Catalogue M-101
January 2003

MORPAC INDUSTRIES, INC.

MEMCO POWER PRODUCTS DIVISION

AIRBREAK SWITCHES

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Morpac Industries, Inc.

Founded by Lloyd Morgan in 1956 as Morgan Power Apparatus, Morpac has been an electric utility supplier for more than 40 years. We have produced over 200 transmission line pullers and tensioners. Our cable handling expertise is highlighted by one of the worlds longest spans, 19,000 feet in British Columbia, Canada. Field experience gained from over 25,000 miles of transmission line construction on five continents and unique jobs ranging from aerial trams to mooring winches have made Morpac Industries the leader in reliable cable handling equipment.

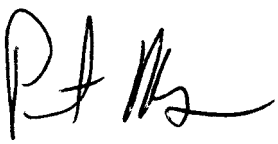
In 1962 Morgan Power Apparatus of Canada was formed, introducing a series of heavy duty off-road crawlers. The capability of these machines to carry up to 60 tons over rough terrain at 20 miles per hour made them ideal for use on transmission line projects to transport equipment and supplies. As a result of their outstanding durability, speed and capacity, we adapted over 1,000 crawlers into rock drills, portable spars, and supply carriers for the logging and mining industries as well.

In 1974 Morpac complimented the electric utility market with the acquisition of a high voltage disconnect switch company. More than 30,000 substation and distribution switches ranging from7.5kV to 500kV have since been installed throughout the world, as well as over 1,300 stored energy operators for automation of distribution switches.

In 1998 Morpac acquired the switch product line of MEMCO Manufacturing out of Commack, New York. The MEMCO operations have been relocated to Morpac's manufacturing facility in Tucson, Arizona. In addition, key MEMCO management, engineering and shop personnel are also now working in Tucson with Morpac.

Morpac is now able to offer you one of the broadest switch lines in the industry. Please take a moment to review the entire catalog and familiarize yourself with our newly expanded product line.

As always, if you have any questions or desire futher information about Morpac Industries, we or our representatives are available to assist you.



Peter Morgan
President, Morpac Industries, Inc.

Introduction

In our quest to offer the best products in the industry, we have four key criteria that must be met before we will even consider any design changes, new products or manufacturing changes:

- The product must last over 30 years in a harsh environment with virtually no attention.
- Changes should not be made just for the sake of lowering costs.
- Only those changes that can produce real product improvements or enhancements are to be considered.
- Changes must make the product more competitive.

Here are some recent product additions and enhancements:

• We have just introduced two new vertical break switches, the EA1 and EA2, with ratings up to 800kV and 4000 amps maximum continuous currrent rating. Using precision made CNC parts and extrusions plus minimizing the use of castings on the EA1 and EA2 allows us to manufacture a high quality switch at comparatively lower costs. See the new catalog section.

• While keeping the basic design the same, we have made some major changes and improvements to our motor operator. These changes were initiated by requests and feedback from customers like you. Check the motor operator section of this catalog.

Morpac Type CBV 25 kV, 1200 ampere ready for shipment

Table of Contents

Morpac/Memco Group Operated Switches

Table of Ratings

Amp	Type of Switch	Model	Mat'l	7.5	15	23	34	46	69	115	138	161	230	345
600	Vertical Break	EA	Al	■	■	■	■	■	■					
	" "	EAB	Cu	■	■	■	■	■	■					
	" " V	VBV	Cu	■	■	■	■	■	■	■	■	■	■	
	Side Break	R14C	Cu	■	■	■	■	■	■					
	" "	CSB	Cu	■	■	■	■	■	■					
	Center Break	EE	Al											
	" "	EEB	Cu	■	■	■	■	■	■					
	" " V	VEE	Al											
	" " "	CBV	Cu	■	■	■	■	■	■	■	■	■	■	
	Dbl. Side Break	EB	Al											
	" " "	EBB	Cu											
	" " "	EBF	Cu	■	■	■	■	■	■					
	Vertical Reach	VR2	Al											
	" "	VR1	Al											
1200	Vertical Break	EA	Al	■	■	■	■	■	■	■	■	■	■	■
	" "	EAB	Cu	■	■	■	■	■	■	■	■	■	■	
	" " V	VBV	Cu	■	■	■	■	■	■	■	■	■	■	
	Side Break	R14C	Cu	■	■	■	■	■	■					
	" "	CSB	Cu	■	■	■	■	■	■					
	Center Break	EE	Al	■	■	■	■	■	■	■	■	■	■	■
	" "	EEB	Cu	■	■	■	■	■	■					
	" " V	VEE	Al						■	■	■	■	■	
	" " "	CBV	Cu	■	■	■	■	■	■	■	■	■	■	
	Dbl. Side Break	EB	Al						■	■	■	■	■	■
	" " "	EBB	Cu						■	■	■	■	■	■
	" " "	EBF	Cu	■	■	■	■	■	■					
	Vertical Reach	VR2	Al											
	" "	VR1	Al											
1600	Vertical Break	EA	Al						■	■	■	■	■	■
	" "	EAB	Cu	■	■	■	■	■	■	■	■	■	■	
	" " V	VBV	Cu											
	Side Break	R14C	Cu											
	" "	CSB	Cu											
	Center Break	EE	Al	■	■	■	■	■	■	■	■	■	■	■
	" "	EEB	Cu											
	" " V	VEE	Al						■	■	■	■	■	
	" " "	CBV	Cu											
	Dbl. Side Break	EB	Al						■	■	■	■	■	■
	" " "	EBB	Cu						■	■	■	■	■	■
	" " "	EBF	Cu											
	Vertical Reach	VR2	Al											
	" "	VR1	Al											

NOTE: EA ratings may refer to types EA, EA1, or EA2.

Morpac/Memco Group Operated Switches

Table of Ratings

Amp	Type of Switch	Model	Mat'l	7.5	15	23	34	46	69	115	138	161	230	345	500	765
2000	Vertical Break	EA	Al	■	■	■	■	■	■	■	■	■	■	■		
	" "	EAB	Cu	■	■	■	■	■	■	■	■	■	■			
	" " V	VBV	Cu	■	■	■	■	■	■	■	■	■	■			
	Side Break	R14C	Cu													
	" "	CSB	Cu													
	Center Break	EE	Al	■	■	■	■	■	■	■	■	■	■	■		
	" "	EEB	Cu													
	" " V	VEE	Al						■	■	■	■	■			
	" " "	CBV	Cu	■	■	■	■	■	■	■	■	■	■			
	Dbl. Side Break	EB	Al						■	■	■	■	■	■		
	" " "	EBB	Cu						■	■	■	■	■	■		
	" " "	EBF	Cu													
	Vertical Reach	VR2	Al													
	" "	VR1	Al													
3000	Vertical Break	EA	Al	■	■	■	■	■	■	■	■	■	■	■	■	■
	" "	EAB	Cu	■	■	■	■	■	■	■	■	■	■			
	" " V	VBV	Cu													
	Side Break	R14C	Cu													
	" "	CSB	Cu													
	Center Break	EE	Al	■	■	■	■	■	■	■	■	■	■	■		
	" "	EEB	Cu													
	" " V	VEE	Al						■	■	■	■	■			
	" " "	CBV	Cu													
	Dbl. Side Break	EB	Al						■	■	■	■	■	■		
	" " "	EBB	Cu						■	■	■	■	■	■		
	" " "	EBF	Cu													
	Vertical Reach	VR2	Al										■	■		
	" "	VR1	Al												■	■
4000	Vertical Break	EA	Al	■	■	■	■	■	■	■					■	■
	" "	EAB	Cu	■	■	■	■	■	■							
	" " V	VBV	Cu													
	Side Break	R14C	Cu													
	" "	CSB	Cu													
	Center Break	EE	Al													
	" "	EEB	Cu													
	" " V	VEE	Al													
	" " "	CBV	Cu													
	Dbl. Side Break	EB	Al													
	" " "	EBB	Cu													
	" " "	EBF	Cu													
	Vertical Reach	VR2	Al													
	" "	VR1	Al												■	■

NOTE: EA ratings may refer to types EA, EA1, or EA2.

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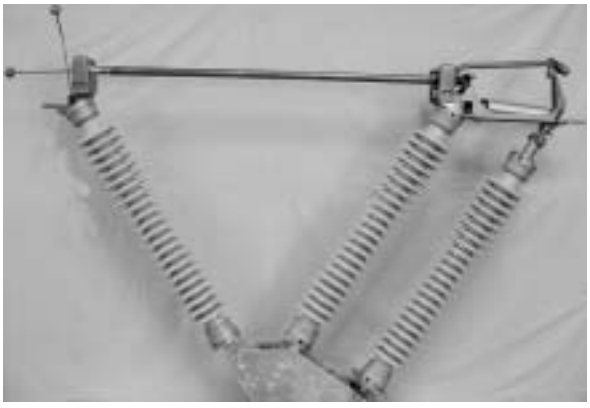
MORPAC INDUSTRIES, INC.

MEMCO POWER PRODUCTS DIVISION

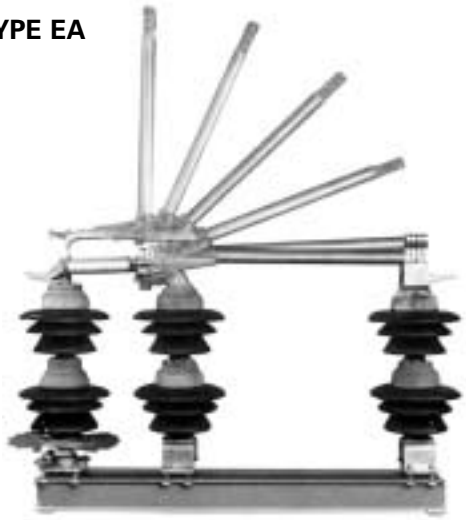
Type EA, EA1, EA2 EAB, EA1S and VBV VERTICAL BREAK SWITCHES

8.25 KV through 800 kV 600 to 4000 Ampere

TYPE VBV



TYPE EA



Type EA and EAB

GENERAL DESIGN FEATURES

Type EA – Aluminum Vertical Break Switch

8.25 kV through 362 kV
600-4000 Amps

Type EAB - Copper Vertical Break Switch

8.25 kV through 242 kV
600-4000 Amps

The EA rotating rear insulator, vertical break switch embodies all of the rugged physical characteristics of the Memco product line. The design utilizes the best features of both copper and aluminum in the live parts, maintaining the time proven concept of silver to copper at all moving contacts. The result is a truly high performance switch.

APPLICATION: With arcing horns or quick break attachment it can be used for line sectionalizing, bypassing circuit breakers, or opening magnetizing current of transformer primary connections. Without arcing horns it can be used for isolating breakers or as a disconnecting switch.

FEATURES

- **Jaw & Hinge Contacts**

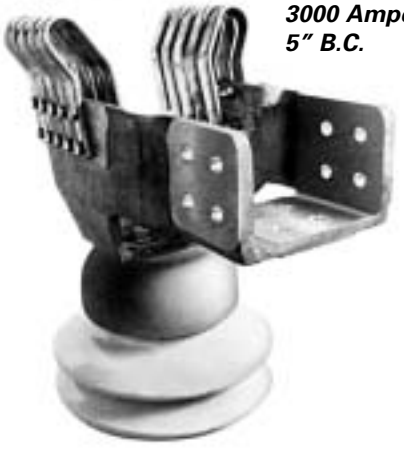
Both the jaw and hinge employ similar types of special high temperature resistant, copper alloy contact fingers. This material, possessing excellent spring characteristics and high conductivity, makes an ideal self contained contact. There is no need for back-up springs or other pressure compensating devices commonly found on other switches. The end result is cleaner and better contact arrangement. The reverse loop contact as used on the jaw takes advantage of the magnetic forces found under fault conditions to increase the contact pressure of the fingers and to force the blade against the closed position blade stop.
The hinge contact fingers are in continuous contact with the switch blade throughout the complete opening and closing operation of the switch.

1200 Ampere, 5″ B.C.

TYPICAL JAW CONTACT ARRANGEMENTS

600 Ampere, 3″ B.C.

2000 Ampere 5″ B.C.



3000 Ampere, 5″ B.C.

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Type EA and EAB

• Current Carrying Parts

High strength, high conductivity aluminum is used where practical throughout the live parts. Blade end transitions are made by either bolted aluminum to copper or threaded copper to aluminum depending upon the blade diameter. In either case, all copper or bronze transition pieces are tinned and the current interchange points between the tinned copper and aluminum are effectively sealed to prevent the entrance of moisture.
All bearings and counterbalancing springs are isolated from the main current path by insulating bushings. The switch is designed in accordance with the latest ANSI standards. It is also available, when specified, based upon past industry standards which limit temperature rise to 30˚ C over an ambient of 40˚ C.

• Wiping Action & Operation

The rolling action of the blade when opening and closing the switch provides a positive wiping and cleaning action of the jaw and hinge contacts. The jaw contact pressure is relieved by the blade rotation prior to lift out.
In the closed position the blade mechanism is mechanically locked over center thereby locking the blade closed. In the open position the blade center of gravity is located well behind the pivot point thereby preventing the blade from falling closed.

3000 Ampere, 5" B.C. hinge assembly

• Blade Height Adjustment

Blade height adjustment is provided by a very convenient arrangement located in the linkage between the top of the rotating insulator and the blade.

• Mounting Position

The type EA switch may be mounted in horizontal, upright, vertical, or underhung position. Counterbalancing is provided, where required, by compression type spring assemblies. Conversion in the field from one mounting position to another can be made with a minimum of difficulty.

• Bearings

Maintenance free bearings are used at the base of the rotating insulator of all switches. Switches through 72.5 kV are furnished with sleeve or ball bearings. At 121kV and above, ball bearings are used. All bearings are enclosed in weatherproof housings and are free of maintenance.
Live part bearings consist of teflon, nylon, or roller type, depending upon the application. No field servicing is required.

• Bases

Rigid galvanized structural steel channel bases are furnished on all switches. Switches rated 72.5kV, 1200 ampere and below are normally furnished on flat channel bases. Double channel bases are furnished at 121 kV and above. Aluminum bases are available when specified.

• Leveling Bolts

All switches 121 kV and above are furnished with four leveling bolts per insulator stack to provide fast, effective means of aligning insulator stacks in the field.

Rigid welded base showing bearing and leveling bolts.

Type EA and EAB

- **Factory Assembled & Adjusted**

Switches 48.3 kV and below are pre-assembled and adjusted on insulators at the factory. Switches 72.5 kV and above are assembled and adjusted, less insulators. Only minor adjustments, if any, are required at installation.

- **Insulators**

NEMA standard station post or cap and pin insulators are available as specified.

- **Field Installation**

The simplicity of design assures ease of installation and years of trouble-free service.

Type EAB - Copper Vertical Break Switch

FEATURES

The type EAB vertical break switch utilizes copper and bronze for all current carrying parts. In all other respects it is identical with the type EA, described previously. Aluminum is used for corona rings and counterbalancing spring housing. Blade end transitions, as described under "EA Carrying Parts" are unnecessary. Silver contact material is silver brazed directly to the copper blade tip. The resulting contact is time proven silver to copper.
Not all ratings are available in copper, refer to factory.

EA & EAB SWITCH ACCESSORIES

- **Ground Switches**

Ground switches of the same or lower momentary ratings as the main switches can be installed on either the jaw or hinge end of the switch. Standard practice is to operate the ground blade 90˚ to the main blade. However, ground blades parallel to the main blade are available. Both braid and braidless ground switches are available.

- **Quick Break Attachments**

Quick break attachments having the following interrupting ratings can be furnished on all EA switches.

Switch Rating kV	Magnetizing Current Bank kVA	Line Charging Current Amps.	Dropping Equivalent Lines - Miles
8.25	20,000	22	*
15.5	30,000	20	*
25.8	40,000	18	*
38.0	50,000	16	*
48.3	60,000	14	75
72.5	80,000	12	50
121	100,000	9	25
145	100,000	7.5	18
169	100,000	6	12

- **Outriggers**

Outriggers of various designs are available for copper or aluminum conductors.

- **Terminal Connectors**

When specified terminal connectors can be furnished.

Refer to factory for outline drawings.

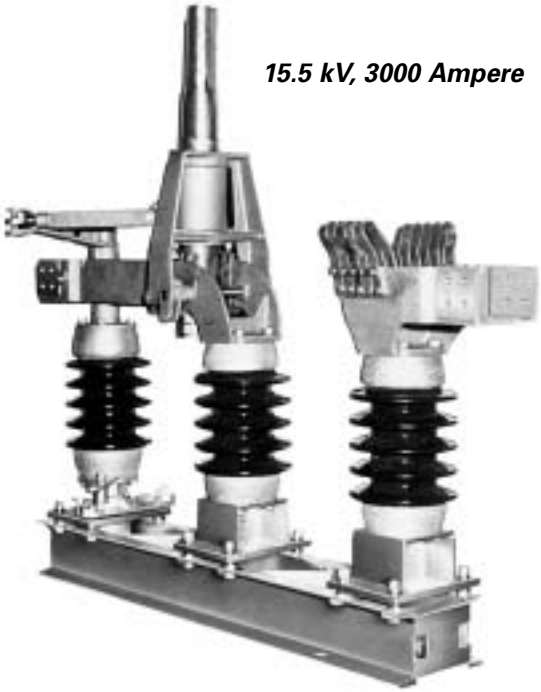
TYPICAL EA SWITCHES

15.5 kV, 600 Ampere

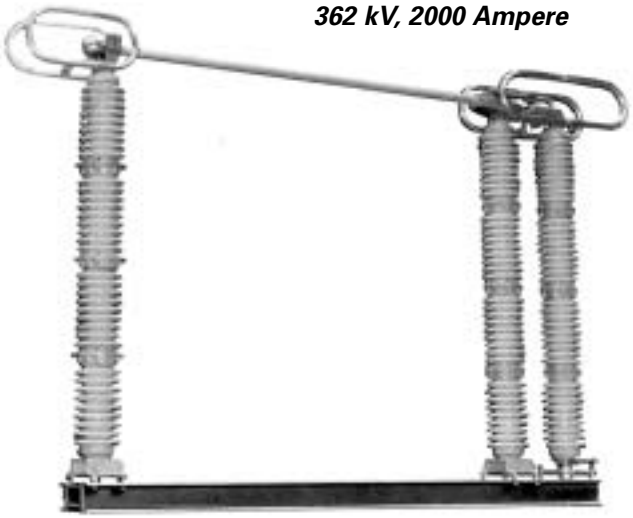
38 kV, 1200 Ampere

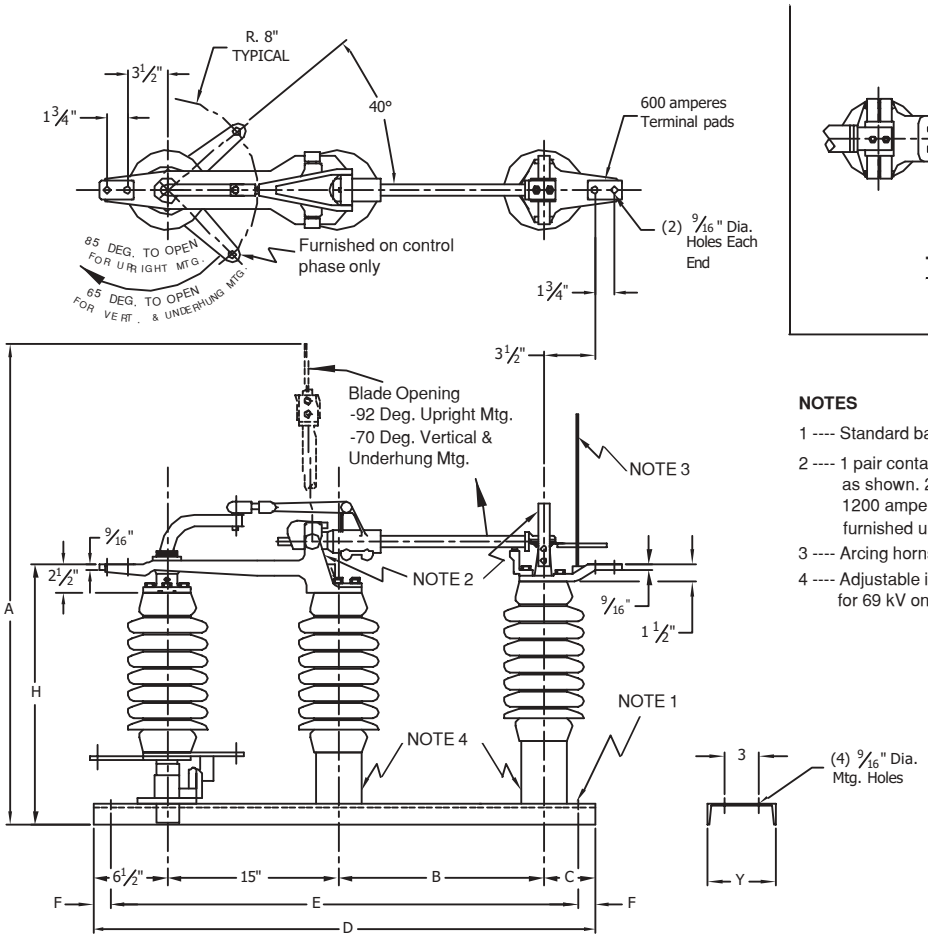
145 kV, 3000 Ampere

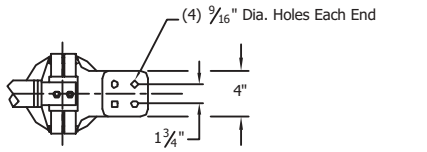
15.5 kV, 3000 Ampere



362 kV, 2000 Ampere







1200 AMPERES TERMINAL PADS

NOTES

1 ---- Standard base shown, others available.

2 ---- 1 pair contact loops furnished for 600 ampere as shown. 2 pair contact loops furnished for 1200 ampere. Silver-to-copper contacts furnished unless otherwise specified.

3 ---- Arcing horns furnished only when specified.

4 ---- Adjustable insulator adapter provided for 69 kV only.

Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)							
Max.	BIL	(1) (2) (3)		A	B	C	D	E	F	H	Y
8.2	95	7EA-6HP3	202	38 3/4"	15"	4 1/2"	41"	36"	2 1/2"	16 1/4"	5"
15.5	110	15EA-6HP3	205	41 1/4"	15"	4 1/2"	41"	36"	2 1/2"	18 3/4"	5"
25.8	150	23EA-6HP3	208	48 1/4"	18"	4 1/2"	44"	39"	2 1/2"	22 3/4"	5"
38	200	34EA-6HP3	210	58 1/2"	24"	4 1/2"	50"	48"	1"	27"	6"
48.3	250	46EA-6HP3	214	68 1/2"	30"	4 1/2"	56"	54"	1"	31"	6"
72.5	350	69EA-6HP3	216	88 1/2"	42"	7 1/2"	71"	69"	1"	39"	6"

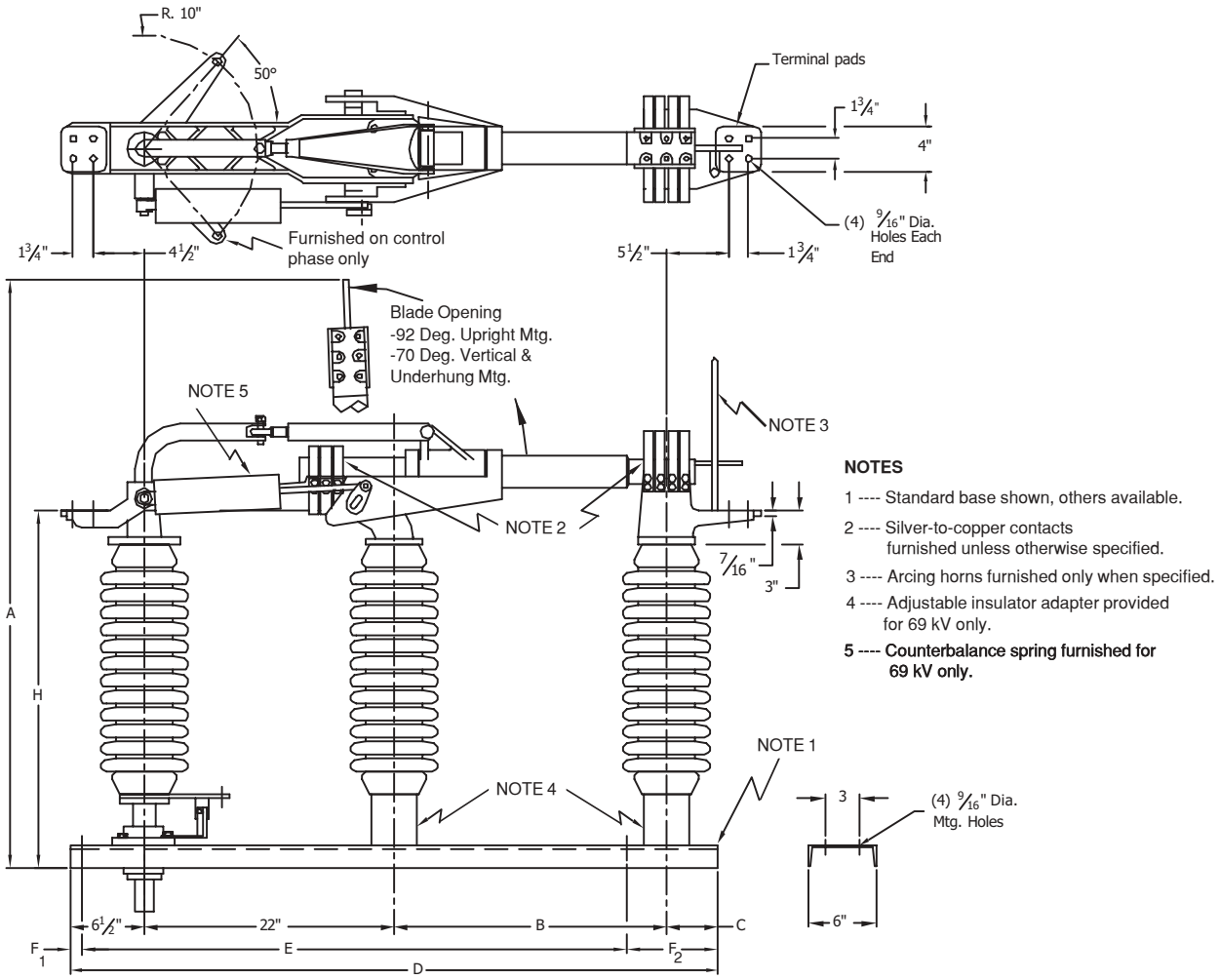
(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 7EA-6HC3).

(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 7EA-6P3).

(3) Catalog numbers shown are for 600 amps. For 1200 amps, change 6 to 12 in the catalog number as required (eg.: 8.2 kV-1200 A: Cat. No. 7EA-12HP3).

Ampere Rating	Momentary Rating
600A	40 KA
1200A	61 KA

Type EA 8.2 kV - 72.5 kV 600 and 1200 Ampere



NOTES

1 ---- Standard base shown, others available.

2 ---- Silver-to-copper contacts furnished unless otherwise specified.

3 ---- Arcing horns furnished only when specified.

4 ---- Adjustable insulator adapter provided for 69 kV only.

5 ---- Counterbalance spring furnished for 69 kV only.

