



**Power Plant Electrical
Technologies (Pty) Ltd**



RETRO-FLEX RANGE

Retrofit Solutions - Vacuum Circuit Breaker

www.ppetech.co.za | 013 752 3570 | sales@ppetech.co.za

INTRODUCTION

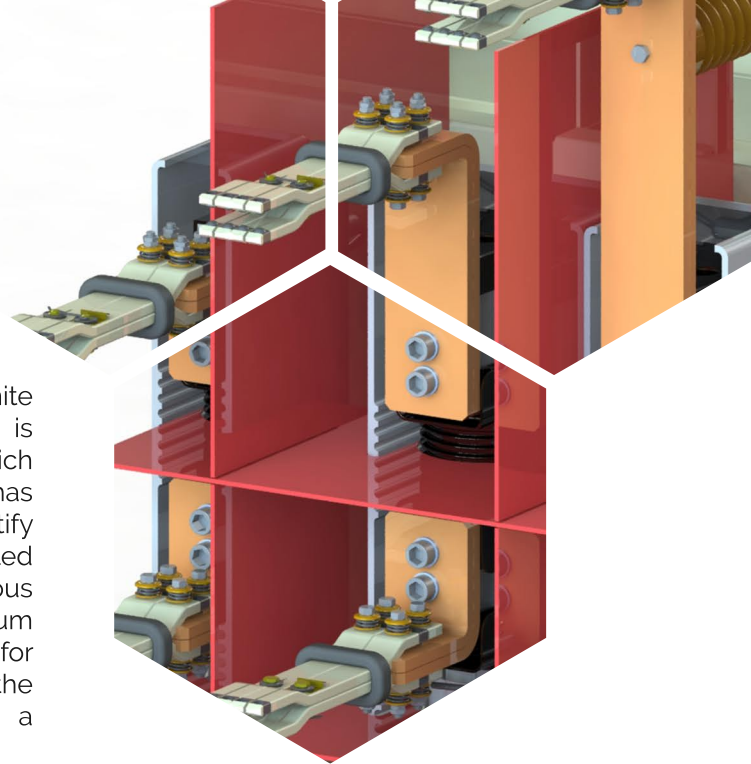
It is well understood that electrical components have a finite service life, and for medium voltage switchgear this is determined by the number of mechanical operations, which is shortened by the number of times the switchgear has cleared high load currents or fault currents. Failing to identify and replace aged switchgear often causes unwanted breakdowns and unforeseen downtime, with a risk of serious equipment damage or injury to personnel. As medium voltage switchgear begins to age, it is wise to prepare for replacement or modernisation of the full switchboard or the breaker equipment, in a structured manner, using a well-engineered solution.

The replacement of a full switchboard may not be practically possible, due to the considerable time required to remove old panels and install new. The cost of such a full switchboard may also be prohibitive and a safe alternative is often required. For these reasons, it is more feasible to replace selected switchboard components, thereby reducing risk, cost and potential down time.

PPE Technologies has therefore developed the MV Retro-Flex solution aimed at providing a quick, safe and cost effective retrofit option for customers wanting to retain their original switchboard investment. The MV Retro-Flex solution includes a breaker block replacement for Siemens 3AF type circuit breakers as used in Siemens 8BD1 switchboards. The MV Retro-Flex solution makes use of the original 3AF breaker truck, which we strip and refurbish. The busbar fingers are refurbished and retained and a new Tavrida vacuum circuit breaker block, with electronic control module is fitted.

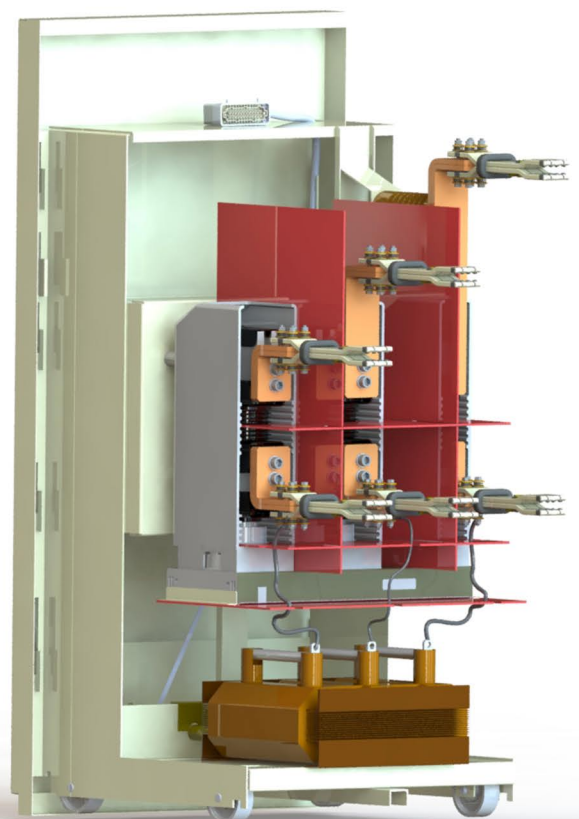
TABLE OF CONTENTS

Introduction	01
General	02
Drive Meganism	03
Figures	04-05
Main Technical Parameters	06-07
Control Module Potition Indicator	08
Circuit Diagram with Cable	09-10

