

3.3KV – 11KV  
125 – 25.000 KW  
40 – 2.500 A

RIGHT FROM  
THE START

**MVH2.0**  
Medium Voltage  
Variable  
Frequency Drive

**AuCom**  
MOTOR CONTROL SPECIALISTS



**BENSHAW**  
Applied Motor Controls



# MVH2.0

## Medium Voltage Variable Frequency Drive

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# Company Profile

## AUCOM – RIGHT FROM THE START

AuCom is a Kiwi success story. From humble beginnings in a Christchurch garage in 1978, AuCom has grown to become a global business in a highly competitive market. While we look to the future and to new ways that we can provide value for our customers, it is equally important that we remember our past.

AuCom began as the brainchild of two close friends with a passion for high quality audio amplifiers. Ray Archer and Mark Empson were amateur radio enthusiasts, and Mark possessed an innovative electronic design streak. With an eye for exciting new technologies, in 1981 the pair licensed a share of the rights to a power saving technology developed by NASA. Ray and Mark saw potential in this new technology to provide benefits in electronic motor control and became pioneers of that industry. As AuCom's activities and product range expanded the garage was quickly outgrown and after three factories, we moved to our present location on Wrights Road in 1993. We developed a global AuCom sales network, and also began to supply re-branded motor control products to a number of well-known global companies to complement their existing product line.

This multi-channel approach increased our share of the global market and established AuCom as the place to go for low and medium voltage motor control systems. Our distribution partners thrived, and AuCom quickly became an industry leader behind the scenes.



# Product Structure

Air cooled

FRONT & REAR ACCESS

COMPACT CABINET



STANDARD CABINET



Water cooled

FRONT ACCESS

STANDARD CABINET



FRONT ACCESS

WATER COOLED CABINET





# Compact Cabinet

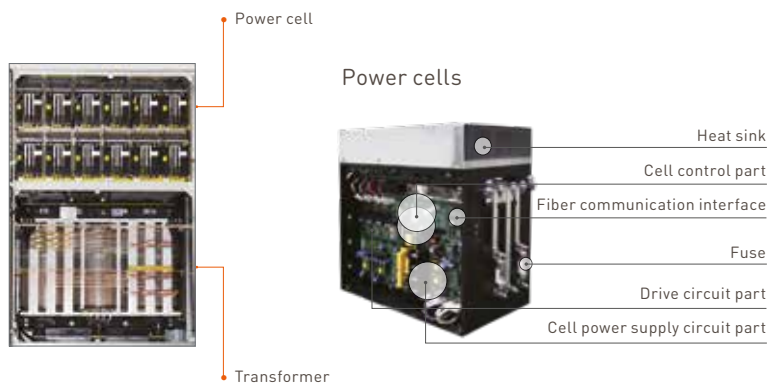
3.3 kV / 150 - 590 kW  
4.16 kV / 180 - 750 kW  
6 kV / 315 - 500 kW  
10 kV / 400 - 800 kW



Control cabinet



Power cell cabinet (Top) Transformer cabinet (Bottom)







# Standard Cabinet

## Double-side Service Zone

3.3 kV / 1.250 – 2.750 kW  
4.16 kV / 1.600 – 4.600 kW  
6 kV / 630 – 5.000 kW  
6.6 kV / 2.500 – 5.500 kW  
10 kV / 400 – 10.000 kW  
11 kV / 470 – 11.000 kW



### TRANSFORMER CABINET



Multipulse phase shift transformer;  
Unique aircooling duct design;  
High efficiency of cooling

### POWER CELL CABINET



Power cell cascaded topology;  
6 kV: 6 cells per phase;  
10 kV: 9 cells per phase

### CONTROL CABINET





# Standard Cabinet

## Front-side Service Zone Only

3.3 kV / 700 – 1.100 kW  
4.16 kV / 900 – 1.400 kW  
6 kV / 315 – 2.000 kW  
6.6 kV / 365 – 2.250 kW  
10 kV / 400 – 3.200 kW  
11 kV / 470 – 3.700 kW



TRANSFORMER CABINET

POWER CELL CABINET

CONTROL CABINET

### COMPACT CABINET Double-Side-Service Zone

Designed to combine the smallest foot-print layout with the full performance of a standard drive without any compromises on power or quality. Ideal solution for retrofit projects or any installation with space constraints.

