	43-1/4”	38”	60”
115kV	51”	45”	61”	47”	84”
138kV	57”	54”	70”	53”	96”
161kV	63”	62”	78”	58”	108”
230kV	75”	80-3/8”	96-1/4”	75”	156”
345kV	84”	106-3/8”	123-1/4”	84”	174”

TCV2: LOWER COSTS AND STATION PROFILE; REDUCED CARBON FOOTPRINT

Turner TCV2 switches are heavy-duty, rotating stack, group operated, aluminum center break designs. Two insulator stacks, instead of the traditional three, reduces the cost of materials, assembly, and installation.

Turner has accumulated more than 50 years of proven field experience in air break switches. That means you get an easily installed, easily operated switch that provides maximum mechanical and electrical performance under all operating conditions.

Its heavy duty construction, proven reliability, and ease of operation make the TCV2 switch perfect for demanding substation and line operations such as breaker isolating and bypassing; transmission line and bus sectionalizing; isolating arrestors, metering equipment and other apparatus.

The 600 ampere switch can easily be upgraded to 1200 ampere rating.

Internal construction is simple and virtually maintenance free. The design provides smooth, easy operation, regardless of the switch mounting position.

TCV2 switches can be mounted in any configuration; horizontal, vertical, or underhung. The low profile, side opening design makes it ideal for low overhead clearance applications. The "V" style switch reduces base mounting requirements, lowering structure costs.

Concerns over station designs and appearances can be minimized due to the TCV2's low profile design.

Right hand or left hand can be specified at the time of order.

Group operation is accomplished with an interphase pipe, control pipe, outboard bearing, vertical operating pipe and swing handle operator.

Switch Operation

Moving parts in the blade assembly are restricted to only one area. The terminal pad to blade interface is threaded, silver plated and spring loaded to ensure optimal current transfer, as well as corrosion and contamination resistance.

Arc transfer is easily accomplished with simple, easily maintained, stainless steel arcing horns. The horns are located away from the main contacts, eliminating any potential damage to critical current carrying surfaces.

An optional quick whip assembly enhances the ability of the switch to drop line or bus charging currents, as well as transformer magnetizing currents.

Main Bearing Assembly

The main pivot bearing assembly consists of two tapered roller bearings, which are adjusted and lubricated at the factory and require no further attention for the life of the switch. These bearings are protected with a permanent o-ring seal and plug.

Reverse Loop Contacts

Reverse loop, silver-plated copper jaw contacts employ the natural repulsion of magnetic fields moving in opposite directions to exert holding forces against the blade edges. In fault conditions, the increased current flow increases the pressure, retaining the blade in the jaw.

Hinge Terminal Pad

The pivot point for the pad is directly over the insulator. This provides a strong load bearing feature, limiting bending of the pad. The terminal pad threads are silver plated and sealed with an o-ring once screwed into the hinge casting.

Current Carrying Components

The TCV2 Aluminum switch has both aluminum and silver plated copper alloy live parts. Exposed current transfer points are silver-to-silver.

Switch Adjustment

Four leveling screws are provided on the sub-base of each insulator stack to facilitate easy alignment after assembling the insulators on the switch. Adjusting the screws raises or lowers the end of the switch blade.

Accessories

Operating Mechanism complete with any of the following:

- Swing Handle (standard)
- Worm Gear (25:1)
- Motor Operator

TECO-Rupter (see pages 29 to 32)

- Full Load Break
- Loop Split
- Line Charging

Arcing Horns (standard)

