



Single phase circuit breakers Tavrida Electric

tavrida.com

Tavrída Electric is a group of companies that specializes in research, development and manufacturing of innovative switchgear solutions for indoor and outdoor medium voltage applications.

Tavrída Electric being present in the market for more than 25 years has become the leader in switchgear manufacturing.



Tavrída Electric's single phase circuit breakers are perfectly suitable for applications like:

- Transformer neutral grounding.
- Generator neutral grounding.
- Single phase load switching.
- Controlled switching.
- Phase grounding.

The circuit breakers weigh less than 14 kg, meaning they can be installed quickly and cost-efficiently even within the smallest areas.

Main parts:

Vacuum interrupter

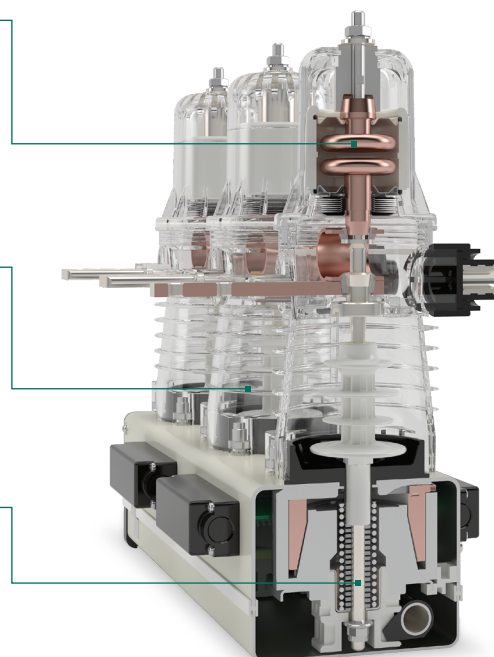
- High amount of CO-cycles (up to 50 000)
- High interrupting capacity
- Very compact dimensions
- Low chopping current

Support insulator

- Exceptional mechanical strength and excellent flame retardancy
- High dielectric strength even in a harsh environmental conditions

Linear motor

- No rotating parts, gears, bearings etc.
- Precise close/open timing
- Fast reaction and operation time
- Very compact dimensions



Key benefits of single pole Tavrída Electric vacuum circuit breakers

The most precise circuit breaker

- Reliable vacuum circuit breakers with precise opening/closing time of 35/70 ms.
- Closing/opening time deviation is only 1 ms in 20 years of operation



Easy installation, maintenance-free vacuum circuit breaker:

- Completely maintenance-free vacuum circuit breaker with a total life expectancy of at least 30 years.
- Low power consumption by control module.
- Minimum vacuum circuit breaker operation & maintenance costs.
- Easy installation and integration into OEM solutions.



Long life and high reliability:

- Up to 50 000 close-open cycles.
- Life expectancy of at least 30 years.



Most compact dimensions, the lightest weight, any spatial orientation:

- Vacuum circuit breaker is fully operational at any spatial orientation.
- The circuit breaker can fit in in any switchgear design.
- Optimum usage of space is guaranteed.



Reduced auxiliary power supply need

- Significant savings on auxiliary power supply and equipment
≤42 Watts during capacitors charging (max 7s).

