





# Trusted brand. Quality products.

The operation of electric arc furnaces requires large amounts of power to be under constant control. If your only means of controlling transformer magnetizing, load and secondary fault currents was the primary circuit breaker, this would result in the circuit breaker being opened and closed more than 100 times per day. This type of wear and tear would cause even the most durable breakers to require frequent and costly maintenance.

With this in mind, Thomas & Betts engineers worked closely with electric arc furnace manufacturers to develop the Joslyn Hi-Voltage® Transmaster VBT electric arc furnace switch. The Transmaster switch is a heavy-duty vacuum switch designed to deliver maintenance-free switching of electric arc furnaces. Not only does this switch reduce maintenance costs, but it offers reliability, environmental sustainability and lifecycle cost reductions throughout the life of the product.

**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

**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\*

**Lifecycle cost reductions** —

with solenoid operators

- Long operational life of up to 100,000 open and close operations with no required maintenance\*
- No monitoring or measuring of oil and gas usage/leakage

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

Operation of electric arc furnaces



# Exceptional value.

## Features and benefits

- Long, maintenance-free life under demanding conditions, designed for 100,000 operations
- No oil or gas used for interruption or insulation
- Safe — all switches exceed the electrical requirements of the ANSI C37.66 standard
- Vacuum interrupter condition can be determined quickly by a high-potential withstand test
- Lightweight, modular design — no special foundations or costly support required
- Removable fuses provide protection
- Vacuum contacts withstand excessive overloads and system short circuits at any power factor
- Eight heavy-duty auxiliary contacts provided for remote indications, control and interlocking of other furnace functions or equipment
- Capacitor discharge circuit trips switch open upon loss of control voltage
- Circuit trips switch open if one mechanism does not close within the specified time

### Designed specifically for use in:

- Steel mills
- Foundries

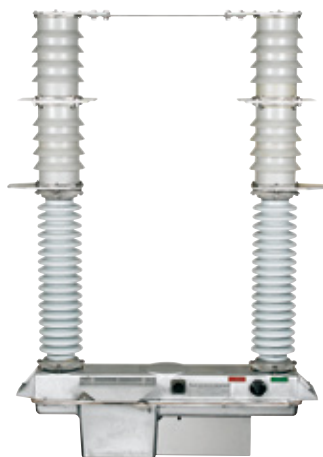
## Design

### Solenoid operating mechanism

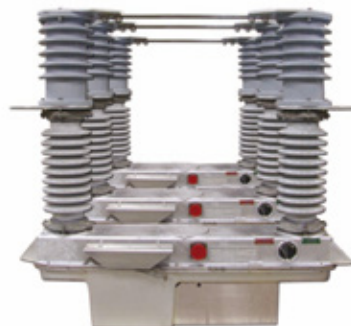
- 100,000 maintenance-free expected operations
- 60 amp control inrush per mechanism
- 6-cycle trip and close times
- Compatible with point on wave control (if using three single-phase switches)

### Transmaster VBT vacuum module cutaway

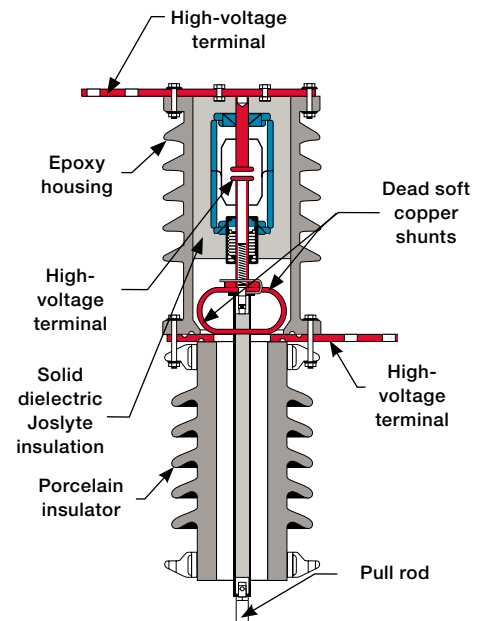
- Vacuum interrupter designed specifically for repetitive switching
- Contacts/bellows
- Minimal force required, resulting in longer life
- Completely sealed
- No combustible material



Transmaster VBT switch



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



Vacuum module

# Ratings

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

VBT 15 kV–69 kV maximum voltage												
Description	15.5 kV						38 kV					
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	
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

# Design enhancements

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

Standardized to the 600 amp-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.

