



New Retrofit MV circuit breakers for legacy switchgear

for power generation, distribution & industrial applications

AEI BVP17 VMX
Brush/HSS VBA VMV
VSI VTD **BTH** JB721
QA/QF **English Electric**
CVOLX1 OLX2 OLX3
GEC KBC BVP VMX
JG Statter ACO1
Metropolitan Vickers
V1R/V2R MV400
Reyrolle/Siemens LMT
LMT2/23 LSR/LMV
South Wales Switchgear
C4X/D4X C8X/D8X
C12X/D12X Hawkgas12
Switchgear & Cowans
A4/A4TE/A6 UA4/UA6
UAE4



VOR-M

Mag-actuated vacuum circuit breaker

VOR-S

Spring-actuated vacuum circuit breaker



www.pbsigroup.com

Made in Manchester, United Kingdom



Retrofit & replacement circuit breakers

Since 1991, we have become the UK market leader in design, type testing and manufacture of many medium voltage vacuum circuit breakers used to retrofit and replace air, oil and gas filled circuit breakers manufactured by a range of historic OEM UK suppliers.

Benefits

- Increased operating reliability and safety
- Reduced risk of failure
- Improvement to short circuit rating
- Reduced maintenance
- Equipment life extended by up to 30 years
- Reduction of insurance premiums
- Shorter project times
- Reduced operational disruption
- No civil works required

Our design and manufacturing process

P&B's unique approach has built up a portfolio of products based on a high level of engineering expertise and significant investment on equipment, plant, R&D and type testing to ensure that P&B's designs meet required BS/IEC standards.

3D Laser Scan

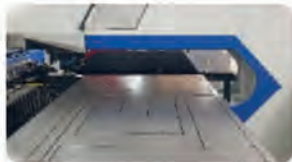
The design of circuit breakers (CB's) typically involves an onsite survey and a geometric laser scan of the original circuit breaker in both the racked down and fully racked up positions and the panel.



The 3D scan data creates a CAD model to 0.1mm precision removing as much human error in the measuring process as possible. The model is compared to P&B's existing design, any dimensional differences can be identified and accommodated for, prior to manufacturing parts.

Fabrication & Assembly

Production is carried out entirely in house at Manchester, where we can control every aspect and if required, make bespoke alterations.



Component parts are typically produced by turning round bar or punched from sheet steel.



Punched parts are formed on a press brake then welded and either galvanized or painted.



The circuit breaker is constructed from ABB encapsulated vacuum interrupters with either a magnetic actuator assembly or spring mechanism.

Model-based definition assembly instructions are used to aid the production team to construct a circuit breaker from its primary parts below.

Clusters, Bushings, Coppers, Vi Poles, Mechanism Racking System (Scissor Jack or Rack & Pinion), Truck, Interlock.

Routine Test

Once a circuit breaker is assembled it is subjected to routine partial discharge, contact resistance, insulation and power frequency withstand as well as full function tests.































































































































































Circuit Breakers are then fully racked into a mating panel to check for shutter operation, interlocking interaction and the breaker has correct engagement of the main and secondary circuits. This whole process ensures that your replacement circuit breaker can be quickly installed first time and without panel modifications.

Type Test

At the beginning of our retrofit work, P&B were faced with upgrading an existing air circuit breaker to improve the short circuit withstand capability, type testing was necessary to support the new rating claim. Ever since, P&B have type tested new designs and variant features so you have absolute confidence when installing P&B equipment to your network. P&B's retrofit breaker was the first to be formally assessed by the UK Energy Networks Association.