Quick Break Whips

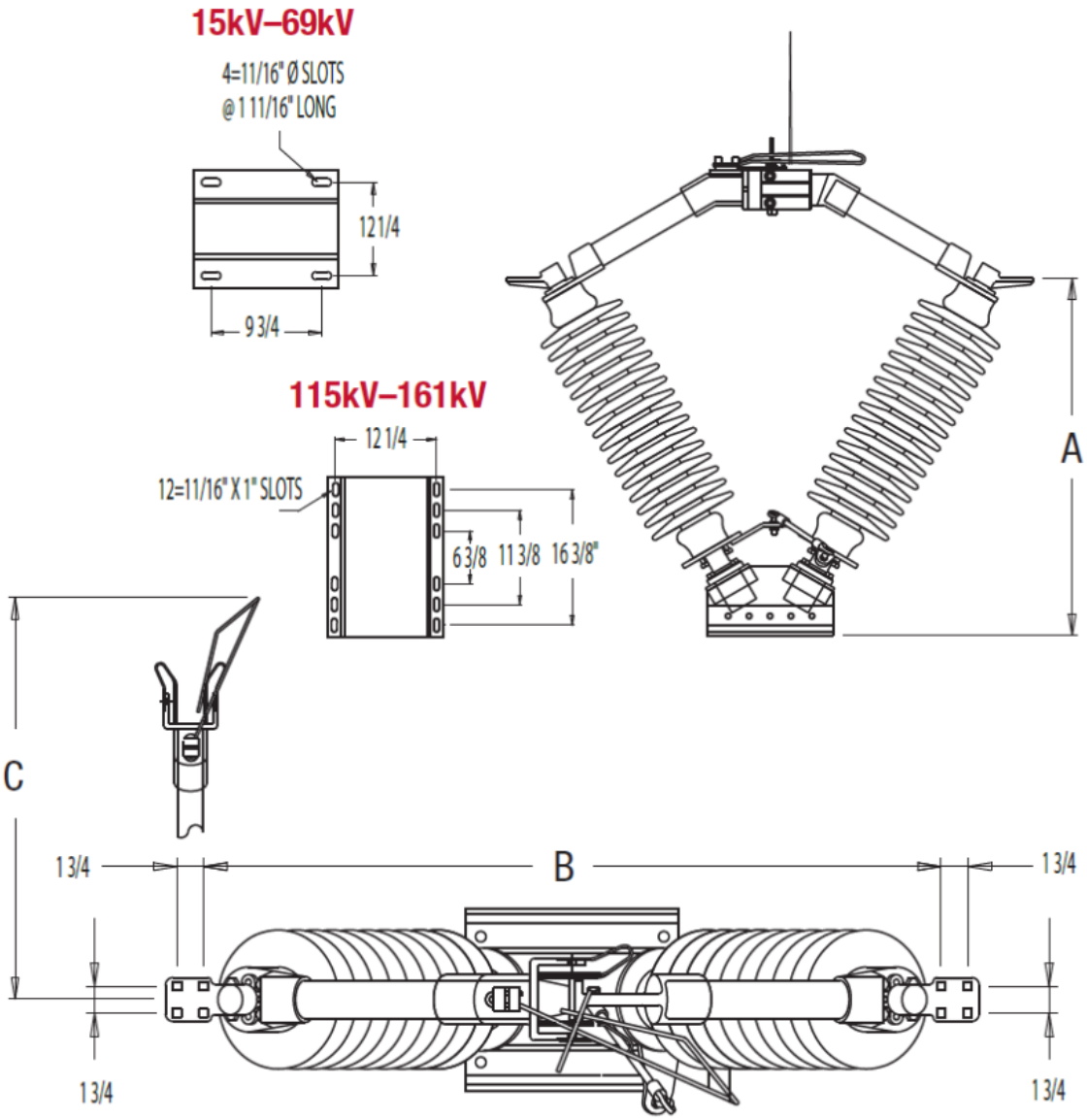
Pole Mounted Galvanized Steel Platforms

Pipe Mounted Rod Insulators

Outriggers and Wire Guides

Vertical Operating Shaft Auxiliary Switches

Ground (Earth) Switches



Dimensions in Inches

	A		B		C	
kV	600/1200A	2000A	600/1200A	2000A	600/1200A	2000A
15kV	22-5/8"	24-1/2"	33-3/8"	37-7/8"	20-1/2"	23-1/2"
23kV	22-5/8"	24-1/2"	33-3/8"	37-7/8"	20-1/2"	23-1/2"
34kV	26"	28"	37-3/8"	41-7/8"	25-3/4"	28-3/4"
46kV	29-3/8"	31-3/8"	41-3/8"	45-7/8"	27-1/2"	30-1/2"
69kV	38-3/8"	38-3/8"	49-3/8"	53-7/8"	31-1/2"	34-1/2"
115kV	52"	54"	70"	73"	41-7/8"	46"
138kV	60-1/4"	62-1/4"	77-1/8"	82"	44-3/8"	50-1/2"
161kV	67-1/4"	69-1/4"	84-1/8"	90"	49-3/8"	54-1/2"