### STANDARD CABINET Double-Side-Service Zone

Classic Line up version with design optimization for an overall reduced switch gear width. Power cell cabinet with cell installations from the front and the backside of the cabinet. This switchgear version is a perfect fit for applications with multiple drive installations.

### STANDARD CABINET Front-Side-Service-Zone

Distribution switchgear style with a single side service access design. This type of VFD is ideal for a wall mounted or back to back installation. It is often used in single installation sites or smaller rooms with a certain limitation of switchgear depth.



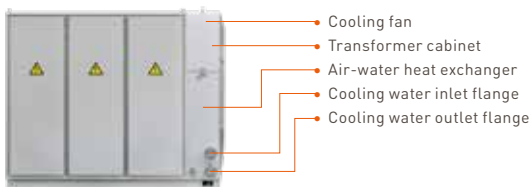
# Water cooled Cabinet

- 3.3 kV / 3.000 – 5.700 kW
- 4.16 kV / 5.500 – 7.200 kW
- 6 kV / 2.250 – 12.500 kW
- 6.6 kV / 2.500 – 13.000 kW
- 10 kV / 12.500 – 23.000 kW
- 11 kV / 12.500 – 25.000 kW



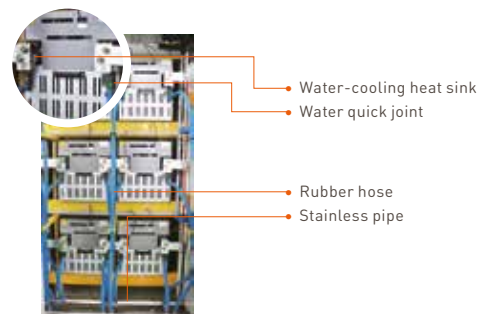
**POWER CELL** Heat sink use vacuum welding, pressure up to 12 bar  
 Laminated design, less inductance, compact dimension  
 Inlet and outlet use double closure quick joint to avoid leakage

## Fully enclosed air-water heat exchange dry type transformer



Protection level IP42;  
 No maintenance;  
 Fully enclosed air-water heat exchange type,  
 protected against outside temperature and dust.

## Power cell cabinet



Water cooling provides a uniformly heat distribution which guarantees lower component temperatures and longer service life;  
 Cooling tap use double closure quick joint, no drainage or linkage during power cell replacement.





### Control system



Central-station control for easy and quick entrance to:

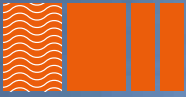
- Customer I/O
- Parameter setting
- Transformer temperature
- Water exchanger protection
- VFD control

### Water cooling exchange system



- Buffer tank
- Cooling water circulation pump
- Plate heat exchanger
- Water deionization system

Stainless for all circulation pipe;  
 Independent deionized water device;  
 Secondary water cooling with high efficiency;  
 Independent PLC monitor system.



# Water cooled Cabinet

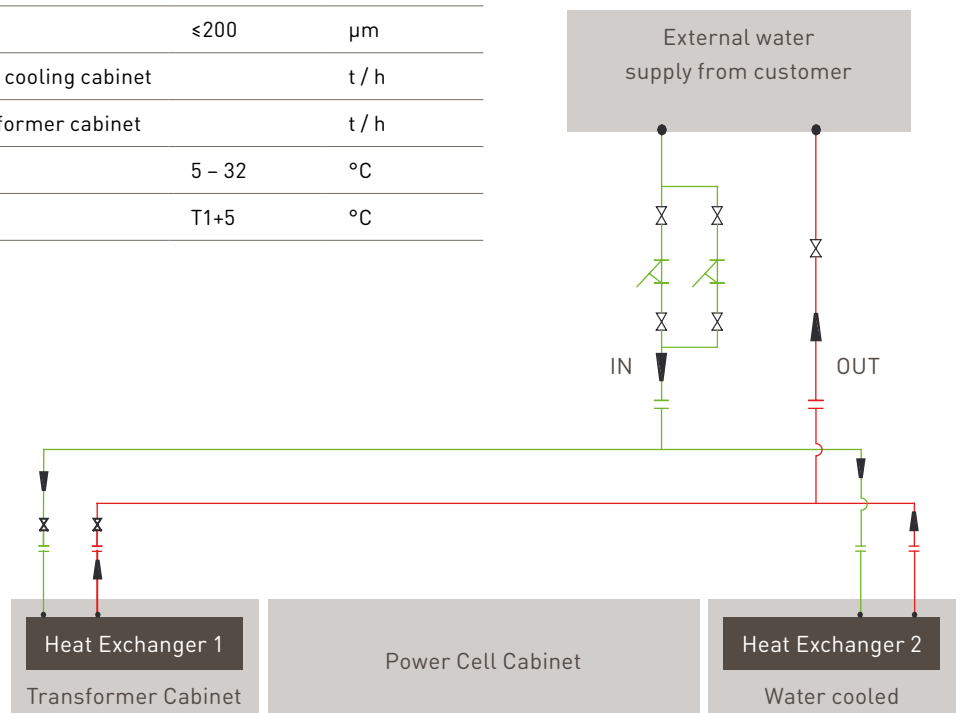
## WATER COOLING VFD EXTERNAL WATER CIRCULATION SYSTEM