Selection chart of common retrofits

Selection chart of common retrofits				GEC (General Electric Co.)							HSS (Hawker Siddeley Switchgear)			Siemens	Switchgear & Cowans	JG Statter Ltd		
				AEI (Associated Electrical Industries)					EE (English Electric)			Brush		SWS (South Wales Switchgear)			Rayrolle	
				Ferguson Pallin & Co			BTH (British Thomson Houston)											Metropolitan Vickers
OEM Breaker Model				BVRP3 BVRP4	BVRP17 VMX Form A, B, C BVP17 compatible		KBC45S	QA (Air insulated) QF (Compound insulated) JB721 JB821 JB921	JB721 JB821 JB921	V1R-HIS V2R-HIS VIR-H2R MV400	CV	OLX	OLX3	VBA (R4/1 Mech) VBC (R4/1 Large Mech)	VSI VTD VMV (Brush VCB)	C4X / D4X C6X / D6X C8X / D8X C12X / D12X CF4X DXD / DXE Hawkgas HG12	LMT LMT2 LMT23 LSR LMV	A4 UA4 UAE4 A6 UA6
P&B VOR Breaker Model				VOR-M-BVP3	VOR-M-BVP17/VMX VOR-S-BVP17/VMX	VOR-M-KBC	VOR-M-QA/QF	VOR-M-BTH	VOR-M-MV400	VOR-M-CV	VOR-M-OLX1	VOR-M-OLX3 VOR-S-OLX3	VOR-M-VBA VOR-M-VBC	VOR-M-VSI VOR-S-VSI	VOR-M-C4X VOR-S-C4X VOR-M-C4XHP	VOR-M-LMT	VOR-M-A4 VOR-M-A4TE	VOR-M-AC01
P&B VOR Technology		Spring actuated (S)  Magnetic actuated (M) 																
Nominal Current Ratings		400A																
	Designed with 1250A VI	630A																
	Designed with 2000A VI	800A																
	Design Coverage	1250A																
	Design Pending	1600A																
	2000A																	
Lifting Mechanism		 Scissor Jack (SJ)	 Rack & Pinion (R&P)												 (M)			
Transfer Earth 3No. Position, low profile (LP)													 (VSI)					
Accessory Earth 1No. Position, high profile (HP)																		
Busbar Variant		Single Bus (SB) Double Bus (DB)	 	 	 	 	 	 	 	 	 	 	  (VTD)	 				

Note: Please contact us if your breaker rating, type or requirements are not listed here.

Common Specifications

Manufacturing Standards	IEC 62271-100
Maximum Voltage	12/17.5KV
Fault Current Ratings	25KA/3sec - 40KA/3sec
Power Frequency Withstand	28KV
Basic Impulse Lightning Voltage (BIL)	75KV - 95KV
Frequency (Hz)	50/60Hz
Mechanical Endurance	>10,000 ops
Control Voltage	24 to 240V DC

Accessories

All models	VOR Breaker Racking handle
All models	Remote trip/close lanyard reel for use with breaker
All models	VOR breaker mounted socket for use with remote trip/close lanyard reel
All models	Secondary breaker to panel umbilical leads for test trip/close switching or Earthing
VOR-M	Emergency Trip & Close Unit (will require remote trip/close reel lanyard)
VOR-M	VCB Manual trip handle
VOR-M	Trip Circuit Supervision (TCS) unit



Remote Radio Control

P&B have recently introduced radio control capability to its range of circuit breakers, Compliant with FCC Part 15:247, the system can be used overseas as well as in the UK.

The handheld transmitter and breaker mounted receiver operates any single breaker from the switchboard by means of a single key activation which provides increased safety for the switching engineer.



VOR-M Mag actuator-operated vacuum circuit breaker

Using vacuum interrupters embedded in the poles, the construction method makes the poles particularly sturdy and protects the interrupter from shocks, dust and condensation reducing maintenance requirements and further protecting equipment from common issues.

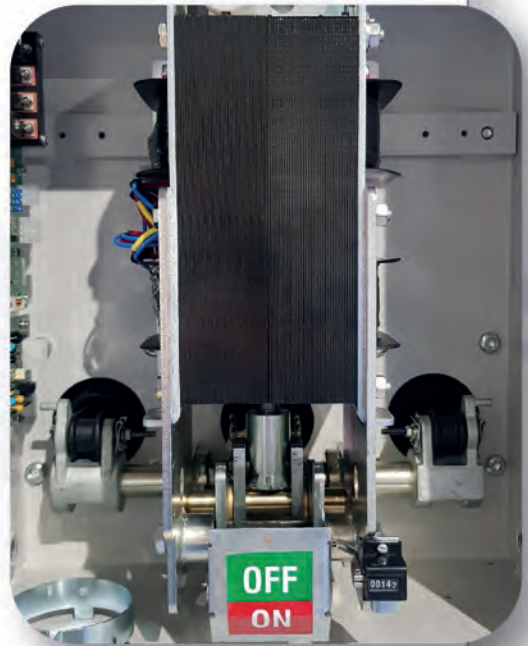
Designed for 100,000 operations and ideal for high switching requirements such as electric motors. Ultra-reliable high performance is delivered by the Mag Latch magnetic actuator that has been repeatedly proven to outclass other mechanisms on endurance tests, typically ten times the operational performance of traditional spring mechanisms.

