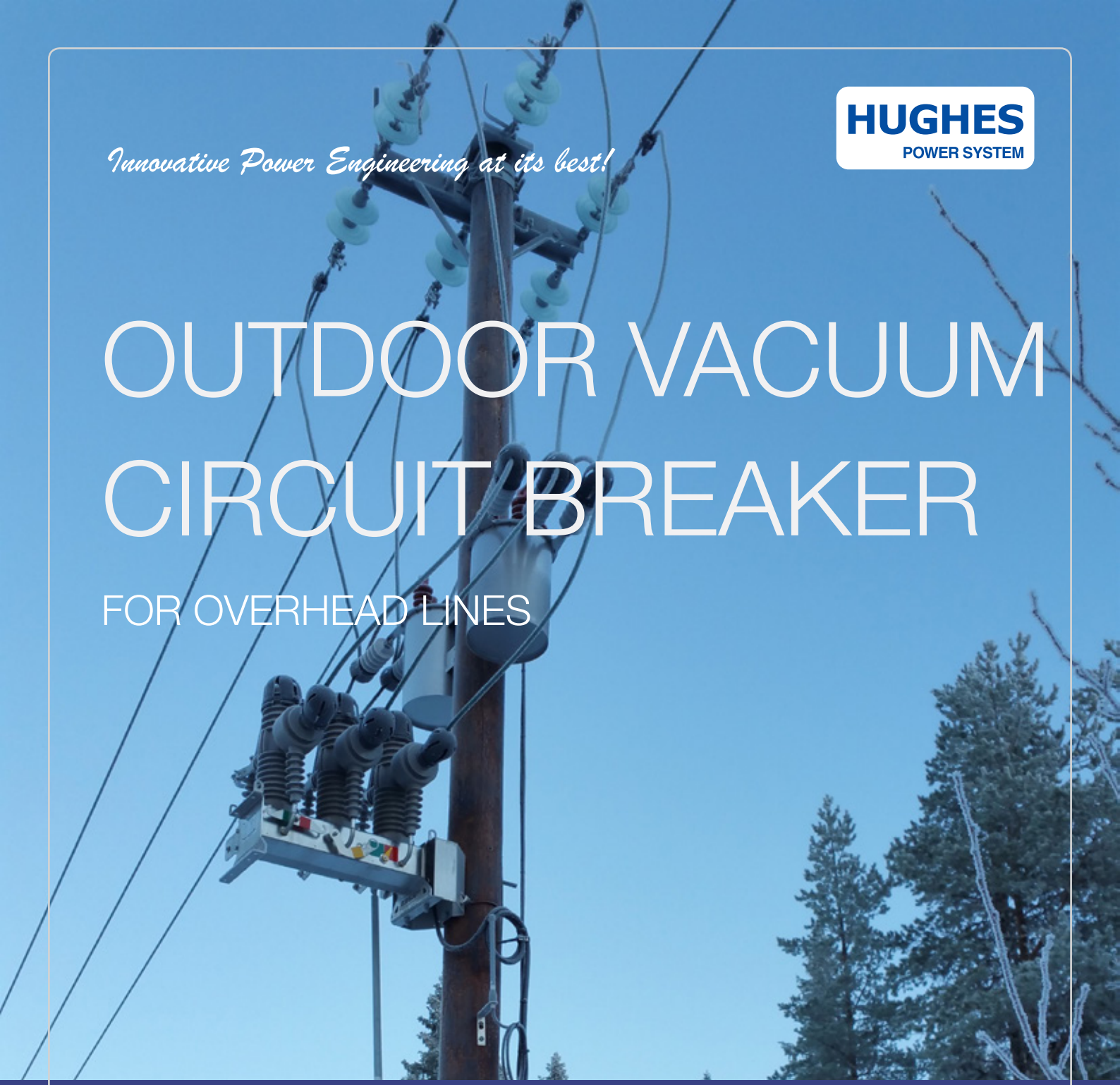


Innovative Power Engineering at its best!

HUGHES POWER SYSTEM

OUTDOOR VACUUM CIRCUIT BREAKER

FOR OVERHEAD LINES

OVX OVERHEAD LINES VACUUM CIRCUIT BREAKER SERIES FOR DIFFERENT VOLTAGE CLASSES:

- OVX120 series for 6/15kV;
- OVX240 series for 22/27kV;
- OVX405 series for 33/40kV;

ABOUT US

Hughes Power System is a Swedish manufacturer of environmentally friendly equipment for electrification and automation of mass transport and electrical distribution systems. Very high quality standards together with innovative approach result in an advanced range of products, aiming to improve network quality by minimizing the number and duration of faults.

Our product portfolio includes:

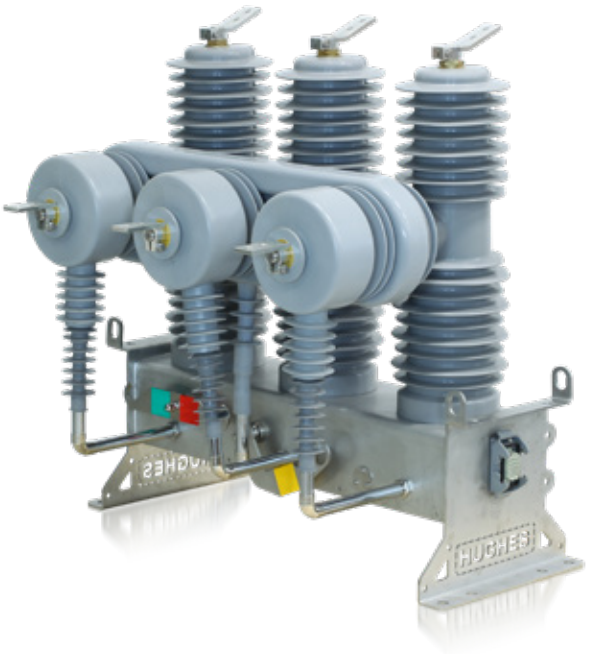
- Reclosers
- Vacuum interrupter switches
- Disconnectors
- Motor drives
- Voltage transformers
- D/C power supplies

With its more than 30 years expertise in research, development, manufacturing, marketing and sales the company operates in many countries though cooperation with local partners. As we move towards our goal of being a world class advanced technological company in electrical utility products, we guarantee our commitment to the well known Swedish standards of reliability, safety and quality.

The majority of Hughes Power System's products are designed and built in Sweden.

HUGHES POWER SYSTEM

GENERAL DESCRIPTION



WHAT IS A VACUUM CIRCUIT BREAKER

Hughes OVX overhead line vacuum circuit breaker series is designed and manufactured in Sweden. It is built for use on overhead distribution lines for recloser applcations as an advanced Smart Grid building block. The products are built to remain in operation for more than 30 years without major maintenance due to the highest quality materials used in its construction.

OVX can be equipped with Hughes control unit for a simple remote control or with Hughes recloser control unit to form a recloser/sectionalizer.

OPTIONAL CXB CONTROL UNIT

- The **CXB-1** (1) control unit is intended for a simple remote control of an OVX switch.
- The cabinet contains all necessary components for local and remote control of the device.
- The CXB unit has a parallel remote control Interface to a RTU.