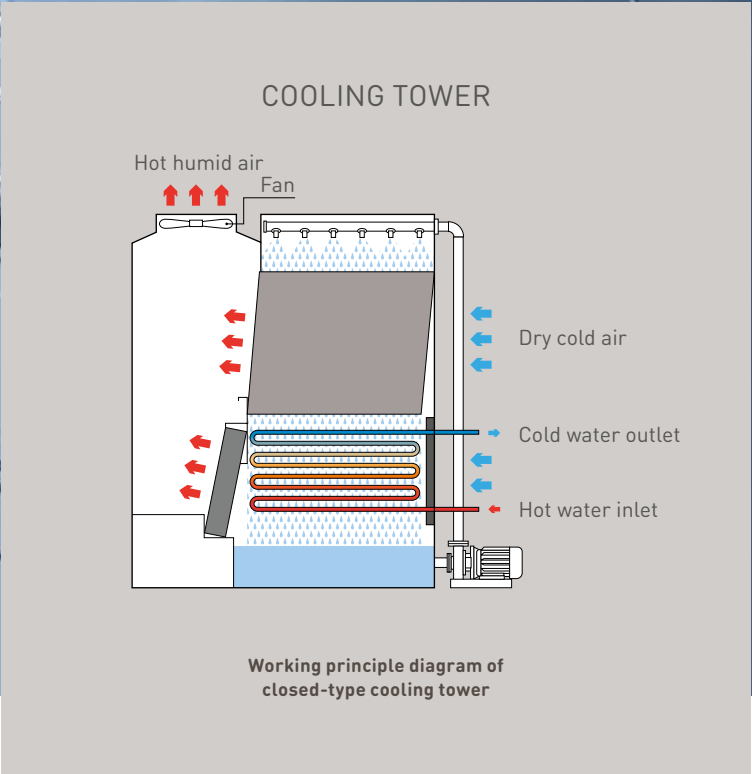
### Scheme 1 // External water supply

#### Specification and requirements

The external water quality and temperature requirements:

Name	Parameter	Unit
TDS(total dissolved solids )	≤1.000	mg / L
PH value	6.5 – 8.5	
Hardness (caco3)	≤450	mg / L
Chloride	≤250	mg / L
Sulfate	≤250	mg / L
Suspended Material	≤30	mg / L
Water Pressure	2.50 – 6	Bar
Solid particles size	≤200	µm
Water freezers of external water of water cooling cabinet		t / h
Water freezers of external water of transformer cabinet		t / h
inlet temperature of external water	5 – 32	°C
outlet temperature of external water	T1+5	°C





**Scheme 2 // Cooling tower**

**Description**

Closed Circuit Cooling Tower / Closed Loop Cooling Tower operates during a manner the same as standard cooling towers, except that the smart heat to be rejected is transferred from the method fluid to water and close air directly through a heat exchange coil. The coil serves to isolate the method fluid from outside atmosphere, keeping it clean and contamination free during a control system, so making two separate circuits.

- Primary / Internal circuit in which the process fluid circulates inside the coil
- Secondary / External circuit sprays circulating water from the basin over the coil which evaporates to reject heat to the environment.

**Scheme 3 // Cooling chiller**

**Working principle**

The cooling water removes heat from the MVH2.0 VFD and returns warm water back to the chiller. The chiller cooling process contains a refrigerant which work on the basic principle of compression and phase-change of the refrigerant from a liquid to a gas and back to a liquid. This refrigeration principle provides two separate liquid systems. While the Chiller take the heat out of the cooling water of the VFD and transfers this heat to the second cooling system within the chiller.

