

FEBRUARY 14, 2017

# Joslyn Hi-Voltage<sup>®</sup>

Transmaster<sup>®</sup> switch — customer presentation

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# Joslyn Hi-Voltage Transmaster switch — agenda

Fundamentals

Compelling value

Product overview

– Features and benefits

– Design

– Ratings

– Applications

– Design enhancements

Exclusive products and features

– POW

Support and service

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# Joslyn Hi-Voltage Transmaster switch — agenda

## Fundamentals

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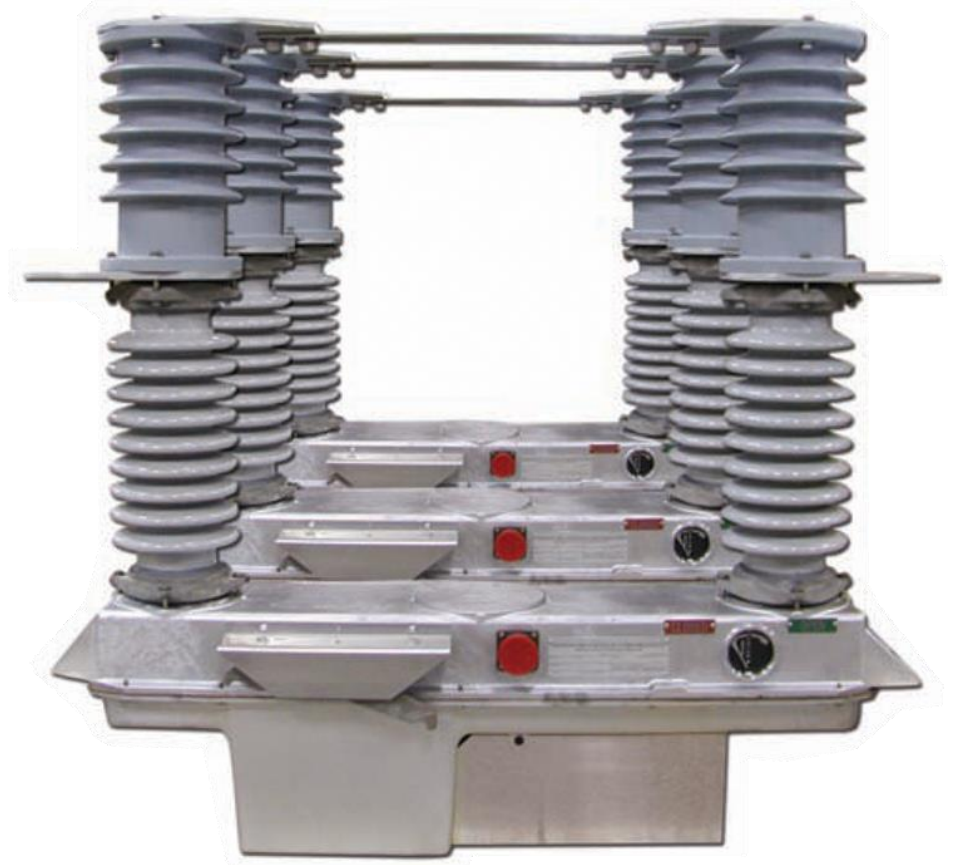
Support and service