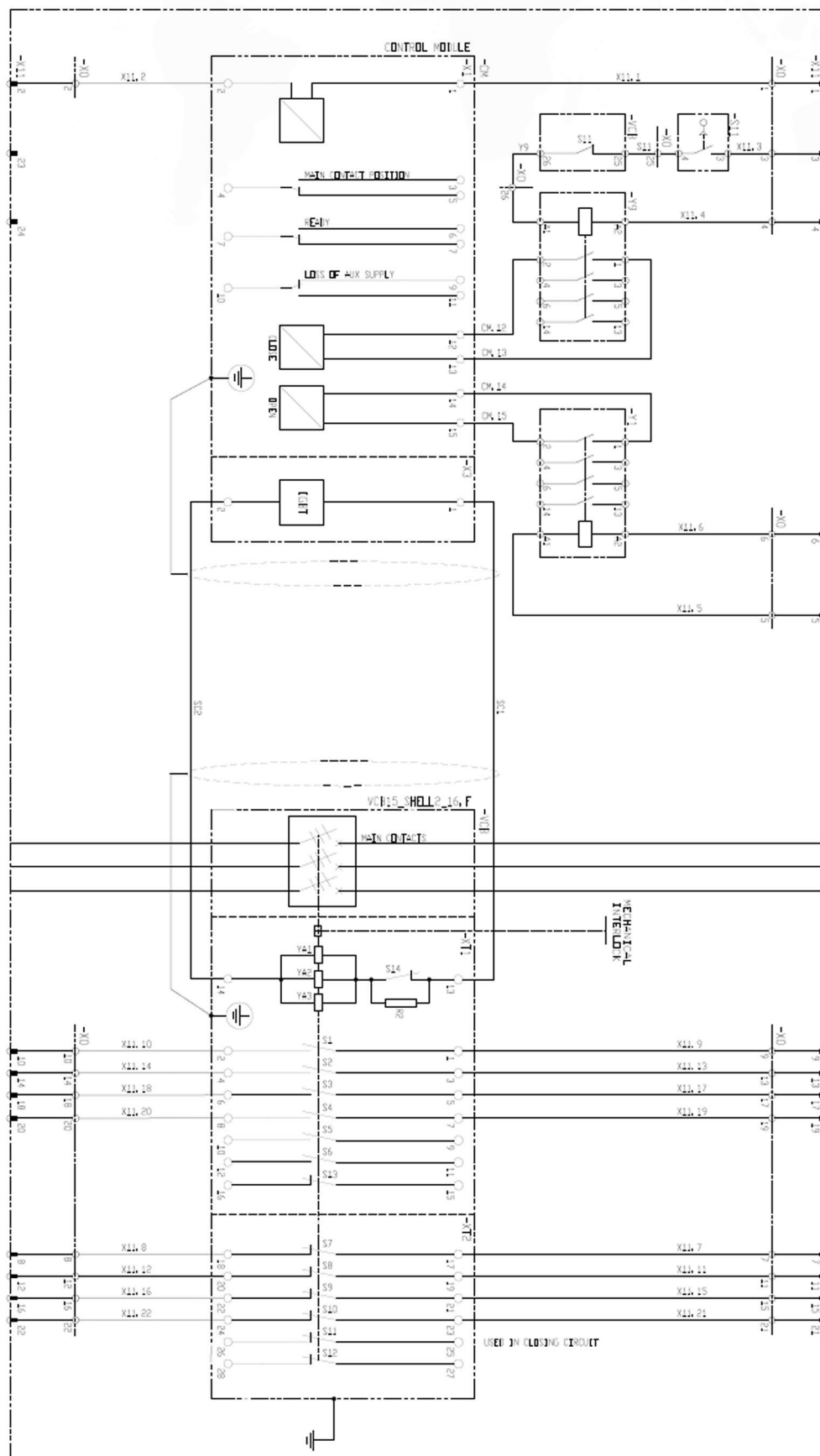


The breaker face plate is replaced in such a manner as to retain the same look and feel as the original 3AF breaker, with the same racking mechanisms.

The MV Retro-Flex solution replaced only those components that are worn and at risk, thereby saving our customers considerable cost and lost time. With due planning we can refurbish and modernise all breakers in a switchboard in a relatively short period.