OPTIONAL FTU RECLOSER CONTROL

- The **FTU** (2) recloser control cabinet together with the OVX switch forms a recloser or a sectionalizer.
- FTU handles the network protection and the RTU functionality.
- The protective relay senses the faults, assists the vacuum circuit breaker module in a recloser to clear the fault on the line.

1

2

OPERATION PRINCIPLE

- The OVX series of vacuum circuit breakers can be operated manually or motorized for remote control.
- The manual operation can be done by a hook stick or by a fixed operation rod. If it is done by a down pole operation handle, which can be pad locked in open or closed position.
- There are two different motor/spring mechanisms that has different operation principles.
- The solenoid release mechanism has the operation springs charged all the time. It is released by an electric solenoid (ca 25 ms delay) or by a manual operation mechanism. This mechanism has stored spring energy for 3 operations before it needs to be charged.
- The traditional spring mechanism charges the spring in the same operation as it is operated. It will be operated ca 15 seconds after the spring charge motor starts or when it is operated by a hook stick or by a fixed operation rod.

OVX SERIES FOR VACUUM CIRCUIT BREAKER MODEL RANGE

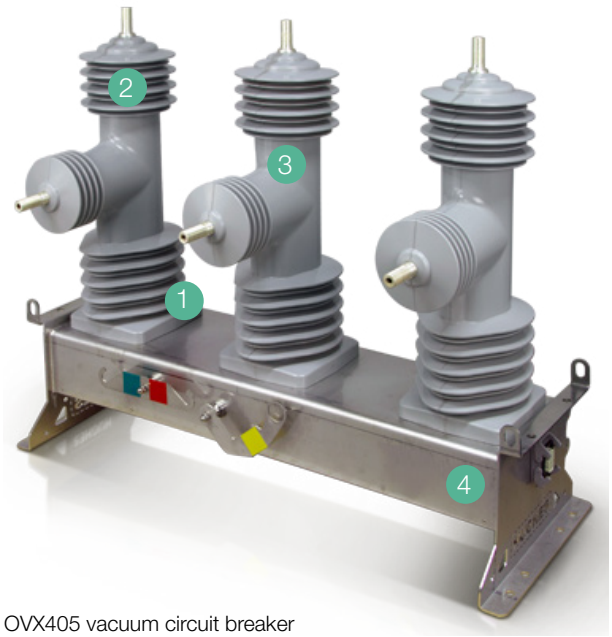
- For 6/12kV **OVX120** model of vacuum circuit breaker equipped with 12kV bushings, built-in disconnector and voltage sensors on the load side.
- For 6/15kV **OVX121** model of vacuum circuit breaker equipped with extra insulated 27kV bushings and with 1 or 2 sets of voltage sensors on feed and/or load side;
- For 22/27kV **OVX240** model of vacuum circuit breaker equipped with 24kV bushings, built-in disconnector and voltage sensors on the load side.
- For 22/27kV **OVX241** model of vacuum circuit breaker equipped with 27kV bushings and with 1 or 2 sets of voltage sensors on feed and/or load side;
- For 33/40kV **OVX405** model of vacuum circuit breaker equipped with ABB VG10 2000A/20kA 40.5kV vacuum interrupter and voltage sensors on the load side;

GENERAL DESCRIPTION

OVX VACUUM CIRCUIT BREAKER COMPONENTS AND ADVANTAGES

Hughes **OVX** series of vacuum circuit breaker has the following advantages:

- **Low maintenance.** Hughes vacuum circuit breakers are built to remain in operation for more than 30 years without major maintenance due to the highest quality materials used in its construction;
- **Low initial investment cost.** OVX can operate with or without fault pass indicator and radio. The local operation is performed with a hook stick, fixed operation rod or via push buttons in a control cabinet. The remote control is performed via the control cabinet with the communication options: SMS, MODBUS, DNP3 and IEC 60870-5-101/104 serial and IP communication via radio-GSM.
- **Long operational life time.** Up to 20,000 interruptions (one of the longest operating life on today's market) of the well proven OVX switch;
- **Live tank construction** (1) completely eliminates the occurrence of internal arc faults and the risk of explosion or destruction inside the recloser switch tank. That makes it repairable in case one of the poles is damaged. It provides improved cooling of the vacuum interrupters due to unhindered air circulation. It has the increased creepage distance that allows the use of reclosers in an environment with a 4th degree of atmospheric pollution and cleaning of insulation without dismantling;
- Can operate as a **recloser or sectionalizer**;
- OVX can **make and break short circuit currents** if needed, both electronically and mechanically.
- **Simple setup** with an OVX switch and optional CBX-1 control unit or FTU recloser control cabinet;
- **Simple upgrade** of OVX to a recloser is possible via replacement of the control cabinet software;
- **Vacuum interrupter bottles** (2) can handle up to 20kA faults for 3s guarantee long term problem free operation in networks with many high current faults;
- **Bushings and insulators** (3) with solid epoxy insulation. Silicon coating provides UV protection, is environmentally friendly, does not contain harmful SF6 gas or oil;
- **Frame** (4) made of 5 and 4mm highest quality stainless steel to minimize electrochemical corrosion. The use of stainless steel in accordance with DIN50049 / 3.1B, thanks to its non-magnetic properties, completely eliminates the occurrence of any kind of corrosion, including electrochemical corrosion over the entire life of the product;
- **Electrical circuit** (5) made of high grade copper;

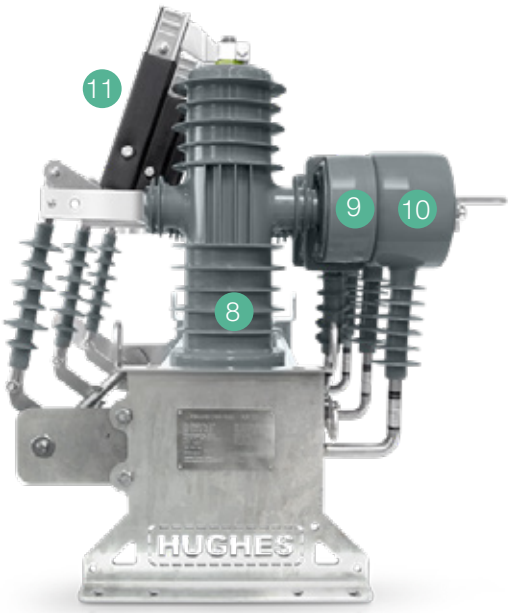


OVX405 vacuum circuit breaker

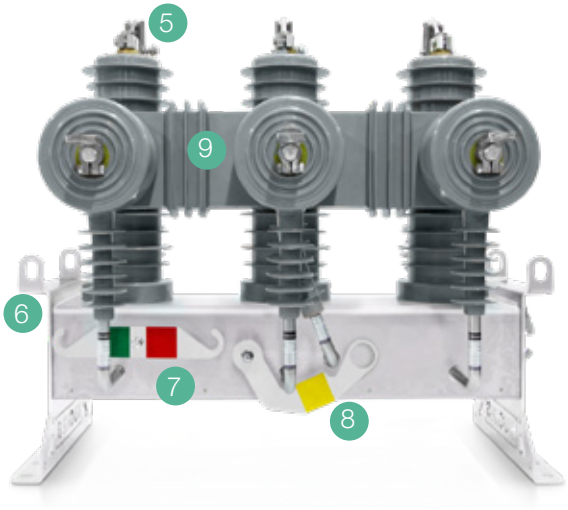
- **Attachment points** (6) for down pole mounted disconnector operation handle;
- **Spring stored energy operating mechanism** (7). It provides turning On and Off the switch module even in the complete absence of power supply (voltage transformer malfunction, full battery discharge).
- **Manual maneuvering** (8) of OVX. Manual charging of the spring mechanism as well as switch operation On and Off are possible with the help of manoeuvring arms located on a switch body. The spring capacity is enough for the full reclosing cycle (Off - On - Off) without recharging;