# Fundamentals

## Why is the Transmaster switch used?

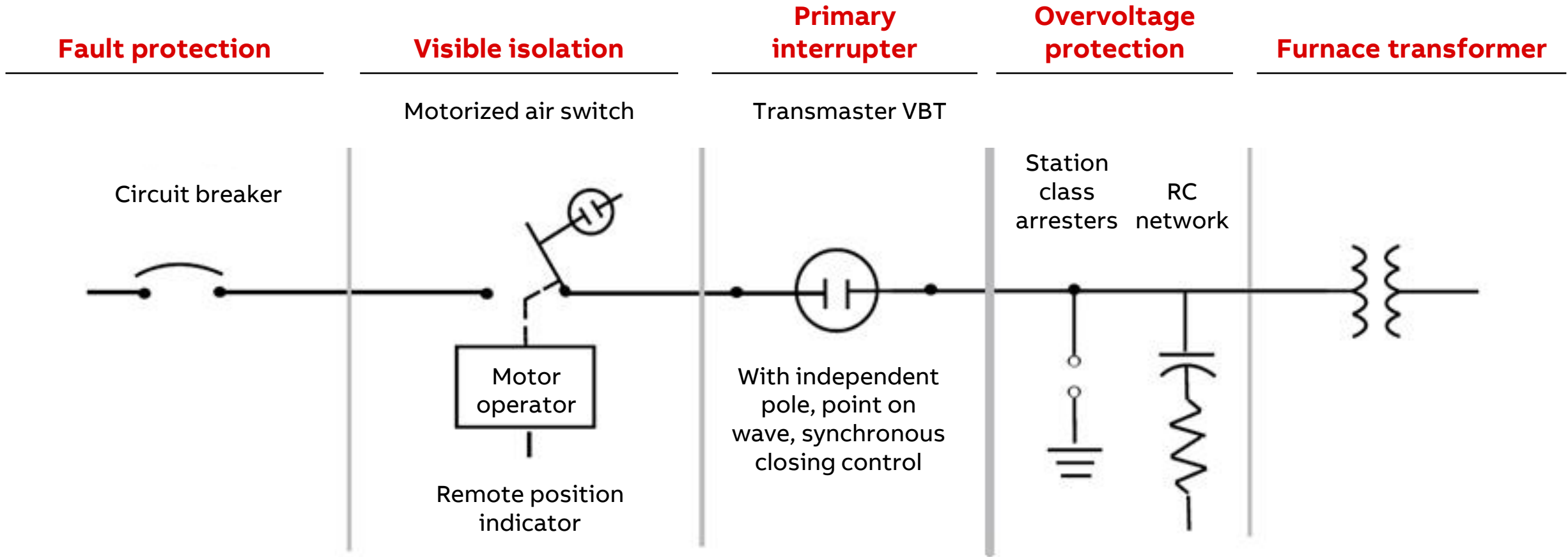
- Uses vacuum interruption and solid dielectric insulation for 15 kV to 69 kV applications
- Provides the longest maintenance-free life of any electric furnace switch\*
- Proven in over 4000 field installations worldwide
- Point-on-wave (POW) closing control options available

\* **Note:** Because it contains no oil or gas to monitor or maintain, the Transmaster switch is considered maintenance-free.



# Fundamentals

How is the Transmaster switch used?



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Fundamentals

**Compelling value**

Product overview

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Exclusive products and features

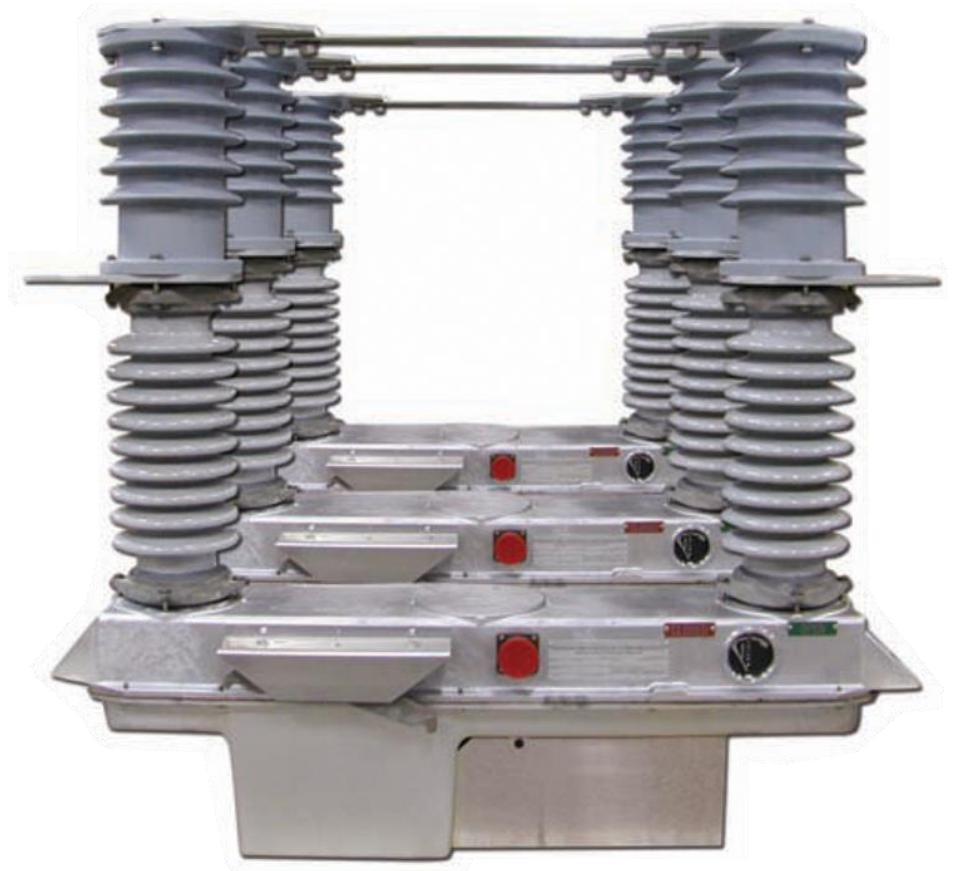
– POW

Support and service

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# Compelling value

- Reliability
- Environmental sustainability
- Lifecycle cost reductions



# Compelling value

Reliability — reduces stress on equipment associated with closing circuit of transformers

- Reduces inrush currents and transients associated with transformer switching
- Synchronous closing of three switch poles independently, with the occurrence of peak voltage in each phase
- Reduces stress on all other components of the furnace





# Compelling value

## Environmental sustainability — no oil or gases

- Uses vacuum interruption and solid dielectric insulation for 15 kV to 69 kV applications
- Solenoid operating mechanism provides a long life of maintenance-free operations\*

\* **Note:** Because it contains no oil or gas to monitor or maintain, the Transmaster switch is considered maintenance-free.