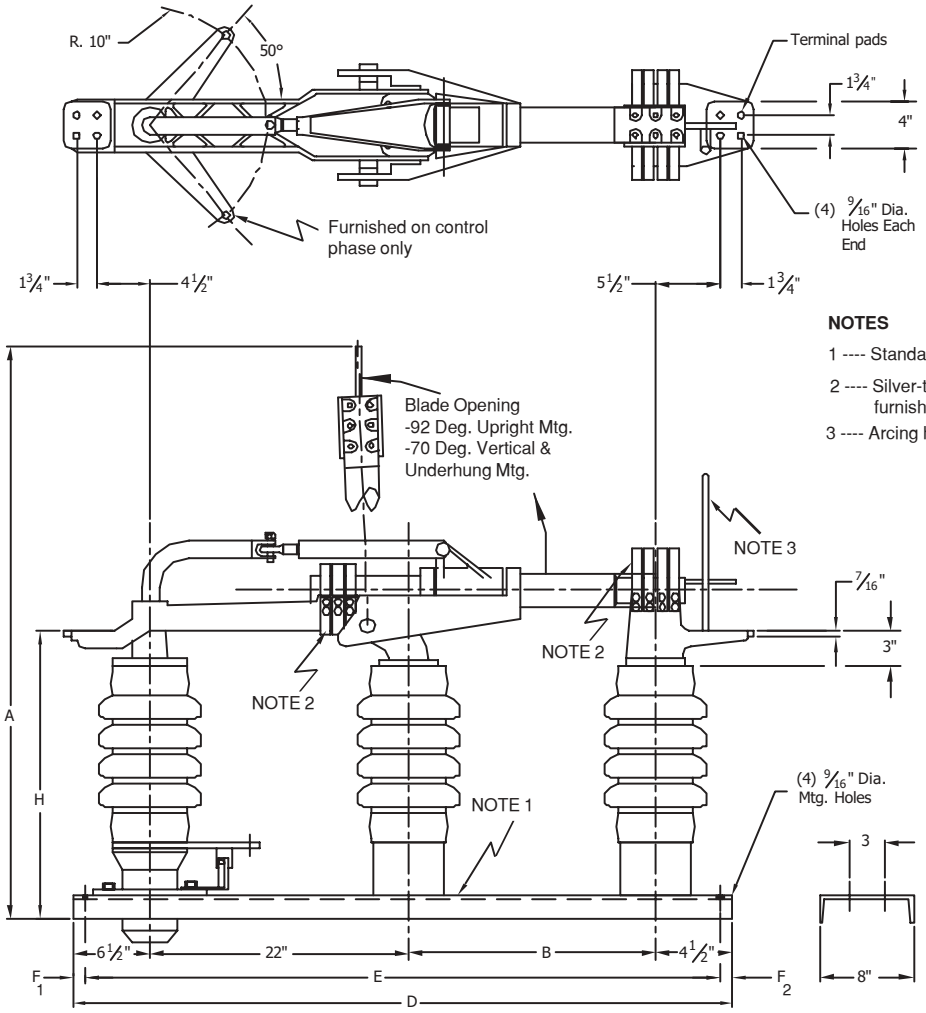
Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)							
Max.	BIL	(1) (2)		A	B	C	D	E	F_1	F_2	H
8.2	95	7EA-20HP3	202	47"	15"	$4\frac{1}{2}$"	48"	36"	$2\frac{1}{2}$"	$9\frac{1}{2}$"	17"
15.5	110	15EA-20HP3	205	$49\frac{1}{2}$"	15"	$4\frac{1}{2}$"	48"	36"	$2\frac{1}{2}$"	$9\frac{1}{2}$"	$19\frac{1}{2}$"
25.8	150	23EA-20HP3	208	$53\frac{1}{2}$"	18"	$4\frac{1}{2}$"	51"	39"	$2\frac{1}{2}$"	$9\frac{1}{2}$"	$23\frac{1}{2}$"
38	200	34EA-20HP3	210	$63\frac{1}{2}$"	24"	$4\frac{1}{2}$"	57"	48"	1"	8"	$27\frac{1}{2}$"
48.3	250	46EA-20HP3	214	$73\frac{1}{2}$"	30"	$4\frac{1}{2}$"	63"	54"	1"	8"	$31\frac{1}{2}$"
72.5	350	69EA-20HP3	216	$81\frac{1}{2}$"	42"	$7\frac{1}{2}$"	71"	69"	1"	8"	$39\frac{1}{2}$"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 7EA-20HC3).

(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 7EA-20P3).

Ampere Rating	Momentary Rating
2000A	100 KA

Type EA 8.2 kV - 72.5 kV 2000 Ampere



NOTES

1 ---- Standard base shown, others available.

2 ---- Silver-to-copper contacts furnished unless otherwise specified.

3 ---- Arcing horns furnished only when specified.

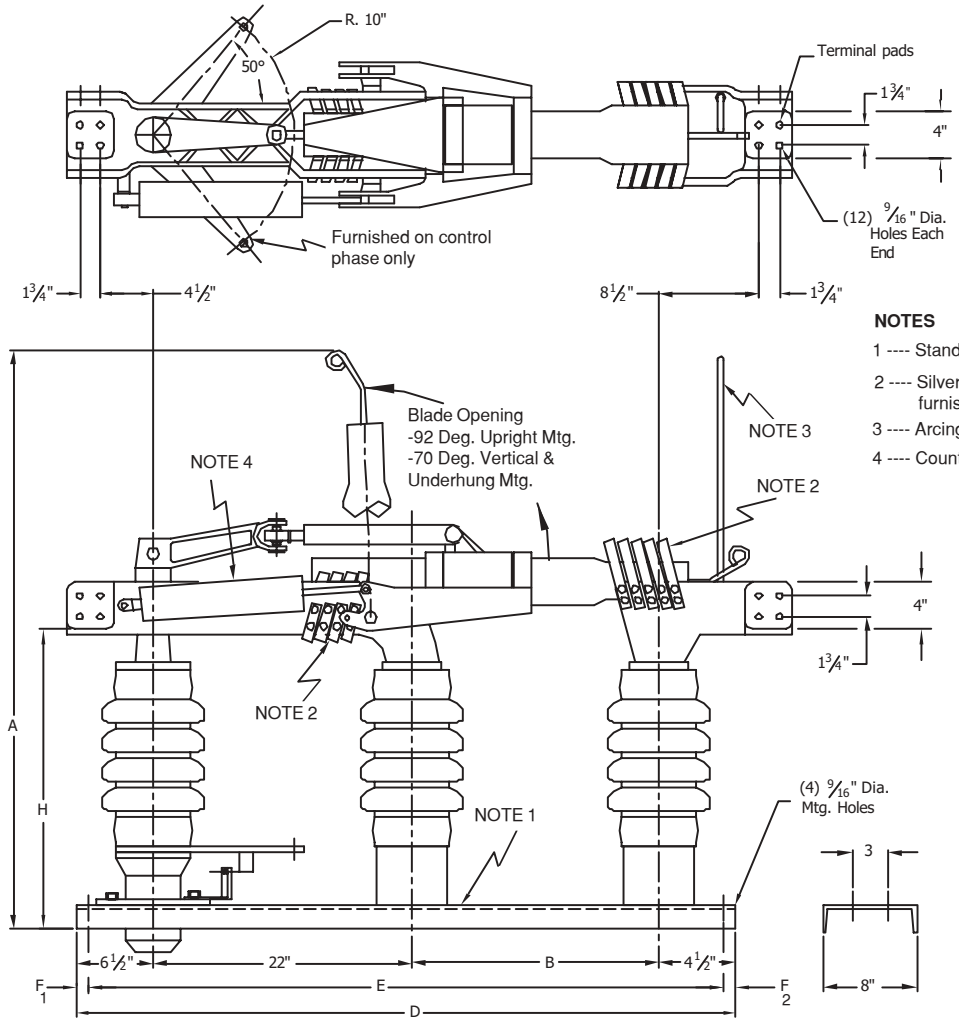
Voltage Rating kV		CATALOG NUMBER (1) (2)	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)						
Max.	BIL			A	B	D	E	F_1	F_2	H
8.2	95	7EA-20HP5	222	49 3/4"	21"	54"	36"	1"	17"	19 3/4"
15.5	110	15EA-20HP5	225	51 3/4"	21"	54"	36"	1"	17"	21 3/4"
25.8	150	23EA-20HP5	227	54 3/4"	21"	54"	36"	1"	17"	24 3/4"
38	200	34EA-20HP5	231	65 3/4"	27"	60"	48"	1"	11"	29 3/4"
48.3	250	46EA-20HP5	267	75 3/4"	33"	66"	54"	1"	11"	33 3/4"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 7EA-20HC5).

(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 7EA-20P5).

Ampere Rating	Momentary Rating
2000A	100 KA

Type EA 8.2 kV - 48.3 kV 2000 Ampere



NOTES

1 ---- Standard base shown, others available.

2 ---- Silver-to-copper contacts furnished unless otherwise specified.

3 ---- Arcing horns furnished only when specified.

4 ---- Counterbalance spring furnished as required.

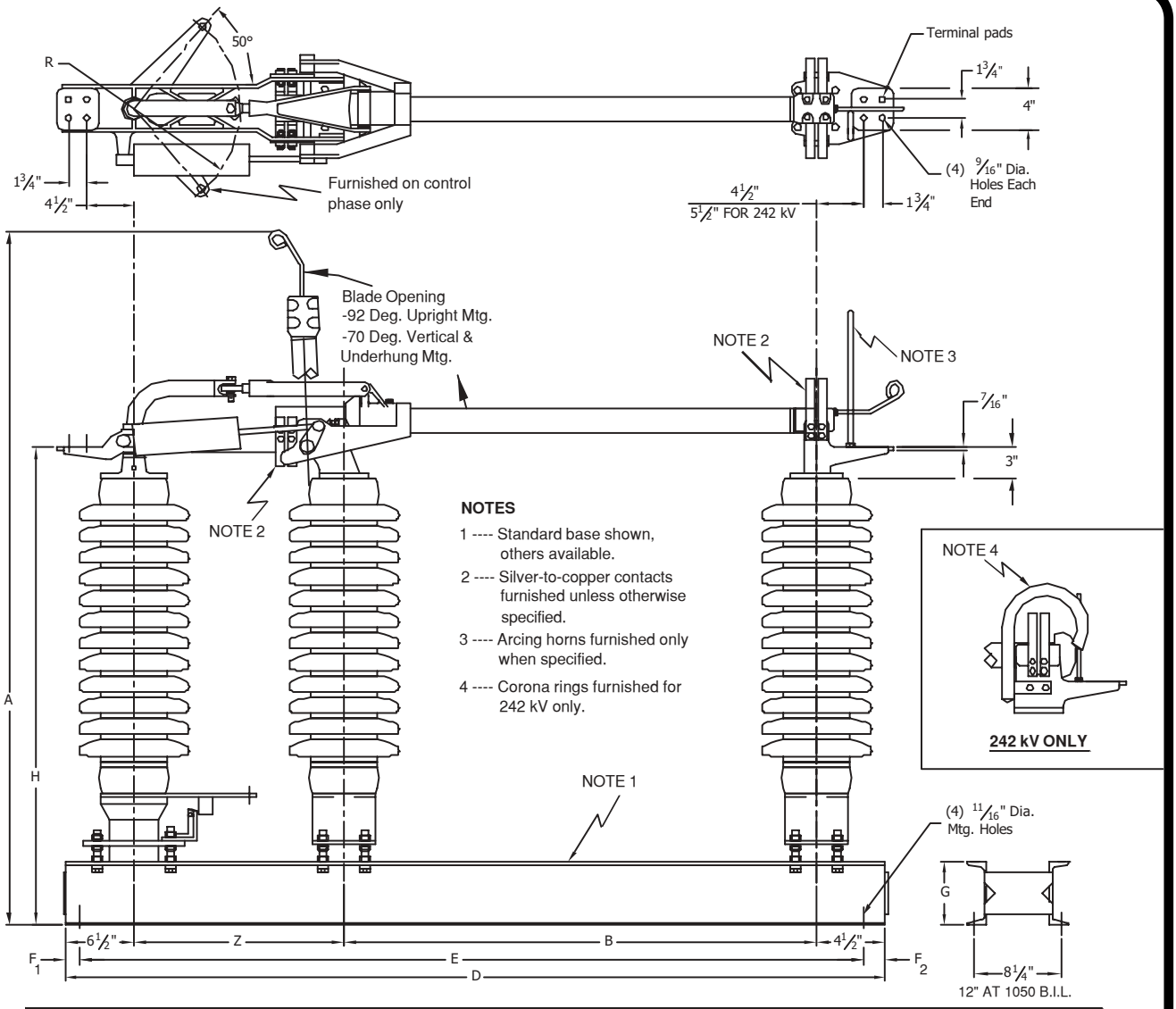
Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)						
Max.	BIL	(1) (2)		A	B	D	E	F_1	F_2	H
8.2	95	7EA-30HP5	222	53 3/4"	21"	54"	36"	1"	17"	20 1/4"
15.5	110	15EA-30HP5	225	55 3/4"	21"	54"	36"	1"	17"	22 1/4"
25.8	150	23EA-30HP5	227	58 3/4"	21"	54"	36"	1"	17"	25 1/4"
38	200	34EA-30HP5	231	63 3/4"	27"	60"	48"	1"	11"	30 1/4"
48.3	250	46EA-30HP5	267	67 3/4"	33"	66"	54"	1"	11"	34 1/4"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 7EA-30HC5).

(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 7EA-30P5).

Ampere Rating	Momentary Rating
3000A	120 KA

Type EA 8.2 kV - 48.3 kV 3000 Ampere

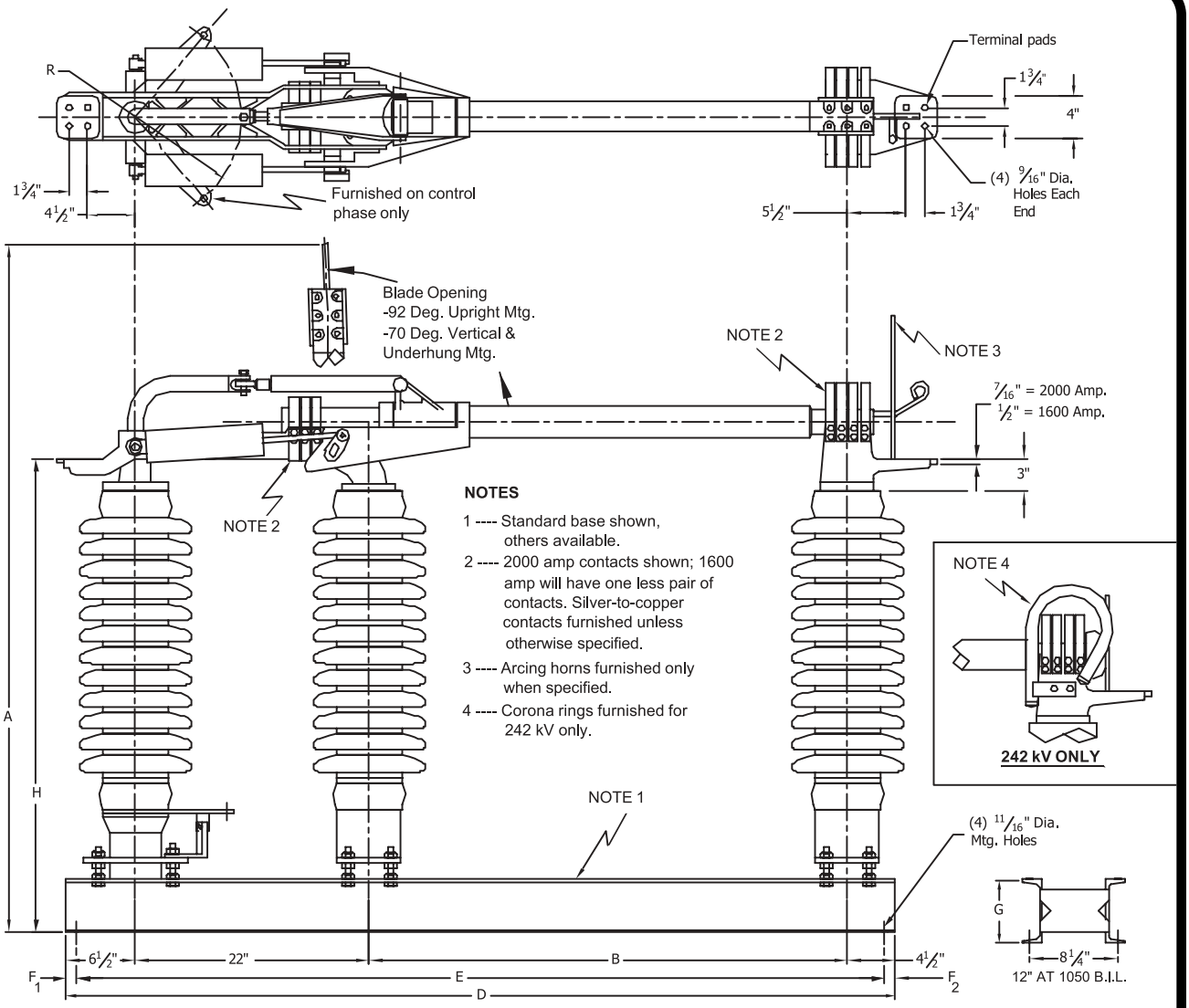


Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)									
Max.	BIL	(1) (2)		A	B	D	E	F_1	F_2	G	H	R	Z
72.5	350	69EA-12HP5	278	99 5/8"	45"	76"	69"	3 1/2"	3 1/2"	5"	44 5/8"	10"	20"
121	550	115EA-12HP5	286	128 5/8"	60"	91"	87"	2"	2"	5"	59 5/8"	10"	20"
145	650	138EA-12HP5	288	149 5/8"	72"	103"	99"	2"	2"	5"	68 5/8"	10"	20"
169	750	161EA-12HP5	291	170 5/8"	84"	115"	111"	2"	2"	6"	77 5/8"	10"	20"
242	900	230EA-12HP5	REFER TO FACTORY	195 1/8"	96"	129"	123"	3"	3"	6"	95 5/8"	12"	22"
242	1050	230EA-12HP5	312	225 1/8"	114"	147"	123"	3"	21"	6"	107 5/8"	12"	22"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 69EA-12HC5).
(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 69EA-12P5).

Ampere Rating	Momentary Rating
1200A	61 KA

Type EA 72.5 kV - 242 kV 1200 Ampere

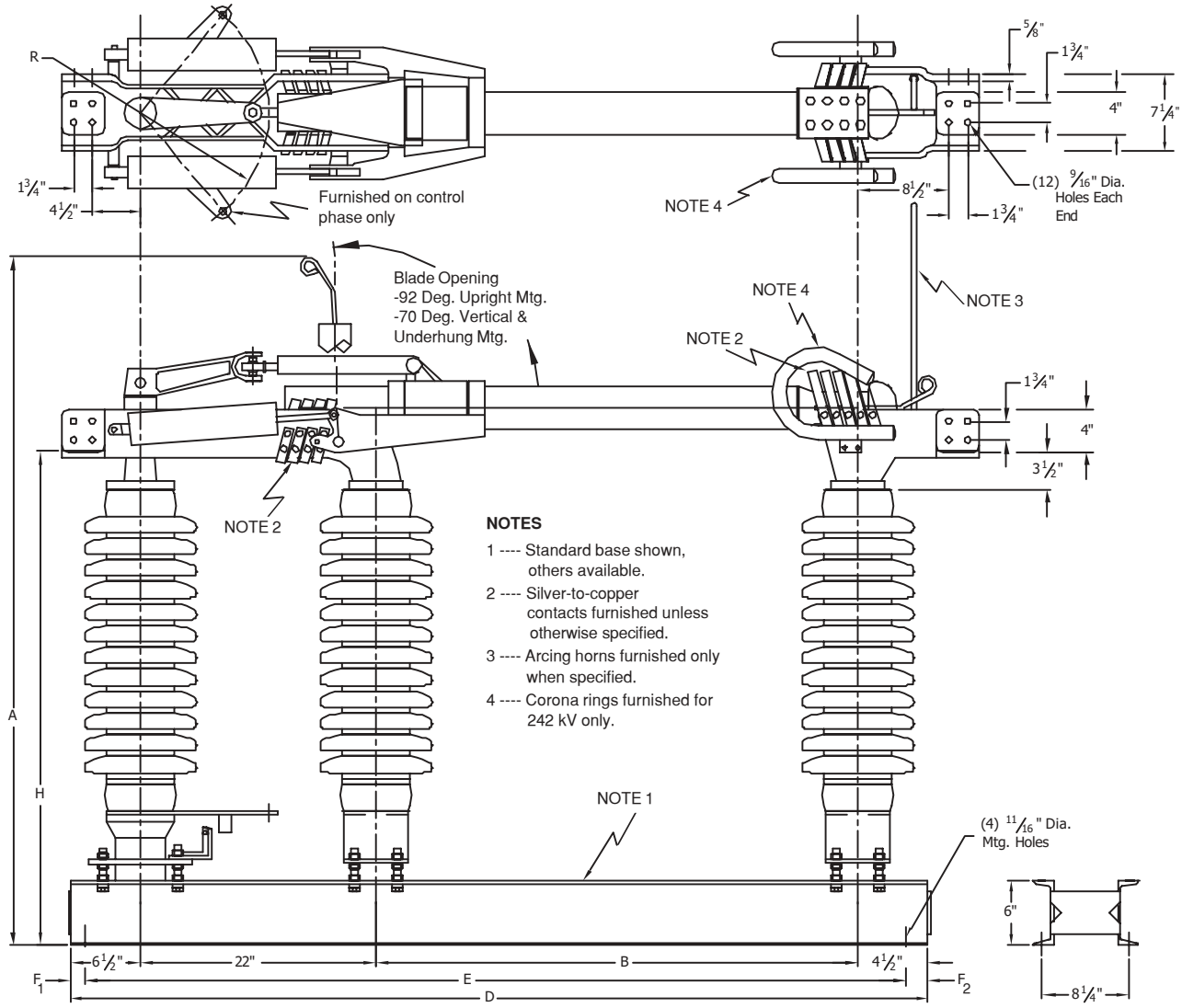


Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)								
Max.	BIL	(1) (2) (3)		A	B	D	E	F_1	F_2	G	H	R
72.5	350	69EA-20HP5	278	109 1/8"	45"	78"	69"	4 1/2"	4 1/2"	5"	44 5/8"	10"
121	550	115EA-20HP5	286	129 5/8"	60"	93"	87"	3"	3"	5"	59 5/8"	10"
145	650	138EA-20HP5	288	150 1/8"	72"	105"	99"	3"	3"	5"	68 5/8"	10"
169	750	161EA-20HP5	291	171 1/8"	84"	117"	111"	3"	3"	6"	77 5/8"	12"
242	900	230EA-20HP5	REFER TO FACTORY	195 5/8"	96"	129"	123"	3"	3"	6"	95 5/8"	12"
242	1050	230EA-20HP5	312	255 5/8"	114"	147"	123"	3"	21"	6"	107 5/8"	12"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 69EA-20HC5).
(2) When 30∞temperature rise unit is required, omit the H in the catalog number (eg.: 69EA-20P5).
(3) Catalog numbers shown are for 2000 amps. For 1600 amps, change 20 to 16 in the catalog number as required (eg.: 72.5 kV-1600 A: Cat No. 69EA-16HP5).

Ampere Rating	Momentary Rating
1600A	70 KA
2000A	100 KA

Type EA 72.5 kV - 242 kV 1600 and 2000 Ampere



Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)							
Max.	BIL	(1) (2) (3)		A	B	D	E	F_1	F_2	H	R
72.5	350	69EA-30HP5	278	103 3/4"	45"	78"	69"	3 1/2"	5 1/2"	46 1/8"	10"
121	550	115EA-30HP5	286	133 3/4"	60"	93"	87"	2"	4"	61 1/8"	12"
145	650	138EA-30HP5	288	154 3/4"	72"	105"	99"	2"	4"	70 1/8"	12"
169	750	161EA-30HP5	REFER TO FACTORY	174 3/4"	84"	117"	111"	2"	4"	78 1/8"	12"
242	900	230EA-30HP5	REFER TO FACTORY	204 3/4"	96"	129"	123"	3"	3"	96 1/8"	12"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 69EA-30HC5).

(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 69EA-30P5).

(3) When 120 KA momentary amperage is required for 115 kV through 230 kV, add a S to the end of the catalog number (eg.: 69EA-30HP5S).

Ampere Rating	Momentary Rating	
3000A	69 kV	120 KA
	115-230 kV	100 KA
	115-230 kV	120 KA ← NOTE 3

Type EA 72.5 kV - 242 kV 3000 Ampere

Type EA1

Morpac Type EA1 Aluminum Vertical Break Switch
Voltage ratings to 242 kV
1200 to 2000 Amps

The EA1 incorporates the best of the combined experience of Morpac Industries, Inc. and Memco Manufacturing, Inc. (acquired by Morpac in 1998). The EA1 has been tested to the latest ANSI standards and easily met and exceeded those requirements.

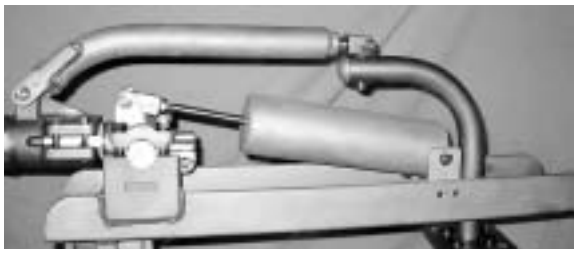
Applications: Ratings and dimensions are compatible with the type EA. EA1 live parts can replace EA live parts to upgrade older, existing switches. In fact EA1 live parts can be used to replace live parts on switches of other manufacture. Contact us for details.

15 kV Type EA1, 2000A, 30° C rise Version

The EA1 utilizes extrusions and all CNC (computer numerical control) precision machined parts. The result is a high quality, yet economical switch.

The maintenance free rotating insulator bearings are ball type with bronze spindles and stainless steel races.

Standards now allow higher temperature rises than 30 degrees. Because of the efficient design of the EA1 we can offer a 30 degree version as an option. See below for further details.

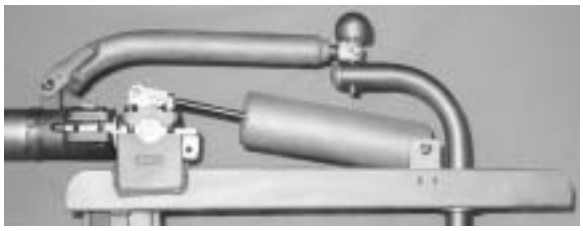


Hinge Mechanism, 1200 and 2000 Amp, 138 kV and below. Both 1200 and 2000 Amp use the same hinge mechanism.

The hinge mechanism for the 1200 and 2000 amp switches is identical. The standard hinge mechanism current carrying parts are rated for 30 degree rise.

To make the EA1 a complete 30 degree rise switch an additional pair of jaw contacts and heavier wall blade are used.

Type EA1



Hinge mechanism for 161 to 230 kV EA1 Note addition of corona ball to hinge.

Current transfer on all EA1 hinge mechanisms is through heavy silver plated, threaded copper studs. The threaded studs also allow the rotational hinge movement for open and closing.

The threaded studs are sealed and lubricated for life. No maintenance is required.

Hinge extrusion is made of high conductivity 6063 T6 aluminum alloy for cooler and longer life operation.

In designing the EA1 Morpac reviewed every component to determine whether extrusions and fabricated parts would provide real improvements over the traditional use of castings. The final conclusion was that a combination of all three offered the best solution.

The result is a high quality switch that is actually less expensive to manufacture than one that relies primarily on castings.

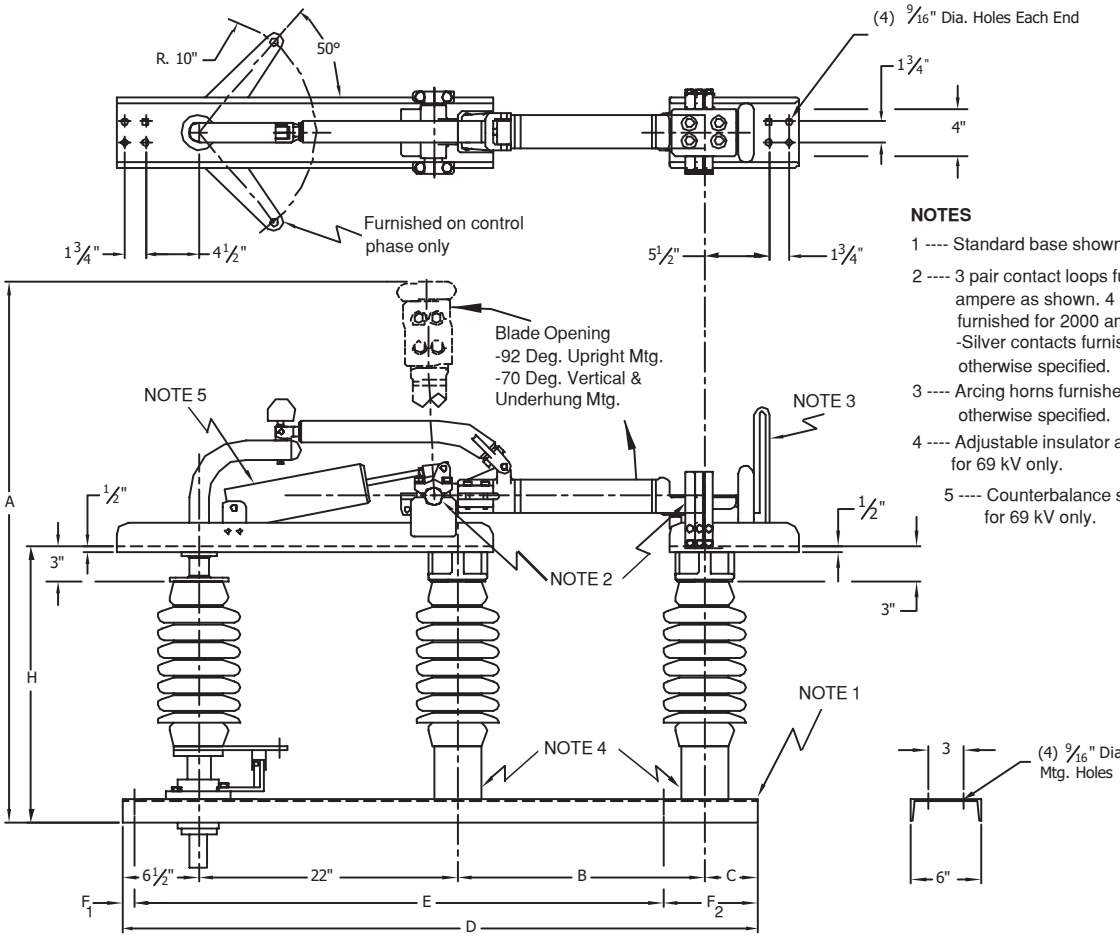
Hinge crank

The stainless steel hinge crank or "gooseneck" is precision formed and has a universal foot for either a 3 or 5 inch (75 or 125mm) bolt circle insulator.