OPTIONAL COMPONENTS:

- **Core balance current transformer** (9) measures and detects extreme low earth currents and is suitable for all networks with isolated neutral point. This solution gives a secure detection of extreme low earth currents as the CCT unit combines all three phases in one winding;
- **Phase current transformers** (10). The OVX can be fitted with a combination of none, two or three phase current transformers with different winding ratio and with multiple tapings and with built in voltage sensors;
- **Earth switch** (11) is synchronized with the vacuum interrupter and cannot be closed when the vacuum interrupter is closed;
- **Disconnector switch** (11) gives visible open points of all three phases for extra safety. The disconnector (for OVX120 and 240 only) is synchronized with the vacuum interrupter and cannot be open or closed when the vacuum interrupter is closed;
- **1 set of voltage sensors** can be installed on feed side (for OVX121 and 241) or on load side (for OVX405);



OVX120 vacuum circuit breaker, side view



OVX120 vacuum circuit breaker, front view

GENERAL DESCRIPTION

OPTIONAL CXB-1 CONTROL CABINET AND FTU RECLOSER CONTROL ADVANTAGES

Hughes CXB and FTU control units for OVX vacuum circuit breaker have the following advantages:

- **Complete solution** from a pole to SCADA system;
- **Easy installation** and compatible with most disconnectors;
- **Compact design**;
- **External cabinet** (1) of highest quality stainless steel. The use of stainless steel in accordance with DIN50049 / 3.1B, thanks to its non-magnetic properties, completely eliminates the occurrence of any kind of corrosion, including electrochemical corrosion over the entire life of the cabinet;
- **Special double roof** (2) prevents the accumulation of the water / snow on the cabinet and protects from over-heating of the internal cabinet in hot climates;
- **Padlock facility** (3) handle protects from unauthorized access;
- **Protection lips** (4) from rain water;
- **Connector** (5) for antenna remote control;
- Rugged pole **mounting brackets** (6) for different pole types;
- **Door alarm switch** (7) activates when the door is opened and sends the signal to the SCADA system. This feature notifies about access to the cabinet;
- **Inventive climate system** (8) for long term reliability. The lower louvers have a combination of a polymeric fine filter and a PTC thermoelement, which creates a moving air stream to the upper louvers. This air stream always evens out the day and night effect. The bottom of the cabinet has 5 drainage holes with micro filter preventing water gathering in case of any condensation;
- **Inventive protection system** from water ingress via the outgoing drive shaft;
- **Communication** to the control centre can be done via SMS, MODBUS, DNP3 and IEC 60870-5-101/104 serial and IP communication via radio-GSM;

CXB control unit

FTU recloser control cabinet

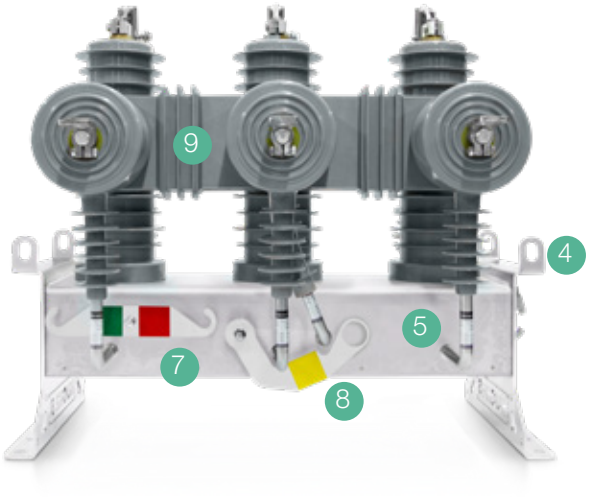
OVX120 SERIES FOR 6/15KV

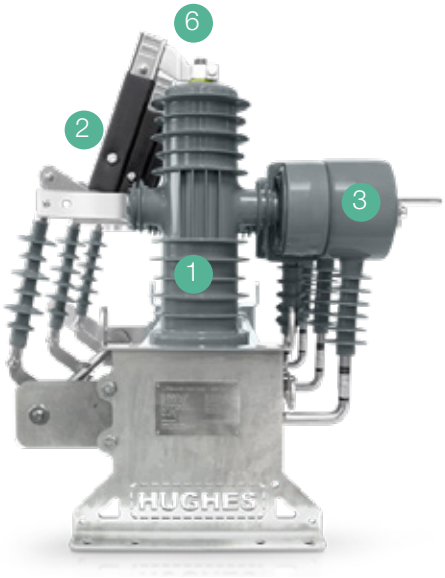
THE OVX120/240 VACUUM CIRCUIT BREAKER COMPONENTS

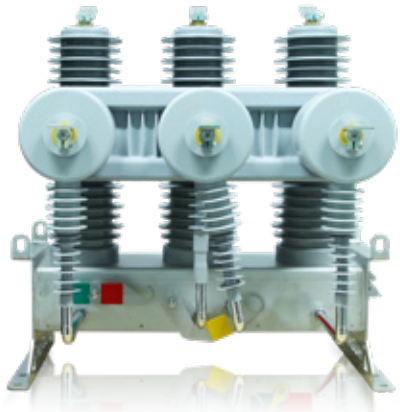
- 12/24kV bushings (1) of epoxy with silicone surface;
- Integrated and synchronized disconnector (2) with visible open points on all 3-phases;
- Integrated 3x phase current transformers (3) with built-in voltage sensors on load side;
- High current vacuum breaker element (1), AMF type for 630 or 1250A continuous line load and 20kA fault current in 3 sec
- Attachment points (4) for down pole mounted disconnector operation handle;
- Frame (5) made of 5 and 4mm stainless steel to eliminate electrochemical corrosion;
- Electrical circuit (6) made of high grade copper;
- Manual maneuvering (7) of both vacuum interrupter and disconnector;
- Spring stored energy operating mechanism (8);

OPTIONAL COMPONENTS:

- Integrated 1x core balance CT (9) for detecting low earth faults;







OVX240 vacuum circuit breaker, front view

OVX240 vacuum circuit breaker, side view

HUGHES POWER SYSTEM

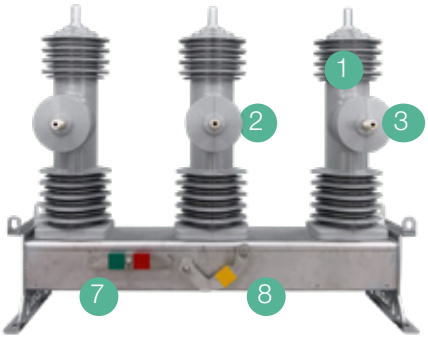
OVX240 SERIES FOR 22/27KV

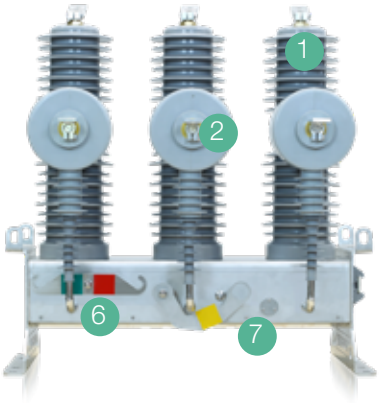
THE OVX121/241 VACUUM CIRCUIT BREAKER COMPONENTS