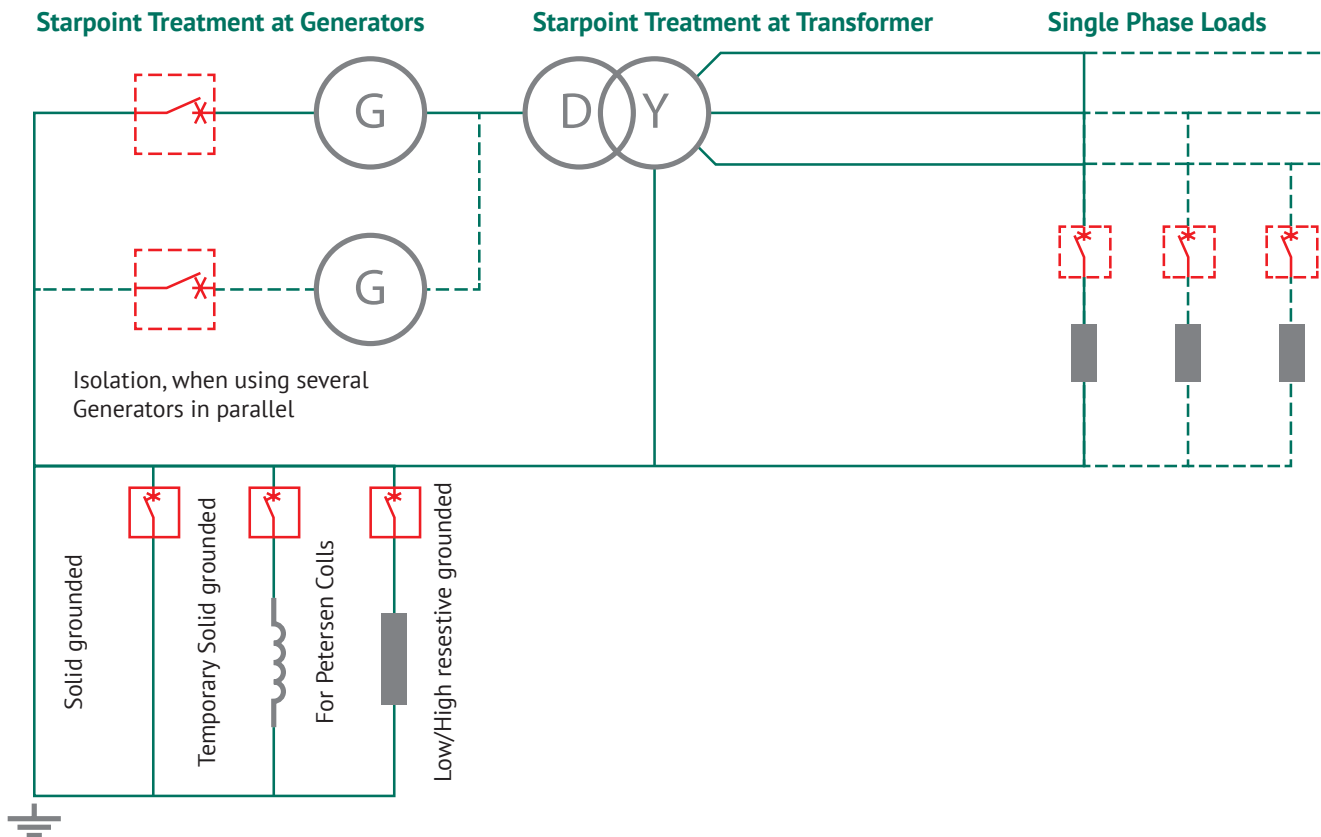


Additional benefits of the circuit breaker:

- Continuous self-supervision of the whole trip and close circuit.
- Event log available.
- Environmentally friendly SF6-free vacuum circuit breaker.
- Unique and patented design of the actuator. Optimal in terms of reliability, dimensions, and weight.



Applications: Single pole vacuum circuit breaker neutral treatment Utilities



Starpoint treatment at transformer

Vacuum circuit breakers are used for switching and bypassing transformers' neutral grounding devices like:

- 1) Resistor
- 2) Reactor
- 3) Petersen coil

To enable relay protection, to detect and clear the faults in networks, where earth fault current is limited or compensated, it is recommended to install a bypass circuit breaker.

Tavrada Electric has supplied such solutions to customers all around the world.

Customers pick Tavrada Electric breakers as VCB series breakers are the only ones that possess:

- 1) Reliability
- 2) No maintenance is required (0 OPEX)
- 3) Simple installation due to small size, light weight, any spatial orientation

Transient earth fault clearing scheme*

Customer supply interruptions in case of transient earth faults in MV distribution networks with earthed neutral result in low distribution network KPI's, high values of SAIDI and SAIFI, threats to the network integrity and public safety.

Temporary conversion to an unearthed network results in up to 90% successful transient fault extinguishing.

Providing exceptional amount of CO cycles (up to 50,000) Tavrada Electric's single phase vacuum circuit breaker is a perfect match in such cases.

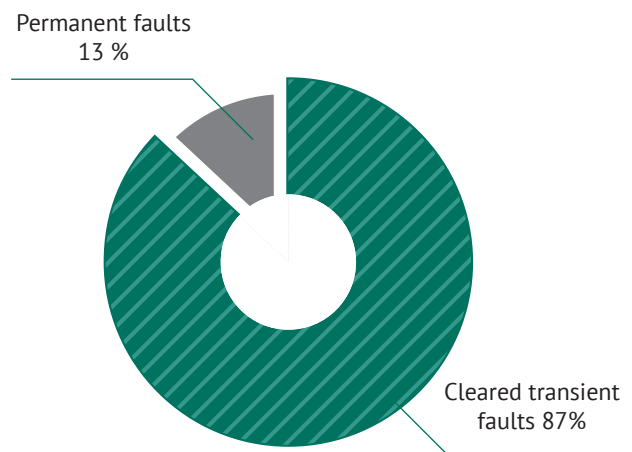
* *Improved transient earth fault clearing on solid and resistance earthed MV networks by JP Scholtz, March 2011.*

ESKOM case (South Africa):

Tavrida Electric has supplied Transient earth fault clearing scheme solution based on OSM35 for the biggest African power company Eskom, that generates approximately 95% of the electricity used in South Africa and approximately 45% of the electricity used in Africa. The project took place near Cape Town, in Badsberg trial site.