Jaw contact

Jaw contacts are traditional and time proven reverse loop design with stainless steel backup springs, isolated from the current path.

The jaw extrusion is also of 6063 T6 aluminum alloy.



NOTES

1 ---- Standard base shown, others available.

2 ---- 3 pair contact loops furnished for 1200 ampere as shown. 4 pair contact loops furnished for 2000 ampere. Silver-to -Silver contacts furnished unless otherwise specified.

3 ---- Arcing horns furnished standard unless otherwise specified.

4 ---- Adjustable insulator adapter provided for 69 kV only.

5 ---- Counterbalance spring furnished for 69 kV only.

Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)							
Max.	BIL	(1) (2) (3)		A	B	C	D	E	F_1	F_2	H
8.2	95	7EA1-12HP3	202	45 5/8"	18"	4 1/2"	51"	40"	2 1/2"	8 1/2"	17"
15.5	110	15EA1-12HP3	205	48 1/8"	18"	4 1/2"	51"	40"	2 1/2"	8 1/2"	19 1/2"
25.8	150	23EA1-12HP3	208	55 1/8"	21"	4 1/2"	54"	43"	2 1/2"	8 1/2"	23 1/2"
38	200	34EA1-12HP3	210	65 1/8"	27"	3"	58 1/2"	49"	1"	8 1/2"	27 1/2"
48.3	250	46EA1-12HP3	214	75 1/8"	33"	3"	64 1/2"	55"	1"	8 1/2"	31 1/2"
72.5	350	69EA1-12HP3	216	95 1/8"	45"	6"	79 1/2"	77"	1"	1 1/2"	39 1/2"

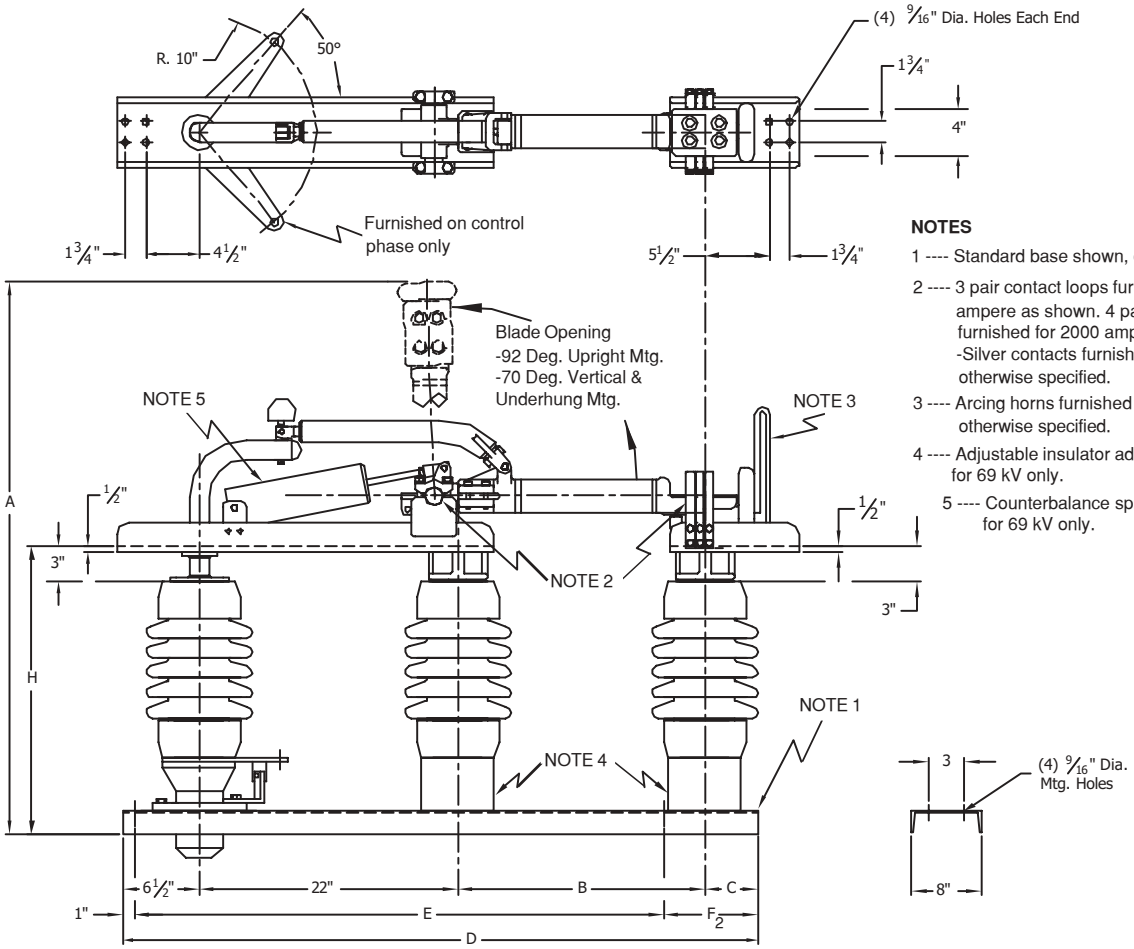
(1) Catalog numbers shown are with station post insulators.

(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 7EA1-12P3).

(3) Catalog numbers shown are for 1200 amps. For 2000 amps, change 12 to 20 in the catalog number as required (eg.: 8.2 kV-2000 A: Cat. No. 7EA1-20HP3).

Ampere Rating	Momentary Rating
1200A	61 KA
2000A	100 KA

Type EA1 8.2 kV - 72.5 kV 1200 and 2000 Ampere



NOTES

1 ---- Standard base shown, others available.

2 ---- 3 pair contact loops furnished for 1200 ampere as shown. 4 pair contact loops furnished for 2000 ampere. Silver-to -Silver contacts furnished unless otherwise specified.

3 ---- Arcing horns furnished standard unless otherwise specified.

4 ---- Adjustable insulator adapter provided for 69 kV only.

5 ---- Counterbalance spring furnished for 69 kV only.

Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)						
Max.	BIL	(1) (2) (3)		A	B	C	D	E	F	H
8.2	95	7EA1-12HP5	222	48 3/8"	18"	4 1/2"	51"	40"	10"	19 3/4"
15.5	110	15EA1-12HP5	225	50 3/8"	18"	4 1/2"	51"	40"	10"	21 3/4"
25.8	150	23EA1-12HP5	227	56 3/8"	21"	4 1/2"	54"	43"	10"	24 3/4"
38	200	34EA1-12HP5	231	67 3/8"	27"	4 1/2"	60"	49"	10"	29 3/4"
48.3	250	46EA1-12HP5	267	77 3/8"	33"	4 1/2"	66"	55"	10"	33 3/4"
72.5	350	69EA1-12HP5	278	95 3/8"	45"	6"	79 1/2"	77"	1 1/2"	39 3/4"

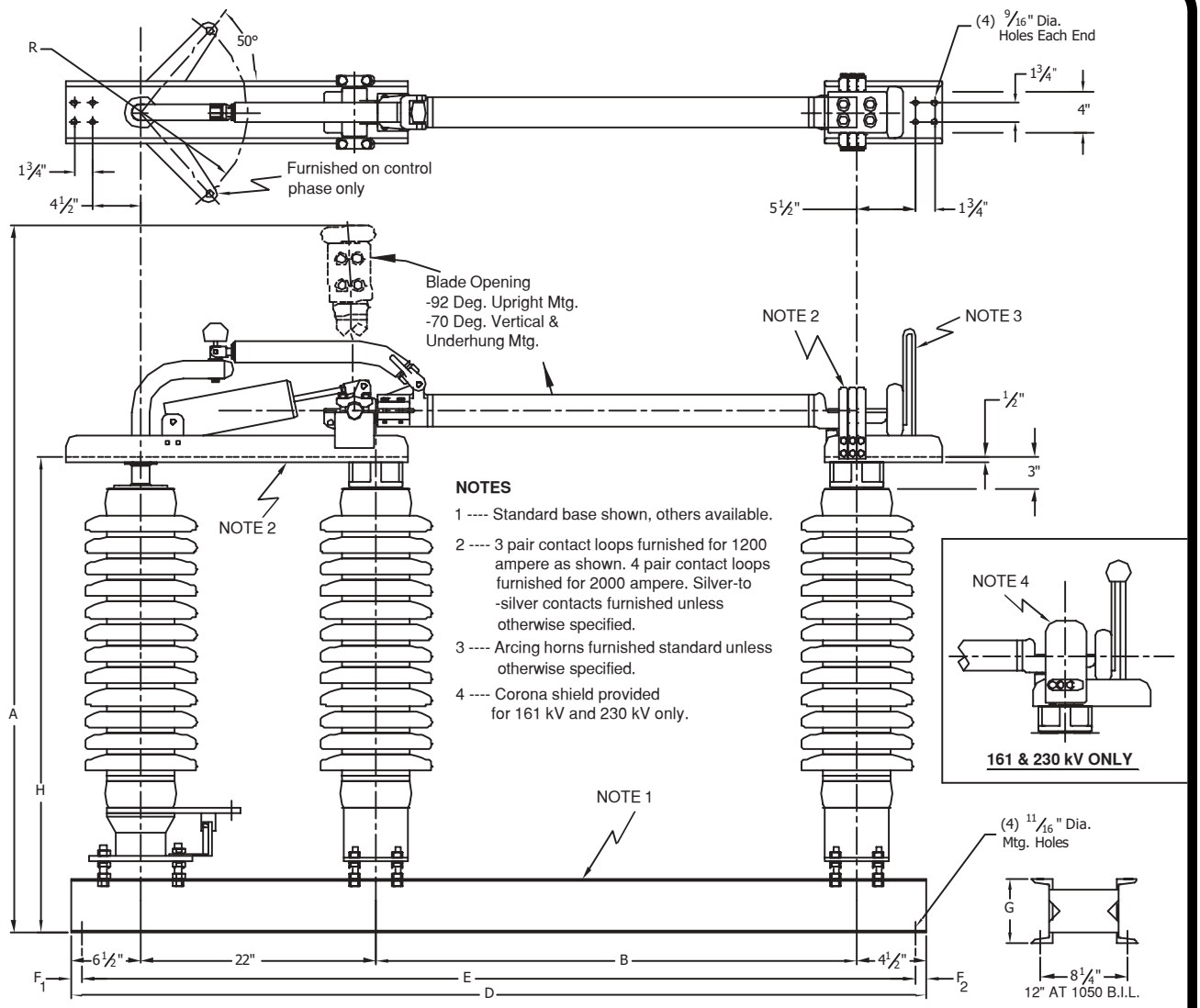
(1) Catalog numbers shown are with station post insulators.

(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 7EA1-12P5).

(3) Catalog numbers shown are for 1200 amps. For 2000 amps, change 12 to 20 in the catalog number as required (eg.: 8.2 kV-2000 A: Cat. No. 7EA1-20HP5).

Ampere Rating	Momentary Rating
1200A	61 KA
2000A	100 KA

Type EA1 8.2 kV - 72.5 kV 1200 and 2000 Ampere with optional extra strength insulators



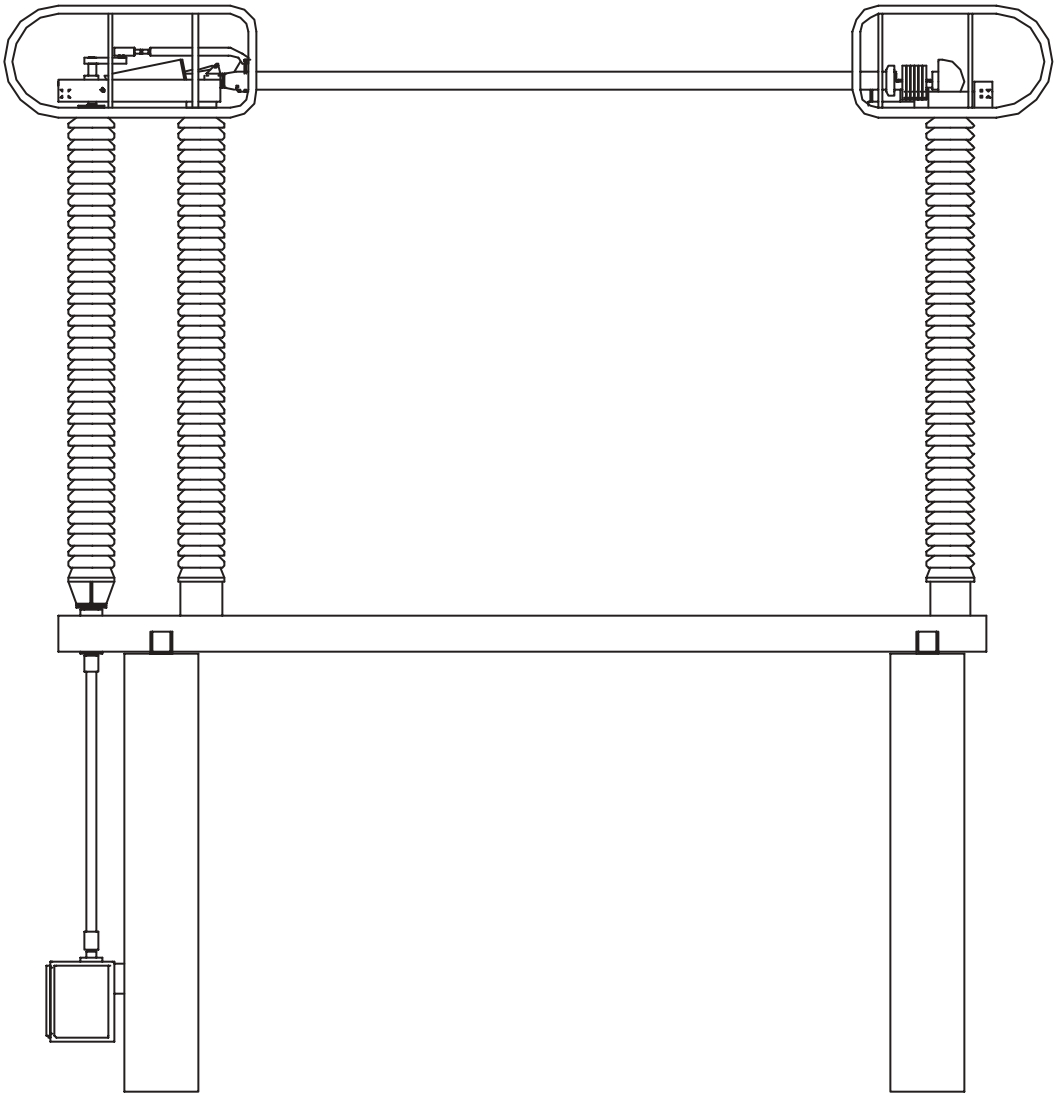
Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)								
Max.	BIL	(1) (2) (3)		A	B	D	E	F_1	F_2	G	H	R
72.5	350	69EA1-12HP5	278	100 1/4"	45"	78"	69"	4 1/2"	4 1/2"	5"	44 5/8"	10"
121	550	115EA1-12HP5	286	130 1/4"	60"	93"	87"	3"	3"	5"	59 5/8"	10"
145	650	138EA1-12HP5	288	151 1/4"	72"	105"	99"	3"	3"	5"	68 5/8"	10"
169	750	161EA1-12HP5	291	172 1/4"	84"	117"	111"	3"	3"	6"	77 5/8"	12"
242	900	230EA1-12HP5	REFER TO FACTORY	202 1/4"	96"	129"	123"	3"	3"	6"	95 5/8"	12"
242	1050	230EA1-12HP5S	312	232 1/4"	114"	147"	123"	3"	21"	6"	107 5/8"	12"

(1) Catalog numbers shown are with station post insulators.
(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 69EA1-12P5).
(3) Catalog numbers shown are for 1200 amps. For 2000 amps, change 12 to 20 in the catalog number as required (eg.: 72.5 kV-2000 A: Cat. No. 69EA1-20HP5).

Ampere Rating	Momentary Rating
1200A	61 KA
2000A	100 KA

Type EA1 72.5 kV - 242 kV 1200 and 2000 Ampere

Morpac Type EA2



Type EA2, Vertical Break Switch, 500-765 KV. 3000 to 4000 Amps.
4000 Amp. version shown with Morpac Motor Operator.

Type EA2

Type EA2, 550 to 765 kV Vertical Break Switch

Morpac Industries, Inc. has provided 765 KV vertical reach switches for over 30 years. Now with the introduction of the 765 KV EA2 switch, there are two types of switches available for 765 KV, the EA2 vertical break and the VR1 vertical reach. Morpac is the only US manufacturer to offer both a vertical reach and vertical break switch at 765. Refer to our catalog for information on the VR1 or contact us directly for more information on the VR1.

Morpac's experience at 765KV, its experience with vertical break switches at 500 KV and below, along with an increased market demand for 765 KV switches led logically to the development of a vertical break switch for 765 kV applications. Although the switch is relatively new, its design incorporates tried and true principles and has behind it over 50 years of vertical break switch design experience.

Our design goal was not to make the cheapest switch that would pass ANSI, but to design and build a competitive switch that not only passes ANSI but will last 75 years.

Features

- The EA2 is an aluminum, vertical break switch rated for 550 and 765 KV applications.
- Current ratings available are 3000 or 4000 amps.
- Jaw contacts are traditional reverse loop design.
- Hinge contacts are sealed, threaded, heavy silver plated copper studs.
- Sealed hinge contacts help provide superior ice breaking capabilities
- All contact points are silver to silver.
- The minimal use of castings in favor of extrusions and CNC produced parts make the EA2 a consistent, reliable, high quality, yet competitive switch.
- Time proven design features representing over 50 years experience in vertical break switches and over 30 years experience in building 765 KV switches.

Morpac is committed to building high quality, trouble free switches at competitive prices. For more information about this switch, please contact us.

Type EA1S and VBV

Morpac Vertical Break V Switches

Morpac offers two types of vertical break V style switches, The EA1S and the VBV. The VBV is a true vertical break V switch and the only true vertical break V switch available in the world. The EA1S is a slant V vertical break switch with conventional insulator arrangement on the hinge end but with a slanted insulator on the stationary, jaw contact end.

EA1S. The EA1S is an aluminum switch with all live parts common to the EA1. For further feature details refer to the EA1 section of this catalog. The shorter base of the EA1S allows for fitting in tight locations and may be ideal for substation voltage upgrade applications, since existing structures may not have to be changed to accommodate the longer bases required for conventional vertical break switches.

VBV. Morpac's vertical break VBV switch is a heavy duty, copper, substation class switch designed to the old 30 degree C rise standard. All current carrying parts are high conductivity copper or copper alloy. Contacts are silver to silver. Contact shoes are reverse loop design with stainless steel back up springs isolated from any current path. The VBV is a *true* "V" style vertical break switch. With a center of gravity within 5 % of its geometric center the VBV can be safely and securely mounted on a single beam unlike conventional vertical break switches.

Select the one best suited to your application:

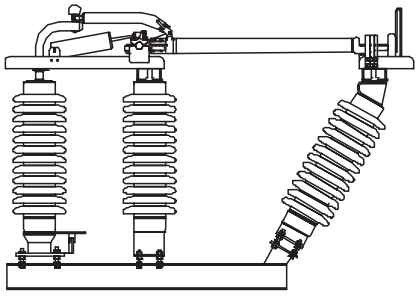
VBV

- Copper/ bronze construction
- Only true vertical break V switch available
- Silver to silver contacts
- Maintenance free bearings
- Available in ratings up to 245 kV, 2000A
- Small footprint allows switch to be mounted on single beam

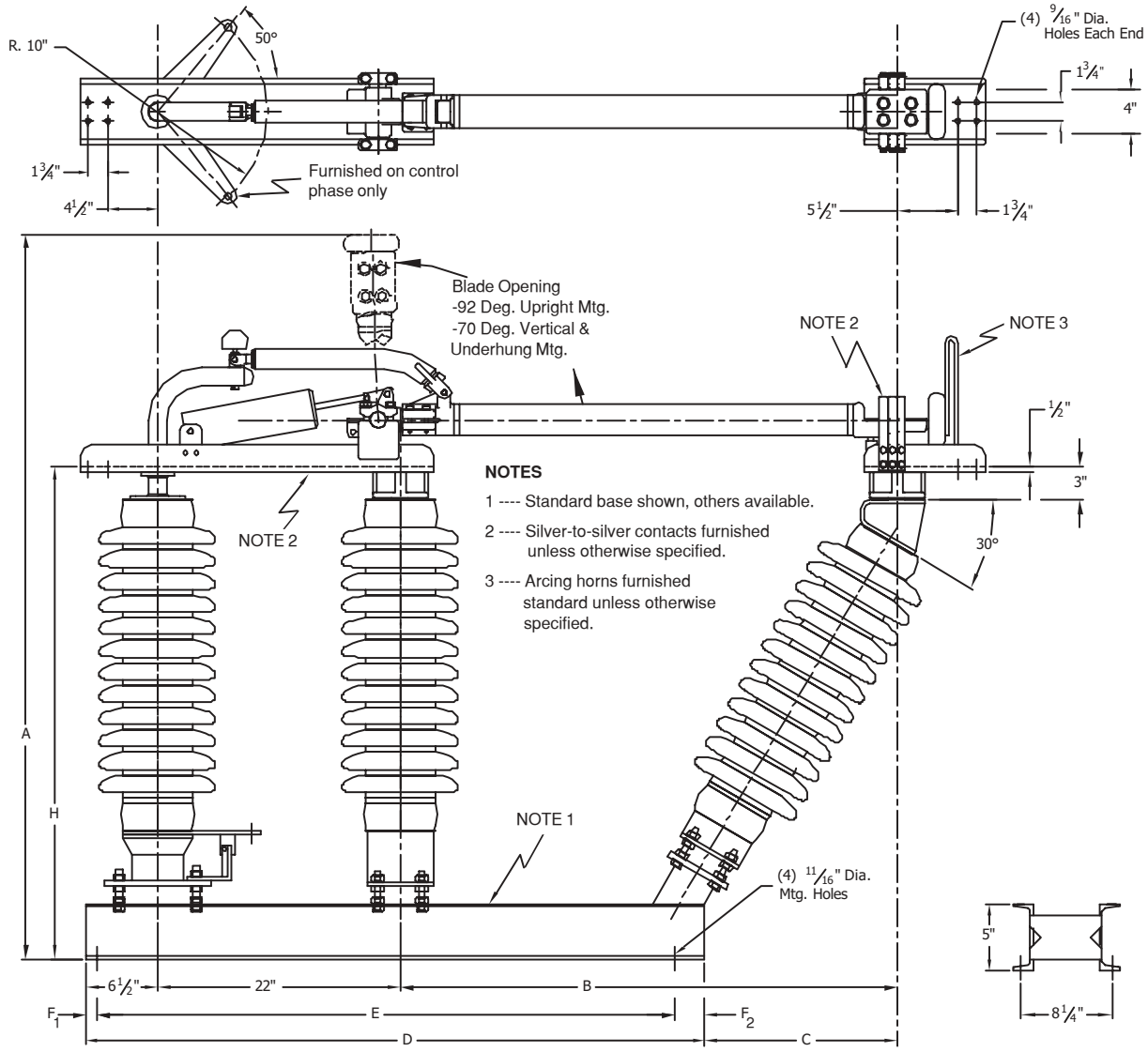
EA1S

- High conductivity aluminum
- V style, with short base but live parts from traditional EA1 line
- Silver to silver contacts
- Maintenance free bearings
- Available in ratings up to 245 kV, 2000A
- Short foot print allows fitting in tight locations.

Morpac type VBV, 72.5 kV, 1200A



Morpac Type EA1S



Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)							
Max.	BIL	(1) (2) (3)		A	B	C	D	E	F_1	F_2	H
72.5	350	69EA1S-12HP5	278	100 1/4"	45"	17"	56 1/2"	36"	4 1/2"	16"	44 5/8"
121	550	115EA1S-12HP5	286	130 1/4"	60"	25 1/2"	63"	54"	3"	6"	59 5/8"
145	650	138EA1S-12HP5	288	151 1/4"	72"	29 1/2"	71"	66"	3"	2"	68 5/8"

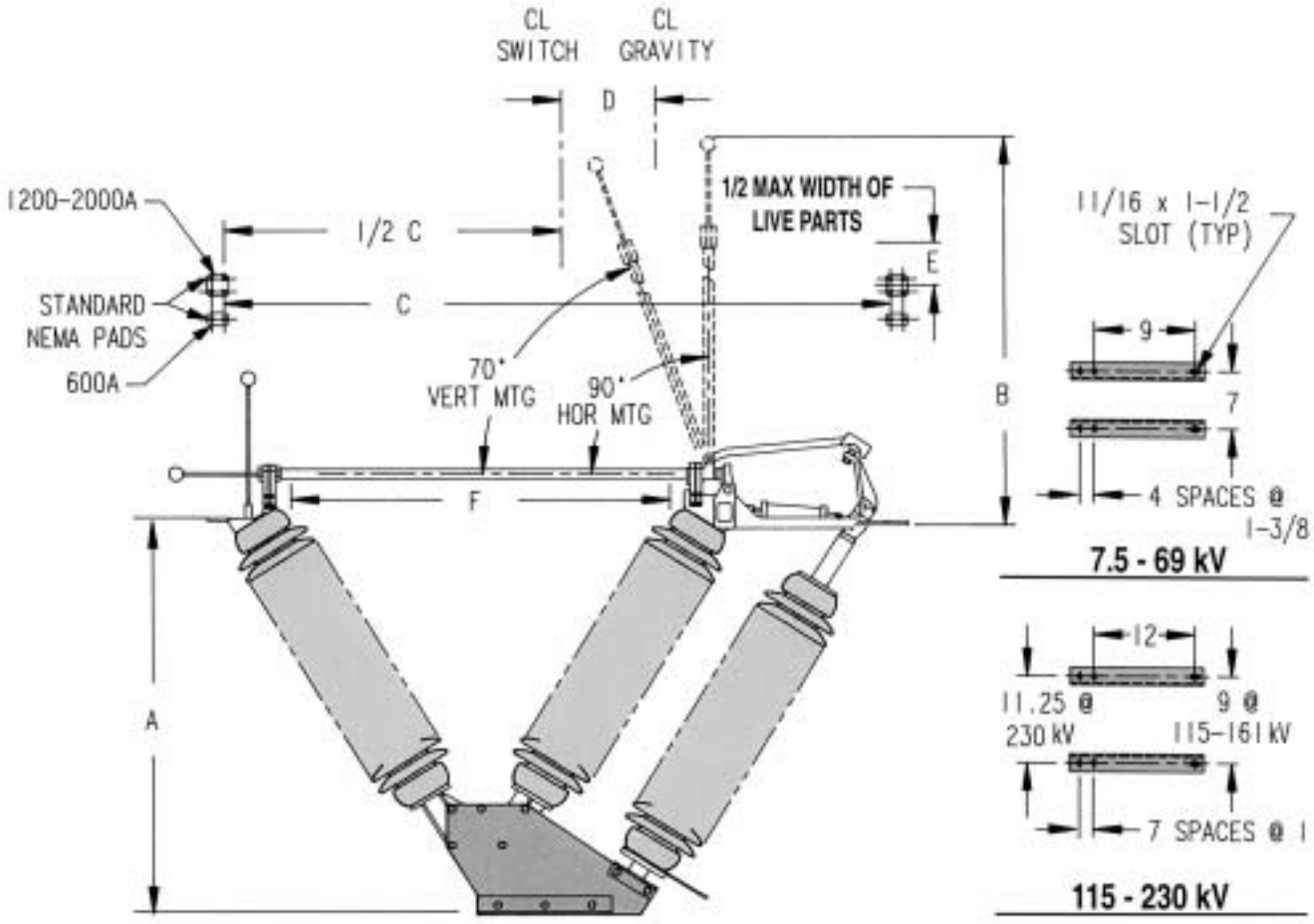
(1) Catalog numbers shown are with station post insulators.
(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 69EA1S-12P5).
(3) Catalog numbers shown are for 1200 amps. For 2000 amps, change 12 to 20 in the catalog number as required (eg.: 72.5 kV-2000 A: Cat No. 69EA1S-20HP5).