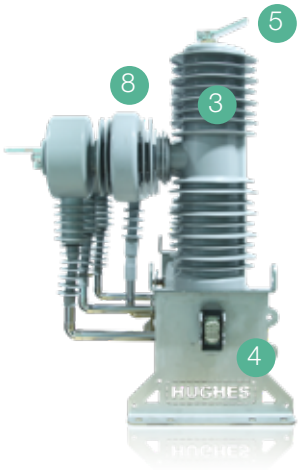
- Extra insulation with 27kV bushings (1) of epoxy with silicone surface with built-in voltage sensors on feed side;
- Integrated 3x phase current transformers (2);
- High current vacuum breaker element (3), AMF type for 630 or 1250A continuous line load and 20kA fault current in 3 sec;
- Frame (4) made of 5 and 4mm stainless steel to eliminate electrochemical corrosion;
- Electrical circuit (5) made of high grade copper;
- Manual maneuvering (6) of vacuum interrupter;
- Spring stored energy operating mechanism (7);

OPTIONAL COMPONENTS:

- Integrated 1x core balance CT (8) for detecting low earth faults;
- Voltage sensors on load side;







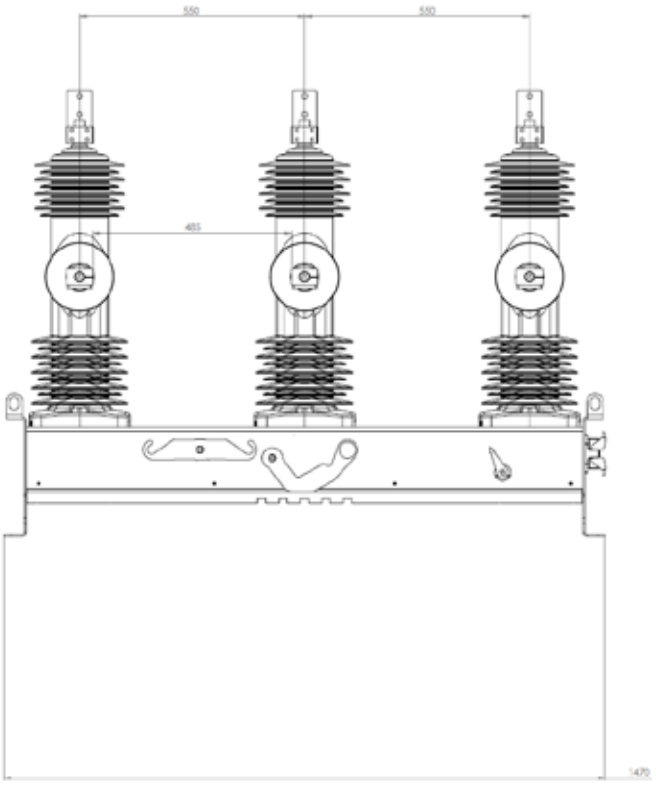
OVX405 SERIES FOR 33/40KV

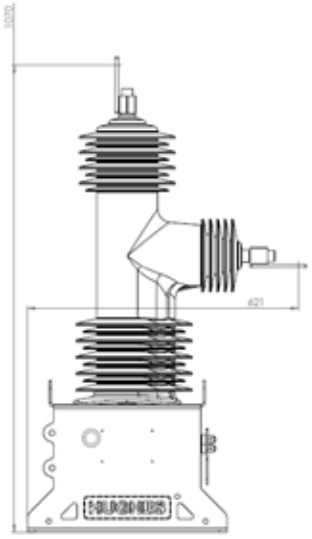
THE OVX405 VACUUM CIRCUIT BREAKER COMPONENTS

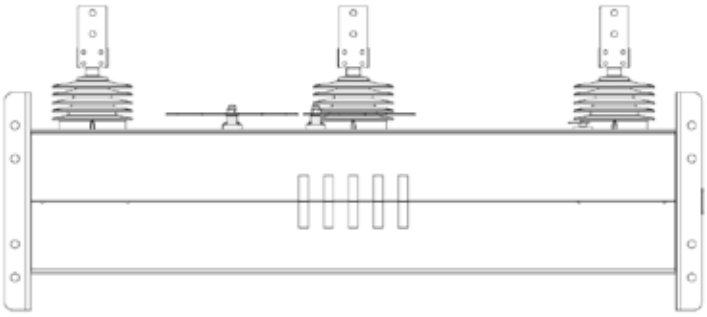
- ABB VG10 2000A/20kA 40.5kV vacuum interrupter (1);
- Integrated 3x phase current transformers (2);
- Integrated voltage sensors on load side (3);
- High current vacuum breaker element (1), RMF type for 1200 A continuous line load and 16 kA fault current in 3 sec;
- Frame (4) made of 5 and 4mm stainless steel to eliminate electrochemical corrosion;
- Electrical circuit (5) made of high grade copper;
- IP67 Control cable contact (6);
- Manual maneuvering (7) of vacuum interrupter;
- Spring stored energy operating mechanism (8);