The Mag Latch reduces mechanical complexity and stresses of the mechanism providing high reliability and maintenance free operation over a very long life.

Open and closed latched positions are held by strong permanent magnets which do not require a continuous auxiliary supply. Actuator drive operation is by momentarily energising either the trip or closing coils similar to a conventional spring mechanism. The actuator mechanism is also provided with an emergency opening system which has been type tested to manually operate at 60% of full fault rating i.e. 15KA.

Electronic controller

Operation (including anti-pumping) is by a proven electronic controller, the trip and close coil energy is supplied from a capacitor to ensure a power reservoir is available for trip and close operations with sufficient energy to perform a complete auto reclose cycle. Fast charging allows for repeated reclose sequences and configurable inputs and outputs are available to suit customers' requirements.



VOR-S Spring-operated vacuum circuit breaker

Utilising the market leading ABB spring operated Vmax and VD4 vacuum Circuit Breakers ensures a consistent and reliably performing circuit breaker that has been proven and tested.

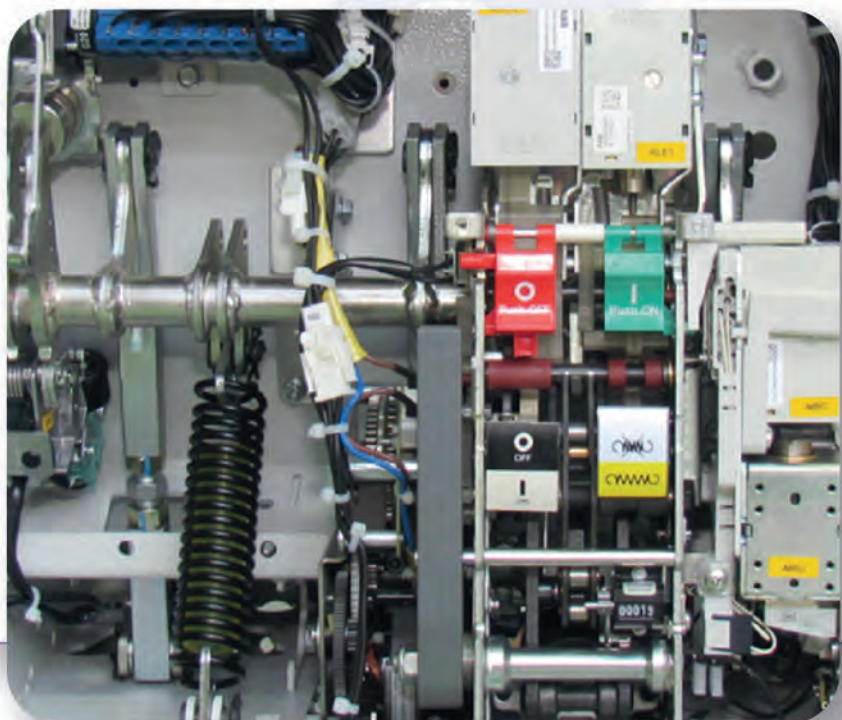
Using vacuum interrupters embedded in the poles, the construction method makes the poles particularly sturdy and protects the interrupter from shocks, dust and condensation reducing maintenance requirements and further protecting equipment from common issues.

The operating mechanism is of a robust design and can be customised with a wide range of easily installed accessories.

The circuit breakers have mechanical operating mechanisms with stored

energy as a result of a charged spring and free trip. The breaker has inbuilt anti-pumping and interlocking

features which makes the equipment safer and suitable for a wide range of applications.





Today, as a **global supplier**, we cater for **many industrial sectors** including power generation, water, oil & gas, chemical, pharmaceutical and food, helping end users to replace not only air and oil circuit breakers but gas and even early generation vacuum breakers.

Safety of your personnel is a strong motivation for bringing new features to our retrofits. We can equip our breakers with a RF receiver which allows the breaker to be open and closed from a hand-held RF transmitter, **providing reliable control** from a physically distant position safely away from the vicinity of the circuit breaker.

Installation by our experienced team allows us to perform training with your operators ensuring you have full confidence of **operating and using your new P&B equipment.**