Ampere Rating	Momentary Rating
1200A	61 KA
2000A	100 KA

Type EA1S 72.5 kV - 145 kV 1200 and 2000 Ampere

Morpac Type VBV

Vertical Break "V" Group Operated Switch



MOUNTING DIMENSIONS
(ALL HOLES 11/16)

KV	INSULATOR	DIMENSIONS						WEIGHT/POLE		
		A	B	C	D	E	F	600A	1200A	2000A
7.5	TR-202	16	27½	37	1½	5½	13	127	133	389
15	TR-205	18	30	39½	1¾	5½	15¼	145	153	407
23	TR-208	21½	34	43½	2	5½	19¼	174	189	442
34.5	TR-210	25¼	38	47½	2½	5½	23¼	203	211	465
46	TR-214	28½	42	51½	3	5½	27¼	243	253	503
69	TR-216	35¼	48	59½	3½	5½	33¼	293	334	553
115	TR-286	55½	82	92¾	2	7½	54	719	736	869
138	TR-288	62¾	93	102¼	3	7½	63½	803	820	945
161	TR-291	67½	99	108½	4	7½	72	865	884	1003
230	900 BIL	82½	114	128	9¼	8	88	1390	1413	1537
230	1050 BIL	89½	126	140	10	8	100¾	1565	1590	1715

MORPAC INDUSTRIES, INC.

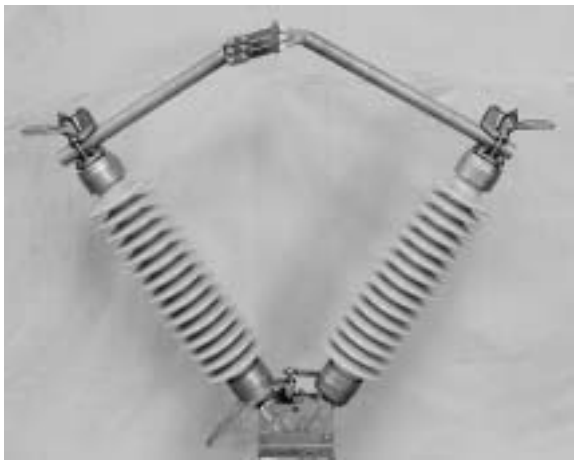
MEMCO POWER PRODUCTS DIVISION

TYPE EE and EEB CENTER-SIDE-BREAK SWITCH
TYPE VEE and CBV CENTER BREAK "V" SWITCH

1200, 1600, 2000 & 3000 Amperes
7.5 through 362 kV

TYPE EE

TYPE CBV



Type EE

GENERAL DESIGN FEATURES

The EE center-side-break switch is a two insulator switch with both insulator stacks rotating for operation. The design of the live parts is essentially aluminum with properly treated copper utilized where necessary to achieve MEMCO's time proven concept of **silver-to-copper** at all moving contacts.

The EE center-side-break when furnished with arcing horns or quick-break attachment can be used for line sectionalizing, by passing circuit breakers or opening magnetizing current of transformers. Without arcing horns it can be used for isolating breakers or as a disconnecting switch.

ADVANTAGES

Economical – The EE center-side-break is more economical than a vertical-break or a double-side-break switch because it requires one less insulator per phase or three per switch.

Self-balancing – Inherent self-balancing design eliminates the need for counter-balancing springs except in special applications.

Low operating effort – Inherent design requires less operating effort for a given rating than an equivalent vertical-break or side-break switch.

Contact engagement – Full contact engagement easily seen from ground position.

INDUSTRY STANDARDS

The EE center-side-break switch is designed in accordance with latest industry standards. It is also available when specified based upon past industry standards which limit temperature rise to 30˚C over an ambient of 40˚ C.

SWITCH OPERATION

Opening and closing of the EE switch is accomplished by rotation of the vertical control pipe.
This rotary motion results in a push-pull motion of the interphase of the insulator stack. Both insulators of each phase are rotated simultaneously in opposite directions by the connecting rod between them. When in the open position each blade has moved 90˚.

Type EE

1200 Ampere Jaw - Partially Open

2000 Ampere Jaw - Closed Position

DETAILS

High-strength, high-conductivity aluminum is used where practical throughout the live parts. Wherever copper-to-aluminum transitions are made the copper is tinned and an oxide inhibitor compound is used to provide an efficient transition.

CONTACTS

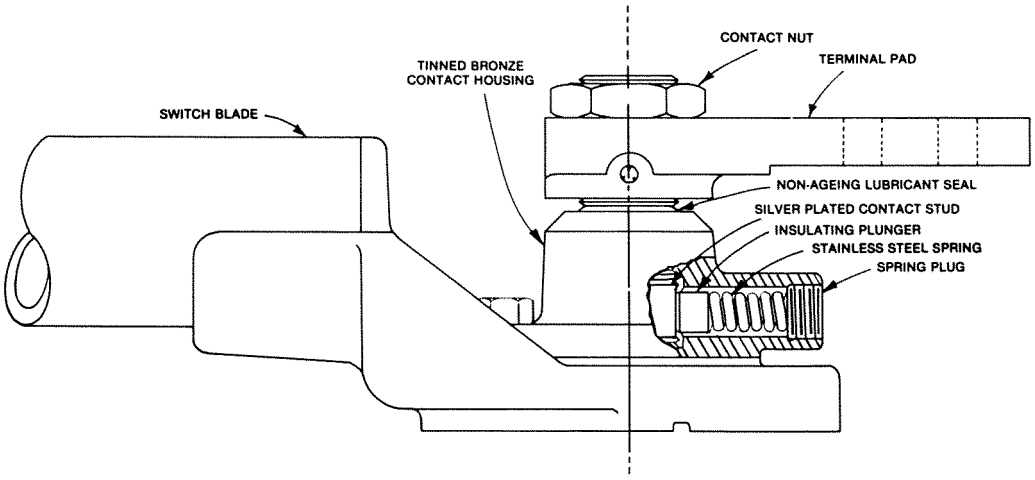
The male contact has a tinned copper bar securely bolted to the aluminum casting welded to the tubular blade. The tinned copper bar has a silver overlay brazed along each make-break surface.

The female contact has special, high temperature resistant, copper alloy reverse-loop contact fingers which are bolted to a rugged aluminum jaw casting. Because of the excellent mechanical, electrical and thermal properties of the reverse-loop material there is no need for back-up springs or other pressure compensating devices commonly found on other switches.

The reverse loop configuration utilizes the magnetic forces produced during fault conditions to increase contact pressure.

2000 Ampere Jaw - Partially Open

Type EE



HINGE ARRANGEMENT

HINGE

The hinge contact is sealed with a non-ageing lubricant. Current transfer is through the threaded contact surfaces of a silver plated copper stud and its mating tinned bronze contact housing. High pressure is established and maintained by a stainless steel spring, electrically isolated from the current path. This time proven arrangement has been used by MEMCO since the mid 1950's.

TERMINAL PADS

All ratings of the EE switch have 4" x 4" aluminum terminal pads with NEMA standard 1 3/4" x 1 3/4" drilling for four (4) 1/2" bolts.

Terminal Pad Arrangement

Type EE

LEVELING BOLTS

All switches are furnished with four leveling bolts per bearing to provide fast, effective means of aligning insulator stacks in the field.

SWITCH BASES

Rigid double-channel galvanized steel bases are normally provided on all EE switches. The rigid trussed construction of the bases assures perfect alignment of the insulators and smooth operation of the switch. An equivalent aluminum base is available when specified.

INSULATORS

Industry standard station post or cap and pin insulators are normally provided. Others are available when specified.

BEARINGS

Maintenance free stainless steel bearings with stainless steel races within a galvanized housing are provided at the base of each insulator.

OPERATING MECHANISM

Each three pole, group operated type EE switch is furnished complete with an operating mechanism for either manual or motor operation depending on customer specification. Unless otherwise specified by customer, manually operated switches are furnished with a swing handle at 169 kV and below. AT 242 kV a worm-gear mechanism replaces the swing handle.

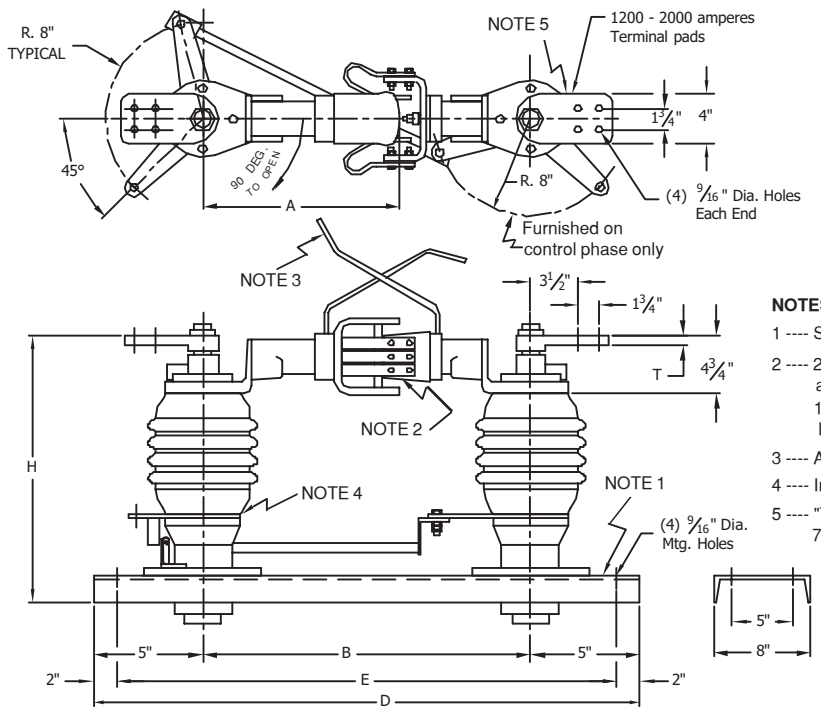
Each operating mechanism is designed to fit the customers support structure. Included with the operating mechanism are vertical pipe, connecting rods, interphase rods, outboard bearing, open-close position indicator, flexible ground strap and provision for customer's padlock. Other accessories such as auxiliary switches and interlocks can be provided at an added cost.

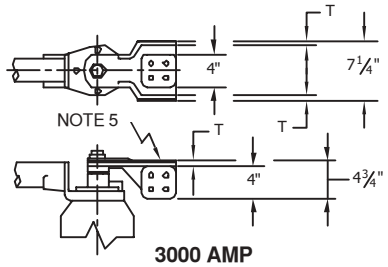
FIELD INSTALLATION

The simplicity of the EE center-side-break switch design assures ease of installation and years of trouble-free service.

ACCESSORIES

Ground switches, quick break attachments, outriggers, spill gaps, along with terminal connectors, motor mechanisms and pole top frames are available on request.





3000 AMP
TERMINAL PADS

(12) 9/16" DIA. HOLES AT1-3/4" CENTERS EA. END

NOTES

1 ---- Standard base shown, others available.

2 ---- 2 pair contact loops furnished for 1200 ampere as shown. 3 pair contact loops furnished for 1600 ampere and 2000 ampere; 4 pair contact loops for 3000 ampere.

3 ---- Arcing horns furnished only when specified.

4 ---- Insulator leveling screws provided at 69 kV only.

5 ---- "T" = terminal pad thickness's are 5/8" for 1200 amperes, 7/8" for 1600 and 2000 amperes; 5/8" for 3000 amperes.

Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)				
Max.	BIL	(1) (2) (3)		A	B	D	E	H
8.2	95	7EE-12HP5	222	16 1/4"	27"	37"	33"	21 1/2"
15.5	110	15EE-12HP5	225	16 1/4"	27"	37"	33"	23 1/2"
25.8	150	23EE-12HP5	227	16 1/4"	27"	37"	33"	26 1/2"
38	200	34EE-12HP5	231	16 1/4"	27"	37"	33"	31 1/2"
48.3	250	46EE-12HP5	267	19 1/4"	33"	43"	39"	35 1/2"
72.5	350	69EE-12HP5	278	25 5/8"	45"	55"	51"	42 1/2"

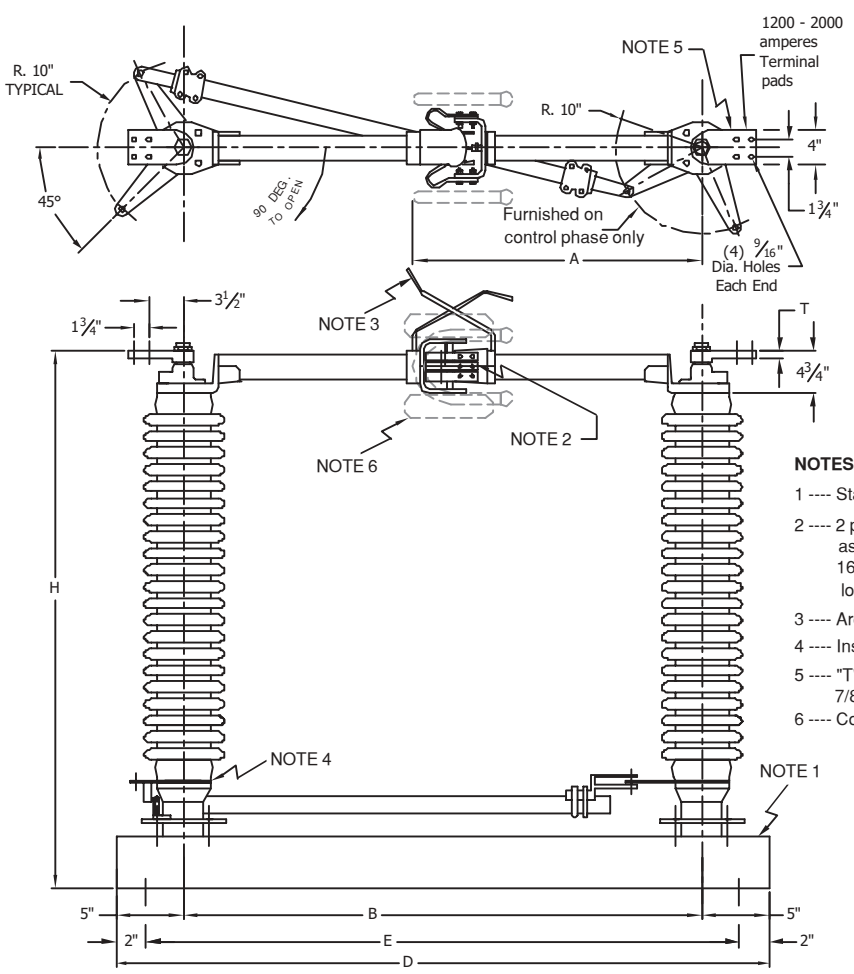
(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 7EE-12HC5).

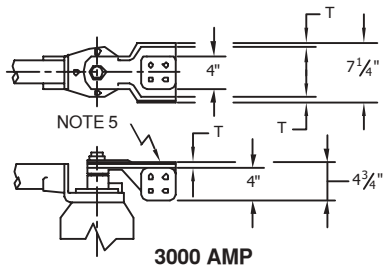
(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 7EE-12P5).

(3) Catalog numbers shown are for 1200 amps. For 1600, 2000, or 3000 amps, change 12 to 16, 20 or 30 in the catalog number as required (eg.: 8.2 kV-2000 A: Cat. No. 7EE-20HP5).

Ampere Rating	Momentary Rating
1200A	61 KA
1600A	70 KA
2000A	100 KA
3000A	120 KA

Type EE 8.2 kV - 72.5 kV 1200 thru 3000 Ampere





3000 AMP TERMINAL PADS

(12) 9/16" DIA. HOLES AT1-3/4" CENTERS EA. END

NOTES

1 ---- Standard base shown, others available.

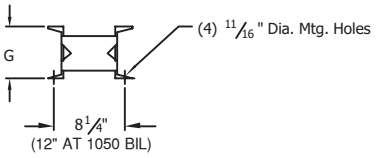
2 ---- 2 pair contact loops furnished for 1200 ampere as shown. 3 pair contact loops furnished for 1600 ampere and 2000 ampere; 4 pair contact loops for 3000 ampere.

3 ---- Arcing horns furnished only when specified.

4 ---- Insulator leveling screws provided at 69 kV only.

5 ---- "T" = terminal pad thickness's are 5/8" for 1200 amperes, 7/8" for 1600 and 2000 amperes; 5/8" for 3000 amperes.

6 ---- Corona rings furnished for 230 and 345 kV only.



Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions in Inches (Refer to Factory for Certified Prints)					
Max.	BIL	(1) (2) (3)		A	B	D	E	G	H
72.5	350	69EE-12HP5	278	25 5/8"	45"	55"	51"	6"	46 3/8"
121	550	115EE-12HP5	286	33 1/8"	60"	76"	72"	6"	60 7/8"
145	650	138EE-12HP5	288	39 1/8"	72"	88"	84"	6"	66 3/8"
169	750	161EE-12HP5	291	45 1/8"	84"	100"	96"	6"	75 3/8"
242	900	230EE-12HP5	304	53 1/8"	96"	108"	104"	6"	89 7/8"
242	1050	230EE-12HP5	316	60 1/8"	114"	126"	122"	8"	111 3/8"
362	1300	345EE-12HP5	367	62 3/8"	136"	152"	148"	8"	113 3/8"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 7EE-12HC5).

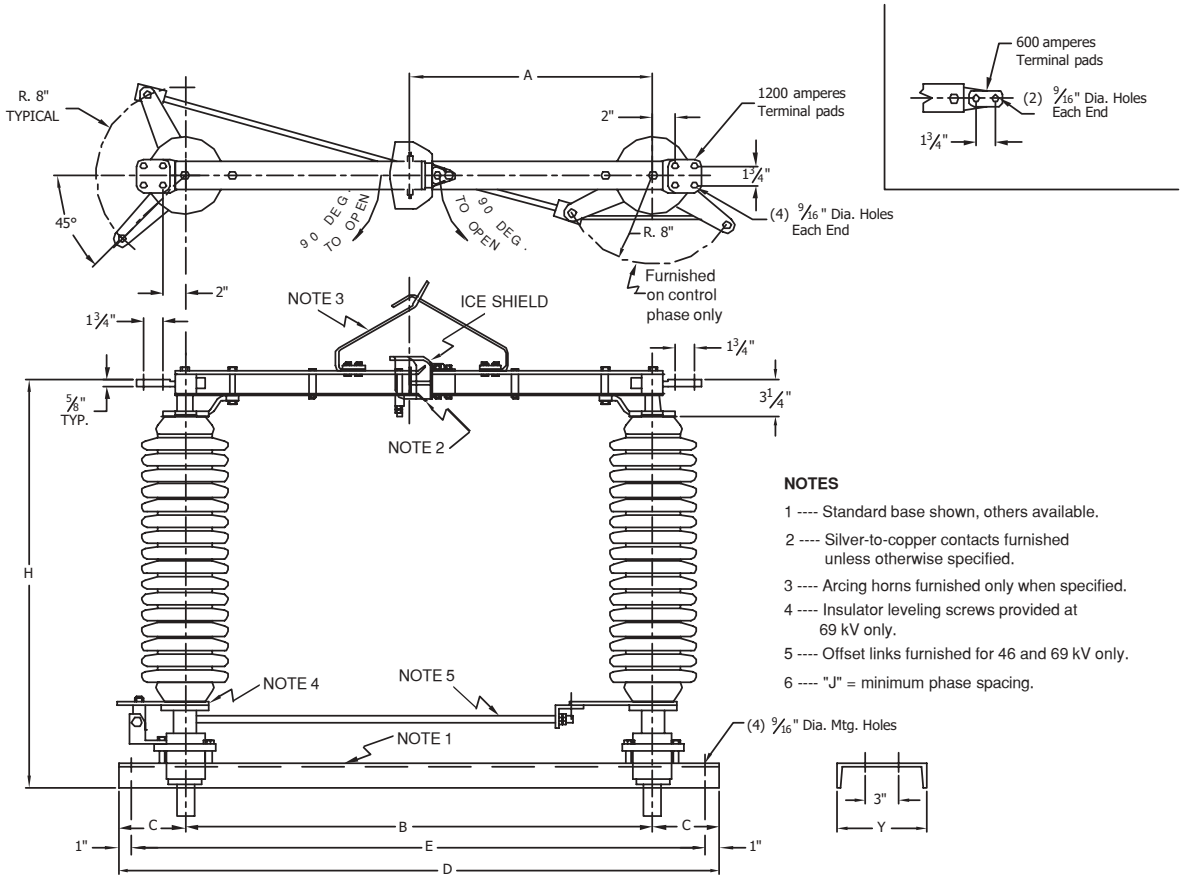
(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 7EE-12P5).

(3) Catalog numbers shown are for 1200 amps. For 1600, 2000, or 3000 amps, change 12 to 16, 20 or 30 in the catalog number as required (eg.: 8.2 kV-2000 A: Cat. No. 7EE-20HP5).

Ampere Rating	Momentary Rating
1200A	61 KA
1600A	70 KA
2000A	100 KA
3000A	120 KA

Type EE 72.5 kV - 362 kV 1200 thru 3000 Ampere

Type EEB



NOTES

1 ---- Standard base shown, others available.

2 ---- Silver-to-copper contacts furnished unless otherwise specified.

3 ---- Arcing horns furnished only when specified.

4 ---- Insulator leveling screws provided at 69 kV only.

5 ---- Offset links furnished for 46 and 69 kV only.

6 ---- "J" = minimum phase spacing.

Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions in Inches (Refer to Factory for Certified Prints)							
Max.	BIL	(1) (2) (3)		A	B	C	D	E	H	J	Y
8.2	95	7EEB-6P3	202	10 1/8"	18"	5 1/2"	29"	27"	17 1/4"	21"	6"
15.5	110	15EEB-6P3	205	10 1/8"	18"	5 1/2"	29"	27"	19 3/4"	26"	6"
25.8	150	23EEB-6P3	208	10 1/8"	18"	5 1/2"	29"	27"	23 3/4"	29"	6"
38	200	34EEB-6P3	210	13 1/8"	24"	5 1/2"	35"	33"	27 3/4"	35"	6"
48.3	250	46EEB-6P3	214	16 1/8"	30"	6 1/2"	43"	39"	31 3/4"	42"	6"
72.5	350	69EEB-6P3	216	22 1/8"	42"	6 1/2"	55"	51"	41"	58"	8"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 7EEB-6C3).

(2) Catalog numbers shown are for 30° rise ANSI-C37.37 ACCC designation A01.

(3) Catalog numbers shown are for 600 amps. For 1200 amps, change 6 to 12 in the catalog number as required (eg.: 8.2 kV-1200 A: Cat. No. 7EEB-12P3).

Ampere Rating	Momentary Rating
600A	40 KA
1200A	61 KA

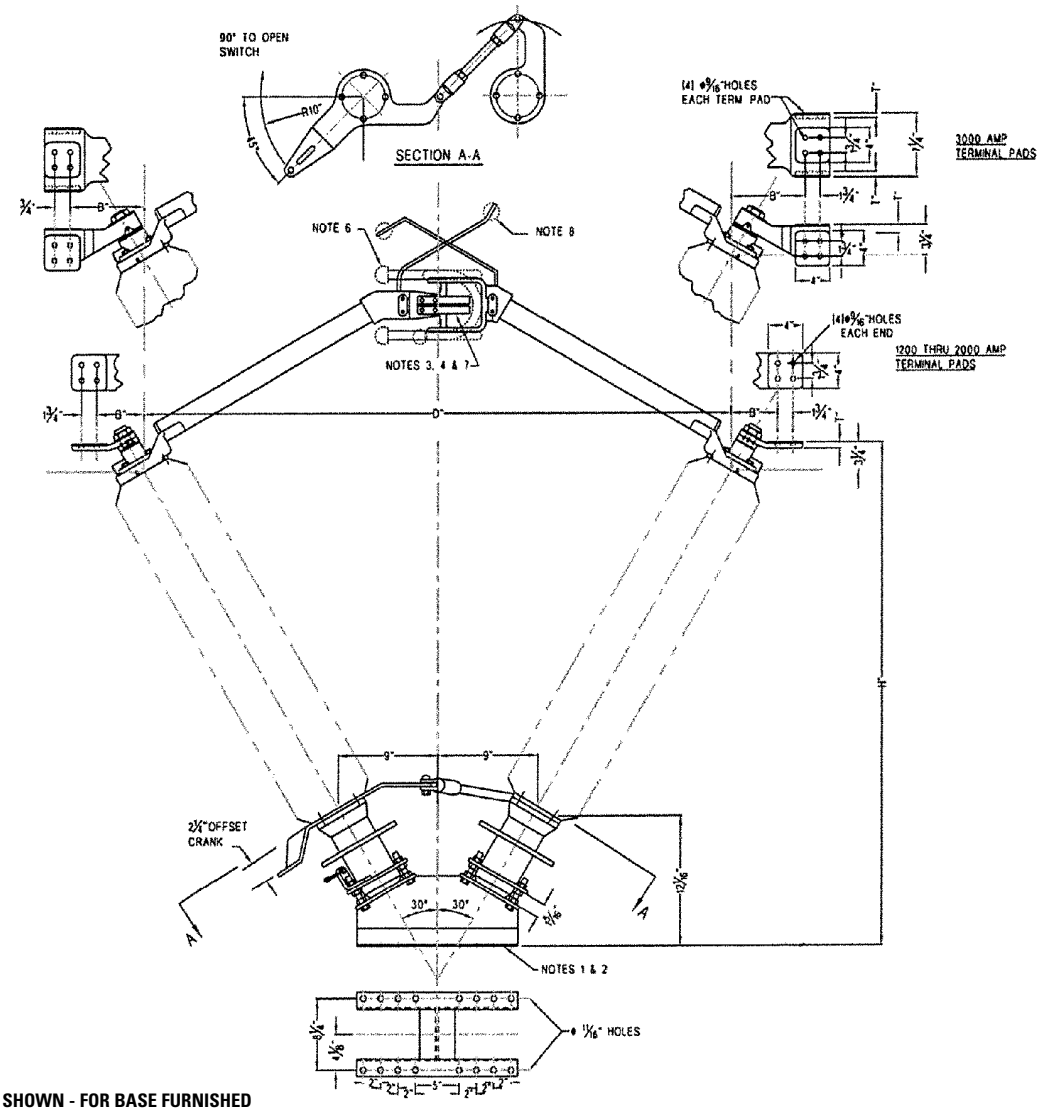
The EEB is an economical, copper/bronze double side break, with bearings, contacts and blades similar to those used on the R14C.

Type EEB 8.2 kV - 72.5 kV 600 and 1200 Ampere

Type VEE

Aluminum Center Break "V" Switch

The type VEE incorporates all of the design features of the EE Switch except for its "V" configuration which provides a compact base where installation requirements may be tight. Available in aluminum only.



NOTES:

1) STANDARD BASE SHOWN - FOR BASE FURNISHED SEE SWITCH OPERATING MECH. DWG.
2) ALL FERROUS PARTS H.D. GALVANIZED.
3) SILVER - TO - COPPER CONTACTS FURNISHED UNLESS OTHERWISE SPECIFIED.
4) SWITCH FURNISHED WITH COPPER CONTACT LOOPS AND BLADE ENDS. OTHER PARTS ALUMINUM.
5) CURRENT RATING BASED ON ANSI C 37.30-1971
6) CORONA RINGS FURNISHED FOR 230KV RATING ONLY.
7) 2 PAIR CONTACT LOOPS FURNISHED FOR 1200 AMP AS SHOWN.
   3 PAIR CONTACT LOOPS FURNISHED FOR 1600 & 2000 AMP
   4 PAIR CONTACT LOOPS FURNISHED FOR 3000 AMPS
8) ARC HORNS FURNISHED ONLY WHEN SPECIFIED.