Ordering Information

Switch Rating			Station Post Insulators	Catalog Number	
Voltage	BIL	Continuous Current (Amp)	Technical Reference Number	Horizontal Mounting	Vertical Mounting
15KV	110KV	600	TR205	TCV201506	TCV2V01506
		1200		TCV201512	TCV2V01512
		2000		TCV201520	TCV2V01520
23KV	150KV	600	TR208	TCV202306	TCV2V02306
		1200		TCV202312	TCV2V02312
		2000		TCV202320	TCV2V02320
34KV	200KV	600	TR210	TCV203406	TCV2V03406
		1200		TCV203412	TCV2V03412
		2000		TCV203420	TCV2V03420
46KV	250KV	600	TR214	TCV204606	TCV2V04606
		1200		TCV204612	TCV2V04612
		2000		TCV204620	TCV2V04620
69KV	350KV	600	TR216	TCV206906	TCV2V06906
		1200		TCV206912	TCV2V06912
		2000		TCV206920	TCV2V06920
115KV	550KV	600	TR286	TCV211506	TCV2V11506
		1200		TCV211512	TCV2V11512
		2000		TCV211520	TCV2V11520
138KV	650KV	600	TR288	TCV213806	TCV2V13806
		1200		TCV213812	TCV2V13812
		2000		TCV213820	TCV2V13820
161KV	750KV	600	TR291	TCV216106	TCV2V16106
		1200		TCV216112	TCV2V16112
		2000		TCV216120	TCV2V16120

Rated Continuous Current (Amp)	Short-time Withstand (kA)	Peak Withstand (kA)
600	25	65
1200	38	99
2000	63	164
3000	75	195

TCB2: LOWER MATERIAL, ASSEMBLY AND INSTALLATION COSTS

Turner TCB2 switches are heavy-duty, rotating stack, group operated, aluminum center break designs. Two insulator stacks, instead of the traditional three, reduces the cost of materials, assembly, and installation.

Turner has accumulated more than 50 years of proven field experience in air break switches. That means you get an easily installed, easily operated switch that provides maximum mechanical and electrical performance under all operating conditions.

Its heavy duty construction, proven reliability, and ease of operation make the TCB2 switch perfect for demanding substation and line operations such as breaker isolating and bypassing; transmission line and bus sectionalizing; isolating arrestors, metering equipment and other apparatus.

The 600 ampere switch can easily be upgraded to 1200 ampere rating.

Internal construction is simple and virtually maintenance free. The design provides smooth, easy operation, regardless of the switch mounting position.

TCB2 switches can be mounted in any configuration; horizontal, vertical, or underhung. The low profile, side opening design makes it ideal for low overhead clearance applications. The center break switch reduces base mounting requirements, lowering structure costs.

Concerns over station designs and appearances can be minimized due to the TCB2's low profile design.

Right hand or left hand can be specified at the time of order.

Group operation is accomplished with an interphase pipe, control pipe, outboard bearing, vertical operating pipe and swing handle operator.

Switch Operation

Moving parts in the blade assembly are restricted to only one area. The terminal pad to blade interface is threaded, silver plated and spring loaded to ensure optimal current transfer, as well as corrosion and contamination resistance.

Arc transfer is easily accomplished with simple, easily maintained, stainless steel arcing horns. The horns are located away from the main contacts, eliminating any potential damage to critical current carrying surfaces.

An optional quick whip assembly enhances the ability of the switch to drop line or bus charging currents, as well as transformer magnetizing currents.

Main Bearing Assembly

The main pivot bearing assembly consists of two tapered roller bearings, which are adjusted and lubricated at the factory and require no further attention for the life of the switch. These bearings are protected with a permanent o-ring seal and plug.

Reverse Loop Contacts

Reverse loop, silver-plated copper jaw contacts employ the natural repulsion of magnetic fields moving in opposite directions to exert holding forces against the blade edges. In fault conditions, the increased current flow increases the pressure, retaining the blade in the jaw.

Hinge Terminal Pad

The pivot point for the pad is directly over the insulator. This provides a strong load bearing feature, limiting bending of the pad. The terminal pad threads are silver plated and sealed with an o-ring once screwed into the hinge casting.

Current Carrying Components

The TCB2 Aluminum switch has both aluminum and silver plated copper alloy live parts. Exposed current transfer points are silver-to-silver.

Switch Adjustment

Four leveling screws are provided on the sub-base of each insulator stack to facilitate easy alignment after assembling the insulators on the switch. Adjusting the screws raises or lowers the end of the switch blade.

Accessories

Operating Mechanism complete with any of the following:

- Swing Handle (standard)
- Worm Gear (25:1)
- Motor Operator

TECO-Rupter (see pages 29 to 32)

- Full Load Break
- Loop Split
- Line Charging

Arcing Horns (standard)

Quick Break Whips

Pole Mounted Galvanized Steel Platforms

Pipe Mounted Rod Insulators

Outriggers and Wire Guide

Vertical Operating Shaft Auxiliary Switches

Ground (Earth) Switches

Rated Continuous Current (Amp)	Short-time Withstand (kA)	Peak Withstand (kA)
600	25	65
1200	38	99
2000	63	164
3000	75	195