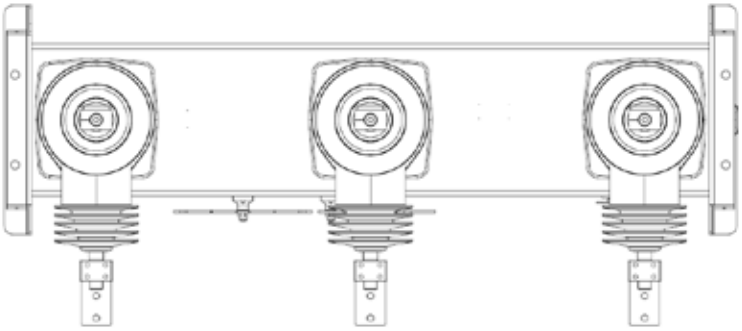
DRAWINGS

LBS405



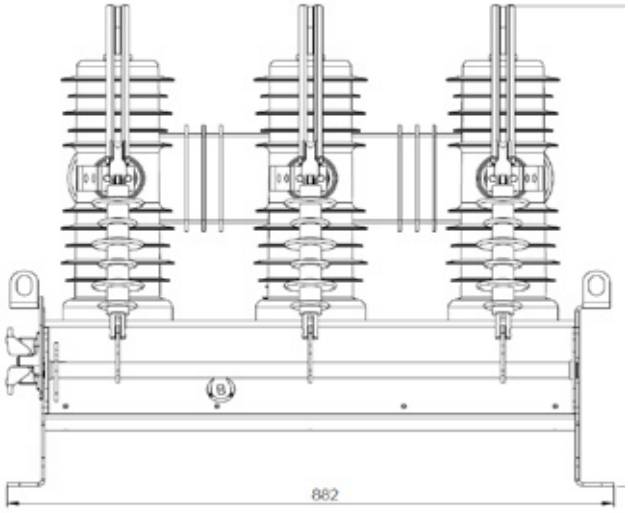


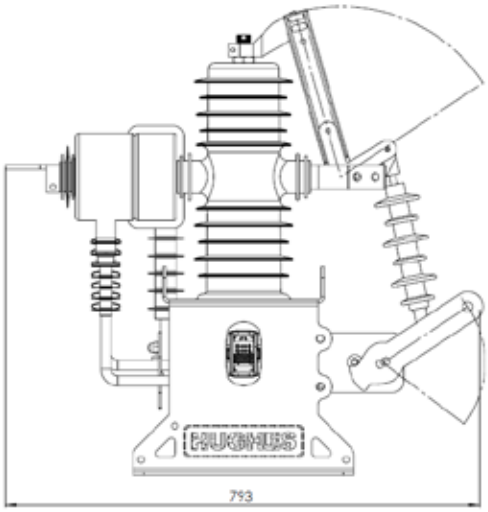




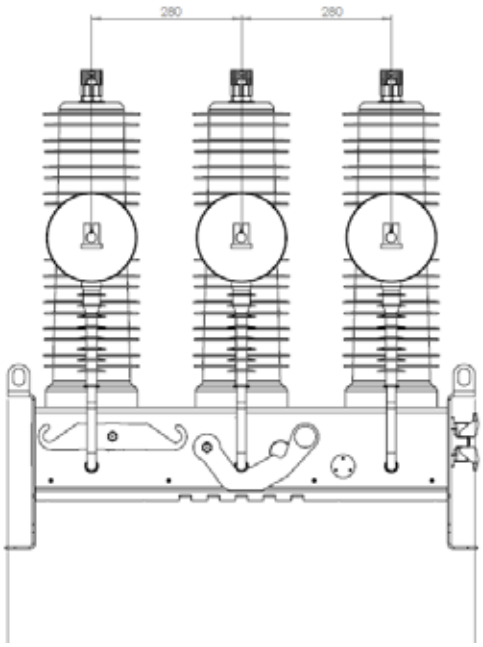
DRAWINGS

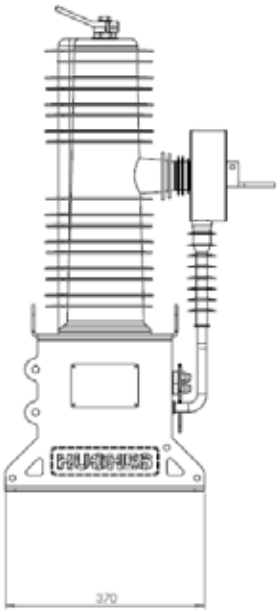
OVX120



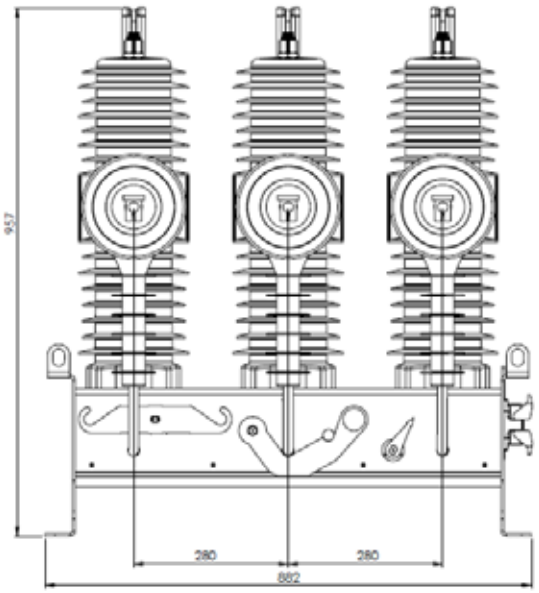


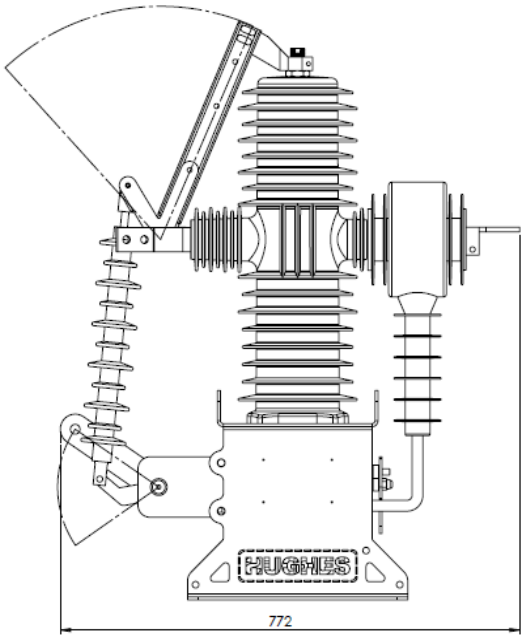
OVX121