AMPERE RATING	MOMENTARY RATING T"	TERM. PAD THICKNESS B"	TERM. PAD LOCATION
1200 A	61 KA	3/4"	5 1/4"
1600 A	70 KA	7/8"	5 1/4"
2000 A	100 KA	7/8"	5 1/4"
3000 A	120 KA	5/8"	8 1/2"

ITEM	KV		CAP & PIN INSUL'S		STA. POST INSUL'S		DIMENSIONS IN INCHES						
NO.	RATING	BIL	SWITCH CAT. No.	TR.No.	SWITCH CAT. No.	TR. No.	H	D					
1	69	350	69 VEE - 12 HC5	56	69 VEE - 12 HP5	278	41-1/4	48-5/16					
2	115	550	115 VEE - 12 HC5	19	115 VEE - 12 HP5	286	54-1/4	63-5/16					
3	138	650	138 VEE - 12 HC5	22	138 VEE - 12 HP5	288	62	72-5/16					
4	161	750	161 VEE - 12 HC5	25	161 VEE - 12 HP5	291	69	80-5/16					
5	230	900	230 VEE - 12 HC5	126	230 VEE - 12 HP5	304	84-1/2	98-5/16					

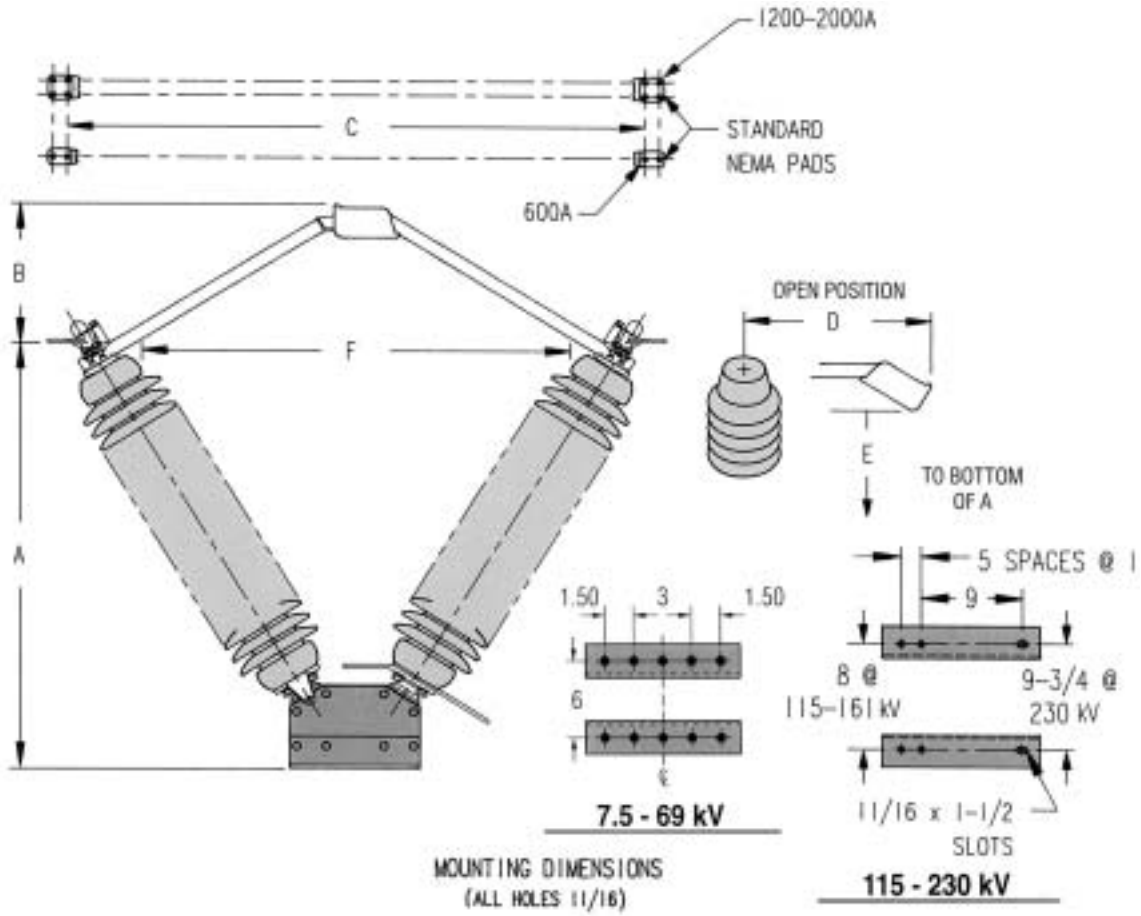
NOTE: CATALOG No.'s SHOWN ARE FOR 1200 AMPS - FOR 1600, 2000 OR 3000 AMPS. CHANGE 12 TO 16, 20 OR 30 IN CATALOG No. AS REQUIRED. EXAMPLE: 161 KV - 2000 A, CAT. No. 161 VEE - 20 HPS

Morpac Type CBV

Copper Center Break "V" Switch

CENTER BREAK "V"

The Morpac center break "V", designated Type CBV, is a heavy duty, substation class, 30° C rise, maintenance free disconnect switch for outdoor installation. The switch is designed for group operation, and is used in all types of electrical power circuits from 7.5 kV to 230 kV, with continuous current ratings from 600 to 2000 amperes. The compact base design and symmetrical features are ideal for direct pole mounting (phase over phase and center phase opposite), cross arm mounting, and substation installations where a massive support structure is not desirable.

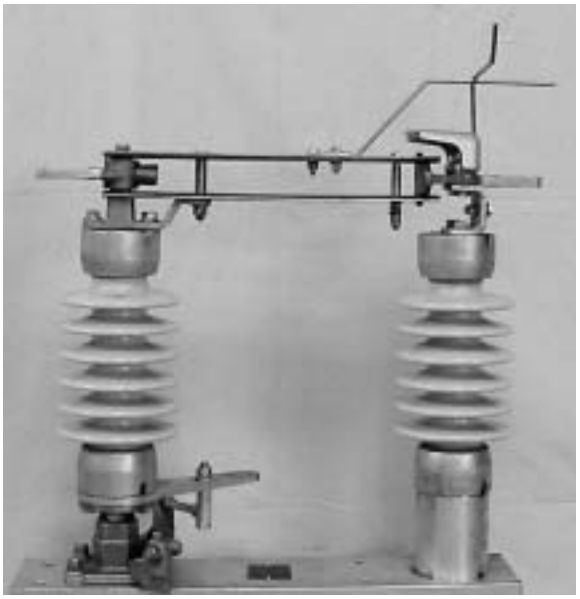


kV	INSULATOR	DIMENSIONS						WEIGHT/POLE		
		A	B	C	D	E	F	600A	1200A	2000A
7.5	TR-202	15¼	2¼	25	11½	11	10¼	72	88	132
15	TR-205	17½	3½	27¾	13½	13¼	13½	84	100	145
23	TR-208	21	4	31¼	15½	18¼	17½	107	124	170
34.5	TR-210	24	8	36½	19	21	21	124	130	189
46	TR-214	28¼	5½	41	20	23	25¾	174	195	512
69	TR-216	35¼	11	48½	25½	30½	32	235	238	254
115	TR-286	53	17	73	41	50	55	447	465	501
138	TR-288	60¼	24	84	47	54	61½	497	524	561
161	TR-291	67¼	29	90½	50	61	70	535	566	605
230	900 BIL	89	35	110	61	88	93	894	929	971
230	1050 BIL	98½	40	126	68	98	105	1022	1058	1110

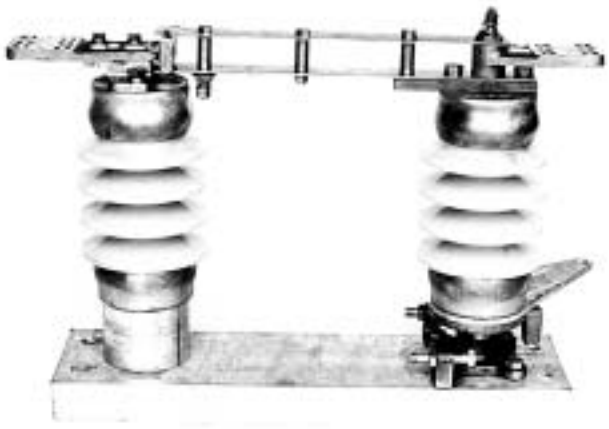
SIDE BREAK SWITCHES TYPES R14C and CSB

Ratings from 7.5 KV to 69 KV 600 and 1200 Amps

R14C



CSB



Type CSB 15kV, 1200 ampere

Type R14-C

The type R14-C is a three pole, single throw side-break, outdoor disconnect switch available in ratings up to 72.5 kV at 600 and 1200 amps. The R14-C is an all copper switch with high conductivity copper blades and silver inlaid stationary contacts.

BLADE

Parallel copper bar construction formed and trussed for maximum rigidity. Special forming provides four high pressure contact points. Pressure is supplied by stainless steel compression springs.

To reduce operating effort at 69 kV, the blades are articulated to create a whip effect when closing. This insures positive and consistent closing. Blades for 48.3 kV do not require articulation to insure positive closing.

JAW CONTACT

Cast copper, high conductivity alloy terminal, bayonet style with silver inlay brazed to the contact surfaces.

HINGE CONTACT

Threaded copper stud with heavy silver plate, completely sealed and enclosed. Contact pressure is provided by a stainless steel compression spring to insure continuous contact throughout the range of operation. No maintenance is required for the hinge contact.

MOUNTING

The R14-C is suitable for horizontal, vertical or underhung mounting on wood or steel structures.

BASE

Galvanized structural channel base is standard. Aluminum bases available as an option

ROTATING INSULATOR BEARING

Sleeve type sintered bronze bearings are used on switches up to 48.3 KV. Stainless steel ball and race bearings are used on 69 kV switches.

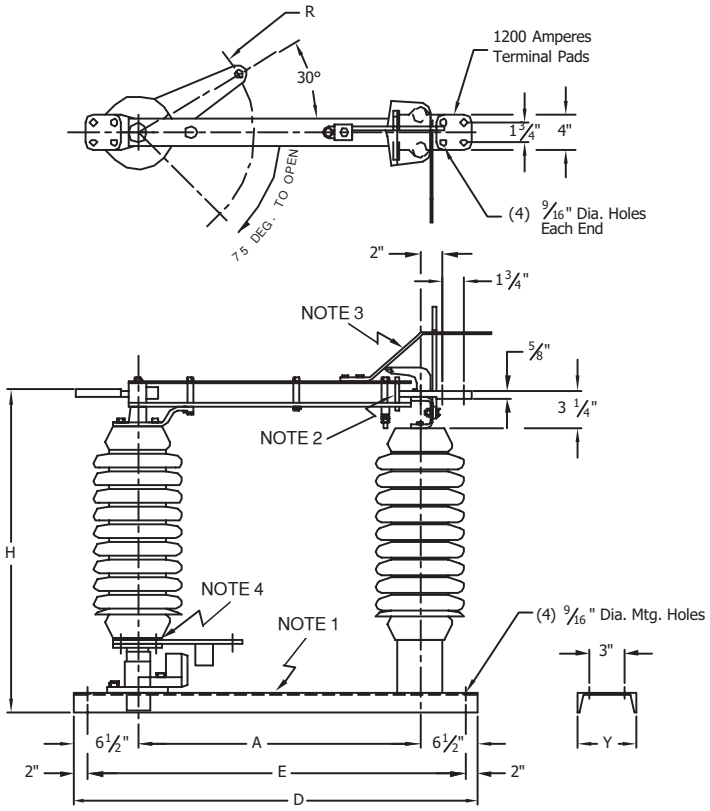
R14-C with optional arcing horns

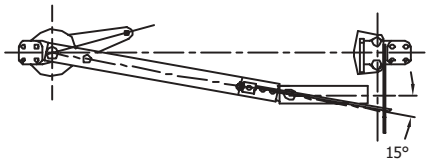
ASSEMBLY

Switches rated 48.3 kV and below are shipped completely assembled on insulators, standard. Assembly on insulators is offered as an option at 69 kV.

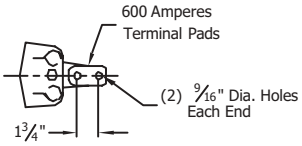
ACCESSORIES

Ground switch, arc horns, motorized operation, outriggers, auxiliary switches and much more.





TOGGLE-ACTION BLADE TIP FOR 69 kV ONLY



NOTES

1 ---- Standard base shown, others available.

2 ---- Silver-to-copper contacts furnished unless otherwise specified.

3 ---- Arcing horns furnished only when specified.

4 ---- Insulator leveling screws provided at 69 kV only.

Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)					
Max.	BIL	(1) (2) (3)		A	D	E	H	R	Y
8.2	95	7R14C-6P3	202	15"	28"	24"	17"	8"	5"
15.5	110	15R14C-6P3	205	15"	28"	24"	19 1/2"	8"	5"
25.8	150	23R14C-6P3	208	18"	31"	27"	23 1/2"	8"	5"
38	200	34R14C-6P3	210	24"	37"	33"	27 1/2"	10"	6"
48.3	250	46R14C-6P3	214	30"	43"	39"	31 3/4"	10"	6"
72.5	350	69R14C-6P3	216	42"	55"	51"	41"	10"	8"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 7R14C-12C3).

(2) Catalog numbers are for 30° rise ANSI-C37.37 ACCC designation A01.

(3) Catalog numbers shown are for 600 amps. For 1200 amps, change 6 to 12 in the catalog number as required (eg.: 8.2 kV-1200 A: Cat. No. 7R14C-12P3).

Ampere Rating	Momentary Rating
600A	40 KA
1200A	61 KA

Type R14C 8.2 kV - 72.5 kV 600 and 1200 Ampere

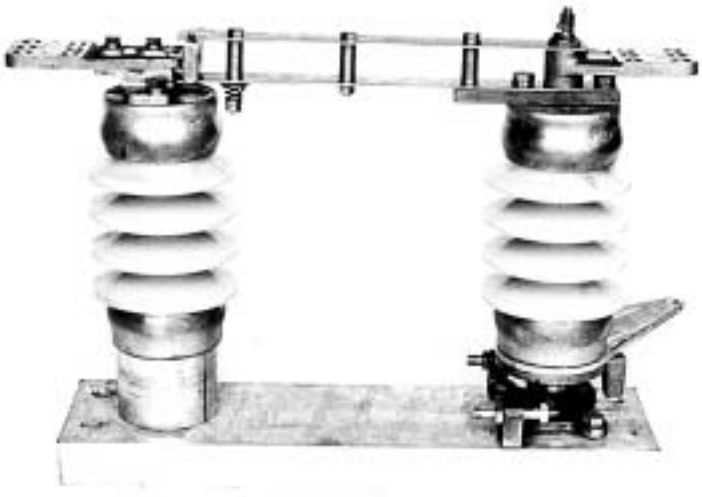
Morpac Type CSB

SIDE BREAK SWITCH

The Morpac Type CSB is designed for substation and distribution use., Engineered to meet the original ANSI 30 degree rise standard, it is a high quality copper switch manufactured to the stringent standards of all Morpac switches.

Current carrying parts are high conductivity copper or copper alloy. The large cross-sectional areas plus a minimum of current interchange surfaces provide a low resistance current path. Both contact surfaces are plated with high-density silver which prevents galling and assures good electrical contact under corrosive conditions. The bearing consists of a cold rolled C1018 shaft running through oilite bushings (roller bearing available), creating a maintenance free bearing for the life of the switch.

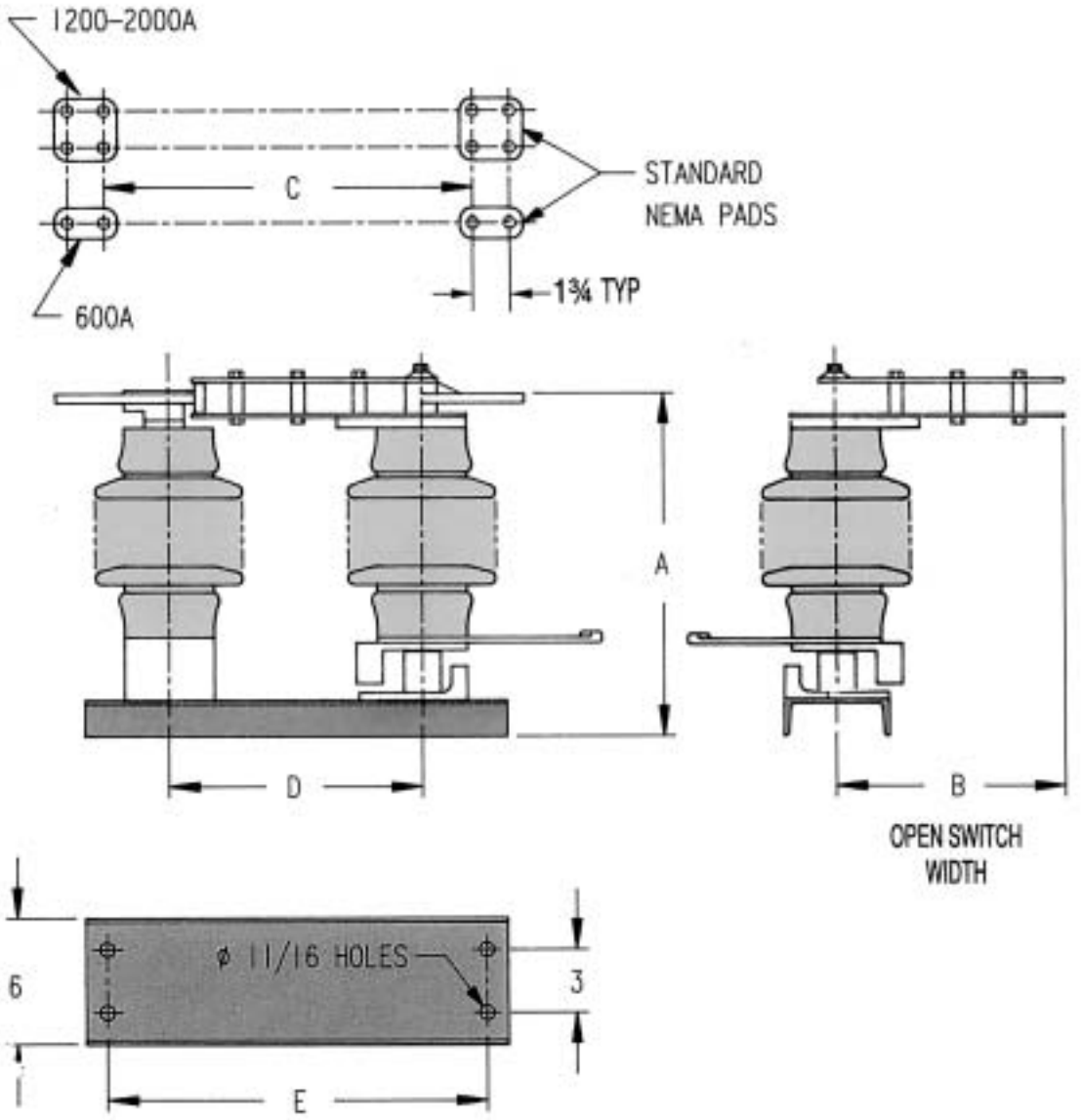
The switch is designed to meet all applicable NEMA and ANSI standards. All live parts hardware is stainless steel/non-ferrous. Tinned terminal pads are available upon request.



Type CSB 15kV, 1200 ampere

Morpac Type CSB

Side Break Group Operated Switch



KV	INSULATOR	DIMENSIONS					WEIGHT/POLE	
		A	B	C	D	E	600A	1200A
7.5	TR-202	14	11	17½	12	18	55	61
15	TR-205	16½	14	20½	15	21	69	76
23	TR-208	20½	17	23½	18	24	93	97
34.5	TR-210	24½	23	29½	24	30	114	121
46	TR-214	28½	29	35½	30	38	148	155
69	TR-216	36½	41	47½	42	48	228	235

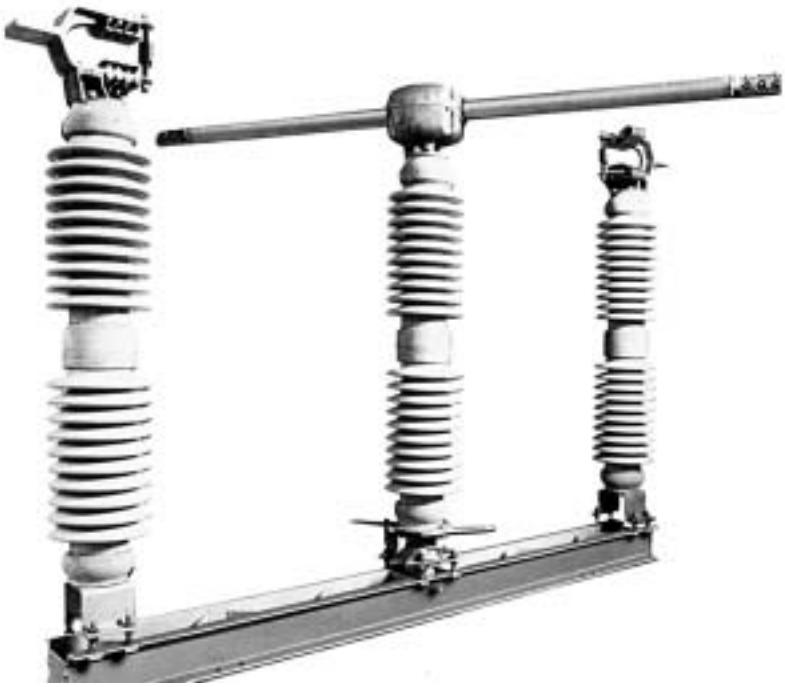
MORPAC INDUSTRIES, INC.

MEMCO POWER PRODUCTS DIVISION

Type EB, EBB, EBF and VEB

DOUBLE SIDE BREAK SWITCHES

38 kV through 362 kV
600 to 3000 Ampere



TYPE EB

Type EB, EBB (VEB)

GENERAL DESIGN FEATURES

Type EB – Aluminum Double Side Break Switch

72 kV through 362 kV
1200, 1600, and 3000 Ampere

The EB rotating center insulator, double side break switch embodies all of the rugged physical characteristics of the Memco product line. The design utilizes the best features of both copper and aluminum in the live parts, maintaining the time proven concept of silver to copper at all moving contacts. The result is a truly high performance switch.

APPLICATION: With arcing horns, it can be used for line sectionalizing, by-passing circuit breakers, or opening magnetizing current of transformer primary connections. Without arcing horns, it can be used for isolating breakers or as a disconnecting switch.

FEATURES

• Current Carrying Parts

High strength, high conductivity aluminum is used where practical throughout the live parts. The blade is a one piece aluminum tube with aluminum castings welded to each end. A tinned copper contact piece having a silver strip brazed to each edge is bolted between the two halves of each weldment and the joint is effectively sealed with an inhibiting compound to prevent the entrance of moisture. The switch is designed in accordance with latest ANSI standards. It is also available, when specified, based upon past industry standards which limit temperature rise to 30˚C over an ambient of 40˚C.

• Jaw Contacts

The jaw contacts employ special high temperature resistant, copper alloy contact fingers. This material, possessing excellent spring characteristics and high conductivity, makes an ideal self contained contact. There is no need for back-up springs or other pressure compensating devices commonly found on other switches. The end result is a cleaner and better contact arrangement.

The reverse loop contact takes advantage of the magnetic forces found under fault conditions to increase the contact pressure of the fingers and to force the blade against the closed position blade stop.

2000 Ampere jaw.

Switch blade in jaw contact against blade stop.

Type EB, EBB (VEB)

• Wiping Action & Operation

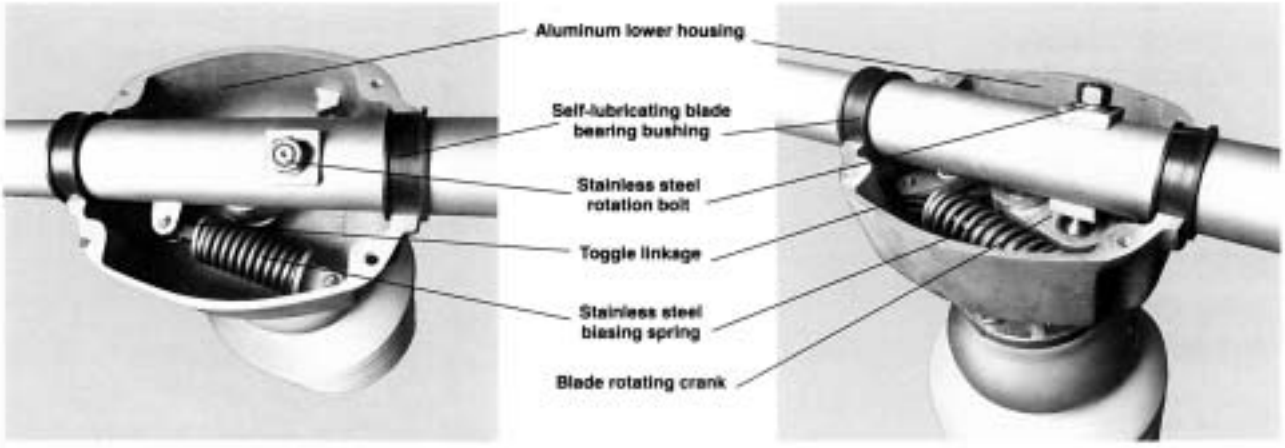
The switch is operated by rotation of the center insulator stack. During closing the initial 70˚ of the insulator rotation swings the blade into the contact jaws, where the blade tips engage stops that limit the swinging action. Continued insulator rotation overcomes a biasing spring and toggle linkage causing the blade to roll 45˚ on its axis, applying contact pressure and latching into the jaw contact. During opening the first 45˚ of insulator rotation allows the compressed spring to return to its original position, and working through the toggle linkage, causes the blade to roll and relieve the pressure on the jaw contact loops. Continued insulator rotation swings the blade to the fully open position.

• Bases

Rigid galvanized structural steel double channel bases are furnished. Aluminum bases are available when specified.

• Bearings

Bearings in live parts are constructed of self-lubricating low friction materials and require no lubrication or maintenance. Main bearing at the base of the rotating insulator is of heavy duty shielded ball bearing construction, providing the necessary strength and rigidity. No field servicing required.



Switch closed. *Switch open.*

• Leveling Bolts

All switches are furnished with four leveling bolts per insulator stack to provide fast, effective means of aligning insulator stacks in the field.

Rigid welded base showing bearing and leveling bolts.

• Mounting Position

The inherent balance of the blade allows the EB switch to be mounted in any position with no need for counterbalancing. Field conversion to another position requires no modification.

• Insulators

NEMA standard station post or cap and pin insulators are available as specified.

• Field Installation

The simplicity of design assures ease of installation and years of trouble-free service.

Type EB, EBB, EBF and VEB

Type EBB, Copper Double Side Break Switch

- The EBB, double side break switch is a copper version of the aluminum EB switch. High conductivity copper and copper alloy castings are used in the live, conducting parts.
- The center hinge housing, which is not part of the current path, is made of aluminum to minimize weight of the switch.
- Blade end transitions, or separate blade tips, as described in the EB section are not necessary on the EBB since silver strips are brazed directly to the copper blade tip on the EBB.
- Available ratings are the same as the EB's. Refer to the rating sheets at the front of this catalog.