Test results and operating performance statistics over nearly a year period on trial site has demonstrated impressive results. Nearly 87% of earth faults resulted in extinguishing the transient earth fault and feeder power supply restoration.

TEFCS (transient earth fault clearing scheme) allows to reduce the number of momentary interruptions (improves system MAIFI). It benefits the customers of the utility (farmers, manufacturers, etc.) by reducing their operational costs, material losses and/or equipment damage.



Western Power Distribution case (United Kingdom):

The protection philosophy for the power transformers 33/11 kV in the network of Western Power Distribution incorporates the star point treatment with Peterson coils.

Using bypass vacuum circuit breaker for short time low resistance earthing is part of WPD's protection philosophy.

Tavrida merged the outstanding properties of its single pole vacuum circuit breaker for indoor use with a special designed weather proof enclosure and could easily meet the expectation of WPD.

Phase grounding

The phase grounding is usefully applied in inductive grounded networks by arc suppression coils. The use in isolated systems is also possible. During a single phase earth fault due to the earth capacitance of the cables or overhead lines, a capacitive charging current is flowing through the fault place.

In case of precise capacitive current compensation at the fault location, only the

“Watt residual current” remains, which in large cable networks can have quite a couple of amps however.

Single phase grounding (at the substation) is a low-cost system, which largely relieves the fault location of residual current, both of its active and reactive components.

Industrial Substations Transformers Neutral Treatment

Transient earth fault clearing scheme

Eliminate your financial losses caused by power outages!

An auto reclosing at substations leads to technological process interruption of industrial customers, in case of connection to medium voltage lines. Such customers can install neutral circuit breakers at feeding substations to temporarily isolate neutral from

the ground to minimize the effect of feeder circuit breaker autoreclosing.

Usage of neutral circuit breaker prevents power outages caused by transient earth faults and eliminates negative consequences like:

- **Costly Downtimes**
- **Damage to production**
- **Stressful equipment restart**
- **Loss of motor control**

With Tavrída Electric vacuum circuit breakers, 30 years of maintenance-free operation is guaranteed (up to 50 000 CO cycles)

No other vacuum circuit breaker on the market can offer such outstanding durability.



Temporary Neutral Grounding

Temporary solid grounding insures earth fault detection and clearance by the relay protection in networks, where the earth fault current is limited or compensated.

Installation of the bypass neutral circuit breaker allows clearing the earth fault and avoiding any expensive production equipment damage.

Tavrída Electric vacuum circuit breakers are unique in terms of any spatial orientation capability and compactness with H/W/D merely: 475/318/265 mm. Tavrída Electric vacuum circuit breakers are far more suitable than switches or other switching equipment due to their capability to make and break short circuit currents.

Single Phase Load Switching

Single phase vacuum circuit breaker could be implemented by various customers:

Power utilities, enterprises, public buildings which have single phase loads, 4-wire distribution networks which have single phase loads to be operated independently.

Compact single pole VCBs save space for the customers and provide reliable and convenient way to switch single phase loads.

Maintenance-free design simplifies electrical operation for the buildings and enterprises, allows to forget about circuit breaker's motor, dielectric medium, and electrical contacts inspections.



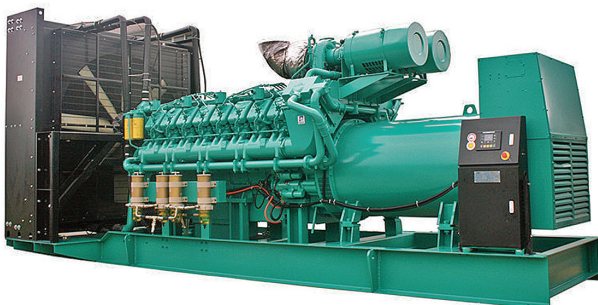
Buildings and enterprises, utilities, obtain a number of benefits using Tavrida Electric vacuum circuit breakers:

- A long-life and up to 50 CO operating cycles over a total life expectancy of at least 30 years.
- Compact grids (compact dimensions and light weight).
- Maintenance free (no need for additional personnel).
- No operational costs.
- The capability to manually/remotely control vacuum circuit breakers.
- SF6 free, environmentally friendly.