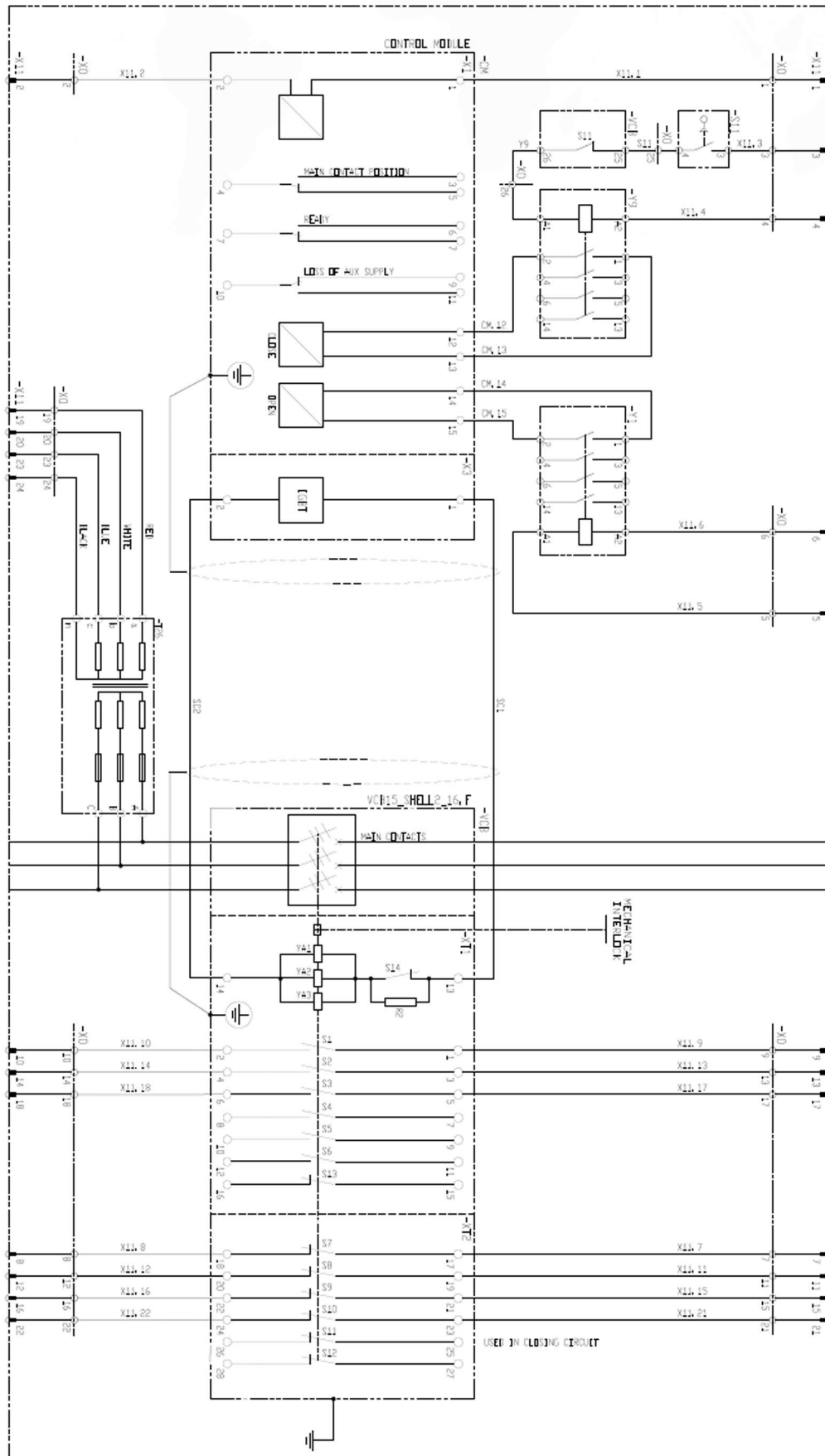


RETROFIT BREAKER INTERNAL WIRING DIAGRAM – WITHOUT CABLE VT



CIRCUIT DIAGRAMS

RETROFIT BREAKER INTERNAL WIRING DIAGRAM – WITH CABLE VT

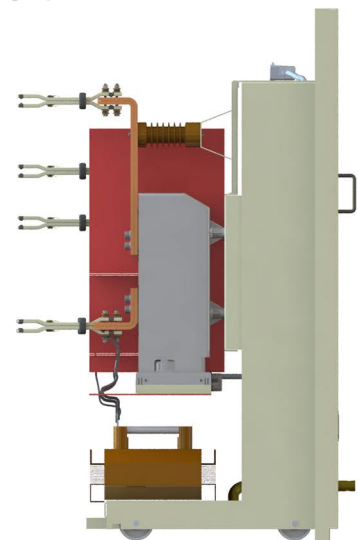


OUR RETROFIT SOLUTIONS OFFERS THE FOLLOWING:

- Reliability of a brand-new switchgear.
- Saving on CAPEX by renewing only the worn-out parts while benefiting from new technologies.
- OPEX is reduced due to the modern maintenance free Tavrida Electric vacuum circuit breaker.
- Increased personnel safety:
 - Mitigate risks of electrical flash fatalities.
 - Mitigate risks of power outages resulting in dangerous accidents.
- No modifications are necessary on the fixed part of the switchgear.
- No changes to existing main busbar.
- No changes to existing relay and breaker control wiring or connecting plug.