Type EBF, Copper Double Side Break Switch

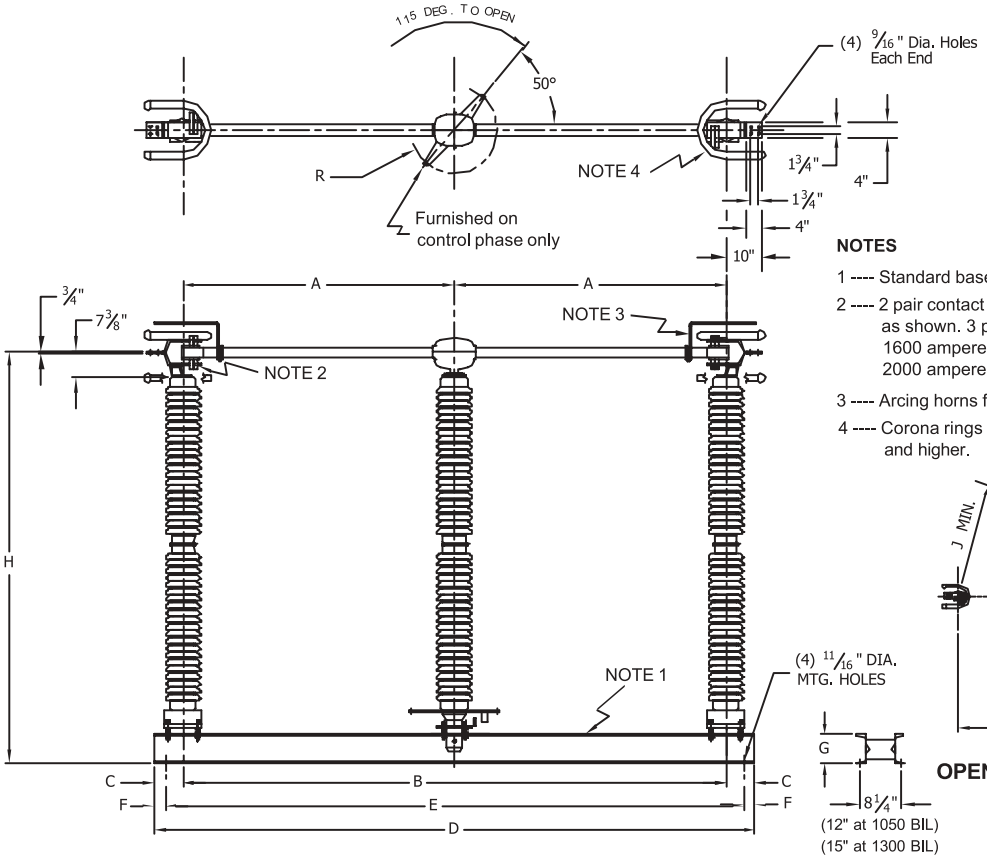
- Blade construction is identical to that of the R14-C. (See R14-C section).
- Jaw construction is also identical to that of the R14-C, except that there are two jaws on the EBF.
- As with the R14-C, 69 kV switches have an articulated blade
- EBF design is simple, time proven and economical
- Ratings up to 72.5 kV at 600 and 1200A.

Type VEB, Aluminum Double Side Break "V" Switch

- The VEB utilizes the same live parts and hinge mechanism as the EB.
- All of the standard features and options for the EB apply as well the VEB
- Refer to the EB section of this catalog for live part construction details
- The "V" configuration offers a smaller footprint for those applications where structure space is at a premium. See tabulated drawing in this section
- Ratings, like the EB, are up to 345 kV, 1200, 2000 and 3000A.

Accessories and Options for EB, EBB, EBF and VEB switches

- Ground switches for either or both ends are available.
- Motorized operation
- Outriggers for copper or aluminum conductor
- Auxiliary switches
- Key interlocks
- Customized operating mechanisms (May be available at no additional cost. Consult factory.)



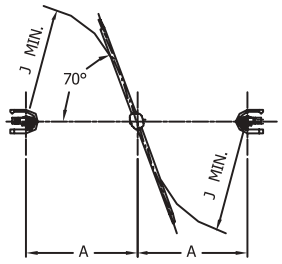
NOTES

1 ---- Standard base shown, others available.

2 ---- 2 pair contact loops furnished for 1200 ampere as shown. 3 pair contact loops furnished for 1600 ampere and 4 pair contact loops for 2000 ampere.

3 ---- Arcing horns furnished only when specified.

4 ---- Corona rings furnished for 230 kV rating and higher.



OPEN GAP CLEARANCE

Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions in Inches (Refer to Factory for Certified Prints)									
Max.	BIL	(1) (2) (3)		A	B	C	D	E	F	G	H J		R
72.5	350	69EB-12HP5	278	34"	68"	4 1/2"	78"	74"	2"	2"	50"	22"	10"
121	550	115EB-12HP5	286	42"	84"	4 1/2"	93"	89"	2"	6"	65"	32"	10"
145	650	138EB-12HP5	288	48"	96"	4 1/2"	105"	101"	2"	6"	74"	38"	10"
169	750	161EB-12HP5	291	54"	108"	4 1/2"	117"	113"	2"	6"	82"	44"	12"
242	900	230EB-12HP5	304	68"	136"	6	148"	142"	3"	6"	102"	50"	12"
242	1050	230EB-12HP5	316	75"	150"	6	162"	156"	3"	8"	114"	57"	12"
362	1300	345EB-12HP5	324	84"	168"	6	180"	174"	3"	8"	128"	66"	12"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 69EB-12HC5).

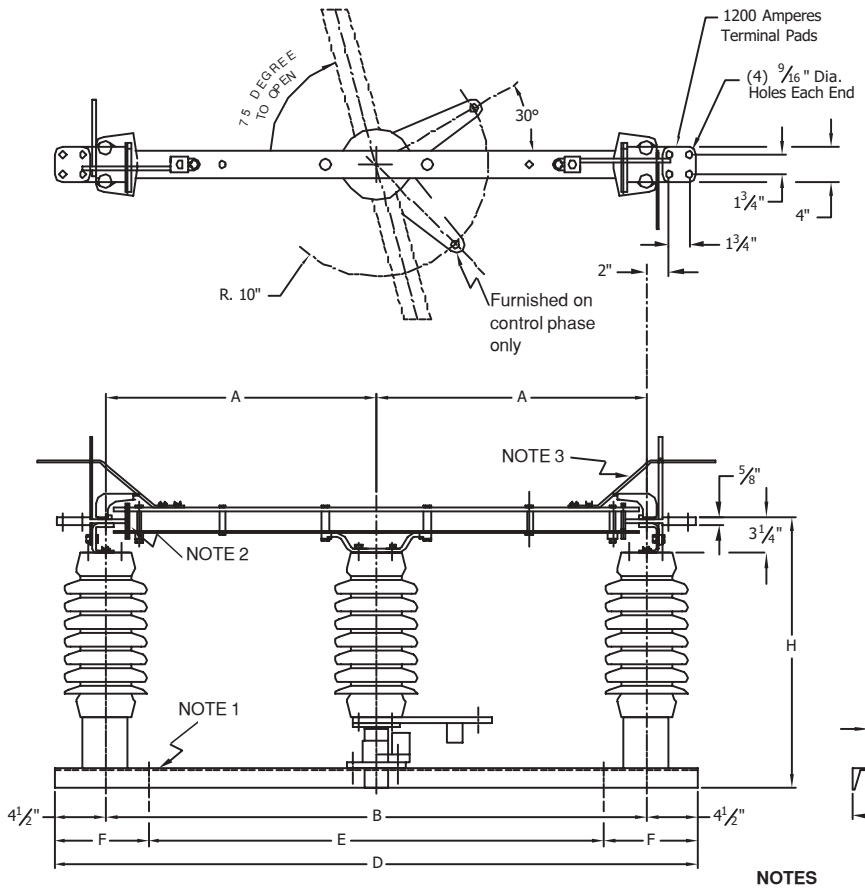
(2) When 30∞temperature rise unit is required, omit the H in the catalog number (eg.: 69EB-12P5).

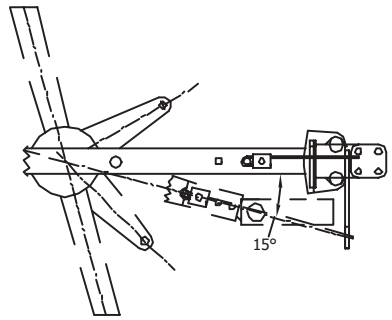
(3) Catalog numbers shown are for 1200 amps. For 1600, 2000, or 3000 amps, change 12 to 16, 20, or 30 in the catalog number as required (eg.: 161 kV-2000 A: Cat. No. 161EB-20HP5).

(4) For 3000 amp. switch refer to factory for dimensions.

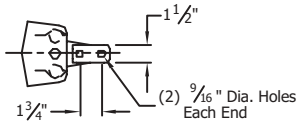
Ampere Rating	Momentary Rating
1200A	61 KA
1600A	70 KA
2000A	100 KA
(4) 3000A	100 KA

Type EB 72.5 kV - 362 kV 1200 thru 2000 Ampere (3000 ampere) (4)

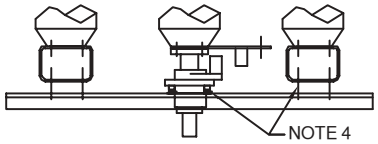




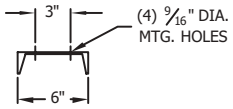
TOGGLE-ACTION BLADE TIP FOR 69 kV ONLY



600 Amperes Terminal Pads



69 kV Amperes Only



NOTES

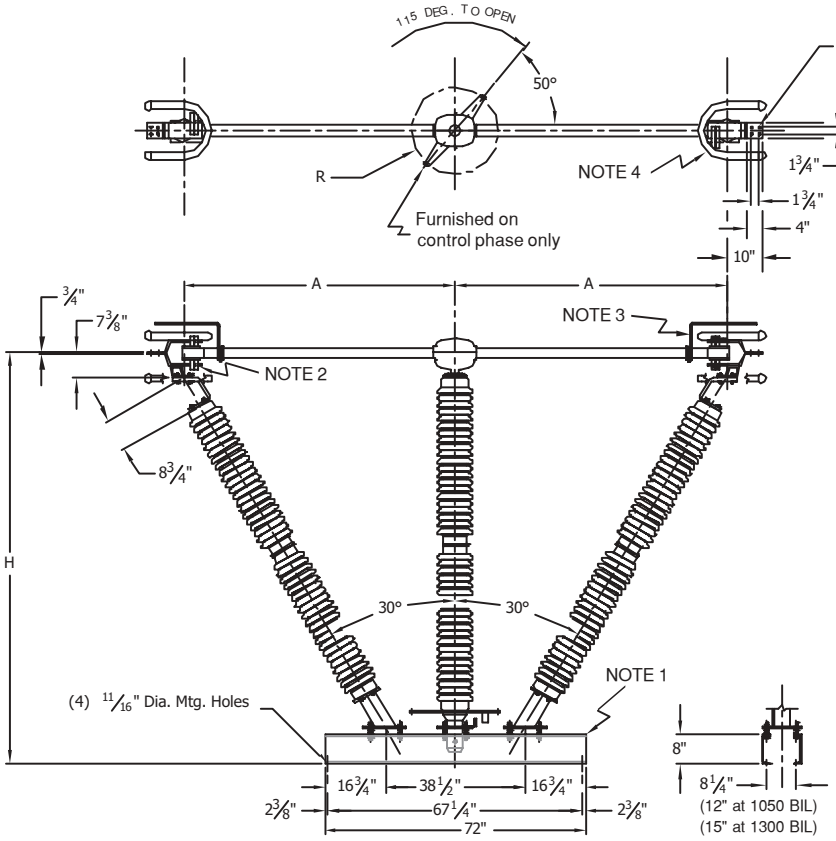
1 ---- Standard base shown, others available.
2 ---- Silver-to-copper contacts furnished unless otherwise specified.
3 ---- Arcing horns furnished only when specified.
4 ---- Leveling screws provided for 69 kV rating.

Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions in Inches (Refer to Factory for Certified Prints)					
Max.	BIL	(1) (2) (3)		A	B	D	E	F	H
15.5	110	15EBF-6P3	205	14"	28"	37"	24"	6 1/2"	19 3/4"
25.8	150	23EBF-6P3	208	14"	28"	37"	24"	6 1/2"	23 3/4"
38.0	200	34EBF-6P3	210	18"	36"	45"	33"	6"	27 3/4"
48.3	250	46EBF-6P3	214	23"	46"	55"	39"	8"	31 3/4"
72.5	350	69EBF-6P3	216	30"	60"	69"	51"	9"	40 3/4"

(1) Catalog numbers shown are with station post insulators.
(2) Catalog numbers shown are for 30° rise ANSI-C37.37 ACCC designation A01.
(3) Catalog numbers shown are for 600 amps. For 1200 amps, change 6 to 12 in the catalog number as required (eg.: 15 kV-1200 A: Cat. No. 15EBF-12P3).

Ampere Rating	Momentary Rating
600A	40 KA
1200A	61 KA

Type EBF 15.5 kV - 72.5 kV 600 and 1200 Ampere



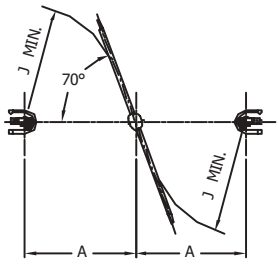
NOTES

1 ---- Standard base shown, others available.

2 ---- 2 pair contact loops furnished for 1200 ampere as shown. 3 pair contact loops furnished for 1600 ampere and 4 pair contact loops for 2000 ampere.

3 ---- Arcing horns furnished only when specified.

4 ---- Corona rings furnished for 230 kV rating and higher.



OPEN GAP CLEARANCE

Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)			
Max.	BIL	(1) (2) (3)		A	H	J	R
72.5	350	69VEB-12HP5	278	40"	56"	22"	10"
121	550	115VEB-12HP5	286	44"	67"	32"	10"
145	650	138VEB-12HP5	288	50"	76"	38"	10"
169	750	161VEB-12HP5	291	56"	84"	44"	12"
242	900	230VEB-12HP5	304	70"	104"	50"	12"
242	1050	230VEB-12HP5	316	75"	114"	57"	12"
362	1300	345VEB-12HP5	324	84"	128"	66"	12"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 69VEB-12HC5).

(2) When 30° temperature rise unit is required, omit the H in the catalog number (eg.: 69VEB-12P5).

(3) Catalog numbers shown are for 1200 amps. For 1600, 2000, or 3000 amps, change 12 to 16, 20, or 30 in the catalog number as required (eg.: 161 kV-2000 A: Cat. No. 161VEB-20HP5).

(4) For 3000 amp. switch refer to factory for dimensions.

Ampere Rating	Momentary Rating
1200A	61 KA
1600A	70 KA
2000A	100 KA
(4) 3000A	100 KA

Type VEB 72.5 kV - 362 kV 1200 thru 2000 Ampere (3000 ampere) (4)

MORPAC INDUSTRIES, INC.

MEMCO POWER PRODUCTS DIVISION

Type VR-1 and VR-2

VERTICAL REACH SWITCHES

242 kV through 800 kV

4000 Ampere

GENERAL DESIGN FEATURES

Type VR Vertical Reach Switch

The continued demand for high voltage and extra high voltage construction has made it necessary for the industry to re-examine conventional station design practices with a view toward a reduction in space requirements. Spiraling land costs and increasing difficulty in obtaining suitable substation sites have further emphasized the need for more compact designs, without sacrificing utility, flexibility and performance. The vertical reach switch, utilizing a vertical rather than horizontal separation, provides substation designers with a means to reduce space requirements by as much as thirty-five percent.

APPLICATION: The MEMCO vertical reach switch is of the semi-pantograph design. It may be installed either directly below and in line with the overhead bus or on the diagonal at the point of bus crossover. The terminal pads can be arranged so that the lower bus may extend in any of four directions; in line with switch or perpendicular to switch.
The upper contact of the type VR switch is supported by the user's overhead bus. Close cooperation between switch manufacturer and substation designer, in the early stages of design, is highly desirable. The switch is available in two (2), models; the VR-1 for application at 550 kV through 800 kV, and VR-2 for application at 242 kV through 362 kV.

VR-1 FEATURES

• Current Carrying Parts

The live parts utilize high strength, high conductivity aluminum tubing and castings. Transition to copper is made in the moving contact areas. At the point of transition, copper is hot dip tinned and bolted to aluminum with stainless steel bolts. The joint is treated with oxide inhibitor and effectively sealed to prevent the entrance of moisture.
All bearings and counterbalancing springs are isolated from the main current path by insulating bushings.

• Upper Contact

The VR-1 switch at 550 kV is adaptable for either fixed or strain bus; at 800 kV its application is limited to rigid bus. The following table shows the maximum contact deviation under which the switch has been designed to operate.

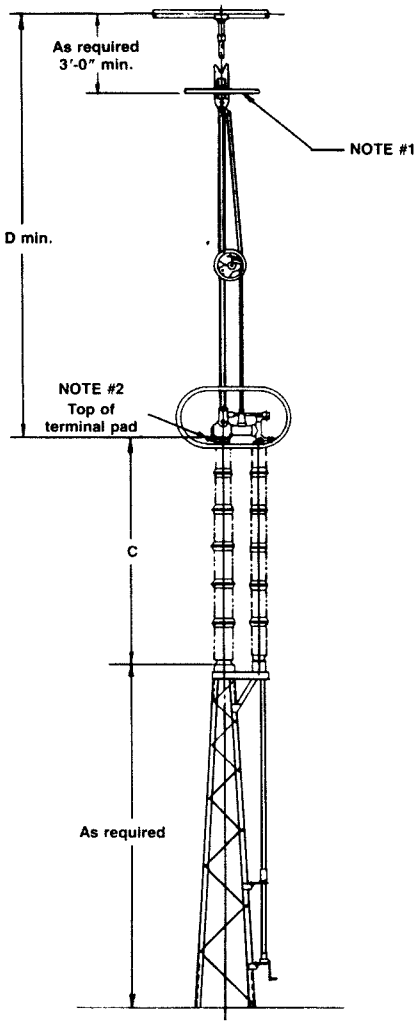
The upper contact bar consists of a formed copper bar with a silver overlay along each of the contact surfaces. The contact bar is furnished with all necessary supporting members for attachment to the overhead bus.
The switch jaw employs a multiple-contact reverse loop arrangement which provides uniform contact pressure throughout the plus-or-minus vertical allowable deviation shown below. This contact arrangement takes advantage of the magnetic forces found under short circuit conditions resulting in increased contact pressure through the "blow on" effect.

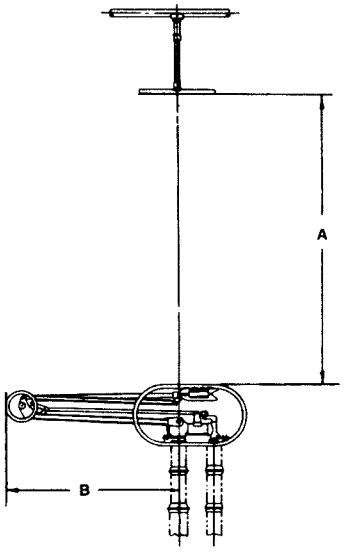
• Switch Operation

In the open position, the blade sections are folded upon themselves, so that the maximum blade extension is slightly greater than half the open gap dimension. Closure of the switch, created by rotation of the insulator by the operating pipe, causes the blade to unfold in such a manner that the jaws rise in a nearly straight vertical path, opening wide as they approach the upper contact. Further movement causes the blade sections to assume a straight-line vertical relationship, with the jaws clamped firmly on the contact bar. The blade is counterbalanced in all positions so that only friction forces must be overcome when opening or closing the switch.

• Operators

The switch is available for either single pole manual operation or three pole power operation.





NOTES:
1 — Switch may be oriented at any angle with respect to upper bus.
2 — Terminal may be located as shown, or at right angles to either side.

TYPE VR-1

Insul. Type	RATINGS				CATALOG NUMBER	APPROXIMATE DIMENSIONS (Refer to Factory for Certified Prints)			
	Voltage Rating kV		Current Rating AMPS						
	Max.	BIL	Cont.	Momentary		A	B	C	D
Station Post	550	1550	3000	100,000	1550VR1-30	13'-6"	9'-6"	11'-0"	19'-10"
	550	1800	3000	100,000	1800VR1-30	16'-0"	10'-6"	13'-0"	22'-4"
	800	2050	3000	100,000	2050VR1-30	19'-6"	12'-0"	15'-9"	25'-10"

For 4000 Amp, change suffix on catalog number to -40.

VR-2 FEATURES

• Current Carrying Parts

The blades are made of high strength, high conductivity parallel aluminum bus bars which are trussed to form a rigid unit. Transition to copper is made in the moving contact areas. At the point of transition, copper is hot dip tinned and bolted to aluminum with stainless steel bolts. The joint is treated with oxide inhibitor and effectively sealed to prevent the entrance of moisture. All bearings and springs are isolated from the main current path by insulating bushings.

• Upper Contact

The upper contact consists of a copper plate located within a bell shaped housing which shields the contact surface from ice formation. The complete assembly is rigidly fixed to the upper bus.
The blade contact consists of multiple reverse loop copper alloy fingers, with silver overlay at the contact point. When the switch is in the open position the contact fingers are arranged to touch the opposing contacts. During closure of the switch the contact fingers deflect as they slide on the upper contact plate.
The reverse loop design takes advantage of magnetic forces found under short circuit conditions to increase the contact pressure through the "blow on" effect.

VR-2

ALLOWABLE DEVIATION OF UPPER CONTACT	
Relationship with	**Fixed Bus**
Contact Plate	**242 kV - 362 k V**
Vertical	± 3"
Parallel	± 4"
Perpendicular	± 4"

• Switch Operation

The blade assembly is raised and lowered by the direct action of a reciprocating, rather than rotating, control insulator. The weight of this insulator assembly partially balances the weight of the blade - the remainder is balanced by a counterbalance assembly located at the base of the insulator stack. A single column insulator furnishes the main support, and the entire assembly is designed for mounting on a single column structure.
The blade weight is slightly underbalanced so that the switch has no tendency to move upward on its own. A downward pull on the control insulator stack will cause the blade to rise and unfold in such a manner that the blade and contacts follow a nearly straight vertical path when approaching the upper contact. The contact fingers are guided onto the flat copper contact plate by guide horns on the blade and slide approximately 4" onto the plate. Since the actual pivot point at the center of the blade ("elbow") has passed over-center, there is no force tending to open the switch.

• Operators

The switch is available for either single pole manual operation, three pole manual operation, or three pole power operation.

ACCESSORIES

• Switch Support Structures

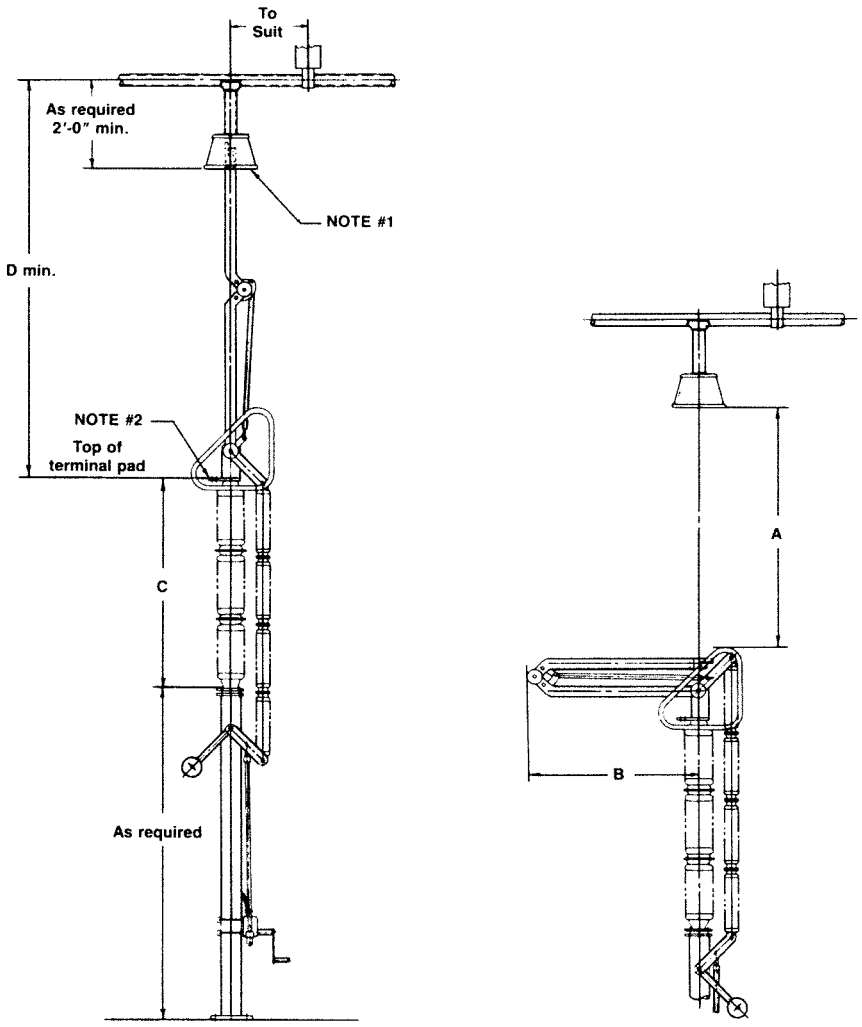
Both the VR-1 and VR-2 are available with or without supporting structure. Supporting structures can be of the tubular, tapered polygon, wide flange or lattice design.

• Ground Switches

Ground switch attachments of the same or lower momentary ratings can be installed as required.

• Terminal Connectors & Outriggers

Terminal connectors and outriggers can be furnished to meet any particular requirement.



NOTES:

1 — Switch may be oriented at any angle with respect to upper bus.

2 — Terminal may be located as shown, or at right angles to either side. Straight-through connection also available.

TYPE VR-2

Insul. Type	RATINGS				CATALOG NUMBER	APPROXIMATE DIMENSIONS (Refer to Factory for Certified Prints)			
	Voltage Rating kV		Current Rating AMPS						
	Max.	BIL	Cont.	Momen-tary		A	B	C	D
Sta-tion Post	242	900	3000	100,000	900VR2-30	7'-3"	4'-10"	6'-9"	11'-10"
	242	1050	3000	100,000	1050VR2-30	8'-11"	5'-8"	7'-9"	13'-6"
	362	1050	3000	100,000	1050VR2-30	8'-11"	5'-8"	7'-9"	13'-6"
	362	1300	3000	100,000	1300VR2-30	10'-3"	6'-4"	8'-11"	14'-10"

Morpac/Memco Operating Mechanisms

Complete manual operating mechanisms are supplied with all group operated switches. Included are operating lever, vertical pipe control, outboard bearing, interphase pipe, levers, clevises, couplings and intermediate guides. Either torsional or reciprocating types are supplied, as best suits each individual installation. A toggle arrangement is used in both types of controls to mechanically lock the switch in the open or closed position. Means are also provided to padlock the handle in either position. Position indicators to show OPEN or CLOSED are available at extra cost. Flexible grounding braid is supplied with pipe controls. Turnbuckles and insulating fiberglass or porcelain inserts for pipe controls as well as kirk key interlock provisions are available at extra cost.

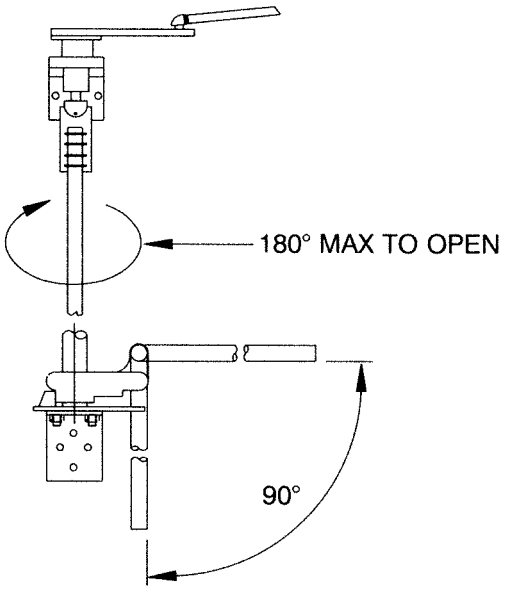
SWITCHES THROUGH 69 kV are supplied with up to 30 feet of galvanized vertical pipe, with intermediate guides and fittings, as standard. Additional lengths, with intermediate guides and fittings, are available at extra cost. The outboard bearing is bronze and requires no maintenance.

SWITCHES RATED AT 115 kV AND ABOVE are supplied with up to 40 feet of galvanized vertical pipe as standard. Additional 10′ to 20′ sections with intermediate guides and fittings are available at extra cost. The outboard bearing is a heavy duty greaseless type ball bearing unit with stainless steel balls. It will give a lifetime of dependable maintenance-free service under the most adverse conditions.

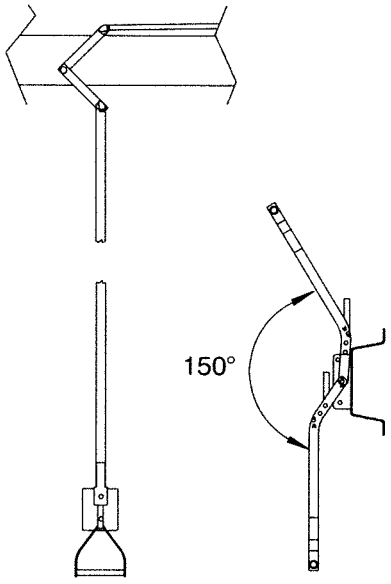
Manual worm-gear operators are available for either right or left hand operation. The units are designed for dependable service with minimum maintenance and are shipped completely lubricated and adjusted.