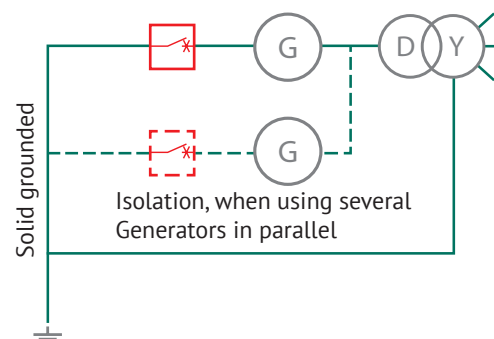
Generators Neutral Switching

Starpoint Treatment at Generators Isolation, when using several Generators in parallel.

Maintain the earth fault current limited to its designed value during generators parallel operation, by earthing one of the generator's neutral. Tavrida Electric vacuum circuit breaker allows performing generators neutral switching, executing required electric network configuration as long as other generators should be ungrounded to avoid circulating current between the generators.



Starpoint Treatment at Generators



Starting and Braking Resistors

Tavrída Electric vacuum circuit breakers are also applicable for starting and braking resistors switching and protection.

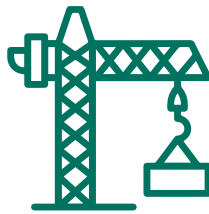
In order to limit the starting current of a motor or to assimilate the kinetic energy during braking applications, the starting and braking resistors are widely used. Renowned remarkable

Tavrída Electric vacuum circuit breakers' durability provides their reliable and long-term operation.

Tavrída Electric vacuum circuit breakers are used in:



Railway



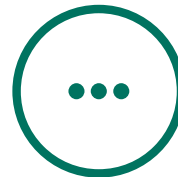
Cranes



Conveyors



Mills



Etc

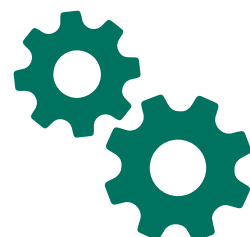
OEM

Tavrída Electric's vacuum circuit breakers through many years of operation have proven themselves to be the ideal switching equipment for OEM solutions.

- Small size of the breaker and its ability to operate in any spatial orientation allows to install the breaker in any switchgear panels/cubicles.

- High reliability ensures the long life of the switchgear.
- Interlocking mechanism using flexible cables provides both reliable and convenient in terms of installation and operation interlocking system.
- Low auxiliary power consumption eliminates the necessity for auxiliary power supply circuits renewal.

Providing very compact dimensions and low weight of both switching and control modules, Tavrída Electric vacuum circuit breakers make it possible for OEMs to meet all the customers' needs for compact and reliable switchgear designs and other solutions.



Controlled Switching

Controlled switching (sometimes also referred as point on wave switching) is a technique of switching the electrical circuit on a specific point of a sin-wave – voltage or current, to minimize:

- switching transients and associated inrush currents
- voltage disturbances
- re-strikes and arc re-ignitions

The controlled switching requires each phase to be operated independently and with a very high timing accuracy. Tavrída Electric breakers have outstanding operational timing accuracy - closing/opening time change over the span of 20 years and in temperature range -25 to +55C is less than 1 ms.

The control switching allows to avoid transients and even make connections that were previously deemed to be not feasible.

Controlled switching main applications:

- Mechanically switched capacitors (MSC)
- Mechanically switched Reactors (MSR)
- Transformers
- Hybrid STATCOMS
- Power consuming drivers
- Shunt reactors

VIZIMAX SynchroTeq MV Controlled Switching Device and Tavrída Electric breakers paired together allow to achieve high accuracy point on the wave switching for any selected switching strategy so destructive current and voltage transients could be avoided.



Liaoning TuoXin Power Electronics Co. Ltd. uses Tavrída Electric vacuum circuit breakers for the capacitor banks switching. The capacity is 6000 kVar.

During 5 years of cooperation, Liaoning Tuoxin Power Electronics has installed more than 350 Tavrída Electric vacuum circuit breakers evidencing significant reliability of the switchgear and wide range of its applicability.

See the reference letter:
<https://lcloud.tavrída.ru/urle42xbpm4tiwn>



Controlled switching offers benefits in industries like:

Utilities

- Controlled switching eliminates harmful high frequent transients caused by the capacitor banks switching. Thus lifespan of the electrical equipment is increased.
- Controlled switching allows to avoid harmful steep overvoltages caused by reignition between the circuit breaker contact gap in a shunt reactors schemes.
- Controlled switching eliminates undesired protection trips and power outages caused by high inrush currents.
- The use of controlled switching allows to comply with the grid code.