THE TAVRIDA ELECTRICAL VACUUM CIRCUIT BREAKERS USED IN OUR RETROFIT SOLUTIONS ENSURE:

- 5 year warranty on the vacuum circuit breaker.
- 30 years maintenance free operation.
- Continuous self-supervision of the whole trip and close circuit.
- Environmentally friendly SF6-free vacuum circuit breakers.
- High operational speed:
 - Opening time of 35ms.
 - Closing time of 60ms.
- Long life and high reliability:
 - 30 000 close-open cycles.
 - Life expectancy of at least 30 years.
- Vacuum circuit breaker tested by KEMA in accordance with IEC 62271-100.



GENERAL

ISM15_Shell_2 Vacuum Circuit Breaker



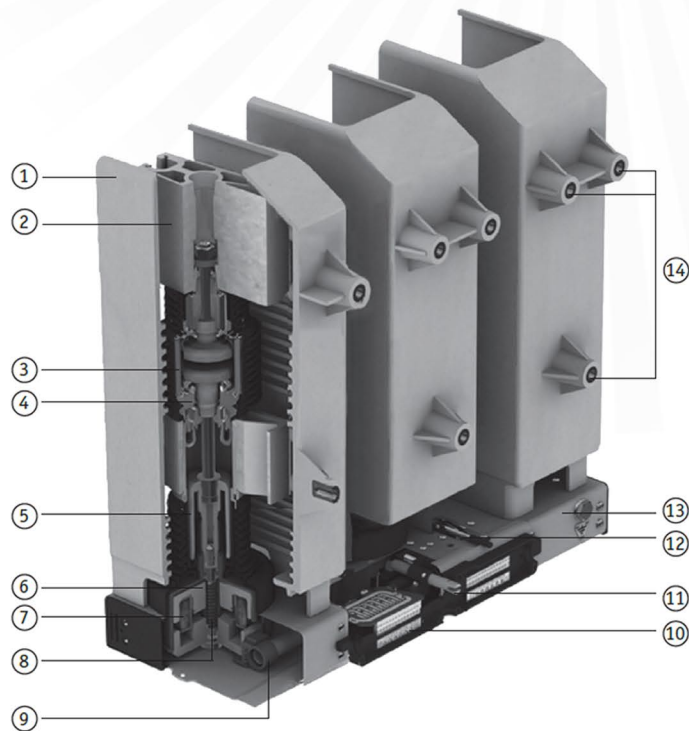
The ISM15_Shell_2 Series Circuit Breaker Module has superior characteristics for fast trip applications as well as high-duty switching. The interrupters are driven by three separate magnetic actuators (one per pole) and the module is capable of 30,000 close-open operations at full load.

The ISM15_Shell_2 can handle as much as 2000A continuous with 31.5kA interrupting. The exceptionally compact, solid dielectric design insulates the phases from each other while the direct, linear connection from the actuator to the interrupter delivers a break time of less than 3 cycles as a standard.

An integrated trip lever at the rear of the module blocks the unit operation electrically as well as mechanically. Six NO and six NC contacts are built-in and a visual position indicator is also provided.

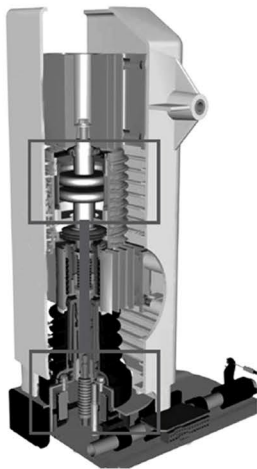
This simple design results in the highest reliability available today. The ISM15_Shell_2 is a maintenance free breaker with a life expectancy of up to 30,000 close-open operations.

Vacuum Circuit Breaker (ISM)



1. Support insulator
2. Upper terminal
3. Vacuum interrupter
4. Movable contact with bellows
5. Drive insulator
6. Armature
7. Actuator coil
8. Opening springs
9. Synchronizing shaft
10. Auxiliary contacts
11. Interlocking shaft
12. Position indicator link
13. Frame
14. Fixing points

DRIVE MECHANISM



Conventional circuit breakers use complicated mechanisms to transfer actions from a single actuator into the movements of three arc quenching contacts. Beyond this, the movable contacts are fixed in their OPEN and CLOSED positions using mechanical latches. These mechanical arrangements are subject to severe stresses at C-O operations and are the main reason for circuit breaker failures.