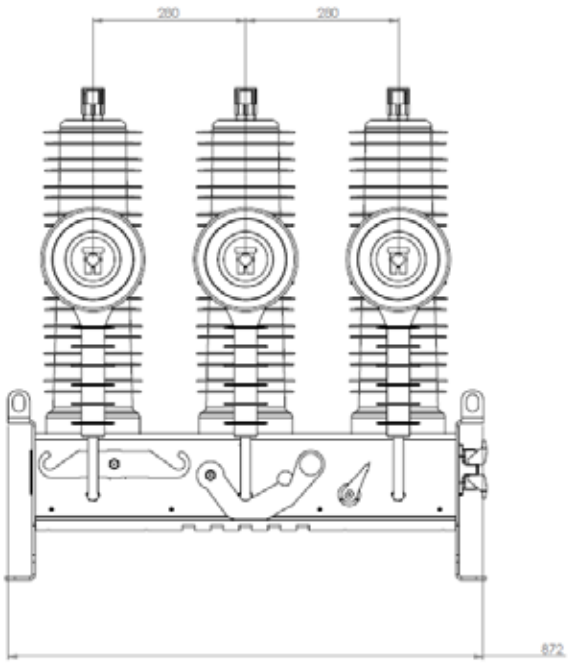


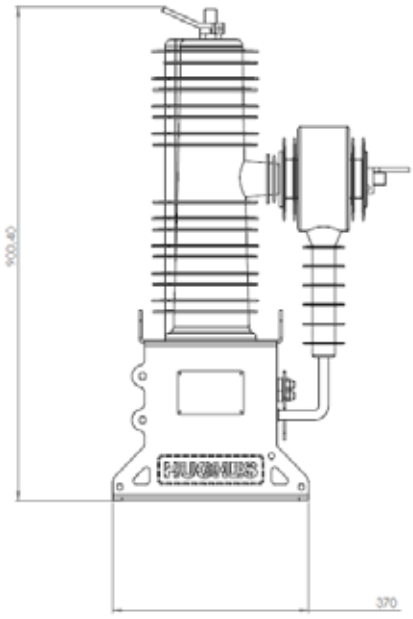
OVX240





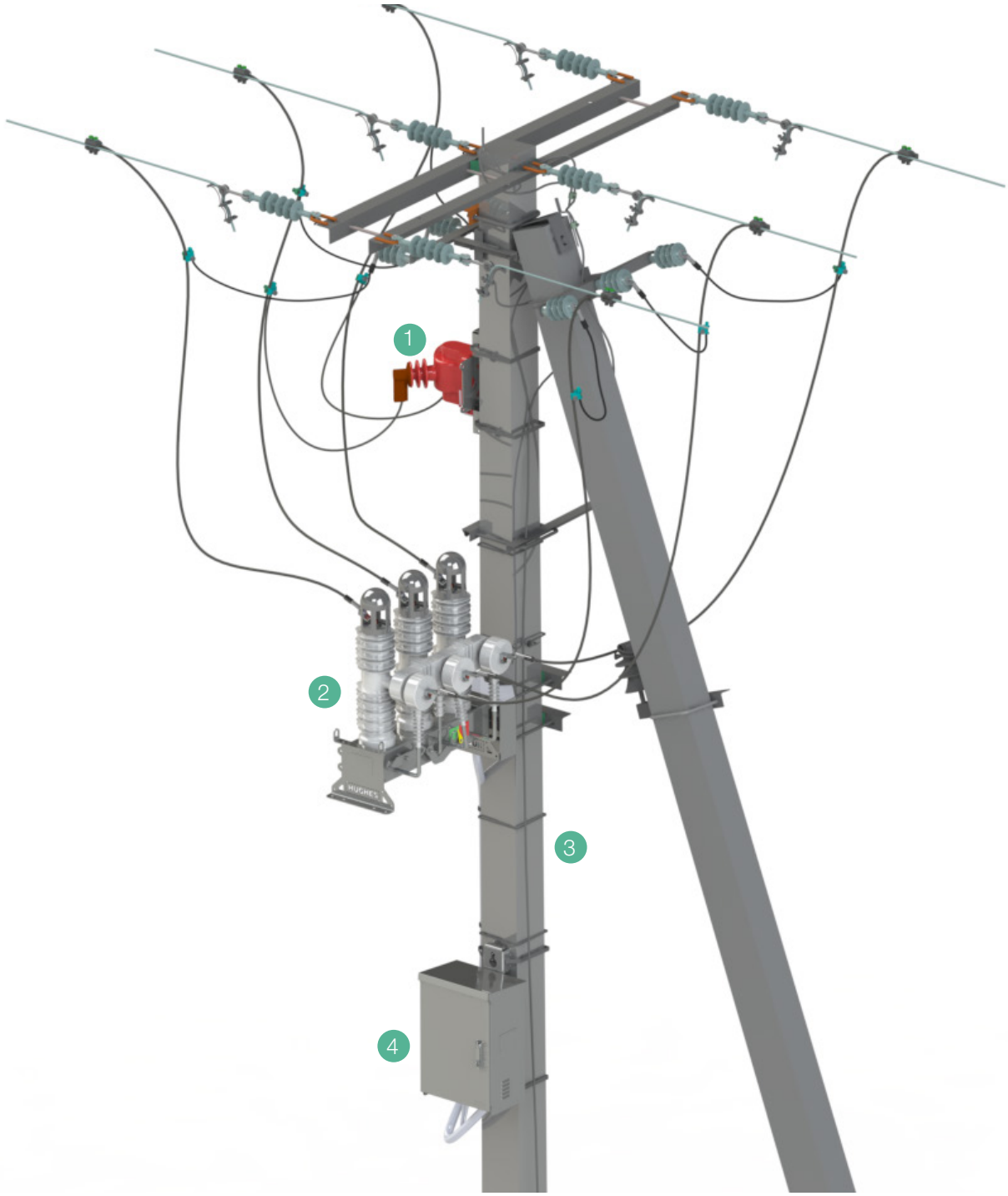
OVX241





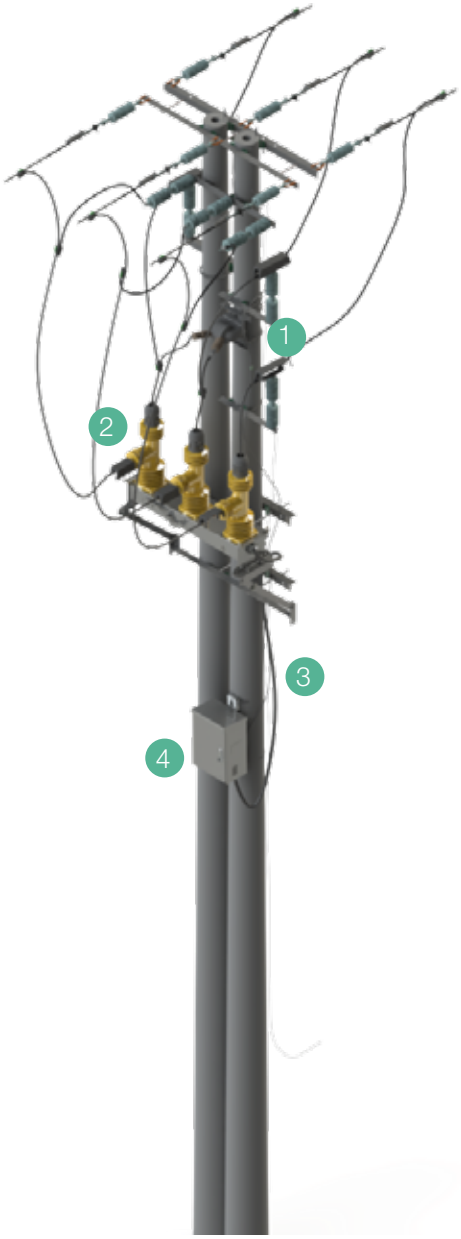
INSTALLATIONS

OVX120/121/240/241

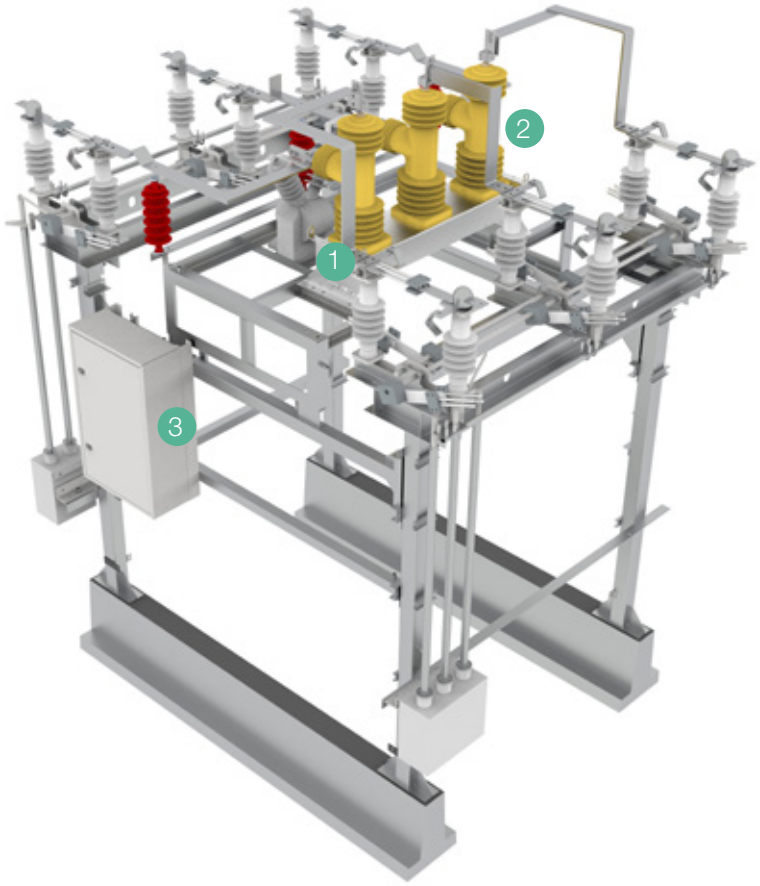


- Voltage transformer (1)
- Vacuum circuit breaker (2)
- Interconnecting cable (3)
- Control cabinet (4)