Mining Industry

- In case of capacitor banks connected to the power station busbars, controlled switching protects the equipment from the harmful transients caused by the capacitor banks switching (high amplitude and high frequency currents).
 - Using controlled switching at power plants allows to protect the production and switching equipment from high inrush currents.
- In case of frequent switching modes of operation, controlled switching protects circuit breakers and other equipment from its intensive wearing and rapid aging.
 - Controlled switching can replace the costly, complex mechanical auxiliary equipment, such as closing resistors.

Electric Arc Furnace

- Arc furnaces operation is always accompanied by high amount of switching on the medium voltage side. This way of switching causes rapid circuit breaker and equipment aging. Using the controlled switching allows to prolong the equipment life and save on its replacement.

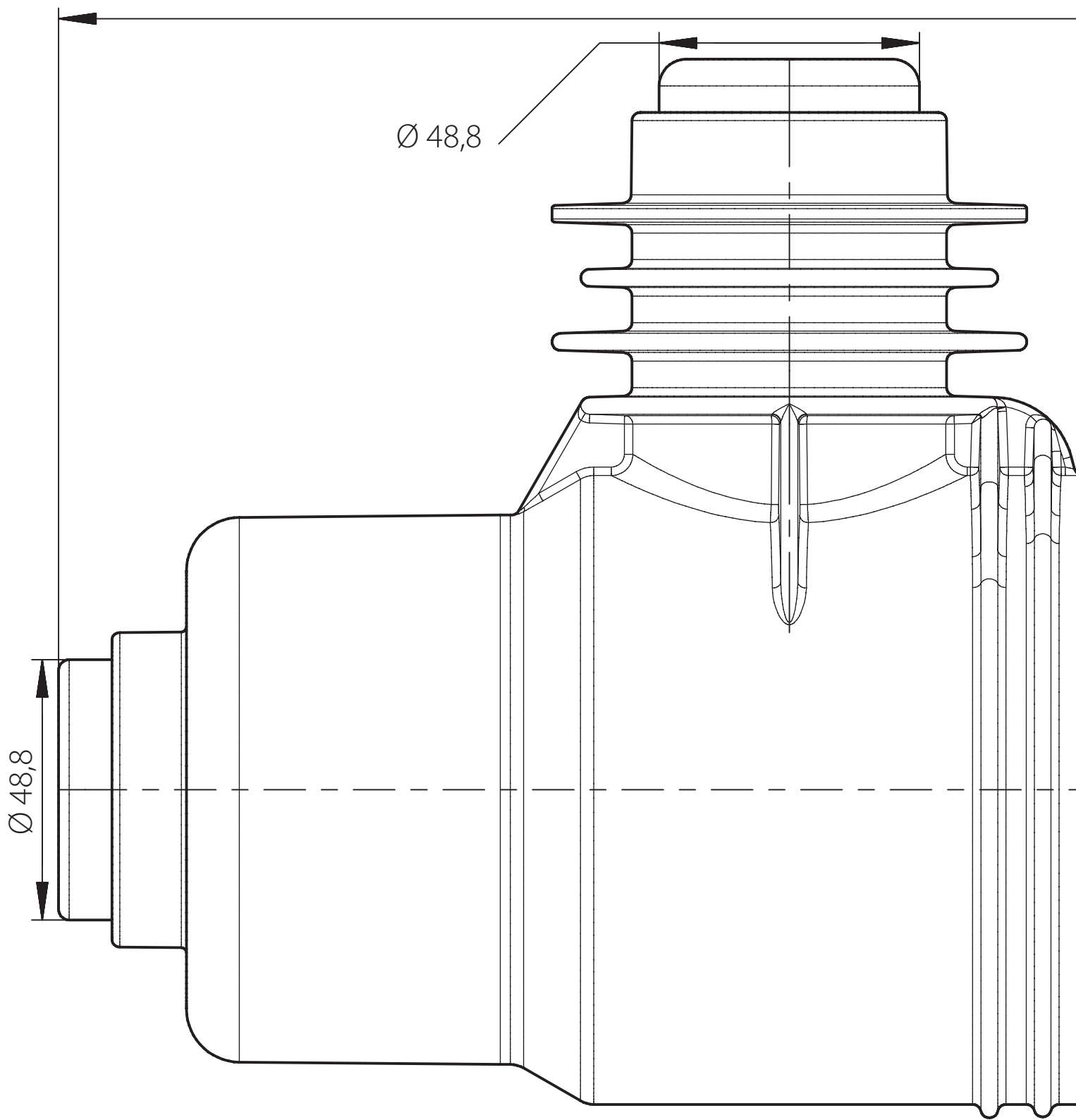


Agriculture and other high power consuming industries

- Controlled switching significantly reduces operating expenses (OPEX) and protects equipment in every industry that operates in frequent switching mode or uses capacitor banks or high power consuming equipment that generates hazardous inrush currents.