Ordering Information

Switch Rating			Station Post Insulators	Catalog Number	
Voltage	BIL	Continuous Current (Amp)	Technical Reference Number	Horizontal Mounting	Vertical Mounting
15KV	110KV	600	TR205	TCB201506	TCB2V01506
		1200		TCB201512	TCB2V01512
23KV	150KV	600	TR208	TCB202306	TCB2V02306
		1200		TCB202312	TCB2V02312
34KV	200KV	600	TR210	TCB203406	TCB2V03406
		1200		TCB203412	TCB2V03412
46KV	250KV	600	TR214	TCB204606	TCB2V04606
		1200		TCB204612	TCB2V04612
69KV	350KV	600	TR216	TCB206906	TCB2V06906
		1200		TCB206912	TCB2V06912
115KV	550KV	600	TR286	TCB211506	TCB2V11506
		1200		TCB211512	TCB2V11512
138KV	650KV	600	TR288	TCB213806	TCB2V13806
		1200		TCB213812	TCB2V13812
161KV	750KV	600	TR291	TCB216106	TCB2V16106
		1200		TCB216112	TCB2V16112

TECO-RUPTERS SAVE MAINTENANCE, DOWNSTREAM EQUIPMENT, AND THE ENVIRONMENT

No Maintenance Required

Vacuum bottles are 100% tested in the factory, not once, but three times, before shipment to the customer. According to the manufacturer's records, "once a Vacuum Interrupter is in the field for 3 to 5 years, it will be vacuum tight for life. During those early years, there is less than 1 chance in 1,000,000 of a vacuum leak occurring." [1]

There is no scheduled maintenance required with a TECO-Rupter. Once installed, it will remain ready for duty until called upon to interrupt load current, magnetizing current, transformer current, loop or parallel circuits or split ties in either a substation or a transmission application.

Unlike alternate dielectric interrupters, TECO-Rupters do not have to be checked annually to confirm proper gas pressure or presence of oil.

Vacuum Bottles Do Not Vent to the Atmosphere

Unlike interruption dielectrics that vent greenhouse gases to the environment, vacuum bottles vent nothing. Current interruption and arc extinction occur in the void of the vacuum, leaving no ash, residue, or by product.

Continued focus on maintaining a clean environment for current and future generations is clearly a desirable attribute for anyone charged with designing apparatus. There are choices in interrupting dielectrics today. We believe in making the clean choice—vacuum.

TECO-RUPTER VACUUM CIRCUIT INTERRUPTER

For more than 35 years, Turner Electric's TECO-Rupter Vacuum Interrupters have been the technology of choice for loop and load break applications because of their current interrupting ability, superior reliability, and ease of application. The TECO-Rupter offers industry leading performance levels including superior TRV ratings comparted to other load break technologies such as SF6, longer service life, and greater interrupting capacity. No other load break device provides 5,000 full load operations at either 2,000 or 3,000 ampere ratings and a TRV rating up to 80kV.

The pick-up finger engages the actuator rod creating a parallel current path. At a pre-determined point, the vacuum contacts separate, interrupting the circuit.

TECO-RUPTERS offer the following advantages over other technologies:

Long Life and Maintenance-Free Operation:

Controlled contact erosion results in long electrical life. Contacts are enclosed within the vacuum Interrupter. More than a million vacuum contacts remain in use.

Durable Housing

New long life fiberglass housing is lightweight yet strong. It is treated with UV inhibiting paint preventing "blooming".

Excellent Sticking Resistance

Hard contact material minimizes contact sticking in vacuum and is ideal for high current applications.

No Atmospheric Contact Contamination

No oxides and corrosion layers can form on the contacts.

No Environmental Effects

Current interruption occurs in a vacuum; no greenhouse or toxic gases are emitted as in the application of SF6 based interruption technology.

Very Low Current Chop

The low average cutoff current results in a minimal induced transient voltage spike so that surge suppressors are not required.

Excellent Design

Simple design = lower maintenance time and cost versus SF6 puffer technology.

Contacts

Rated at 250,000 mechanical operations and at 5,000 full load voltage operations.

No Noise, No Flash

Arcing is confined inside the vacuum interrupter.

TECO-RUPTER APPLICATIONS

The Turner TECO-Rupter vacuum circuit interrupter is offered as an attachment to the Turner switch, as well as designs of other switch manufacturers. The interrupter can be attached to vertical break, side break, hooksticks, and center break switch designs. Different models of the TECO-Rupter can interrupt various types of circuits..

Loop Splitting or Parallel Break

Normally, these are single vacuum contact devices that can interrupt up to 2000 amps (type RLS) and 3000 amps (type RLM) and 230kV, under parallel conditions. In this case, rated voltage will still exist on both sides of the switch after the open operation. The peak recovery voltage must not exceed 50kV RMS for the single contact Type RLS or 80kV RMS for the Type RLM. More contacts can be added to address higher recovery voltages. Please consult the factory. Type RLS and RLB TECORupters can interrupt up to 2000 amps up to 230kV and Type RLM TECO-Rupters can interrupt up to 3000 amps up to 230kV.