Motor operators and auxiliary switches are available to meet any requirements. Please refer to the factory for specific information and prices.

TORSIONAL HANDLE ASSEMBLY



RECIPROCATING HANDLE



SEO 3000
Stored Energy Switch Operator

Morpac's 3000 series of SEO's are available to operate most distribution switches on the market today. They incorporate a custom built 24 VDC permanent magnet motor specifically designed for this service. The unit comes complete with pole mounting hardware and internal batteries. The unit is available as a basic motor operator, or with auxiliary electronics.

SPECIFICATIONS

WEIGHT	180 lbs Nominal
CABINET	18.9" W x 18.9" H x 10.8" D Steel w/ASA Gray Enamel Paint
MOTOR	3.6 HP 24 VDC
CONTROL	24 VDC
BATTERY	33 Amp. Hour Gelled Electrolyte (2)
CHARGER	50 Watt - Regulated 24 VDC
SPEED	14" Vertical Movement @430 lbs Load @ 1/2 Second
STALL TORQUE	8700 Inch Lbs
CONTROL ADJ.	0 to 15" Adjustable Control Rod Travel

STANDARD FEATURES

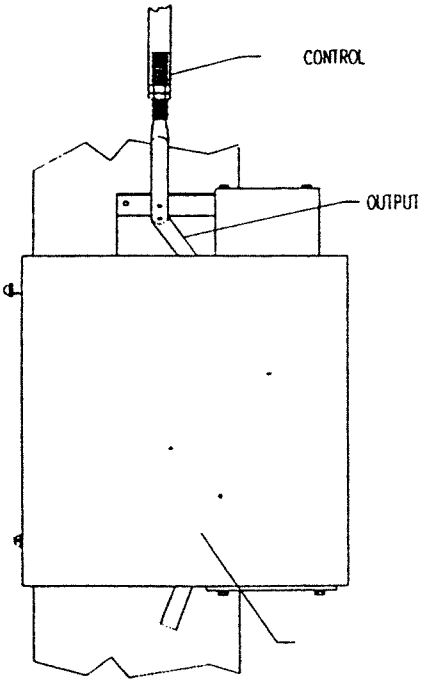
Terminal Board ready for wiring to RTU/PLC SCADA Controllers
Oversize 33 AmpHour battery, capable of supporting additional RTU/PLC SCADA Controllers and Communications Equipment.
Remote or Local Battery Check with "Pass/Fail" Status.
Automatic Lockout of Operation if Battery Test Fails.

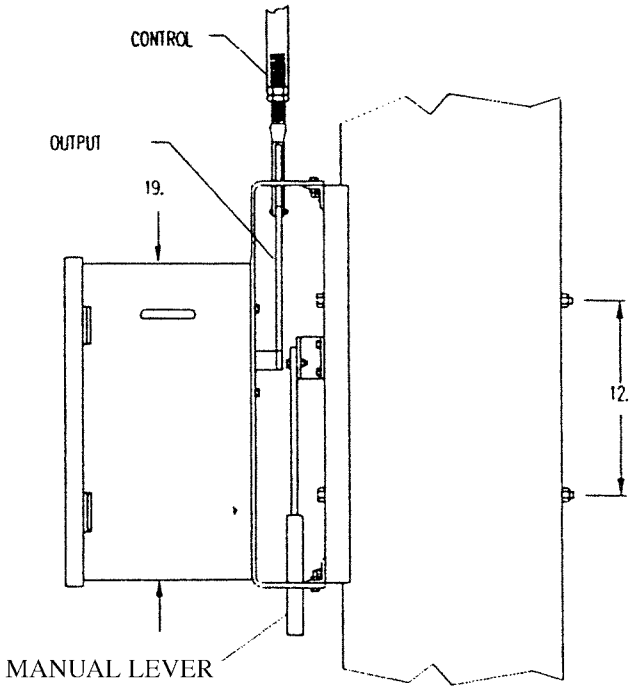
STATUS

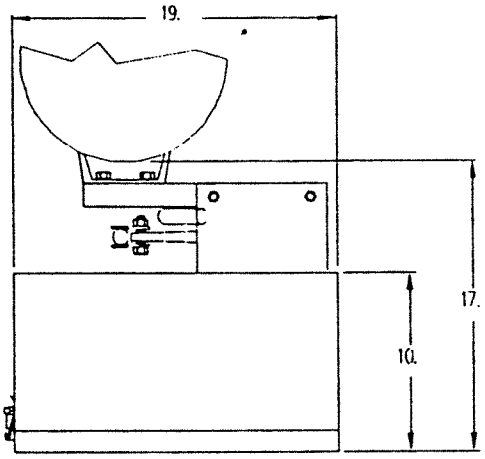
Switch Open	1 Form C Contact
Switch Closed	1 Form C Contact
Remote / Local	Contact Closure in "Remote" disables Local Operation and Vice Versa
Batt. Test in Progress	Open / Close Operation Blocked
Low Battery	Open / Close Operation Blocked Until Serviced.

CONTROL

Open the Switch	Energize "Open" Relay - 50 ma
Close the Switch	Energize "Close" Relay - 50 ma
Initiate Battery Test	Energize Battery Test Timer







OPTIONS

SEO 3000R	Reciprocating Operation - Up/Down
SEO 3000T	Torsional Operation - Rotary

Stainless Steel Cabinet	Operations Counter
Deep Door for Mounting of Controller and Communications	Auto Open or Close on Loss of AC Line
	Auto Transfer (Master / Slave)
Thermostatically Controlled Heater	2A & 2B Auxiliary Contacts
Solar Power Charger	Intrusion Alarm

Contact the factory for pricing, drawings or full specifications.

Morpac Motor Operator
Type MOE-1000

The Morpac Motor Operator, Type MOE, is an electrical all weather switch operating device. The standard heavy gauge aluminum cabinet has three hinged, removable doors for easy access to all wiring and components. (Stainless steel cabinets are available as well). The front door padlocks shut. Opening the front door allows access to the latches for the side doors. A large, bolted conduit entrance panel is located on the bottom of the cabinet. Morpac's upper decoupler is used to physically separate the motor operator from the vertical operating pipe. The decoupler can be padlocked in either the open or closed position.

Morpac uses a single stage, heavy duty, sealed cycloid reducer for long maintenance free life and extreme duty applications. The open and close limit switches are infinitely adjustable up to 360 degrees. Operating time is from 6 to 12 seconds* for typical 180 degree rotation. Full local control with pushbuttons and indicator lights are standard. Also standard are a counter, thermostatically controlled heater and 6 infinitely adjustable auxiliary switches which can be set up as form "c" or "a" and "b" types. Additional auxiliary switch stages are available. Operating voltages available are 120 or 240 VAC and 24, 48, 125 or 250 VDC. 24 and 48 VDC units can be provided with batteries and chargers if desired.

Morpac MOE 1000

Specifications

Voltages, DC	24, 48, 125 and 250
Voltages, AC	120 and 240
Operating time	6 to 12 seconds*
Torque	20,000 pounds-inch
Rotation	Field Reversible, Up to 360 degrees
Motor	3/4 HP

DC Motor Current Draw

Voltage	Full Load	Locked Rotor
24	30A	191A
48	14A	95A
125	5.2A	64A
250	2.65A	32A

*Faster times are available but not recommended for switches 115 kV and above.

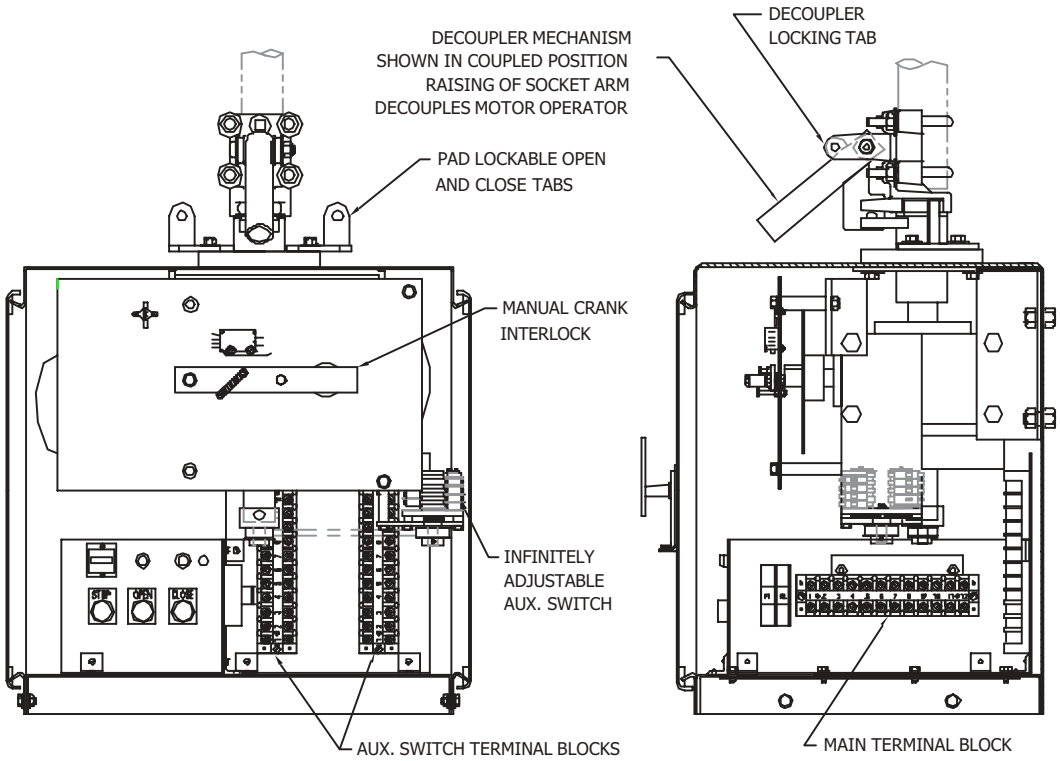
Morpac Type MOE 1000

COMPONENTS AND FEATURES

STANDARD FEATURES

- **100 watt thermostatically controlled strip heater.**
- **22 millimeter open, close and stop pushbuttons.**
- **Super bright led position indicator lights.**
- **Infinitely adjustable auxiliary switch stages, wired to terminal block.**
- **Removable auxiliary operating crank handle, electrically interlocked with control.**
- **Hinged removable pad lockable front door.**
- **Hinged removable side doors.**
- **5052 H32 ⅛ inch aluminum enclosure**
- **Large conduit entrance plate (4.5 x 13.75) for easy wiring access.**

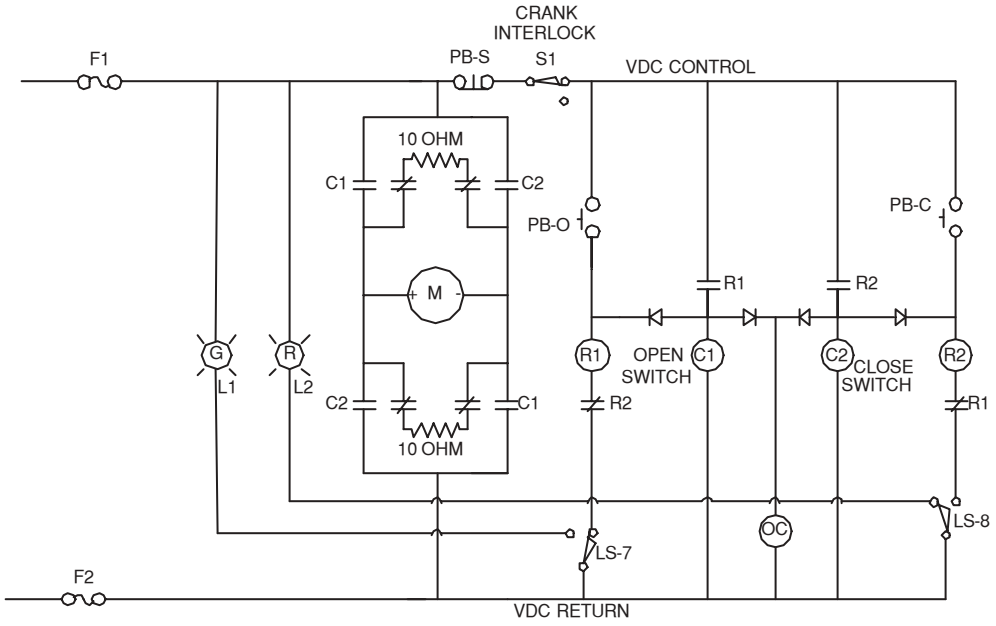
NOTE: IF MOTOR OPERATOR IS IN THE OPPOSITE POSITION OF THE AIR SWITCH THE DECOUPLER WILL PREVENT COUPLING TO THE MOTOR OPERATOR UNTIL BOTH ARE SYNCHRONIZED



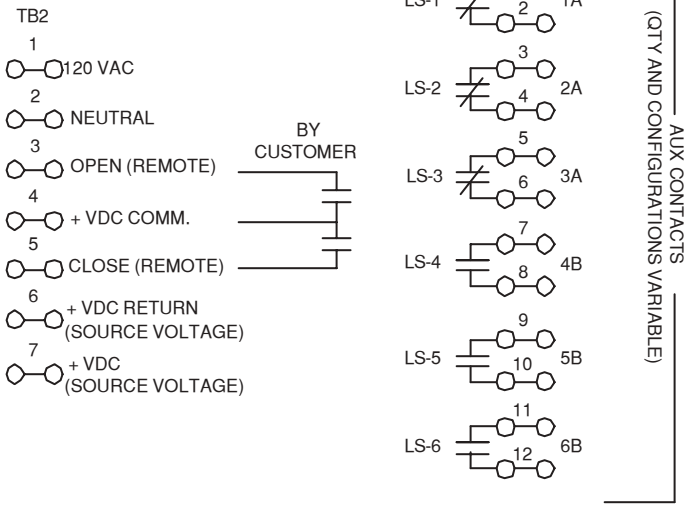
Morpac Type MOE 1000

ELECTRICAL CONNECTIONS

Incoming electrical connections are made on the main terminal board. The schematic shown below is for general information only. Wire per the schematic supplied with your motor operator.



R1 RELAY, CONTROL, OPEN SWITCH, 10K OHM COIL
R2 RELAY, CONTROL, CLOSE SWITCH, 10K OHM COIL
C1 CONTACTOR, MOTOR, OPEN SWITCH, COIL 5.6K OHMS
C2 CONTACTOR, MOTOR, CLOSE SWITCH, COIL 5.6K OHMS
OC OPERATION COUNTER
M MOTOR 3/4 HP
LS LIMIT SWITCH, 8 POLE ADJUSTABLE (2),
(SHOWN WITH SWITCH CLOSED)

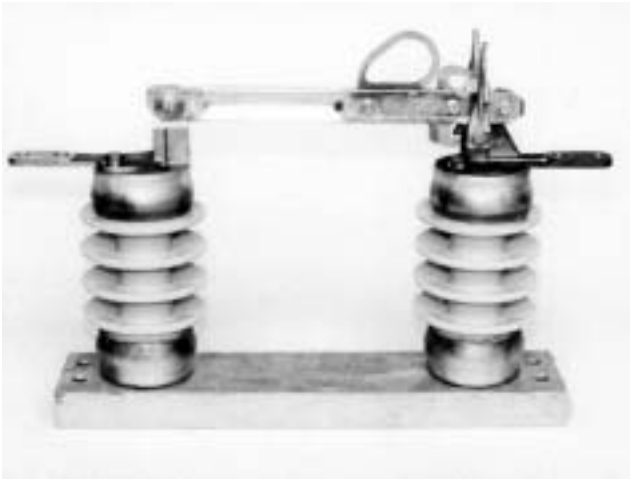


MORPAC INDUSTRIES, INC.

MEMCO POWER PRODUCTS DIVISION

OUTDOOR HOOKSTICK OPERATED DISCONNECT SWITCHES

7.5 kV through 169 kV
600 to 6000 Ampere



TYPE DHS

TYPE STV

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MEMCO Design Hookstick Switches

GENERAL DESIGN FEATURES

Type STV & STU

The STV or STU type of outdoor disconnect is available in voltage ratings from 8.25 to 169 kV and in continuous current ratings from 600 to 3000 ampere. The STV and STU switches are identical in design except that one is arranged for vertical mounting and the other for underhung mounting.

APPLICATION: As a single pole disconnect it can be readily used in substations or on transmission and distribution lines.

FEATURES

• Jaw Contact

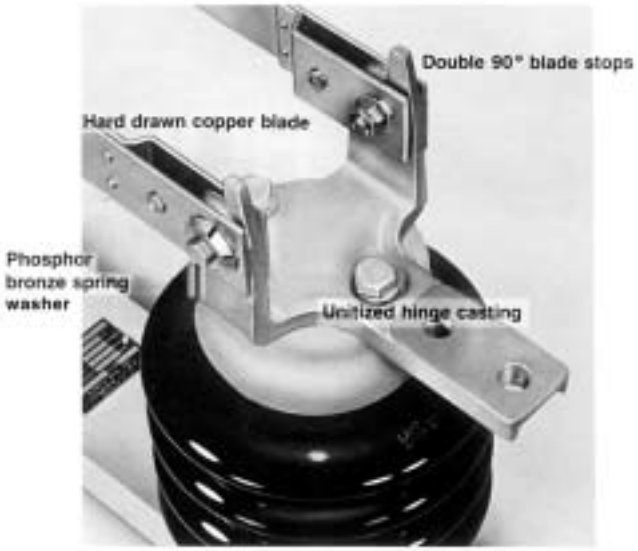
High-pressure, self-wiping line type contacts are provided on all switches. The contact pressure is maintained by heavy phosphor bronze spring washers, or stainless steel coil springs, properly positioned on each side of the contact surfaces.

Typical jaw assembly 8.25-72.5 kV, 600 ampere

• Hinge Contact

High-pressure, self-wiping ring shaped hinge contacts are standard on all switches. Heavy phosphor bronze spring washers assure uniform contact loading.

Typical hinge assembly 8.25-72.5 kV, 600 ampere



• Unitized Jaw & Hinge Construction

Single unit castings are used for both hinge and jaw terminals thereby reducing the number of transfer points and providing a better distribution of current.

• Contact Surfaces

Standard contact surfaces are determined by switch rating and contact construction and are shown in the following table. Other combinations of silver and copper may be specified on the hinge and/or jaw as a special option.

Switch Rating	Hinge Contact (non make-break)	Jaw Contact (make-break)
8.25 - 72.5 kV:		
600 Ampere	copper to copper	copper to copper
1200 Ampere	copper to copper	silver to copper
2000,3000 Ampere	silver to copper	silver to copper
121 - 169 kV:		
All ratings	silver to copper	silver to copper

MEMCO Design Hookstick Switches

• Blade Construction

All switches are furnished with blades of hard drawn high conductivity round edge copper bar. Switches through 2000 ampere are provided with wide truss type blades. Copper cross braces providing extra strength and rigidity are utilized on the larger switches.

• Large Opening Eye

A large opening eye of heavy bronze construction assures ease of operation.

• Positive Blade Latch

Positive side-operating, phosphor bronze spring-type blade latches prevent the switch from opening as a result of fault current or through vibration.

• Pry-Out Leverage

The action of the opening eye with its increased leverage spreads the blade latches and imparts an easy initiating motion to open the switch.

• Rigid Blade Guides

Rigid cast bronze blade guides are provided to assure positive closing of blade on each operation, regardless of position of hookstick.

• Terminals

Terminal pads are provided with NEMA standard 9/16" holes on 13/4" centers.

• Blade Stop

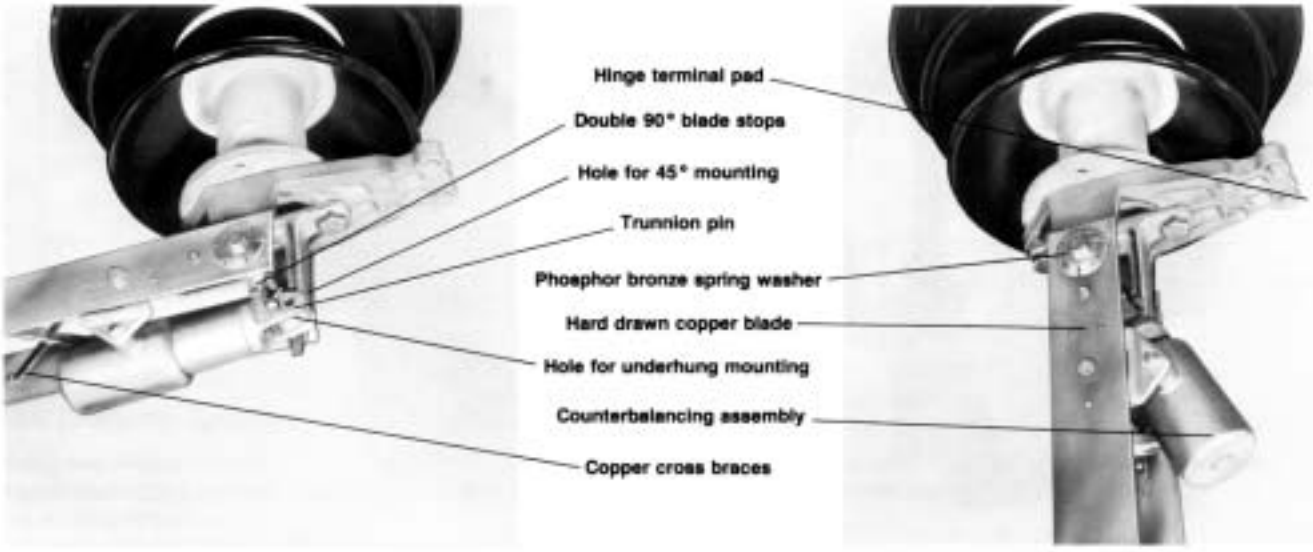
Double 90˚ open blade stops are standard. Other opening stops can be provided when specified.

• Counterbalancing

Switches rated 72.5 kV, (5" B.C.) and above are normally furnished with a compression spring counterbalancing assembly which offsets the weight of the blade when opening or closing the switch. This unique feature makes it practical to use this switch through 169 kV.

Hinge assembly arrangement of a closed, underhung mounted, switch complete with counterbalancing.

Hinge assembly showing underhung mounted, counterbalanced switch when in open position.



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MEMCO Design Hookstick Switches

• Bases

Rigid galvanized structural steel channel bases are furnished on all switches. Switches through 72.5 kV, (3" B.C.) are normally furnished on flat channel bases. Welded, built-up double channel bases are furnished at the higher voltage ratings. Aluminum bases are available when specified.

• Factory Assembled & Adjusted

Switches 48.3 kV and below are pre-assembled and adjusted at the factory. Switches 72.5 kV and above are assembled and adjusted, less insulators. Only minor adjustments, if any, are required at installation.

• Angular Mounted Switches

A single pole angular mounted disconnect is available at 600, 1200, and 2000 ampere from 8.25 kV through 38.0 kV. It is designated as a type STA and utilizes the same parts that are common on the STV and STU switch.

Type STA

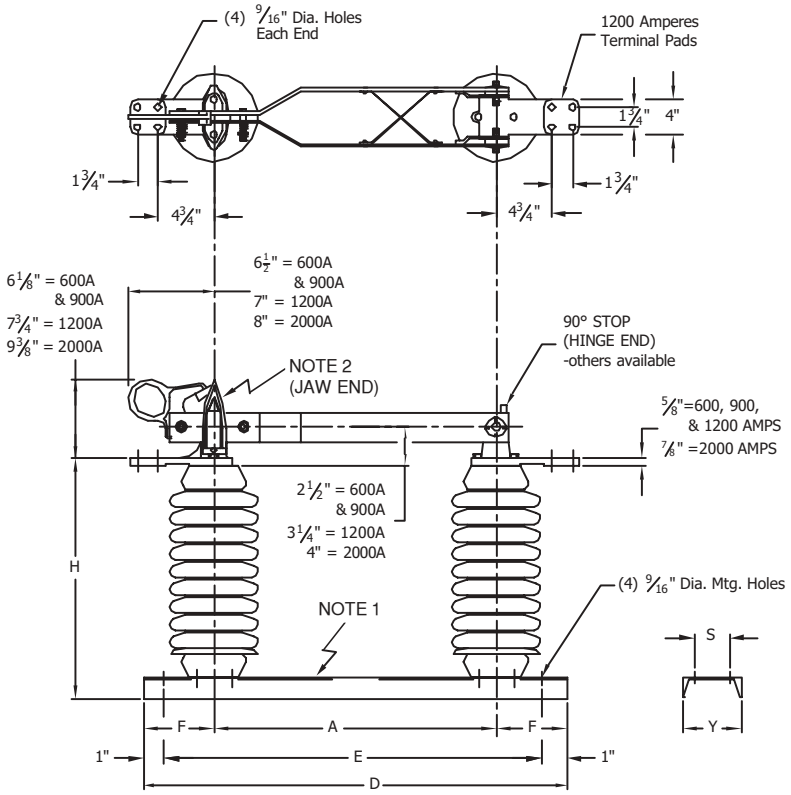
• Standard Specifications

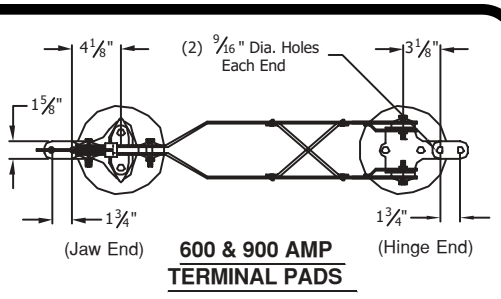
The type STV and STU disconnect switches meet or exceed all of the requirements of NEMA, IEEE and ANSI specifications. They are designed to give years of trouble-free service under the most adverse atmospheric and climatic conditions.

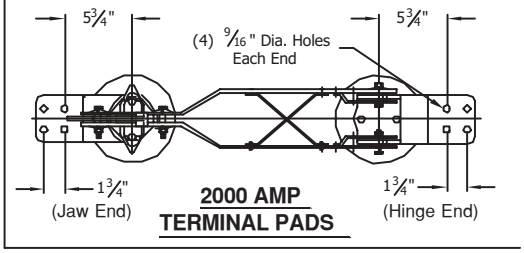
• Tandem Transfer and Regulator Bypass Switches

These switches can be arranged for either underhung or vertical mounting and employ the same design concepts as the STV and STU disconnects.

Type TTV and TTU
Tandem Transfer Switch







NOTES

1 ---- Standard base shown, others available.

2 ---- Copper-to-copper contacts furnished on all other switches unless otherwise specified. Silver-to-copper contacts furnished on 1200 amp jaw end, unless otherwise specified. Silver-to-copper contacts furnished on 2000 amps, unless otherwise specified. Refer to factory for 3000 amp contact specifications.

3 ---- Single eye shown, double eye available for some models of 3000 amp.

4 ---- Spring barrel furnished on 69 kV, 2000 amp only.

Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)						
Max.	BIL	(1) (2) (3) (4)		A	D	E	F	H	S	Y
8.2	95	7STV-6P3	202	12"	20"	18"	4"	9 3/4"	2"	4"
15.5	110	15STV-6P3	205	15"	23"	21"	4"	12 1/4"	2"	4"
25.8	150	23STV-6P3	208	18"	26"	24"	4"	16 1/4"	3"	4"
38	200	34STV-6P3	210	24"	32"	30"	4"	20 1/2"	3"	6"
48.3	250	46STV-6P3	214	30"	41"	39"	5 1/2"	24 1/2"	3"	6"
72.5	350	69STV-6P3	216	42"	53"	51"	5 1/2"	32 1/2"	3"	8"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 7STV-6C3).

(2) Catalog numbers are for vertical mounted switches. If underhung mounting is required, change the V to U in the catalog number (eg.: 7STU-12C3).