Technical Parameters of Single Pole ISM and CM

Parameter	VCB15_LD	VCB25_LD
Rated data		
Rated voltage (Ur)	≤ 12 kV	≤ 24 kV
Rated normal current (Ir)	≤ 800 A	≤ 800 A
Rated power frequency withstand voltage (Ud)	28 (42) kV*	50 kV
Rated lightning impulse withstand voltage (peak) (Up)	75 kV	125 kV
Rated short-circuit breaking current (Isc)	≤ 20 kA	≤ 16 kA
Rated peak withstand current (Ip)	≤ 50 kA	≤ 40 kA
Rated short-time withstand current (Ik)	≤ 20 kA	≤ 16 kA
Rated duration of short circuit (tk)	4 s	
Rated frequency (fr)	50/60 Hz	
Switching performance		
Mechanical life (CO-cycles)	50 000	30 000
Operating cycles, rated breaking current (CO-cycles)	100	100
Closing time	≤ 70 ms	≤ 70 ms
Opening time	≤ 35 ms	≤ 35 ms
Break time	≤ 45 ms	≤ 45 ms
Rated operating sequence at rated short-circuit breaking current	O-0.3s-CO-15s-CO	
General information		
Resistance of main circuit	≤ 40 μOhm	≤ 40 μOhm
Weight of single phase ISM	13 kg	14 kg
Temperature range	-25 °C ... +55 °C	-25 °C ... +55 °C
Altitude above sea level	≤ 1000 m	
Relative humidity in 24 hours	≤ 95 %	
Relative humidity over 1 month	≤ 90 %	
Degree of protection according to IEC 60529	IP 40	
Type of driving mechanism	Monostable magnetic actuator	
Number of available auxiliary contacts for single-phase ISM	2 NO + 2 NC	
Control module		
Weight of CM	1 kg	
Overall dimensions of CM	190x165x45 mm	
Rated range of supply voltage of CM_16_1(60_x_x)	24V to 60V DC	
Rated range of supply voltage of CM_16_1(220_x_x)	110V to 220V AC/DC	
Operating range (80-120%) of CM_16_1(60_x_x)	19V to 72V DC	
Operating range (80-120%) of CM_16_1(220_x_x)	85V to 265V AC/DC	
Charging the close and trip capacitors of CM_16_1(60_x_x)	≤ 25 W	
Charging the close and trip capacitors of CM_16_1(220_x_x)	≤ 42 W AC / ≤ 37 W DC	
Standby power consumption of CM_16_1(60_x_x)	≤ 5 W	
Standby power consumption of CM_16_1(220_x_x)	≤ 7 W AC / ≤ 5 W DC	