OVX405



- Voltage transformer (1)
- Vacuum circuit breaker (2)
- Interconnecting cable (3)
- Control cabinet (4)



Installation of the OVX450 set inside of a sectionalizing scheme.

- Voltage transformer (1)
- Vacuum circuit breaker (2)
- Control cabinet (3)

HUGHES POWER SYSTEM

EXTERNAL ACCESSORIES

FOR OPTIONAL CXB-1 CONTROL CABINET / FTU RECLOSER CONTROL

GROUNDING SYSTEM CABLE THEFT ALARM

Grounding system cable theft alarm is an optional accessory that notifies SCADA system if the grounding system is missing or damaged.

It is installed inside a control cabinet and is suitable for all Hughes pole mounted products, such as:

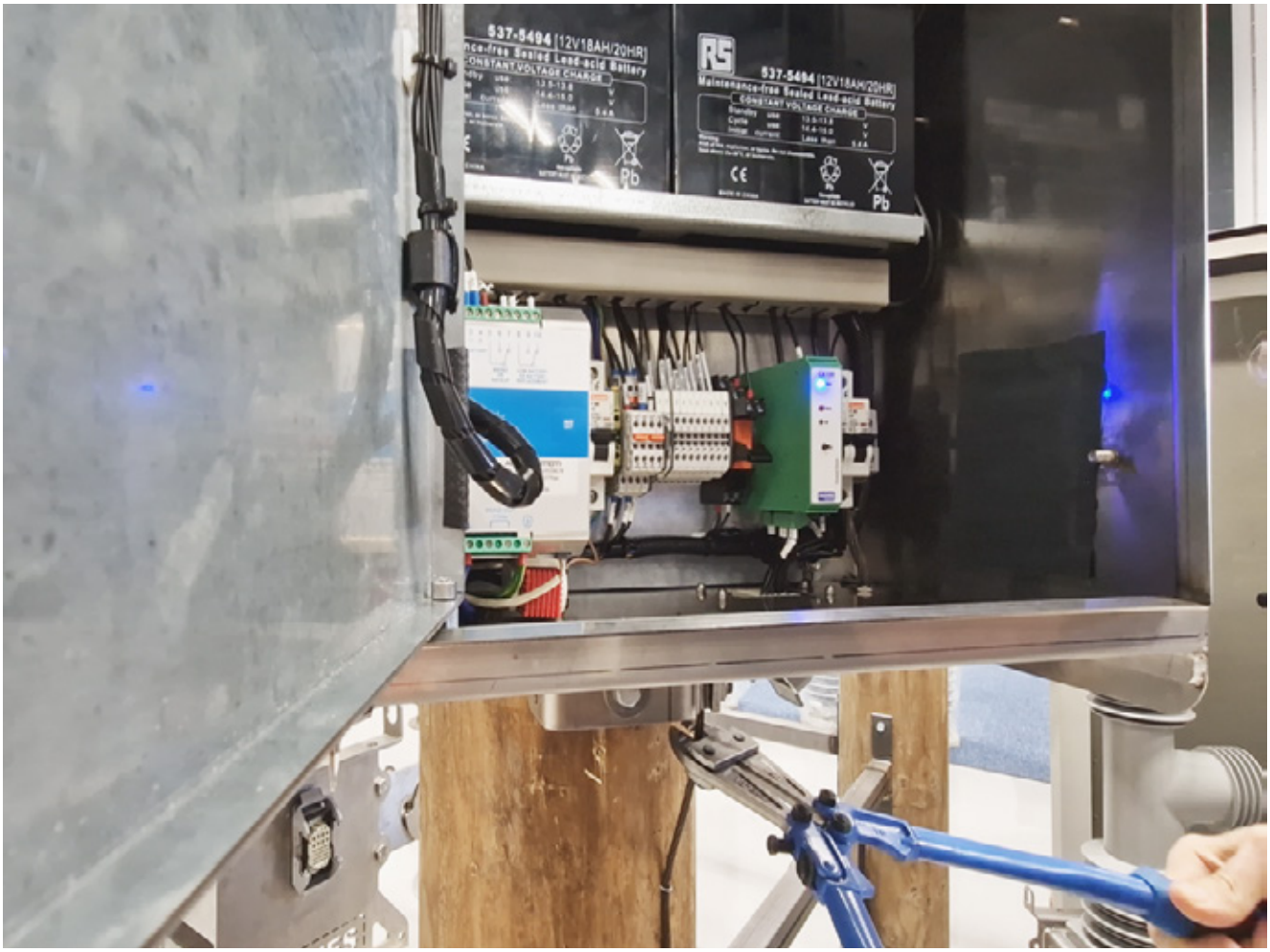
- motor drives;
- overhead line and kiosk reclosers' protection relay cabinets;
- control cabinets for sectionalizers;
- control cabinets for vacuum circuit breakers or load break switches.

Installation in the motor drive cabinet

INDICATORS AND BUTTONS

When a ground wire of a control cabinet is cut, the red LED button is activated, and an immediate notification is sent to a SCADA system.

- The accessory has 3 indicators and one test button:
- POWER - on with a constant blue LED indicator;
- OK - with green LED displaying that ground system is normal;
- ALARM - with red LED displaying that the ground wire is cut;
- Test button - for testing the operation of the device;



PURPOSES

The alarm is in high demand in regions with a big number of copper cable thefts.