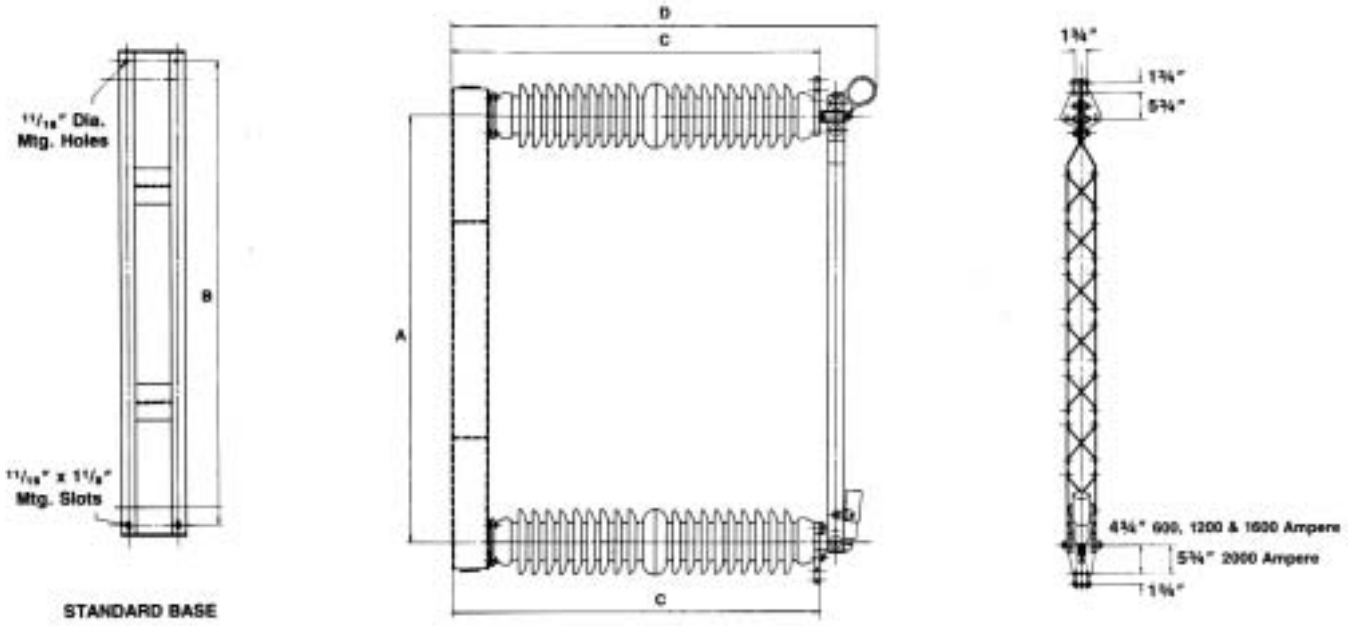
(3) Catalog numbers are for 30° rise ANSI-C37.37 ACCC designation A01.

(4) Catalog numbers shown are for 600 amps. For 1200, or 2000 amps, change 6 to 12, or 20 in the catalog number as required (eg.: 8.2 kV-1200 A: Cat. No. 7STV-12P3).

(5) For 3000 amp switch, refer to factory for dimensions.

Ampere Rating	Momentary Rating
600A	40 KA
900A	40 KA
1200A	61 KA
2000A	100 KA
(5) 3000A	120 KA

Type STV & STU 8.2 kV - 72.5 kV 600 thru 2000 Ampere (3000 ampere) (5)



STANDARD BASE

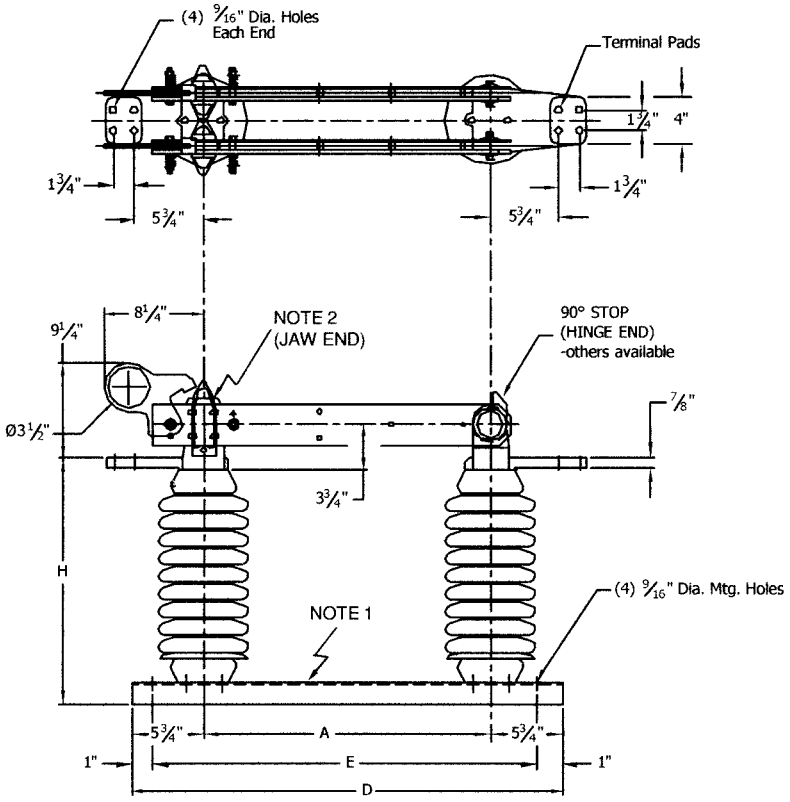
72.5 kV - 161 kV 600, 1200, 1600 & 2000 AMPERE

Insul. Type	RATINGS				Insul. Tech. Ref. No.	CATALOG NUMBER		Approx. Net Weight	APPROXIMATE DIMENSIONS IN INCHES (Refer to Factory for Certified Prints)			
	Voltage Rating kV		Current Rating AMPS			Vertical Mounted	Underhung or 45° Mounted †		A	B	C	D
	Max.	BIL	Cont.	Momentary								
STATION POST	72.5	350	600	40,000	278	69STV-6P5	69STU-6P5	490	45	51	38	44¾
			1200	61,000		69STV-12P5	69STU-12P5	500			38	45⅞
			1600	70,000		69STV-16P5	69STU-16P5	515			38	45⅞
			2000	80,000		69STV-20P5	69STU-20P5	535			38⅛	46⅝
	121	550	600	40,000	286	115STV-6P5	115STU-6P5	575	60	66	53	59¾
			1200	61,000		115STV-12P5	115STU-12P5	595			53	60⅞
			1600	70,000		115STV-16P5	115STU-16P5	615			53	60⅞
			2000	80,000		115STV-20P5	115STU-20P5	635			53⅛	61⅝
	145	650	600	40,000	288	138STV-6P5	138STU-6P5	660	72	78	62	68¾
			1200	61,000		138STV-12P5	138STU-12P5	680			62	69⅛
			1600	70,000		138STV-16P5	138STU-16P5	695			62	69⅞
			2000	80,000		138STV-20P5	138STU-20P5	725			62⅛	70⅛
	169	750	600	40,000	291	161STV-6P5	161STU-6P5	735	84	90	70	76¾
			1200	61,000		161STV-12P5	161STU-12P5	755			70	77⅛
			1600	70,000		161STV-16P5	161STU-16P5	775			70	77⅞
			2000	80,000		161STV-20P5	161STU-20P5	815			70⅛	78⅝

† Specify if switch is to be arranged for underhung or 45° mounting. Switch can be easily converted to either position in the field.

When Ordering Specify:

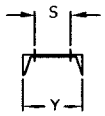
1. ***Rating and catalog number.***
2. ***If other than NEMA standard station post insulators are required refer to factory.***
3. ***Base drilling if different from that shown.***
4. ***If terminal connectors are to be provided with switch, specify size and type of conductor.***
5. ***If underhung or 45° mounted, specify which. Switch can be readily converted in field.***



NOTES

1 ---- Standard base shown, others available.

2 ---- For jaw and hinge contact information, see amperage table.



Voltage Rating kV		CATALOG NUMBER	Insul. Tech. Ref. No.	Approximate Dimensions (Refer to Factory for Certified Prints)						
Max.	BIL	(1) (2) (3)		A	D	E	F	H	S	Y
8.2	95	7STV-30P3	202	12"	20"	18"	4"	10 1/8"	2"	4"
15.5	110	15STV-30P3	205	15"	23"	21"	4"	12 3/4"	2"	4"
25.8	150	23STV-30P3	208	18"	26"	24"	4"	16 3/4"	2"	4"
38	200	34STV-30P3	210	24"	32"	30"	4"	20 3/4"	3"	6"

(1) Catalog numbers shown are with station post insulators. If cap and pin insulators are required, change the P to C in the catalog number (eg.: 7STV-30C3).

(2) Catalog numbers are for vertical mounted switches. If underhung mounting is required, change the V to U in the catalog number (eg.: 7STU-30C3).

(3) Catalog numbers are for 30° rise ANSI-C37.37 ACCC designation A01.

Ampere Rating	Momentary Rating	Contacts	
		Hinge	Jaw
3000A	120 KA	Slvr-Cu	Slvr-Cu

For higher voltages and higher Amp. ratings contact Morpac for further details.

Type STV & STU 8.2 kV - 38 kV 3000 Ampere

Morpac Design Hookstick Switches

The Morgan hook operated switch line offers a wide selection of configurations to accommodate any installation, including tandem transfer and non-sequenced regulator by-pass models. Designed for heavy duty substation and distribution use, these switches have been operating in extreme conditions around the world far in excess of 20 years. Switches meet or exceed the original ANSI C37.34 30˚ C temperature rise standard.

GENERAL DESIGN FEATURES

• Base

All steel bases are hot-dip galvanized per ASTM A123-89ea1. Special bases can be provided for different mounting configurations. Aluminum bases also available.

• Terminals

NEMA standard 2 and 4 hole terminal pads are machined out of cast contact metal alloy C83300. Tinned terminal pads are available upon request.

• Ratings

Voltage ratings up to 169 kV. Current rating up to 3000 Amperes.

• Hinge

Belleville washers insure a constant pressure on the hinge contact.

• Contact

High-pressure, self-wiping contacts are provided. Cast bronze “ears” enable portable load-buster use on all switches.

• Latch

A positive latching mechanism eliminates the possibility of the blade opening due to vibration or high fault current. The hook must be pulled in order to release the blade latch.

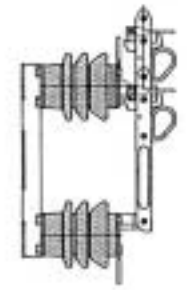
• Blade

All blades are made from high conductivity, round edge, hard drawn bus copper alloy 110 for superior performance and long life.

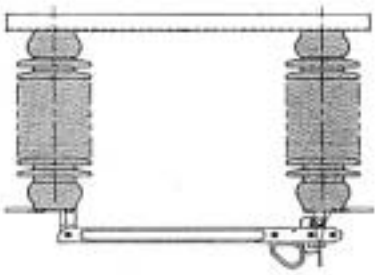
DHS 23kV, 1200 ampere

VHS 15kV, 600 ampere

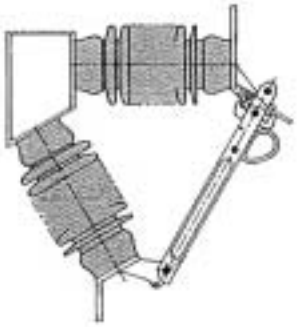
Morpac Design Hookstick Switches
Hookstick Disconnect Switches



RBS
Regulator Bypass
Hook Switch

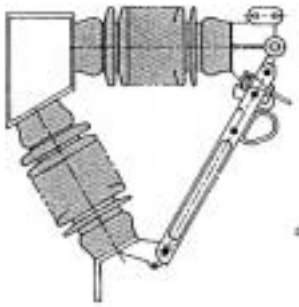


DHS
Disconnect Hook
Switch



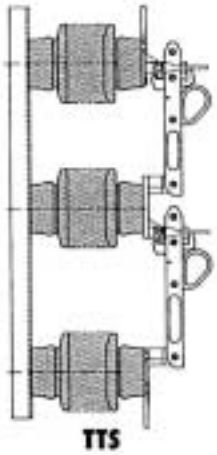
SHV
Sidemount Hook
"V" Switch

LTH
Inline Tension
Hook Switch



LHV
Line Tension Hook
"V" Switch

VHS
Underhung "V"
Hook Switch



TTS
Tandem Transfer
Hook Switch

All current carrying parts are copper/copper alloys.

All switches are heavy duty substation class designed for 30˚C temperature rise.

KV	AMPS	RBS	DHS	SHV	LTH	LHV	VHS	TTS
7.5	600 1200 2000	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ □	■ ■ □	■ ■ ■	■ ■ ■
15	600 1200 2000	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ □	■ ■ □	■ ■ ■	■ ■ ■
23	600 1200 2000	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ □	■ ■ □	■ ■ ■	■ ■ ■
34.5	600 1200 2000	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ □	■ ■ □	■ ■ ■	■ ■ □
46	600 1200	□ □	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
69	600 1200	□ □	■ ■	■ ■	□ □	■ ■	■ ■	■ ■
115	600 1200	□ □	■ ■	■ ■	□ □	□ □	□ □	□ □

■ Available
□ Not Available

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Interrupters

QUICK BREAK WHIPS

There are many factors which govern the interrupting capabilities of a disconnect switch. Some of these factors are: weather conditions, the amount of current, speed of operation, contamination, and the recovery voltage. Very high speeds of contact separation are required to establish the dielectric strength of the air gap ahead of the rise in recovery voltage.

Morpac has taken the speed of operation requirement out of the hands of the switch operator and designed it into the quick break whip, thereby keeping the velocity constant. This device is a whip machined from spring quality stainless steel. The whip is tapered, permitting maximum deflection and high tip speeds, without exceeding the elastic limit of the material.

In the closed position, the whip is engaged in a retaining catch and as the switch is opened, the whip is subjected to a large deflection and, as the switch continues to open, the whip is released and moves with spring action at high speed to the full open position. Through special design the whip is sufficiently dampened so that over-travel does not occur, and rebound is held to a minimum.

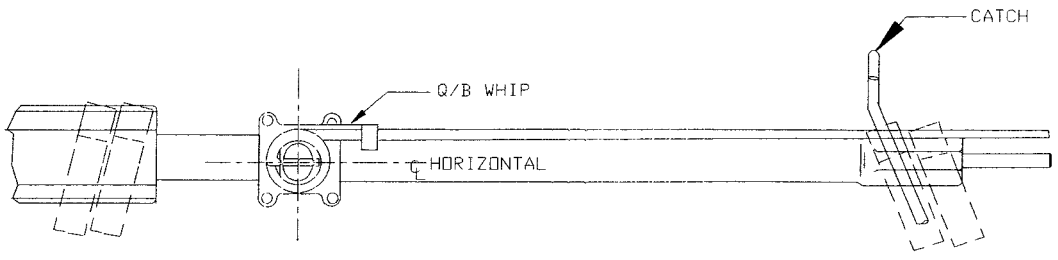
The recommended maximum interrupting range of application for the Morpac quick break whip is:

LINE BREAKING CURRENT		TRANSFORMER MAGNETIZING CURRENT		
7.5 - 115 kV	12 amps	7.5 - 69 kV	up to	35,000 KVA
138 kV	10 amps	115 - 161 kV	up to	100,000 KVA
161 kV	8 amps			

Magnetizing current in modern transformers is about 1 to 6 amperes. Where the actual value for a particular transformer is not known, it can be approximated. For units in the area of 5,000 KVA, the magnetizing current is approximately 1.5% of full load. At 10,000 KVA and above, 1.0% is a good approximation. These values are based on single and three phase multiple winding transformers. Autotransformer magnetizing current is normally less than the multiple winding units.

Field experience by utilities has shown that in network/loop/parallel switching up to 100 amperes of load current can be safely interrupted in 69 kV systems and below. This is due to the low recovery voltage across the switch as compared to radial feed/line charging where a high recovery voltage is seen.

The actual system parameters should be verified by the customer before specifying the addition of a quick break whip.



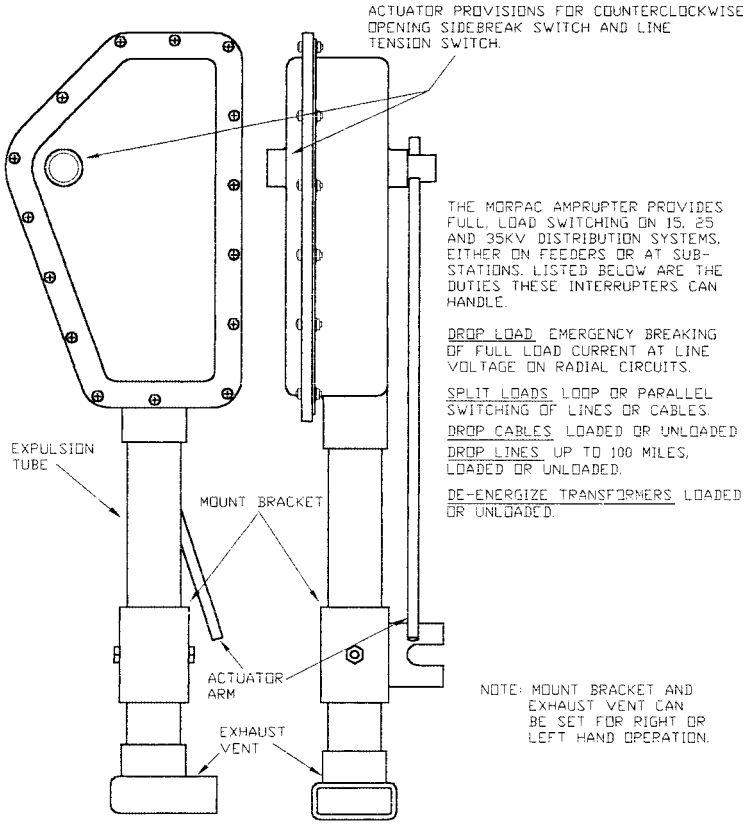
Amprupter™

The Morpac Amprupter™ provides full load switching of 600 amps on 15, 25 and 38 KV systems for either substation or feeder applications. It is designed to operate under adverse conditions for the following applications and others as well:

- Full load dropping at full line voltage
- Load splitting or loop and parallel switching
- Interruption of cable or line charging currents
- Interruption of transformer magnetizing currents

Morpac's Amprupter™ is an expulsion type interrupter that vents gases safely without an external arc. The contacts are spring loaded. When the switch is opened by line personnel, the pick up arm is engaged. Once the arm has traveled over center, the contacts snap open. This opening speed is independent of the operator's speed. Thus safe and consistent interruption is assured.

Morpac's amprupters are typically used on Morpac's CSB switches, but can be adapted to other manufacturer's switches as well.

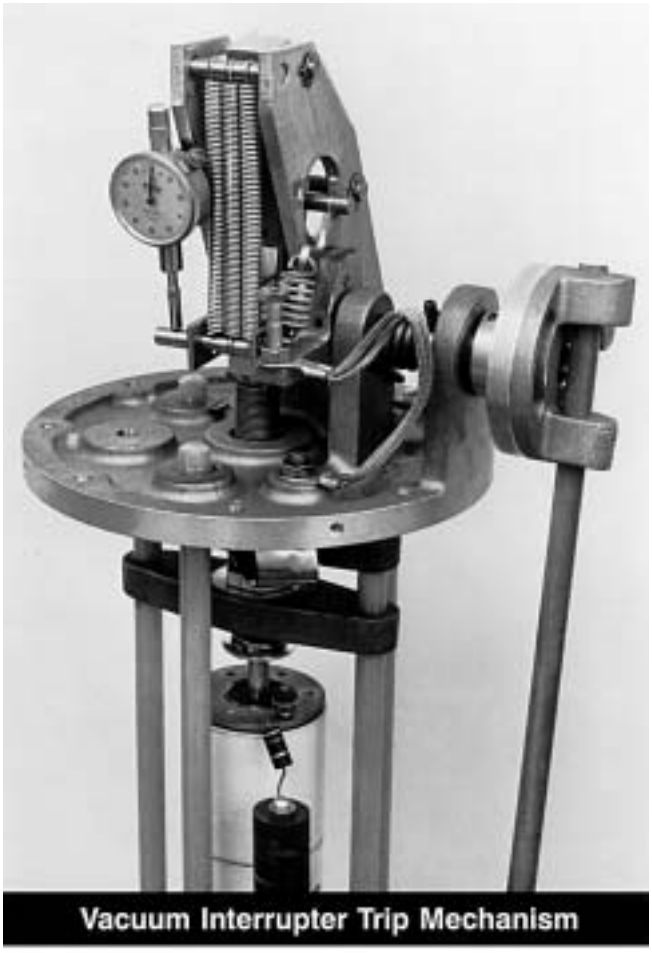


Vacuum Interrupters

The Morpac Type VI Vacuum Interrupter is a field tested and proven design which gives you bolt-on load break capability. The unit is factory sealed and adjusted for ease of installation, whether you are mounting it on a new Morpac switch or retrofitting it to another manufacturer's switch. It is designed to last the life of the switch with no maintenance. Each module within the unit can be individually field tested to verify its integrity.

Refer to the table to determine the number of modules required for your application. Please also note that depending on the type of switch, there may be a mechanical limit to the size of interrupter that can be used. For instance, most center break switches are limited to one bottle.

VI-1. Single Bottle Vacuum Interrupter



Vacuum Interrupter Trip Mechanism

For Multiple Bottle Units

Vacuum Interrupter Head

For Multiple Bottle Units

MORPAC VACUUM INTERRUPTERS

Number of series vacuum bottles required						
Max Voltage	70% PF Load current	Magnetizing current	Cable charging current	Capacitor Bank Grounded Neutral	Vac Bottles Required	Catalog Number
15.5	2000	800	600	800	1	**VI-1**
	2000	1000	600	1000	2	**VI-2**
25.9	1600	800	140	800	1	**VI-1**
	2000	1000	600	1000	2	**VI-2**
38	2000	700	600	700	2	**VI-2**
	2000	700	600	700	3	**VI-3**
48.3	2000	700	450	700	2	**VI-2**
	2000	800	600	800	3	**VI-3**
	2000	1000	600	1000	4	**VI-4**
72.5	2000	600	450	600	3	**VI-3**
	2000	600	600	600	4	**VI-4**
	2000	600	600	600	5	**VI-5**
	2000	600	600	600	6	**VI-6**
121	2000	600	450	600	5	**VI-5**
	2000	600	600	600	6	**VI-6**
	2000	600	600	600	7	**VI-7**
145	2000	600	450	600	6	**VI-6**
	2000	600	600	600	7	**VI-7**
169	1200	450	110	450	6	**VI-6**
	2000	600	450	600	7	**VI-7**
242	2000	450	110	450	8	**VI-8**

Single Bottle Interrupters for Reduced Voltage Applications

Single bottle interrupters can be used at higher line voltages for parallel switching or loop splitting applications. Caution: The peak recovery voltage must never exceed 30 KV for these applications.

Condition of Sale & Warranty

WARRANTY
5 YEARS

The Company warrants to the purchaser that the apparatus to be delivered hereunder will be free from defects in material, workmanship, and title and will be of the kind and quality designated or described in the contract. The foregoing warranty is exclusive and in lieu of all other warranties whether written, oral, or implied (including any warranty or merchantability of fitness for purpose). If it appears within five years from the date of shipment by the Company that the apparatus delivered hereunder does not meet the warranties specified above and the Purchaser notifies the Company promptly, the Company shall thereupon correct any defect, including nonconformance with the specifications, at its option, either by repairing any defective part or parts or by making available at the Company's plant a repaired or replacement part. The conditions of any tests shall be mutually agreed upon, and the Company shall be notified of, and may be represented at all tests that may be made. The liability of the Company to the Purchaser (except as to title) arising out of the supplying of the said apparatus, or its use, whether on warranty, contract, or otherwise, shall not in any case exceed the cost of correcting defects in the apparatus as herein provided and upon the expiration of said five years, all such liability shall terminate. The foregoing shall constitute the sole remedy of the Purchaser and the sole liability of the Company.

PREPAID FREIGHT

Freight prepaid and allowed on orders over $5,000.00 in the continental USA. For orders less than $5,000.00, freight is prepaid and billed. Products shipped on truck via common carriers FOB destination. Morpac will file any freight claims as long as any loss or damage is noted on the receiving copy of the freight bill. Damage that is not noted at time of receiving can not be paid by Morpac.

SALES TAX

The Company's prices do not include sales, use, excise, or similar taxes. Consequently, in addition to the price specified herein, the amount of any present or future sales, use, excise, or other similar tax applicable to the sale of the apparatus hereunder shall be paid by the Purchaser, or in lieu thereof the Purchaser shall provide the Company with a tax-exemption certificate acceptable to the taxing authorities.

RETURNS & CANCELLATIONS

Factory written approval is required for all returns. Returns are subject to freight and restocking charges. Cancellation charges are based on manufacturing and engineering costs incurred as of the date of cancellation.

FIELD SERVICE

A Field Service Engineer is available at a cost of $800.00 per day, plus transportation, lodging and meals. Charges are from time of departure until time of return.

EXPORT

Export crating costs an additional 10% of quoted price, and freight will be billed to purchaser.

DELIVERY

Shipping dates are approximate and are based upon prompt receipt of all necessary information. The Company shall not be liable for delays in delivery or failure to manufacture or deliver (1) due to causes beyond its reasonable control, or (2) due to acts of God, acts of the Purchaser, acts of civil or military authority, priorities, fires, strikes, floods, epidemics, war, riot, delays in transportation, or car shortages, or (3) inability due to causes beyond its reasonable control to obtain necessary labor, materials, components, or manufacturing facilities. In event of any such delay the date of delivery shall be extended for a period equal to the time lost by reason of the delay.

LIMITATION OF LIABILITY

In no event shall the Company be liable for special or consequential damages. The Company's liability or any other claim for loss or liability arising out of or connected with this contract, or the manufacture, sale, delivery, resale, or use of any apparatus covered by this contract (including, but not limited to, loss or liability arising from breach of contract) shall in no case exceed the unit price of such apparatus or part thereof involved in the claim, except as provided in the paragraph entitled "Warranty'.

MINIMUM ORDER

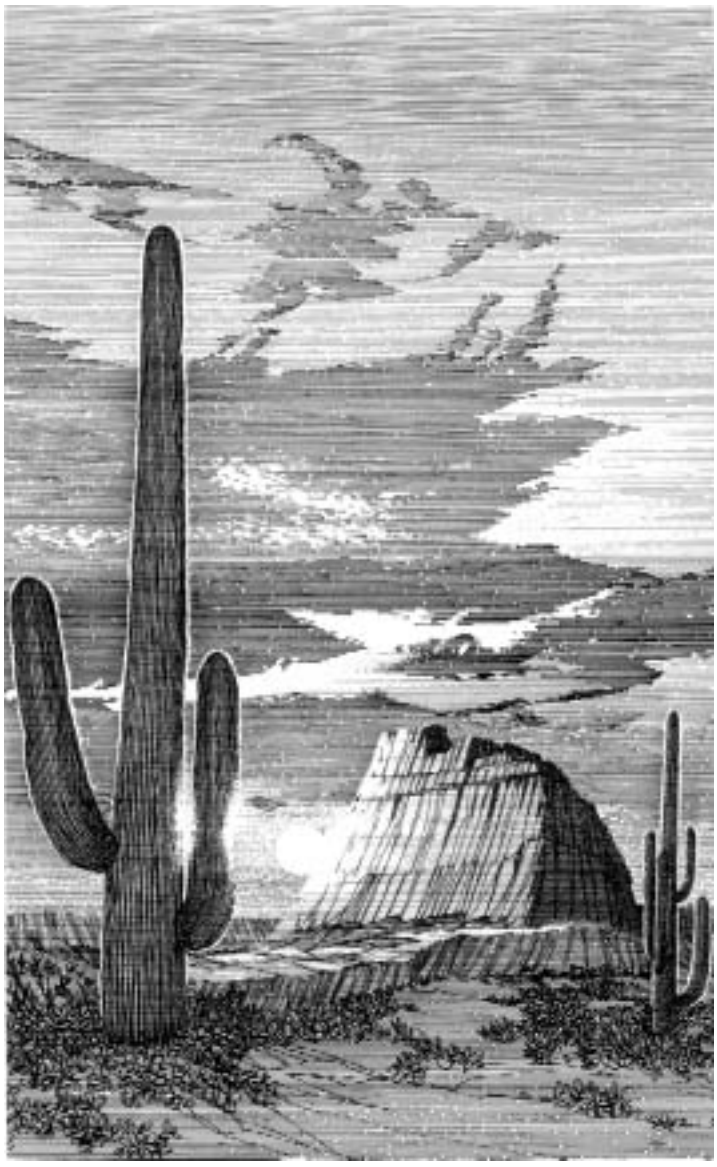
A minimum charge of $100.00 is required on all orders.

SPARE PARTS

Morpac recommends that no spare parts be purchased until needed. We can ship any part commonly needed in 24 hours from our stock.

MORPAC INDUSTRIES, INC.

MEMCO POWER PRODUCTS DIVISION



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