Transmaster VBT

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# Compelling value

## Lifecycle cost reductions — with solenoid operators

### **Long operational life of up to 100,000 open and close operations with no required maintenance\***

- Oil and gas interrupting mediums require maintenance and personal protective equipment
- Regulatory requirements call for monitoring and measuring of oil and gas usage/leakage

\* **Note:** Because it contains no oil or gas to monitor or maintain, the Transmaster switch is considered maintenance-free.

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# Product overview

## Product types

### Transmaster VBT switch

### POW control



#### Products



#### Application

Electric furnace switching

Point-on-wave control option

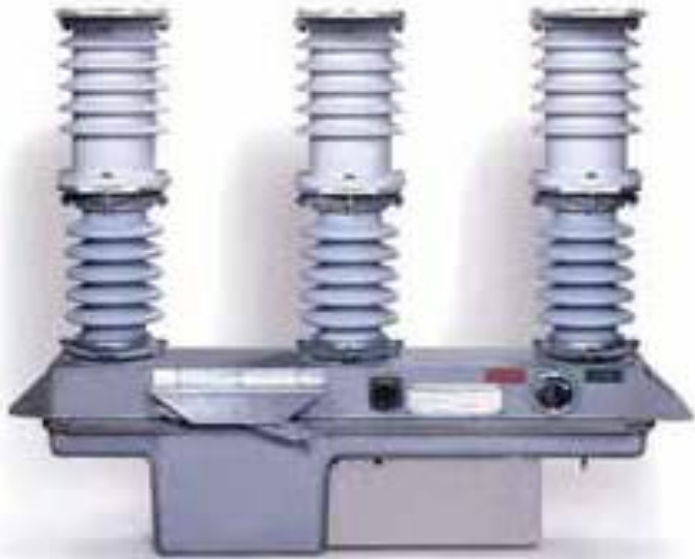
#### Rating

15 kV–69 kV  
300–4000 amps

15 kV–69 kV

# Product overview

Agency standards listings



All switches exceed the electrical requirements of the ANSI C37.66 standard.

# Product overview

## Features and benefits — Transmaster VBT single-phase switch



Longest-life switch for electric furnace applications

### Features

### Benefits/descriptions

Vacuum interruption and solid dielectric Joslyte insulation

No oil, no gas, no maintenance

Long, maintenance-free service life

Depending on operating mechanism and control voltage selection, offers up to 100,000 maintenance-free operations