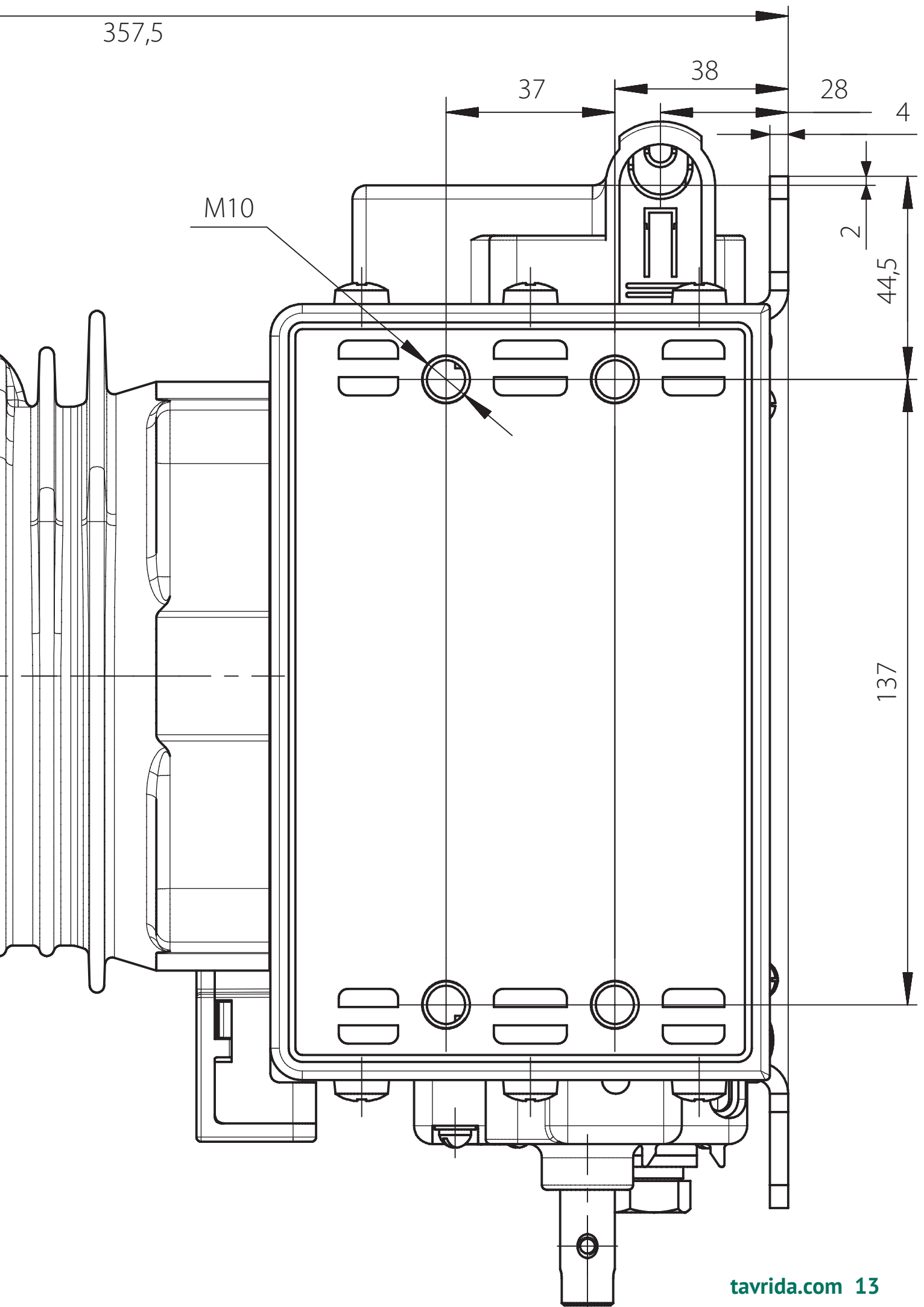
Drawing scale is 1:1.

This is the actual size of Tavrida Electric Vacuum circuit breaker.

Rated voltage.....17,5 kV

Rated normal current..... 1250 A

Rated short-circuit breaking current..... 31,5 kA





VCB15_LD3

Single Phase Light Duty Circuit Breaker

VCB15_LD3_16F		Par1	Par2	Par3	Par4	Par5	Par6	Par7	Par8
VCB application type	CB	CB							
Rated voltage	12 kV		12						
Rated short circuit current	20 kA			20					
Rated normal current	800 A				800				
Pole center distance	Not applicable					NA			
Main low terminal of ISM	One main lower terminal						1		
Range of rated supply voltage of auxiliary circuits	24-60 V DC 110-220 V AC/DC							60 220	
Customization	For customized options consult local representative								