While the low temperature in the VFD cycle guarantees a perfect cooling performance of the power electronics inside the MVH2.0, the relatively high temperature in the Chiller cooling system enable a better heat exchange through the internal heat exchanger with the ambient air because of the higher temperature difference.

The cooling cycle not only separates the two liquid systems, it also provides two independent temperature level in the VFD cooling cycle (Low temperature) and the Chiller cooling cycle (high temperature).





# Product Features





## FULL RANGE OF PRODUCT CATEGORIES

With the 4<sup>th</sup> generation of the MVH2.0 MV-Frequency Drive, AuCom provides a solution for all kind of applications in nearly every industrial sector.

- Classified by Power: 315 kw – 25.000 kw
- Classified by Cabinet: compact cabinet, separate cabinet, water cooled cabinet, outdoors cabinet, flameproof cabinet
- Classified by voltage: 3.3 kV, 4.16 kV, 6 kV, 6.6 kV, 10 kV, 11 kV (2.3 kV,13.8 kV on customers request)
- Classified by cooling mode: air forced cooling, water cooling
- Classified by Motor: synchronous motor, asynchronous motor, permanent magnet motor
- Classified by Performance: standard MV Drive, AFE MV Drive, Drive Start



## MAIN CONTROLLER DSP

The main controller chip uses TI's TMS320 F28335 digital signal processor, the device has 150 MHz high-speed processing capability, 32-bit floating-point processing unit, 6 DMA channels, support ADC, McBSP and EMIF. With up to 18 PWM outputs, six of them are TI's more accurate PWM outputs (HRPWM) and 12-bit 16-channel ADCs. Thanks to its floating-point calculation unit, users can quickly write control algorithms without having to spend too much time and effort on decimal operations, with an average performance improvement of 50% over the previous generation DSPs. At the same time, the application of better control algorithm, so that the waveform of the inverter running at low-frequency current and output harmonics have a significant increase.



Current waveform at 2 Hz



Current waveform at 5 Hz



Current waveform at 10 Hz



## MONITORING HMI



- 10 inch touch screen
- Supporting multi languages
- Control system status and monitoring
- Powerful data control (data logging, diagnostics, and information)
- User-centric convenience  
(HD display, high data throughput, user-friendly interface)

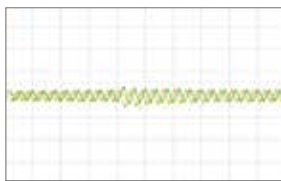
# Product Features



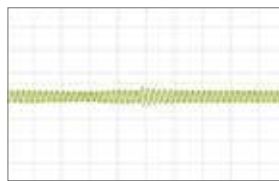
## ADVANCED FUNCTIONS

### Synchronous transfer function:

Using phase lock loop technology to adjust the output of the drive, make the frequency, phase position and amplitude match those of the network. Achieve switching motor power from medium voltage drive to the network power (bypass mode) or vice versa (drive mode).



Current valid value 15 A, switch peak 31 A before sync transfer



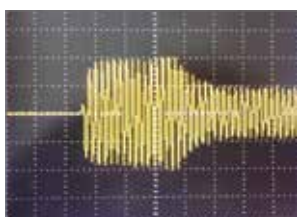
The motor current waveform during sync transfer

Multi-motor synchronous transfer function allows users to start multiple (up to 4) MV motors sequentially in drive mode and control the last motor speed.

### Flying start:

Also called "speed start", when the motor is still rotating, the drive will automatically estimate the motor speed, and output the same voltage waveform with the motor frequency. When start, current is limited within the rated current, this will not cause over current problem.

Used when the drive automatically restarts after power loss, or Motor switch from network running to drive mode running.



Flying start motor / network waveform

### Instant power loss:

When grid voltage drop or power off for less than 1.000 ms, VFD can run without stop to support process at site.

### Torque boost:

Increasing the output voltage at low frequency, to boost the motor torque when running with low speed. The torque boost function supports high breakaway torque applications and guarantees a smooth start of the load.

### Master-slave control:

Supporting multiple VFD system, with several motors running on the same load such a mills or conveyor belts. The VFD analyzes torque and load to balance motors speed and torque.