The ISM vacuum circuit breaker uses three single-coil magnetic actuators, one per pole. All the switching elements are assembled along a single axis. All mechanical movements are therefore direct and linear. The three actuators are mounted in a steel frame and mechanically linked by a synchronizing shaft.

Failure of critical components, such as: mechanical latching, gears, chains, bearings and levers, tripping and closing coils and motors to charge springs are completely avoided.

Interlocking Philosophy

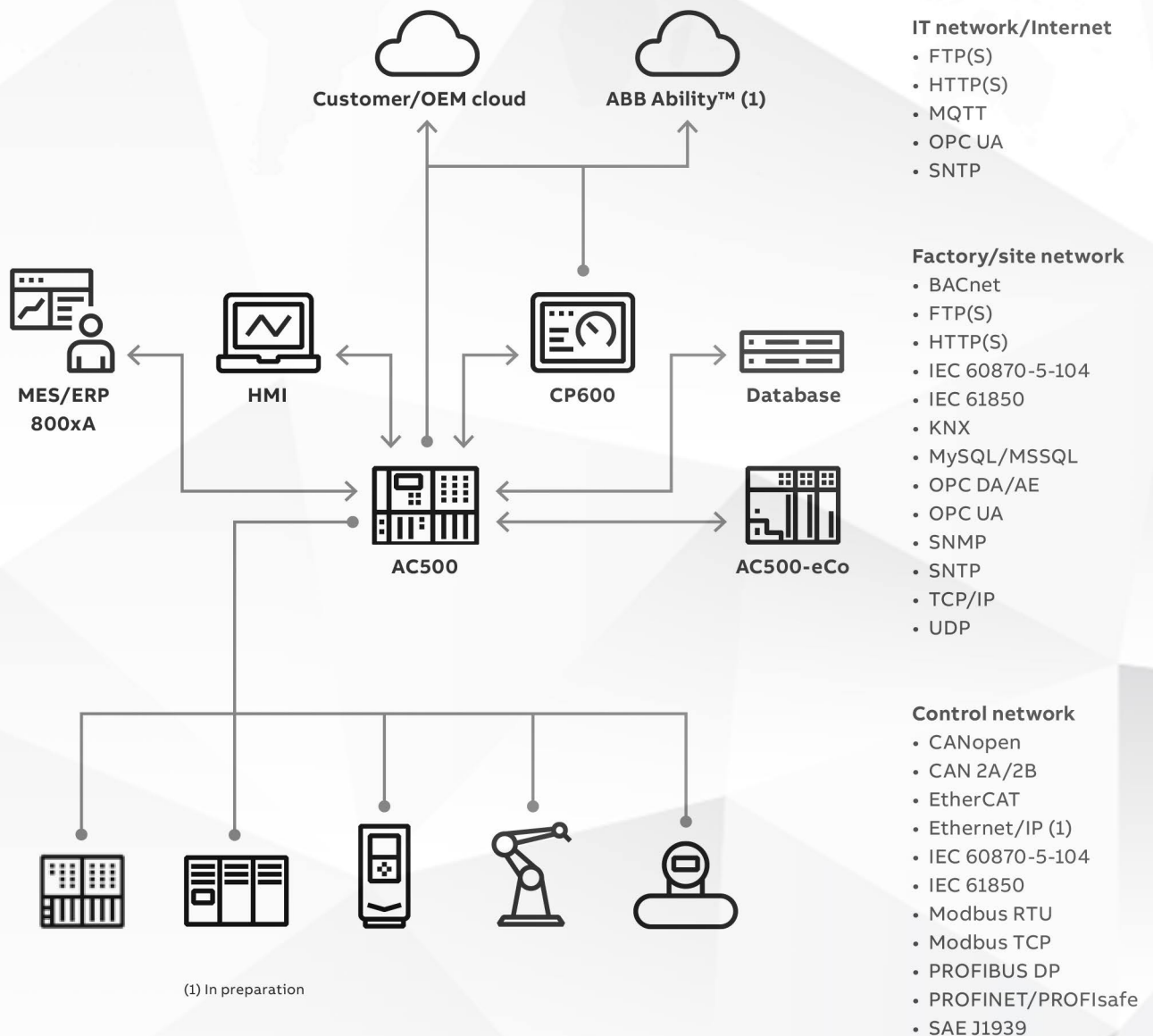
Usually a VCB offers interfaces for mechanical interlocking which move with every switching operation. As a result, the mechanical parts need to be designed to withstand the extreme acceleration during switching operations, and the reliability of the attached mechanical interlocking can influence the performance of the vacuum circuit breaker.

With the new generation of ISM, the operation is not coupled with the operation of the vacuum circuit breaker. By rotating the interlocking shaft by 90° the moving armature of the actuator is mechanically locked in its open position. In addition, the actuator coils are disconnected by a microswitch.