15 kV–69 kV system range

Operates uniformly on all power factors in electric furnace installations

Compact and lightweight

No special foundations or support required

Completely sealed construction

Safe interruption with no external arcing; quiet yet high-speed operation

Factory assembled

Fast, easy, low-cost installation

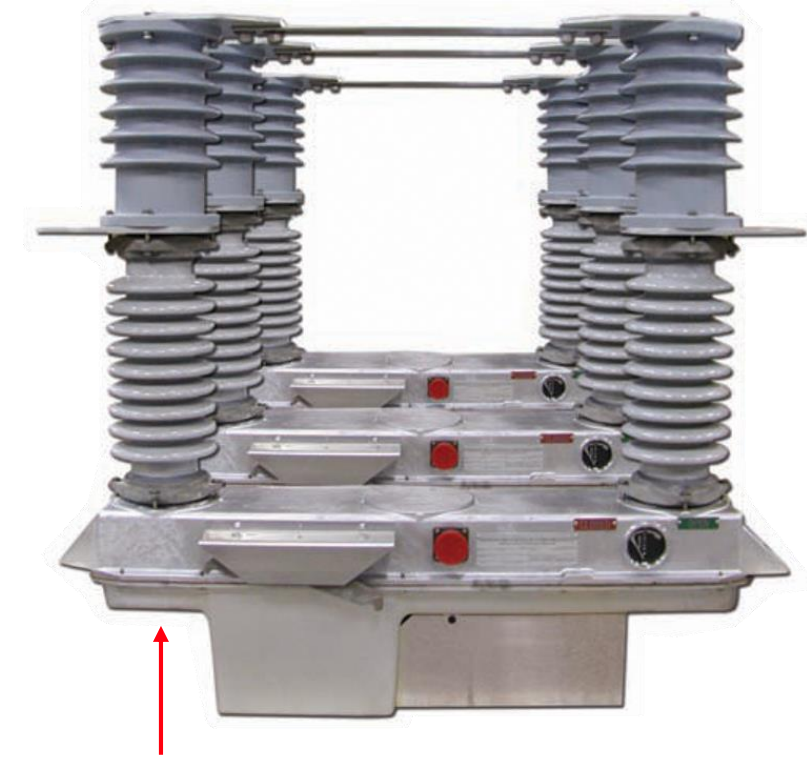
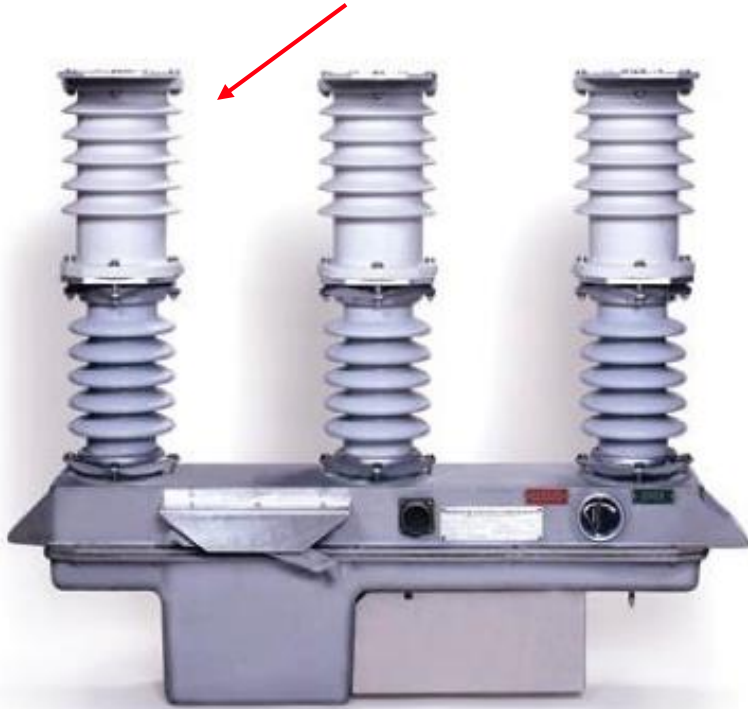
Solenoid operating mechanism

The completely sealed operating mechanism housing supports line-to-ground insulators and the modules

# Product overview

## Features and benefits — Transmaster VBT three-phase switch

Mechanically ganged phases with gang-operated manual handle



Three single-phase VBT switch configuration for use with junction box

# Product overview

## Design — operating mechanism

### Solenoid operating mechanism

- 100,000 maintenance-free expected operations
- 60 A control inrush per mechanism
- 6-cycle trip and close times
- Compatible with POW control (if using three single-phase switches)