Line Charging

A full voltage multiple stack interrupter may be utilized from 15kV through 230kV for interruption of line or bus charging currents and transformer magnetizing currents up to a value of 100 amps at 0% power factor, capacitive or inductive. The nameplate operating current of the switch is not a factor in the application of this device. Type RLS and RLM TECO-Rupters can interrupt up to 100 amps of line charging current up to 34kV while the Type RLB can interrupt 100 amps up to 230kV.

Load Interruption

A full voltage multiple stack interrupter may be applied from 15kV through 230kV for interruption of actual load current at 70% power factor. Type RLS TECO-Rupters can interrupt 2000 amps up to 34kV, Type RLM can interrupt 3000 amps up to 34kV and Type RLB can interrupt 2000 amps up to 230kV. The TECO-Rupter is only in the circuit momentarily during the opening sequence. Contact test studs are located on the exterior of the housing and allow for an independent Hi-Pot test of each vacuum contact with the actuating arm.

Testing and Quality Assurance

Every TECO-Rupter undergoes complete testing before leaving the factory. The test includes a dielectric test, resistance check and three separate vacuum assurance tests. Strict documentation is kept to enable backtracking of contact materials.

Ordering Information

There are currently more than 1,000 pre-engineered designs to retrofit TECO-Rupter to other manufacturers' switches. To see if we have one designed for your application, please contact your local representative or the factory and provide the following information:

- Switch manufacturer
- Catalog number
- kV and current ratings

If we don't have one, we can design one for you. The design and set up is free. Our engineering staff and design team will develop a pre-engineered kit that will reduce field modification, human error, and installation time.

TECO-RUPTER TYPES

Type RLS TECO-Rupters can break load up to 2000A and interrupt line charging up to 100A from 15kV through 34kV; and can interrupt up to 2000A in parallel circuits from 15kV through 230kV.

Type RLM TECO-Rupters can break load up to 3000A and interrupt line charging up to 100A from 15kV through 34kV; and can interrupt up to 3000A in parallel circuits from 15kV through 230kV.

Type RLB TECO-Rupters can break load up to 2000A, interrupt line charging up to 100A, and can interrupt up to 2000A in parallel circuits from 15kV through 230kV.

TECO-Rupter Ratings and Types

Maximum kV	Type RLS			Type RLM			Type RLB		
	Loop Splitting	Loop Breaking*	Line Charging	Loop Splitting	Loop Breaking*	Line Charging	Loop Splitting	Loop Breaking*	Line Charging
15	2000A	2000A	100A	3000A	3000A	100A	2000A	2000A	100A
23	2000A	2000A	100A	3000A	3000A	100A	2000A	2000A	100A
34	2000A	2000A	100A	3000A	3000A	100A	2000A	2000A	100A
46	2000A			3000A			2000A	2000A	100A
69	2000A			3000A			2000A	2000A	100A
115	2000A			3000A			2000A	2000A	100A
138	2000A			3000A			2000A	2000A	100A
151	2000A			3000A			2000A	2000A	100A
230	2000A			3000A			2000A	2000A	100A

* Load Break Capacity at 70% Power Factor. For capacitor bank applications, contact the factory.

NOTE: In General, type RLS TECO-Rupters are used in loop split circuits up to 2000A, type RLM TECO-Rupters are used in loop split circuits up to 3000A, and type RLB TECO-Rupters are used in full load break applications up to 2000A.

MOTOR OPERATORS

Design

The Turner SF210 and SF220 electro-mechanical motor drives are high-speed and high-torque switch operators, with integrated and infinitely field-adjustable auxiliary switches. Only the highest quality components with field-proven ruggedness and long life were chosen. Component redundancy was applied whenever possible to limit customer spare parts stock.

Application

The SF210 and SF220 are completely self contained electric motor-driven switch operators. They can automatically and/or remotely control several different styles and types of transmission or substation switches.

The “Flexability” of the SF210 and SF220 auxiliary switches qualifies it to be the most flexible operator available. It comes standard with eight (8) Auxiliary Switch Cams for customer use. Additional contacts are available. These finger tip adjustable cams provide additional functionality for the operators, which is especially important in the SCADA-interfaced operating environment of today.

Components

Circuit components are protected by standard circuit breakers. All components within the mechanism enclosure are protected from condensation by a standard 100 Watt thermostatically controlled 120/240 VAC heater. The heater circuit is equipped with a circuit breaker switch.