The theft alarm purposes are:

- to receive immediate notification that the grounding system is missing;
- to help to prevent big electrical hazardous risks for the operator or public;
- to avoid receiving false measuring information from the remote device;
- to make it possible to repair the grounding system in the shortest time;

EXTERNAL ACCESSORIES

FOR OVX AND OPTIONAL CXB-1 CONTROL CABINET / FTU RECLOSER CONTROL

CXB-1 mounting bracket

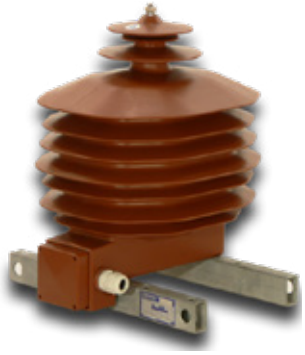
Multicore interconnection cable for OVX and control unit

OVX mounting bracket

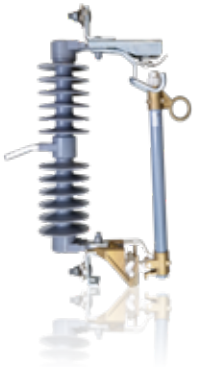
Phase to phase connected, epoxy insulated voltage transformer 11/0.11kV

Phase to phase connected, epoxy insulated voltage transformer 24/0.11kV

Phase to phase connected, epoxy insulated voltage transformer 33/0.11kV

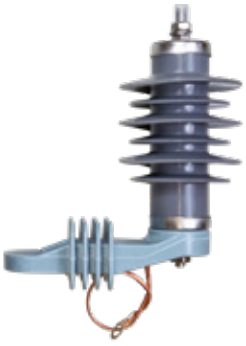


Phase to ground connected, epoxy insulated voltage transformer 19/0.11kV



Drop out fuses, silicone insulated, 15kV 3A

Drop out fuses, silicone insulated, 38kV 3A



Surge arresters silicone insulated, 22kV

Surge arresters silicone insulated, 33kV

Modem – Router G100

Modem – Router G200

Antenna for GSM/4G

Pole mounted bracket for antenna

Surge arresters for antenna
N-N connectors

Antenna cable (3) 8M RG-213 N-N
professional connectors;

Standard lead acid AGM type battery 12 V 20 AH;

Modem – Router G200 Li-Ion batteries for hot climate
with $LiFePO_4$ chemical system 12.8V 20 AH

HUGHES
POWER SYSTEM

TECHNICAL DATA

CHARACTERISTICS	FTU recloser control cabinet	CXB-1 control cabinet
Dimensions (LxWxH), mm	403 x 293 x 630	Wide body version 630 x 465 x 336 (HxWxD), multiple formats, custom fit
Weight, kg	45 (including batteries)	46 (including batteries)
Operating temperature, °C	-50 ... +60 Optional -10…+80	-50 ... +60 Optional -10…+80
Enclosure	IP55-65, non-magnetic stainless steel, optional painted in RAL or ANSI colour	IP55-65, non-magnetic stainless steel, optional painted in RAL or ANSI colour
Climate system	35 W PTC element	35 W PTC element
Thermostat, °C	on at 5°C off at 15°C	on at 5°C off at 15°C
Operation voltage	90– 250VAC 240 W, temperature compensation	90– 250VAC 240 W, temperature compensation
Batteries	2 x 12 V 22 Ah AGM Lead cell	2 x 12 V 22 Ah AGM Lead cell
Battery optional	2 x 12.8 V, 22 AH Li-Ion	2 x 12.8 V, 22 AH Li-Ion
Control interface	Parallel - Modbus	Parallel
Signalling protocols, serial	IEC 60870-5-101, DNP3, Modbus RTU	
Signalling protocols, IP	IEC 60870-5-104, DNP3, Modbus	
Signaling protocols, optional	IEC 61850	
GPS timing protocol	IRIG-B	
Communication interface	1 x RS-232/485, 1 x RS-232, 1 x 10/100Mbit TP(Ethernet), GSM/4G	
Sensor input	2 x 4-20 mA	
Optional communication board	2 x 100Mbit TCP or 2 x Fibre	
Optional communication system	HSR and PRP Redundancy protocols	
Tests	• EN 60068-2-1 • EN 60068-2-2 • EN 60068-2-30 • EN 60068-2-52 • EN 60068-2-78 • EN 62271-102 6.103 • EN 62271-102 6.104 • EN 62271-102 6.105 • EN 60265	• EN 60068-2-1 • EN 60068-2-2 • EN 60068-2-30 • EN 60068-2-52 • EN 60068-2-78 • EN 62271-102 6.103 • EN 62271-102 6.104 • EN 62271-102 6.105 • EN 60265

CHARACTERISTICS	OVX120 / 121 for 6/15kV	OVX240 / 241 for 22/27kV	OVX405 for 33/40kV
Dimensions LxWxH, mm	882x793x775/ 872x370x902	882x772x957 / 872x370x900	1470x621x1070
Mass (weight) without air break switch, kg (lbs)	75 (165) / 75 (165)	101 (222) / 101 (222)	155 (342)
Mass (weight) with disconnector, kg (lbs)	98 (216) / NA	125 (275) / NA	NA
Operating temperature, °C	-45 - +70 / -45 - +70	-45 - +70 / -45 - +70	-45 - +70
Humidity	100% at 25C / 100% at 25C	100% at 25C / 100% at 25C	100% at 25C / 100% at 25C
Enclosure	IP55-65, non-magnetic stain-less steel, optional painted in RAL or ANSI colour	IP55-65, non-magnetic stain-less steel, optional painted in RAL or ANSI colour	IP55-65, non-magnetic stainless steel, optional painted in RAL or ANSI colour
Bushing type	Epoxy core with silicone surface	Epoxy core with silicone surface	Hydrophobic Cycloaliphatic Epoxy (HCEP)
Phase to phase distance, mm	280 /280	280 / 280	550
Creep distance to ground (airbreak switch isolator), mm	400	725	
Creep distance to ground (interruptor isolator), mm	460 / 1090	960 / 1090	1310
Max installation altitude at rated BIL, m	3000 / 3000	3000 / 3000	3000
Rated operation voltage, VDC	24-48-110	24-48-110	24-48-110
Rated maximum voltage, kV	12 / 15	24 / 27	38 / 40
Rated basic impulse level, P>P, kV	85 / 85	145 / 145	185
Rated basic impulse level, P>E, kV	75 / 75	125 /125	170
Power frequency withstand, Dry, kV	60 / 60	60 / 60	70
Power frequency withstand, Wet, kV	45 / 45	50 / 50	60
Rated continuous current, A	630 / 1250	630 / 1250	1200
Rated fault peak current, kA	50 / 50	50 / 50	42
Rated fault breaking current, kA	20 / 20	20 / 20	16
Cable charging current, A	20 / 40	20 / 40	40
Line charging current, A	5 / 10	5 / 10	5
Rated fault duration time, s	3 / 3	3 / 3	3
Contact resistance, VCB, μΩ	< 35 / <35	< 35 / <35	< 40
Contact resistance, ABI, μΩ	< 60	< 60	
Network frequency, Hz	50/60 / 50/60	50/60 / 50/60	50/60 / 50/60
Design min mechanical/electrical	20.000 / 20.000	20.000 / 20.000	20.000 / 20.000
Rated power, W	40 / 40	40 / 40	40
Design specification	IEC 62271-100	IEC 62271-100	IEC 62271-100
Marking specification	IEEE std C37.60	IEEE std C37.60	IEEE std C37.60
Operation sequence, no charge	25ms trip - 50ms close - 25ms trip	25ms trip - 50ms close - 25ms trip	25ms trip - 50ms close - 25ms trip

HUGHES
POWER SYSTEM

Hughes Power System is a Swedish manufacturer of environmentally friendly equipment for electrification and automation of mass transport and electrical distribution systems. Very high quality standards together with innovative approach result in an advanced range of products, aiming to improve network quality by minimizing the number and duration of faults.

The majority of Hughes Power System's products are designed and built in Sweden.

www.hughespowersystem.com

Handelsvägen 10
SE-373 30 Nättraby, Sweden
T +46 470 54 20 00

www.hughespowersystem.com

Printed on recycled paper 2023-09