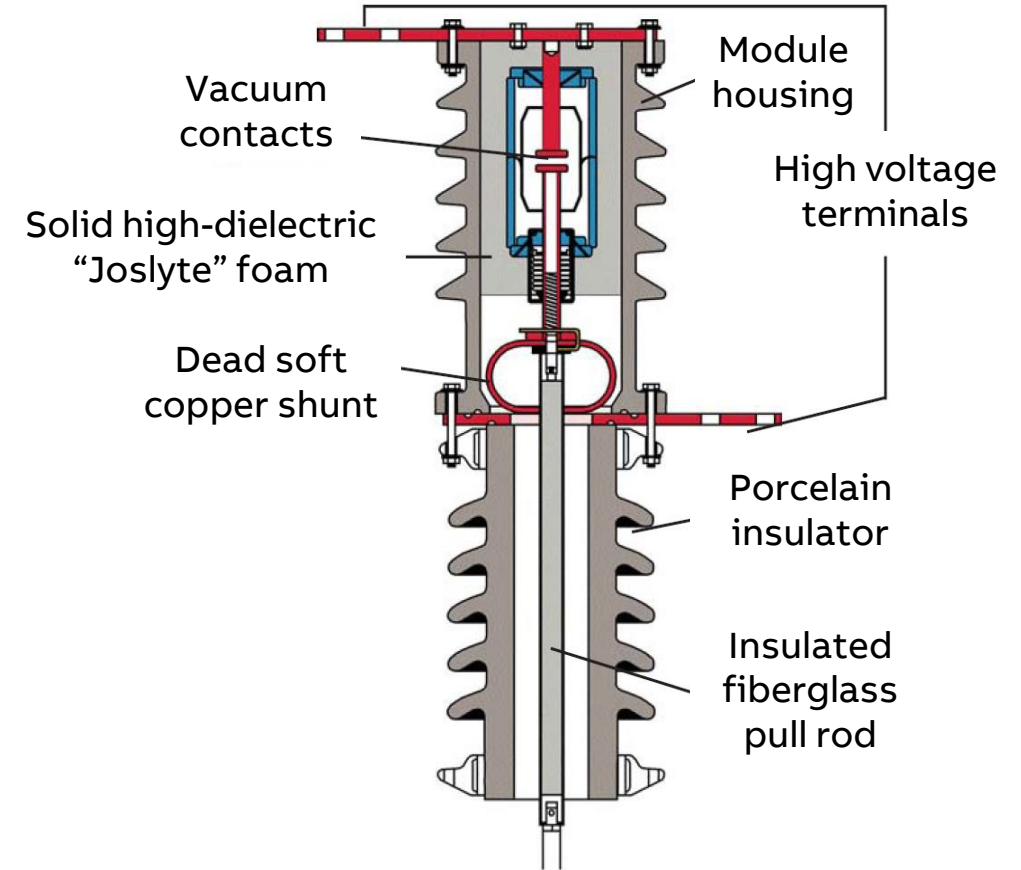


# Product overview

## Design — vacuum module

### Transmaster VBT vacuum module cutaway

- Vacuum interrupter designed specifically for repetitive switching
- Contacts/bellows
- Minimal force required, resulting in longer life
- Completely sealed
- No combustible material



# Product overview

## Ratings — Transmaster VBT models

### VBT 15 kV–69 kV maximum voltage

Description	15.5 kV						38 kV					
	600	1000	1500	2000	3000	4000	600	1000	1500	2000	2500	3000
Continuous current (amps)	600	1000	1500	2000	3000	4000	600	1000	1500	2000	2500	3000
Momentary current (RMS amps, asymmetrical) (kA)	20	35	50	65	65	65	20	35	50	65	65	65
Impulse withstand open-gap (kV BIL)	110	110	110	110	110	110	200	200	200	200	200	200
Impulse withstand line-to-ground (kV BIL)	150	150	150	150	150	150	200	200	200	200	200	200
Maximum 60 cycle withstand line-to-ground dry (one minute) (kV)	112	112	112	112	112	112	112	112	112	112	112	112
Maximum 60 cycle withstand line-to-ground wet (10 seconds) (kV)	55	55	55	55	55	55	55	55	55	55	55	55
Fault interrupting rating (amps, symmetric) (kA)	4	4	4	4	4	4	4	4	4	4	4	4

Description	48 kV						69 kV	
	600	1000	1500	2000	2500	3000	300	400
Continuous current (amps)	600	1000	1500	2000	2500	3000	300	400
Momentary current (RMS amps, asymmetrical) (kA)	20	35	50	65	65	65	15	15
Impulse withstand open-gap (kV BIL)	220	220	220	220	220	220	280	280
Impulse withstand line-to-ground (kV BIL)	250	250	250	250	250	250	350	350
Maximum 60 cycle withstand line-to-ground dry (one minute) (kV)	112	112	112	112	112	112	245	245
Maximum 60 cycle withstand line-to-ground wet (10 seconds) (kV)	55	55	55	55	55	55	198	198
Fault interrupting rating (amps, symmetric) (kA)	4	4	4	4	4	4	4	4

# Product overview

## Ratings — Transmaster VBT models

### Three-phase



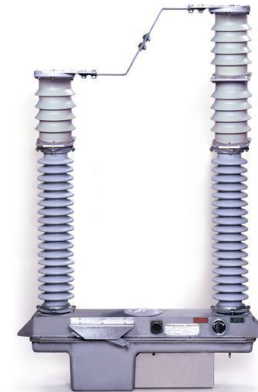
15 kV/25 kV 400 A  
15 kV/25 kV 600 A

### One-pole



34.5 kV 400 A  
34.5 kV 600 A  
48 kV 600 A

### One-pole



46 kV 300 A

### One-pole



69 kV 300 A

### Voltage rating

- Interrupter modules are connected in series
- 15 kV to 69 kV
- This modular technique allows for higher ratings with the same long-life device and results in common spare parts

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# Product overview

Applications — Transmaster VBT models

## Industrial applications



## Operation of electric arc furnaces



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# Product overview

Applications — Transmaster VBT models



Switching of electric transformers.