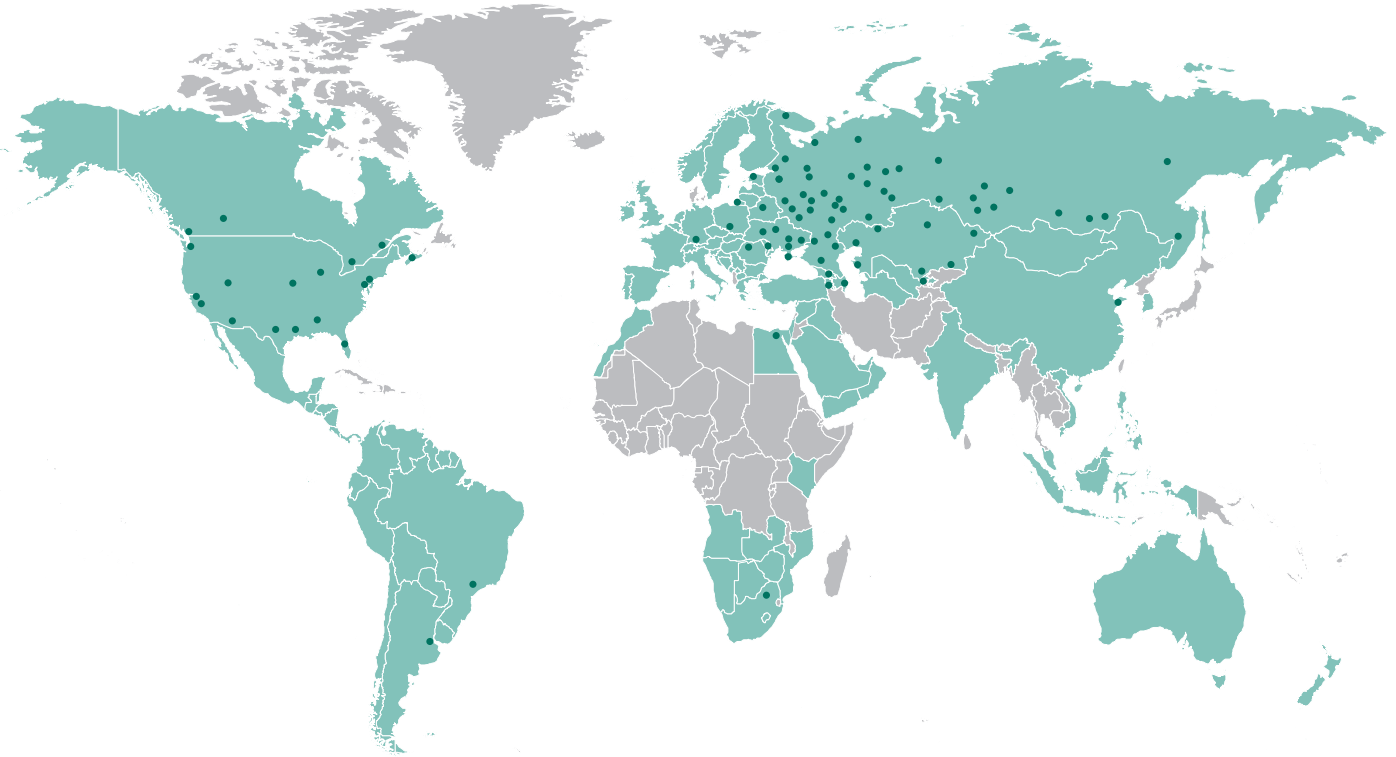


VCB25_LD3

Single Phase Light Duty Circuit Breaker

VCB25_LD3_16F		Par1	Par2	Par3	Par4	Par5	Par6	Par7	Par8
VCB application type	CB	CB							
Rated voltage	24 kV		24						
Rated short circuit current	16 kA			16					
Rated normal current	800 A				800				
Pole center distance	Not applicable					NA			
Main low terminal of ISM	One main lower terminal						1		
Range of rated supply voltage of auxiliary circuits	24-60 V DC 110-220 V AC/DC							60 220	
Customization	For customized options consult local representative								

If you would like to obtain more detailed information about our solutions or become one of our local partners, please feel free to contact us



EUROPE

Tavrída Electric GmbH

Im Leimen 14,
88069 Tettngang,
Germany
Phone: +49 7542 94 678 51
Fax: +49 7542 94 678 61
E-mail: info@tavrida.de

BRAZIL

Tavrída Electric do Brasil

Av. Ireno da Silva Venâncio, 199
GP04A - Protestantes
18111-100, Votorantim / SP, Brazil
Phone: +55 (15) 3243-2555
Fax: +55 (15) 3243-4233
E-Mail: info@tavrida.com.br

NORTH AMERICA

Tavrída Electric North America Inc.

1105 Cliveden Ave.
Delta, BC V3M 6G9
Canada
Phone: +1 (866) 551-8362
Fax: +1 (604) 540-6604
E-Mail: info@tavrida-na.com

SOUTH AFRICA

Tavrída Electric Africa (Pty) Ltd.

Unit 12 Barbeque Terrace
Dytchley Road, Barbeque Downs
Midrand, 1684, Gauteng, South Africa
Phone: +27 (11) 9142-199
Fax: +27 (11) 9142-323
E-Mail: support@tavrida.co.za

SOUTH AMERICA

Tavrída Electric Argentina

Av. Hipólito Yrigoyen 9183/5, 9 piso dpto.
B. Lomas de Zamora,
1832, Provincia de Buenos Aires, Argentina
Phone: +54 (11) 4243-9373
Fax: +54 (9 11) 4026-8563
E-Mail: info@tavrida.com.ar

REST OF THE WORLD

Tavrída Electric AG

Bahnhofstrasse 27, 6300
Zug, Switzerland
Phone: + 49 7542 9467851
E-mail: TES_SM@tavrida.ch



This document is copyright and is intended for users and distributors of Tavrída Electric product. It contains information that is the intellectual property of Tavrída Electric and the document, or any part thereof, should not be copied or reproduced in any form without written permission from Tavrída Electric. Tavrída Electric applies a policy of ongoing development and reserves the right to change product without notice.