Operation

Manual operation is by hand crank, conveniently located inside the enclosure to prevent unauthorized tampering. Insertion of the hand crank actuates an interlock switch to prevent accidental operation when crank is engaged.

Manual hand crank ratio is 20:1 for the SF210 and 42:1 for the SF220, providing excellent mechanical advantage.

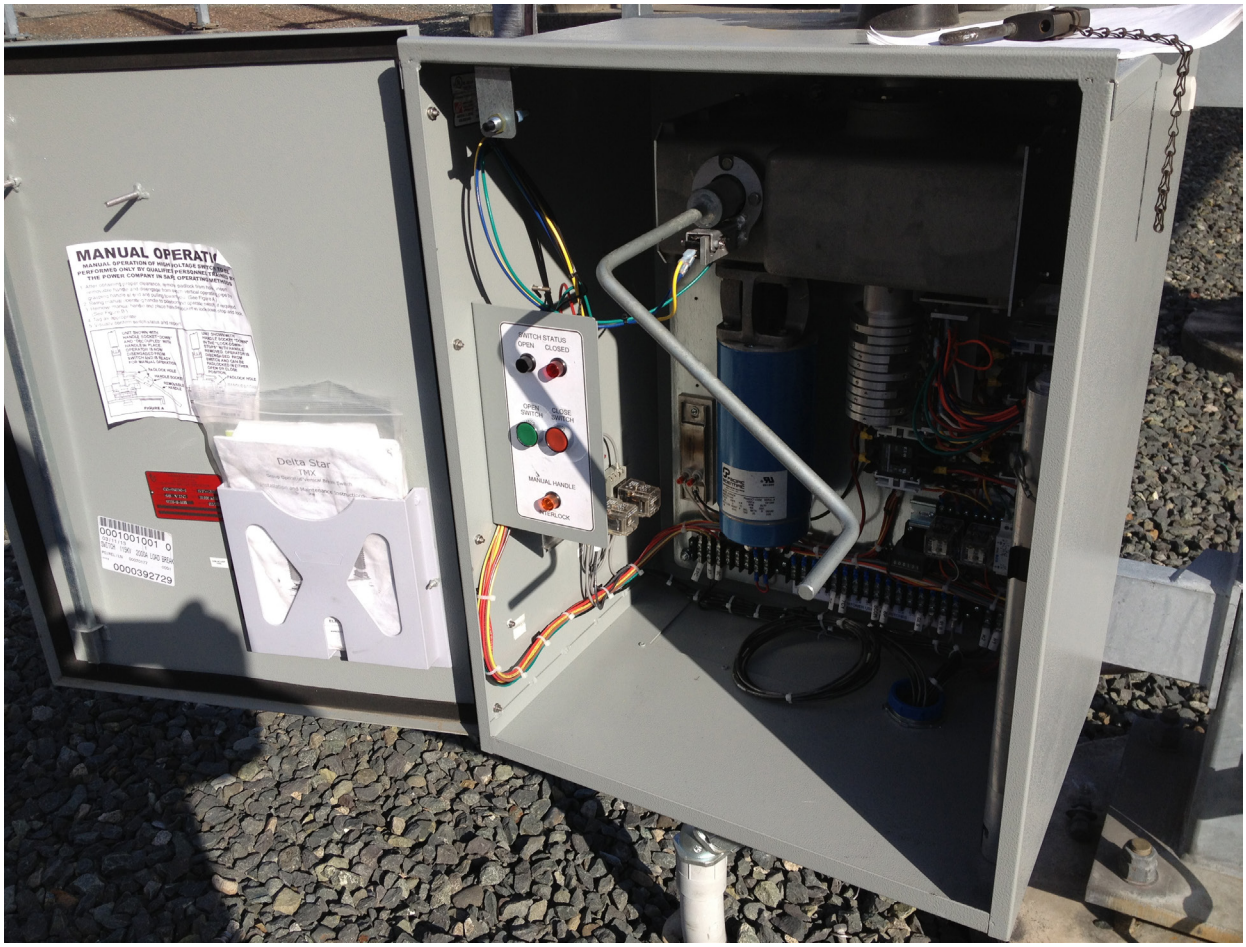
Local operation is accomplished with a push-button control inside the enclosure. A three position “LOCAL/OFF/REMOTE” control switch ensures safe operation without potential for activation from a remote switching center.

Remote operation is accomplished by radio, hard-wire, or fiber optic actuation (depending on the local preference and interface provided). Full SCADA interface is built into every operator.

Opening and Closing

The power train of the motor mechanism is housed in a rugged gear box. The gear train is designed such that no other mechanical braking device is required. The braking capabilities of the mechanism have been designed into the electrical controls.