The advantages are that the number of switching operations of the entire system is not limited by the mechanical lifetime of the connected interlocking mechanism, and the reliability of the switchgear is dramatically increased.

The ISM15_Shell_2 mechanical interlock is incorporated into the racking handle mechanism of the standard Siemens 8BD1 or 3AF type breaker. This ensures that the breaker can only be closed once the breaker is in the racked-in position.

ABB's PLC and control panel portfolio provides a high number of scalable products, communication protocols and connectivity options, from the field layer right through to the management and visualization layers.



With the ABB Automation Builder utilised in the configuration and programming of the AC500 PLC product range, it offers library for various functions and applications such as the below:



ISM ACCESSORIES

CONTROL MODULE (CM):



The CM_16 Control Module serves as the interface between the ISM and a host of third-party relays and controls.

The Control module (CM) is a microprocessor-based controller that provides ISM operation, protection and data logging functions). One control module is required per breaker. The CM can be ordered separately as a spare part.

The CM is installed in the retrofit breaker itself and requires no additional wiring

POSITION INDICATOR:



The CM_16 Control Module serves as the interface between the ISM and a host of third-party relays and controls.

The Control module (CM) is a microprocessor-based controller that provides ISM operation, protection and data logging functions). One control module is required per breaker. The CM can be ordered separately as a spare part.

The CM is installed in the retrofit breaker itself and requires no additional wiring

MAIN TECHNICAL PARAMETERS

Type	VCB15_Shell2
Rated voltage (Ur)	17.5 kV
Rated normal current (Ir)	1250 A, 2000 A
Rated power frequency withstand voltage (Ud)	42 kV
Rated lightning impulse withstand voltage (peak) (Up)	95 kV
Rated short-circuit breaking current (Isc)	31.5 kA
Rated peak withstand current (Ip)	82 kA
Rated short-time withstand current (Ik)	31.5 kA
Rated duration of short circuit (tk)	4 s
Rated frequency (fr)	50/60 Hz
Mechanical life (CO-cycles)	30 000
Maximum number of CO-cycles per hour	60
Operating cycles, at rated–short circuit breaking current	50
Closing time	≤ 60 ms
Opening time	≤ 35 ms
Break time	≤ 45 ms
Rated operating sequence at rated normal current	O-0.3s-CO-10s-CO-10s-CO
Rated operating sequence at rated short-circuit breaking current	O-0.3s-CO-15s-CO
Auxiliary circuits insulation strength	