# Product overview

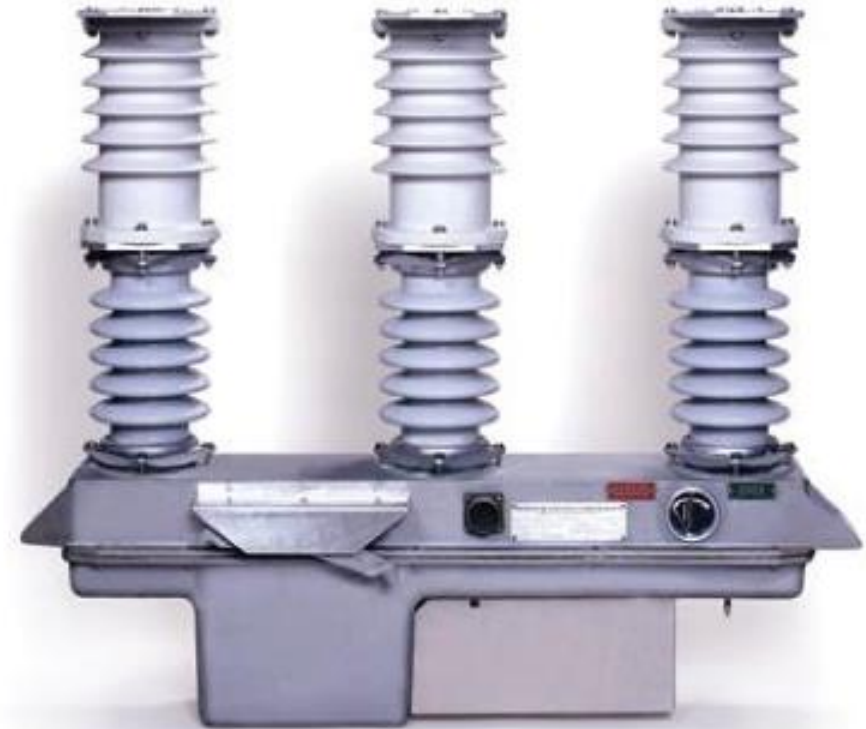
## Design enhancements — Transmaster VBT

### **Changed from a 300 A to a 600 A vacuum interrupter**

Standardized to the 600 A-rated vacuum interrupter, which increased vacuum space by 35%.

### **Electropolish contacts and interrupter stems**

The addition of this process eliminates all rough surfaces and any small imperfections that could potentially cause partial discharge and could temporarily impact an electrical interruption performance. This process allows for higher voltage conditioning.

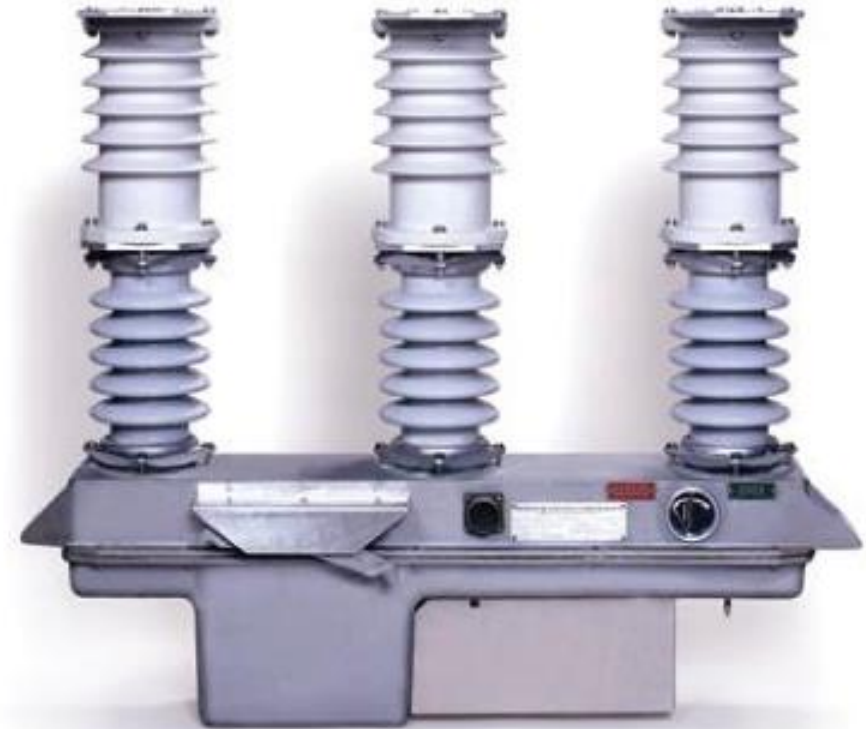


# Product overview

## Design enhancements — Transmaster VBT

### Voltage

This testing procedure is performed by reducing the size of the open gap of the contacts and increasing the conditioning voltage in order to better “clean” the contact surfaces and “burn-off” any initial microscopic particles present during the interrupter manufacturing process. This resulted in an AC withstand test rating of 70 kV for 1 minute with 0 breakdowns.