Primary motor function is initiated by two electrically interlocked contactors that prevent both coils from accidentally being energized at the same time. Each contactor is equipped with a seal-in contact to guarantee a complete opening or closing cycle after initial impulse. An electrical brake is provided to prevent motor coasting.



Specifications

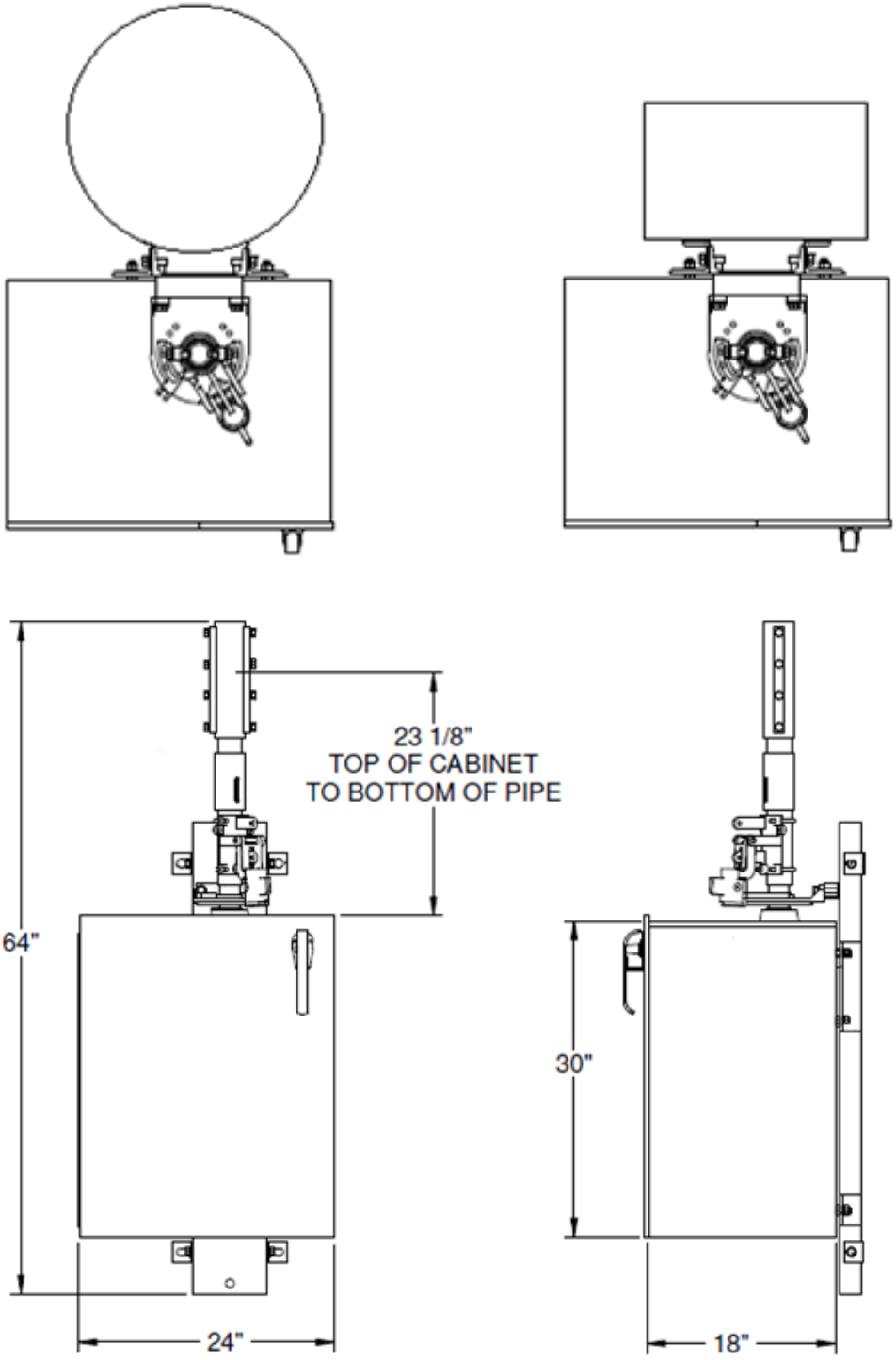
Standard	Optional
Local/Remote Switch	Special Terminal Block
Heavy Duty, Permanent Magnet Motors	Auxiliary Relays
Worm Gear Driven/Pad-lockable	Open/Close Counter
Cabinet Heater: 100 Watts	Select Batteries and Charger
Clockwise Opening Rotation	Low DC Voltage Alarm
	Loss of AC Alarm