## **Voltage withstand testing**

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 one minute with zero breakdowns.

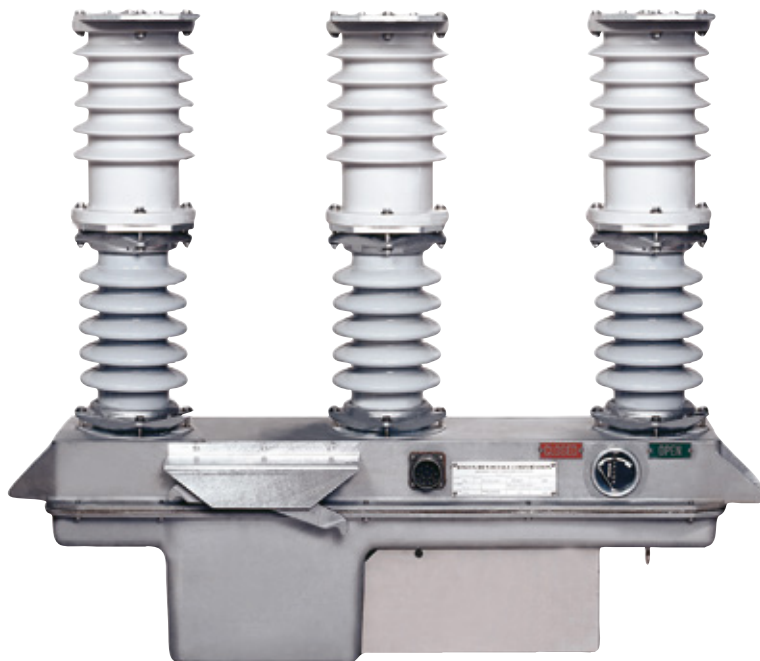
## **Added non-evaporable getters**

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 has 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.



Transmaster VBT switch

# Exclusive products and features

## Digital point on wave (POW) control

The purpose of the independent pole, point on wave, synchronous close system is to reduce transformer energization transients by being able to close each pole at the natural current point zero. The expected benefits include significantly reduced inrush currents, reduced electromechanical stress on transformer bushings and windings and reduced stress on all equipment associated with the closing circuit of the transformer. In addition, the digital point on wave control offers the end user the ability to perform quick and easy calibration themselves, with no need to schedule trained outside personnel for this task.

## Application

When an electric arc furnace switch is called on to close, a random closing occurs, which can energize the transformer at any point on the voltage waveform. This produces high-magnitude transient inrush currents rated 1000% of full load current. The point on wave control is designed to energize the transformer at the optimal point on the voltage waveform.

## Features and benefits

- 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
- Eliminates inrush currents and transients

## Point on wave closing

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



Digital point on wave (POW) control



# Support and service

## Planned maintenance

- A comprehensive planned maintenance program provides the best protection for 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

## 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

Operation of electric arc furnaces



# Visit the T&B world of electrical product solutions

Visit our web site for more information about Thomas & Betts solutions and our newest products. For a user-friendly catalog and competitive part number search, application and technical support and other useful information, go to: [www.tnb.com](http://www.tnb.com)

## Industry codes and specifications

All Thomas & Betts products meet or exceed applicable industry specifications or codes which are detailed in the appropriate T&B product literature.

IEEE   ANSI   IEC

## Online CAD library

Thomas & Betts offers free download of two- and three-dimensional CAD models of many of its products in more than 90 native CAD formats at: [www.tnb.com/cadlibrary](http://www.tnb.com/cadlibrary)

Please ask your Thomas & Betts sales representative for a complete catalog of quality Thomas & Betts electrical products or visit us at [www.tnb.com](http://www.tnb.com). For customer service, call 1-800-816-7809. For technical questions, contact your field applications engineer.

© 2017 Thomas & Betts Corporation. All rights reserved. Printed in the U.S.A.  
4/17 GM7736

Thomas & Betts Corporation  
Electrification Products Division of ABB  
8155 T&B Boulevard  
Memphis, TN 38125  
901-252-5000  
[www.tnb.com](http://www.tnb.com)

**Thomas & Betts**  
A Member of the ABB Group