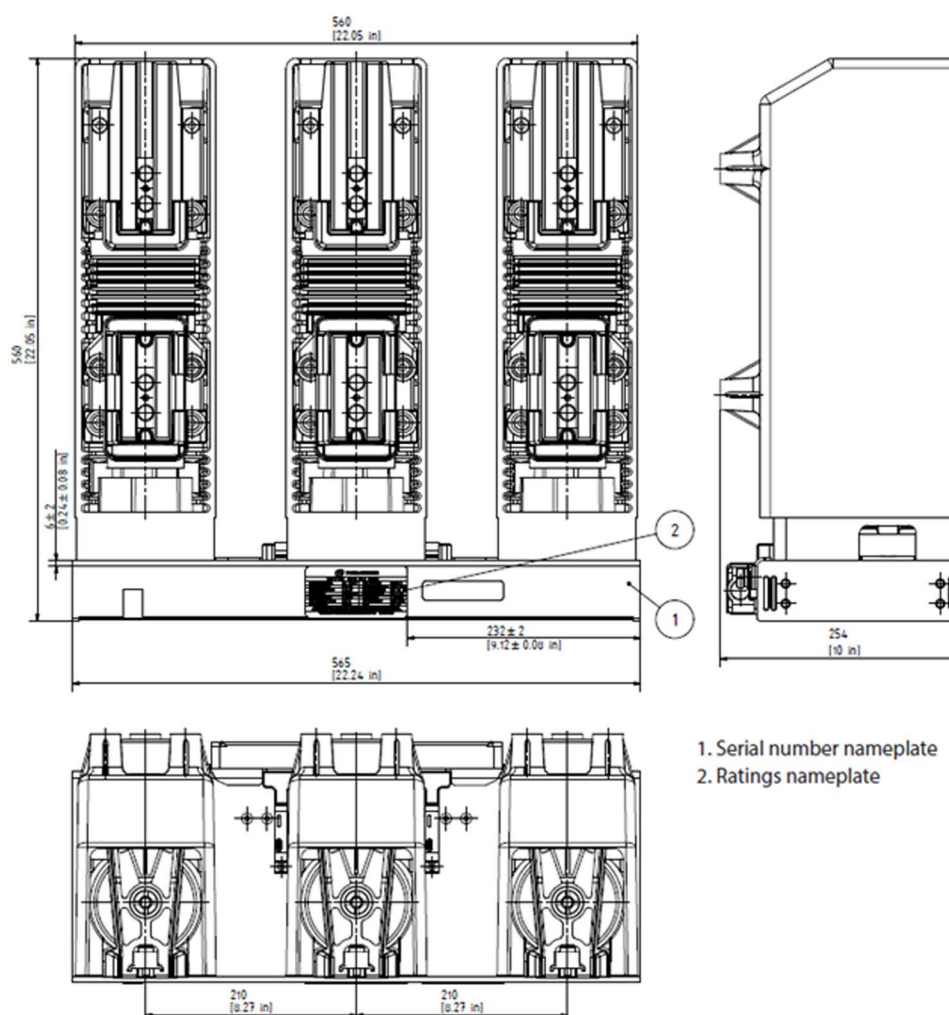
MAIN TECHNICAL PARAMETERS

Auxiliary circuits insulation strength	
Power frequency test voltage (1 min) according to IEC60255-27	2 kV
Lightning impulse 1.2 m s/50 m s/0.5 J according to IEC60255-27	5 kV
Insulation resistance, 1000V DC according to IEC60255-27	≥ 5 MOhm
Design class of switching module with regard to severity of service conditions in accordance with IEC 60932	Class 0
Standards	IEC 62271-100 GB 1984- 2003
Mechanical vibration withstand capability according to IEC 60721-3-4	Class 4M4
Resistance of main circuit	≤ 18 μ Ohm
Weight of VCB (depending on Phase centre distance)	51-55 kg
Weight of CM	1 kg
Overall dimensions of CM	190x165x45 mm
Altitude above sea level	1000 m
Relative humidity in 24 hours	≤ 95 %
Relative humidity over 1 month	≤ 90 %
Temperature Range	-25 °C ... +55 °C
Degree of protection according to IEC 60529 of actuator compartment	IP40
Type of driving mechanism	Monostable magnetic actuator
Design, switching capacity of silver auxiliary contacts	
Number of available auxiliary contacts for three-phase ISM	6 NO + 6 NC
Minimum current for 12 V AC / DC, ohmic load	100 mA
Minimum current for 12 V AC / DC, inductive load (t=20 ms, $\cos\theta = 0,3$)	100 mA
Maximum current for 30 V DC, ohmic load	10 A
Maximum current for 30 V DC, inductive load (t=20 ms)	3 A
Maximum current for 60 V DC, ohmic load	0.9 A
Maximum current for 60 V DC, inductive load (t=20 ms)	0.9 A
Maximum current for 125 V DC, ohmic load	0.5 A
Maximum current for 125 V DC, inductive load (t=20 ms)	0.03 A
Maximum current for 250 V DC, ohmic load	0.25 A
Maximum current for 250 V DC, inductive load (t=20 ms)	0.03 A
Maximum current for 125 V AC, ohmic load	10 A
Maximum current for 125 V AC, inductive load ($\cos\theta = 0,3$)	5 A
Maximum current for 250 V AC, ohmic load	10 A
Maximum current for 250 V AC, inductive load ($\cos\theta = 0,3$)	5 A
Design, switching capacity of gold-plated auxiliary contacts	
Number of available auxiliary contacts for three-phase ISM	-
Minimum current for 5 V AC / DC	1 mA
Maximum current for 10 V AC / DC	300 mA
Maximum current for 30 V AC / DC	100 mA
Maximum voltage AC / DC	30 V

CM reaction times	
Preparation time for the operation of the CM after switching on the auxiliary power supply	≤ 15 s
Preparation time for the close operation of the CM after a previous close operation	≤ 10 s
Preparation time for the trip operation of the CM after switching on the auxiliary power supply	≤ 0.1 s
Trip capability after failure of the auxiliary power supply	≥ 60 s
CM supply voltage	
Rated range of supply voltage of CM_16_1(Par1_60.1_Par2Par3_Par4_Par5)	24V to 60V DC
Rated range of supply voltage of CM_16_1(Par1_220.1_Par3_Par4_Par5)	110V to 220V AC/DC
Operating range (80-120%) of CM_16_1(Par1_60.1_Par3_Par4_Par5)	19V to 72V DC
Operating range (80-120%) of CM_16_1(Par1_220.1_Par3_Par4_Par5)	85V to 265V AC/DC
Power consumption of CM	
Charging the close and trip capacitors of CM_16_1(Par1_60.1_Par3_Par4_Par5)	≤ 25 W
Charging the close and trip capacitors of CM_16_1(Par1_220.1_Par3_Par4_Par5)	≤ 42 W AC, ≤ 37 W DC
Permanent power consumption (standby) of CM_16_1(Par1_60.1_Par3_Par4_Par5)	≤ 5 W
Permanent power consumption (standby) of CM_16_1(Par1_220.1_Par3_Par4_Par5)	≤ 7 W AC, ≤ 5 W DC