# Product overview

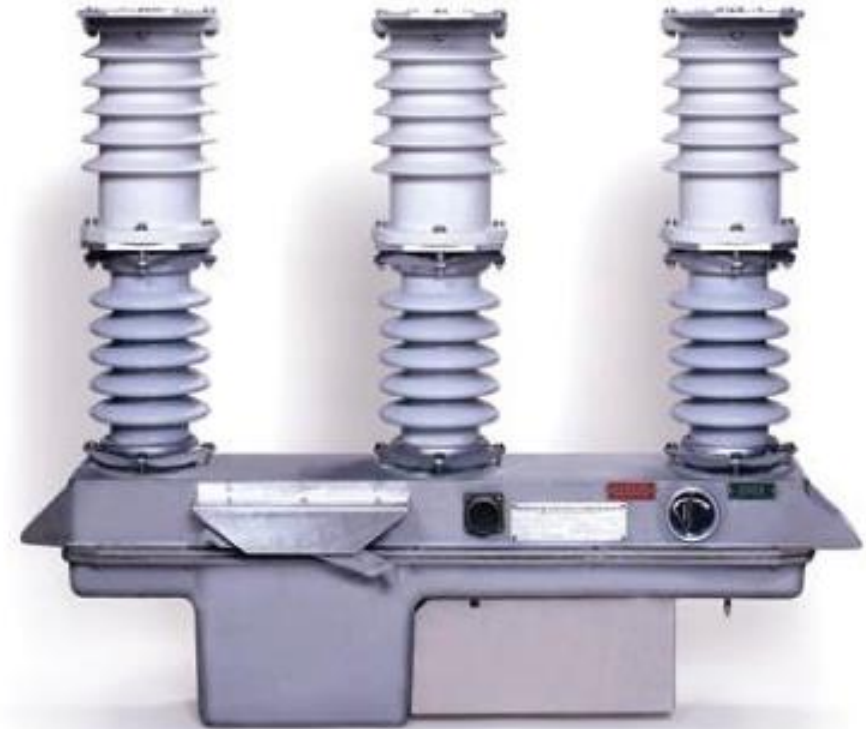
## Design enhancements — Transmaster VBT

### Added non-evaporable getters

Absorbs gases to maintain constant vacuum integrity and performance.

### Retested 38 kV Joslyn Hi-Voltage Transmaster VBT — certified Class C2

- According to IEEE C37.66, 2005, the Class 2 certification is the lowest restrike rating and is defined as 0.2% probability of restrike after 1200 test operations
- During the testing performed by T&B at a certified third-party testing lab, zero restrikes were observed in the 1200-operation test





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Support and service

# Exclusive products and features

## Point-on-wave control (POW)



Eliminates inrush currents and transients.

### Features

### Benefits/descriptions

Longer equipment life

Reduces mechanical forces on transformer bushings and windings, resulting in lower total cost of ownership

Increased safety

Less electrical stress on transformer interwinding insulation

Reduced maintenance costs

Minimal wear on components decreases maintenance requirements

Increased reliability

Reduces stress on all other components of the furnace

# Exclusive products and features

## Point-on-wave control (POW)

### Point-on-wave closing

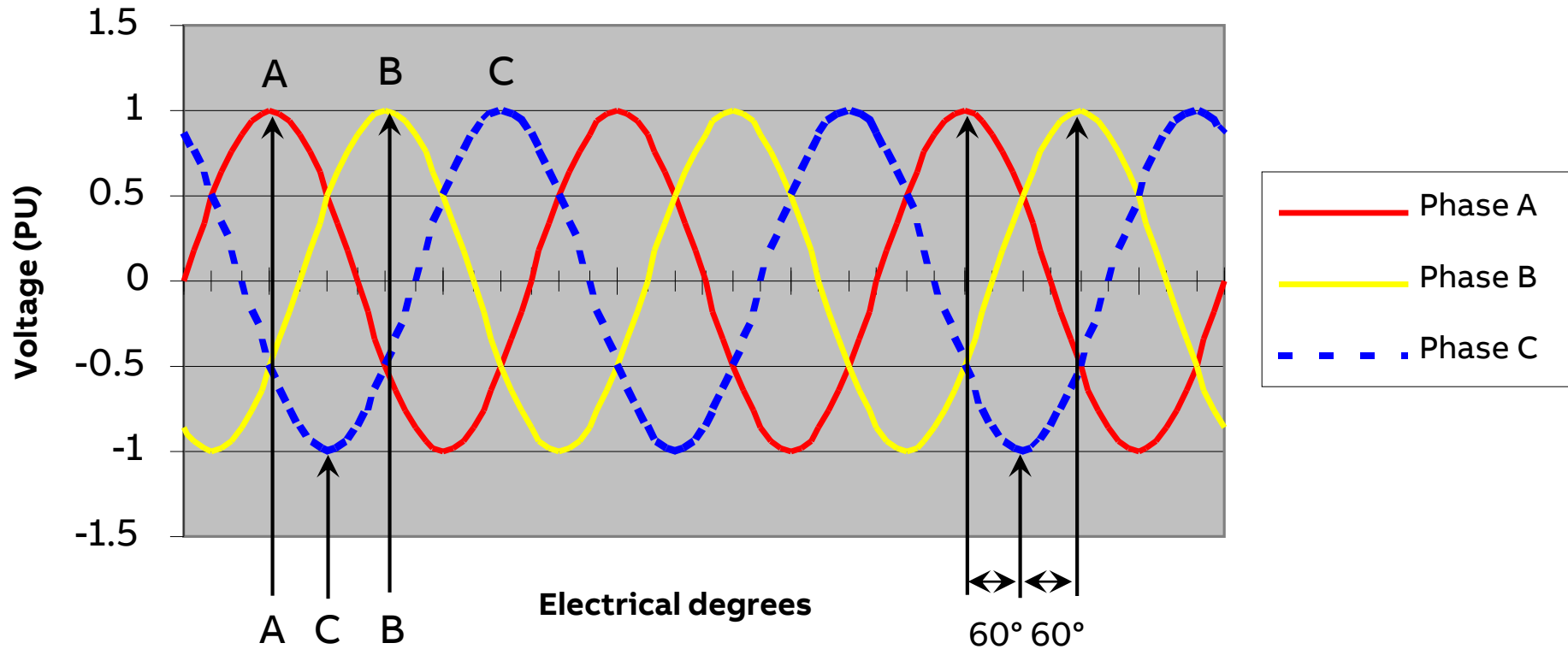
- Energizes each phase of the transformer when the voltage is at a maximum
- Since the voltage and current are  $90^\circ$  apart for inductive loads, switching at a maximum voltage energizes the transformer when a natural current zero would occur