### Double winding motor control:

Double winding motor has higher PF and efficiency, smaller loop circuit increase system capacity. VFD driving the double winding motor can realize full speed with half load, half speed with full load, improve system stability.

### Power cell braking function:

This function enables high braking torque at low speed and guarantees a quick stop time if required.

### Neutral point shift:

In case one power cell is internally bypassed because of a fault, the other power cells can adjust the output voltage to keep a balanced output voltage, by change phase position to maintain continuous running.





Cloud monitoring platform



Management system structure



Work order management model



Digital analysis model



## CLOUD MONITORING

MV drive connected to the server monitoring platform by wireless or wired network, sending real time data to server. Other mobile devices can receive internal data of the server at the same time to monitor real time running condition of the MV drive. By using monitoring the platform or mobile devices, users can analyze parameters, identify problems and diagnose the products fault from remote. At the same time, by using the panoramic camera and voice system, users can instruct technicians from remote to operate on site.



## INTERFACE BOARD

The core of the new interface board is S7.200 SMART CPU, the module comes standard with Ethernet interface, support Siemens S7 protocol, TCP / IP protocol, effectively supporting a variety of terminal connections. In addition, the CPU module is integrated with one RS485 interface, able to communicate with the third-party equipment such as the MV drive and touch screen. At the same time, it is equipped with expansion CM01 signal board to realize RS232 / RS485 free communication and support profibus and Ethernet TCP / IP communication protocol.



## INTERFACE LOGIC CONTROLLER

Interface logic controller uses a standard Siemens S7200 smart PLC as the core component, and this PLC is equipped with Siemens dedicated high-speed processor chip – its basic instruction execution time can be up to 0.15  $\mu$ s. 24 DI, 16 DO, 4 AI, 4 AO have been selected for use according to the MV drive requirements, so it can guarantee adequate interface and ensure fast processing.



## PARAMETERS DOWNLOADING AND UPLOADING

System and motor parameters can be easily downloaded and uploaded with a windows based software tool. The software provides an advanced service functionality and guarantees the correct parameter settings after the replacement of components.



# Product Specification

Specification	General Purpose MV Drives
VFD rated power	210 – 28.000 kVA *
For motor power	150 – 25.000 kW *
Rated voltage	2,3 – 13,8kV (-15% - +10%) *
Rated frequency	50 Hz / 60 Hz (-10% – +10%) *
Modulation technique	SVPWM
Control power	400 V, ≤30 kVA(depend on power level)
Input power factor	>0.96
Efficiency	>96% (>98% for Power Electronic Part)
Output frequency range	0 Hz – 80 Hz *
Frequency resolution	0.01 Hz / 0.002 Hz
Instantaneous over-current protection	150% protect immediately (customized )
Overload capability	120% ,125 s
Current limited protection	10%-150% (1.000 ms – 3 s inverse time protection)
Analog input	3 × AI with 4 – 20mA / 2 – 10V
Analog output	4 × AO with 4 – 20mA
Host communication	Isolated RS485 interface, ModBus RTU, Profibus DP(optional), Industry Ethernet Protocol (optional)
Acceleration and deceleration time	5 s – 1.600 s( related to load)
DI / DO	14 inputs / 22 outputs
Environment temperature	-5 – +45°C *
Storage / transportation temperature	-40 – +70°C *
Cooling	forced air cooling / water cooling
Humidity	<95%, no condensation *
Altitude	<1.500m (1% derating each 100 meter above 1000 meter)
Dust	Non-conductive, no causticity, <6.5 mg / dm <sup>3</sup> *
Protection level	IP30 *
Cabinet colors	RAL 7.035 (other on request)

\* Please consult with AuCom for the information beyond the below table.

\* The dimensions are subject to change without notice, take the technique protocol for correct dimensions.