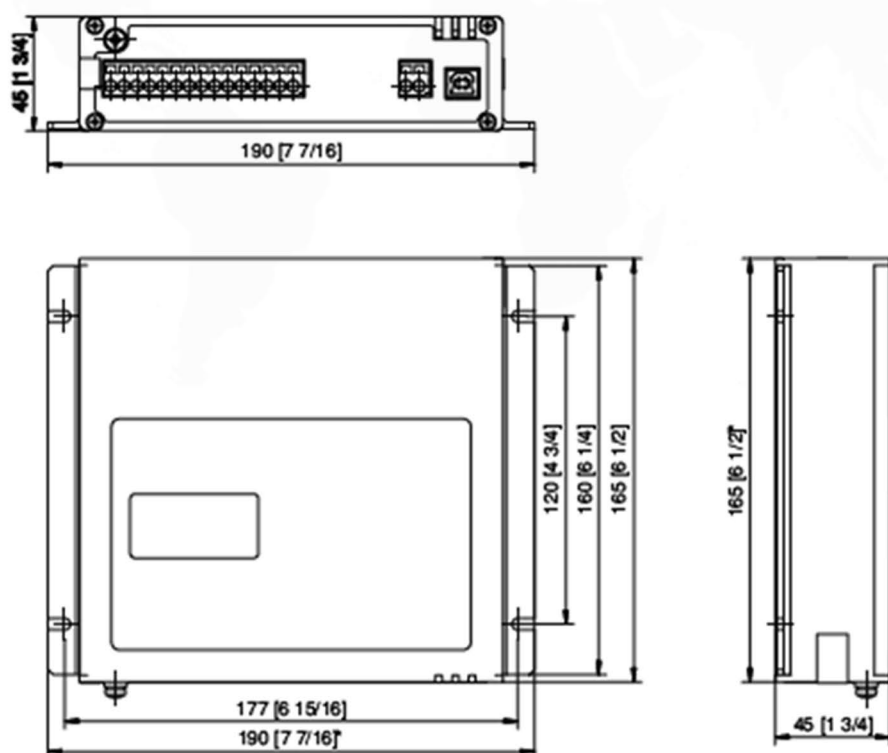
DIMENSIONS DRAWINGS

ISM15_SHELL_2 VACUUM CIRCUIT BREAKER

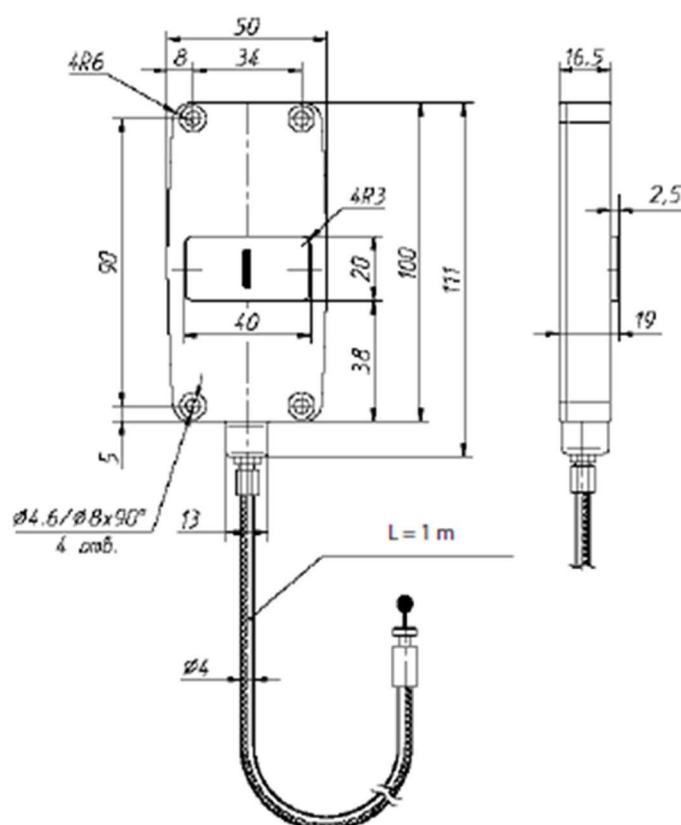


1. Serial number nameplate
2. Ratings nameplate

CONTROL MODULE



POSITION INDICATOR





CONTACT US



www.ppetech.co.za 

sales@ppetech.co.za 

Gauteng: +27 (0)12 940 3971
Mpumalanga: +27 (0)13 752 3570
Western Cape: +27 (0)87 057 4001
KwaZulu-Natal: +27 (0)79 354 2105



Mpumalanga: 3 Christie Crescent Vintonia Ext.2, Nelspruit, 1200
Cape Town: Unit 1 Oro Three 5 Junction Rd, Killarney Junction, 7441
Gauteng: 477 Jasmyn Street, Silverton, 0184
KwaZulu-Natal: 7 Moreland Drive, La Lucia, 4159