# Exclusive products and features

Close sequence at peak voltages

### Three-phase ABC rotation



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# Support and service

## Planned maintenance

- A comprehensive planned maintenance program provides the best protection to your equipment/ investment year after year
- Service is performed on-site to minimize disruption and downtime
- Use of genuine parts only
- Set switches to factory standards



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# Support and service

## Planned maintenance services

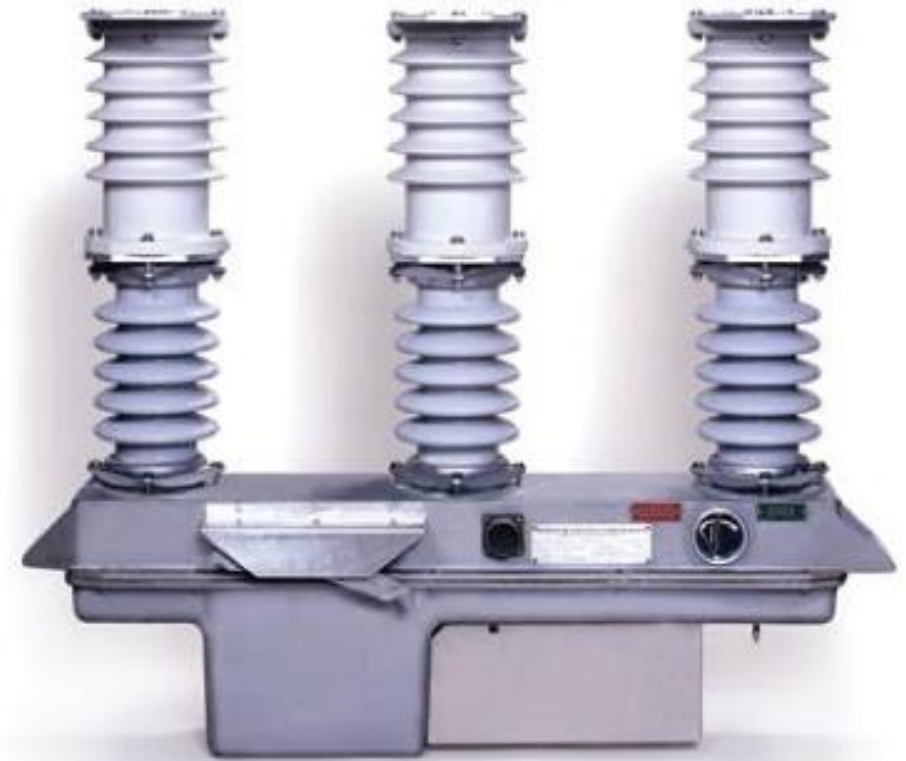
- Visual inspection
- AC hi-pot testing
- Contact resistance testing
- Complete mechanical adjustments
- Dynamic timing shots
- High-voltage timing with POW products
- Performance report for each product

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# Joslyn Hi-Voltage Transmaster switch

Compelling value

- Reliability
- Environmental sustainability
- Lifecycle cost reductions







**AABB**