# Application Industries and Fields

## Petrochemical

- Booster fan
- Induced draft fan
- Pipeline transportation pump
- Water injection pump
- Feed water pump
- Submerged pump
- Oil transfer pump
- Brine pump
- Circulating water pump
- Compressor

## Cement

- Kiln draft fan
- Kiln gas blower
- Separator fan
- Kiln drive
- High temperature fan
- Cement mill (Ball mill)
- Dust removal fan
- Circulating fan
- Grate cooler
- Raw material mill fan
- Raw material mill (Vertical mill)
- Coal mill
- Rotating kiln transmission
- Compressive force draft fan

## Light industry

- Gas blower
- Force pump
- Cleaning pump
- Axial flow pump
- Fresh water pump
- Cooling pump
- Compressor
- Beating engine
- Shredding machine

## Electricity

- Powder exhaust fan
- Booster fan
- Force draft fan
- Induced draft fan
- Condensation pump
- Slurry pump
- Water pumping energy storage pump
- Circulating water pump
- Boiler (feed) pump
- Compressor

## Coal mines & minerals

- BFDS
- De-dusting fan
- Main fan
- Axial flow fan
- De-scaling pump
- Mud pump
- Slurry pump
- Water pump
- Feeding pump
- Stirring pump
- Agitating pump
- Drainage pump
- Process pump
- Belt conveyor
- Kiln drive

## Others

- Pump test stand
- Inverter power supply test stand
- Motor test stand
- Wind tunnel test

## Municipal projects

- Aeration fan
- Induced draft fan
- Force draft fan
- Submersible pump
- Fresh water pump
- Sewage pump
- Hot water circulating pump
- Lifting pump
- Water booster pump
- Water injection pump

## Metallurgy

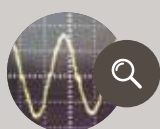
- Induced draft fan
- Force draft fan
- Secondary de-dusting fan
- Compressing blower
- Blast furnace blower
- Blast de-dusting fan
- Hydraulic pump
- Electric furnace cooling fan
- Sulfur dioxide blower
- Slag-flushing pump
- Feeding pump
- Water-delivery pump
- Phosphorus removal pump
- Mud pump
- De-scaling pump
- Kneading machine
- Oxygen compressor
- Gas compression pump

# Quality & Service

## ISO 9001 Quality controlled production process



## Comprehensive in line power cell quality system



Components inspection



Aging test for PCB



The first and the most important step of production inspection AuCom equip with professional tools, such as electrical capacitor tester, leakage tester, to test 100% of IGBT, capacitor. With strict test, AuCom is trying to prevent quality problem.



PCB aging test is classified to be high-low temperature aging test and simulation system aging test. High-low temperature aging test: PCB will be placed in the environment with temperature difference from -20 degree to 80 degree for 73 hours. Simulation system aging test: PCB will be connected as system power on for functional test.

**01 Customized Solution**

Close contact with design institute and user, customize solution based on requirement

**User training 02**

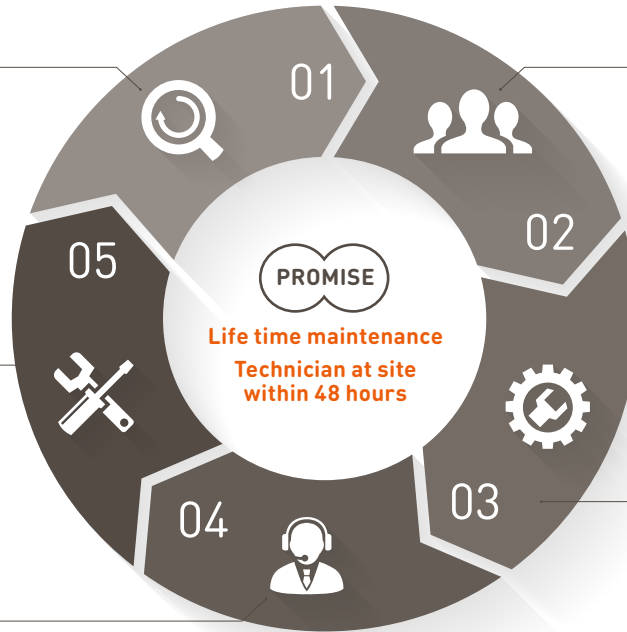
Regular training to customer for operation and maintenance

**05 Installation and commissioning**

Adjust VFD output, monitor load status, 24 hours test commissioning before run into service

**04 Service**

Factory remote support;  
On site service



**Repair and update 03**

Solve the fault with quick response; core PCB free update whole service life



**Power cell aging test**



**System aging test**



Power cell will run at 1.2 times rated voltage and current condition, 100 A 500 A power cell aging test equipment, By touch screen control system to monitor and manage all the power cells.