	SF-210	SF-220
Torque	10,000 inch-pounds	20,000 inch-pounds
Rotation	0 to 180° 3 to 4 seconds	0 to 180° 6 to 8 seconds
Operating Voltage	24VDC, 48VDC, 120VAC, 125VDC	
Voltage Range	24VDC: 18-28V 48VDC: 36-56V 120VAC: 104-127V 125VDC: 90-140V	
Rated Load Current	24VDC: 32A 48VDC: 16A 120VAC: 8A 125VDC: 8A	
Stall Current	24VDC: 140A 48VDC: 85A 120VAC: 35A 125VDC: 35A	
Auxiliary Switches	Standard: 8 Maximum: 12	
Temperature Range	-40°F to 160°F	
Pipe Coupling	1-1/2 or 2 IPS	

Installation

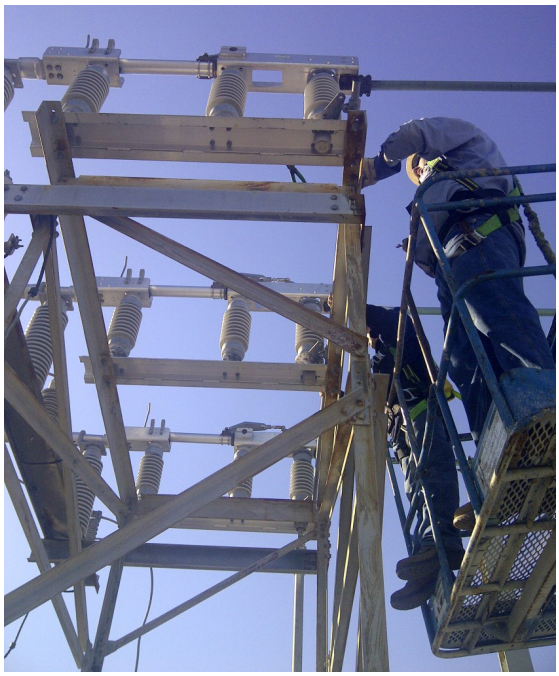
The switch and operator can be mounted on wood, concrete or steel poles and/or substation structures; either new or retrofit installations.

Standard installation mounting arrangements are available for wood, steel, or concrete poles. Standard substation arrangements are available for steel. Of course, custom-engineered mounts are also available. Universal joints and thermal expansion allowances are provided as standard, allowing perfect vertical operating pipe alignment.



FIELD SERVICE DIVISION

Providing factory trained experts to make sure your switch is installed properly the first time providing years of excellent performance.



New Installation Certification

- Final Adjustment Assistance
- Operational Checkout
- Extended Warranty

Troubleshooting Assistance

- On site adjustment assistance for existing equipment
- Warranty service

Education / Remote Training

- Product specific training at your facility
- Pre project walkthrough with operation and/or contractors

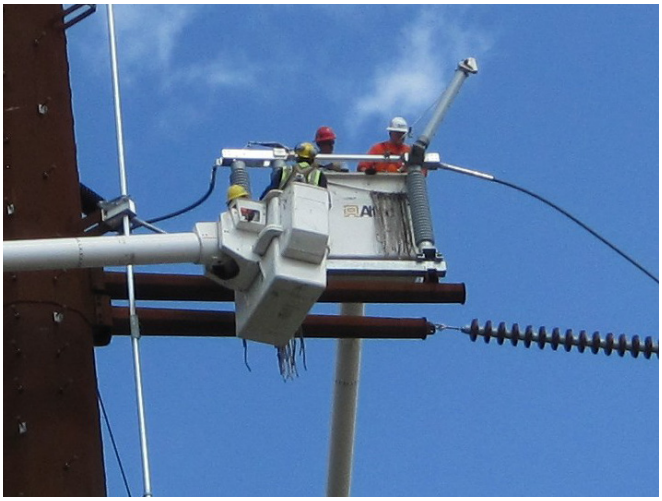
Extended Warrany with Field Service

When you utilize Turner field service we extend the warranty period on the products serviced.

Substation switches - TMX, TDEB, TCV and TCB series
Standard Warranty - 5 years
Extended Warranty - 10 years

Transmission Switches - D series and TSB series
Standard Warranty - 3 years
Extended Warranty - 5 years

TECORupter
Standard Warranty - 1 year
Extended Warranty - 3 years



Our technicians are:

- Factory trained subject matter experts
- Professionals ready to jump in the moment they hit the job site
- Fully equipped with all PPE
- Safety conscious
- Willing and able to get our hands dirty

NOTES

NOTES

TURNER ELECTRIC

Substation Catalog

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Hubbell has a policy of continuous product improvement. Please visit hubbellpowersystems.com to confirm current design specifications

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