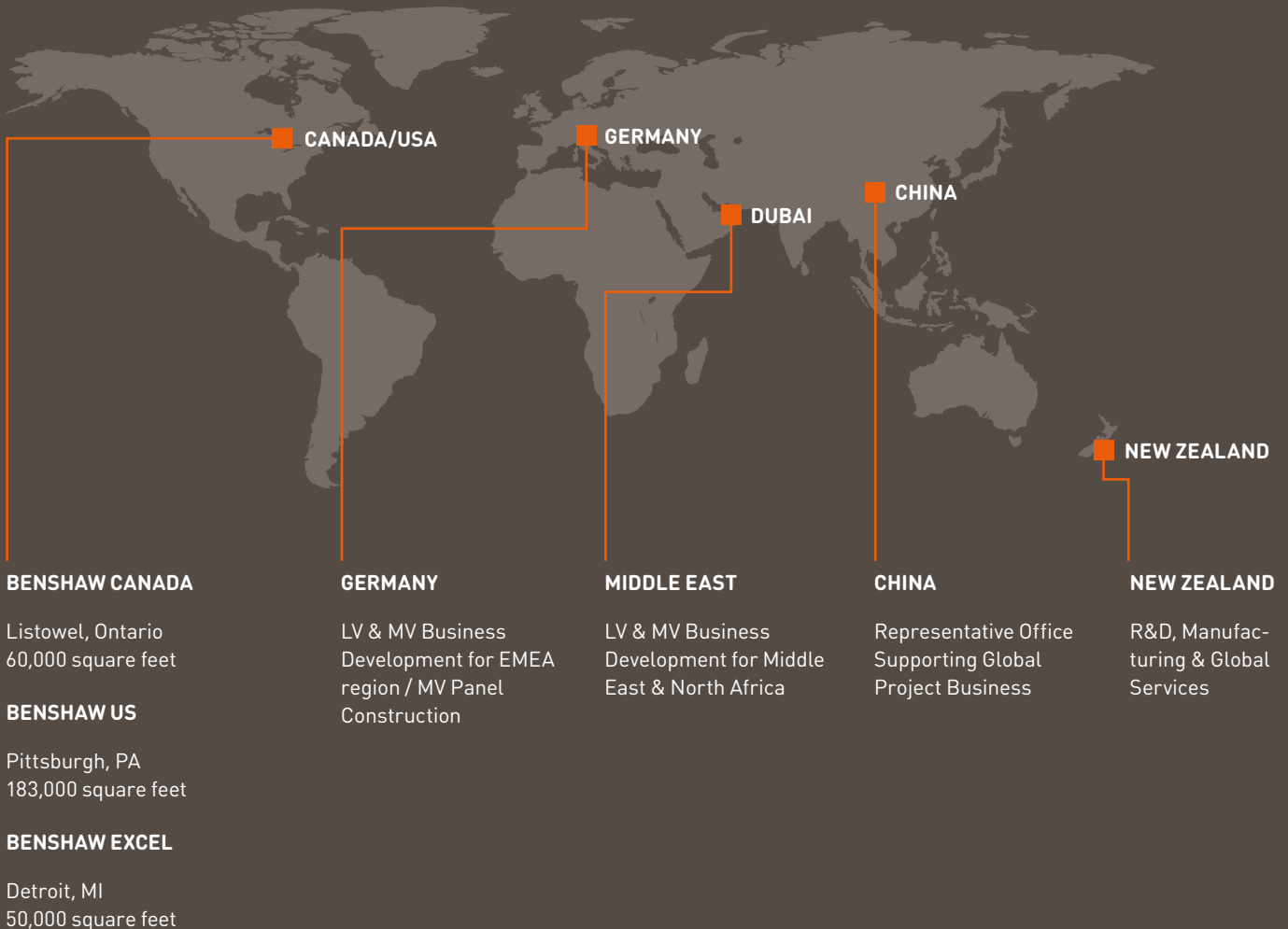
System commissioning test platform locate 11 couple motors, by different match to get different voltages from international market. Test platform is control by pad and PLC, easy to collect data and storage. High efficiency and serious system test guarantee the device long-term stable running.



**BENSHAW**  
Applied Motor Controls

**AuCom**  
MOTOR CONTROL SPECIALISTS

Benshaw's North American, regional manufacturing facilities are fully integrated engineering, assembly, testing, supply chain, customer service and repair operations. Locations include:



FOR MORE INFORMATION AND YOUR LOCAL CONTACT VISIT [WWW.AUCOM.COM](http://WWW.AUCOM.COM)

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