

Innovative Power Engineering at its best!

HUGHES
POWER SYSTEM

KIOSK RECLOSER

FOR SUBSTATIONS, CABLE LINES



VXR KIOSK RECLOSER SERIES FOR DIFFERENT APPLICATIONS:

- Overhead electrical distribution lines;
- Underground distribution lines;
- Distribution substations;
- Smart Grid building block

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:

- High and medium voltage solid insulated vacuum circuit breakers
- Reclosers
- Disconnectors
- Motor operating drives for disconnectors
- 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.



GENERAL DESCRIPTION



VXR120 KIOSK RECLOSER SET INCLUDES:

- The **VX4-12** (1) vacuum circuit breaker (compulsory);
- FTU (2) recloser control cabinet (compulsory);
- Interconnecting cable (3) (compulsory);
- Built in components (optional);
- Additional accessories (4) (optional);



1



2



3



4

WHAT IS KIOSK RECLOSER

Hughes VXR kiosk recloser is a control system, including a vacuum circuit breaker and a recloser control cabinet. VXR series of kiosk recloser is designed for use on underground distribution lines, in distribution substation applications and as an advanced Smart Grid building block. The product's reliability has been proven for more than 30 years of operation in electrical distribution networks.

VXR SERIES:

- VXR120 kiosk recloser for 6/12kV;
- VXR240 kiosk recloser for 22/24kV;

VXR240 KIOSK RECLOSER SET INCLUDES:

- The **VX4-24** (1) vacuum circuit breaker (compulsory);
- FTU (2) recloser control cabinet (compulsory);
- Interconnecting cable (3) (compulsory);
- Built in components (optional);
- Additional accessories (4) (optional);



1



2



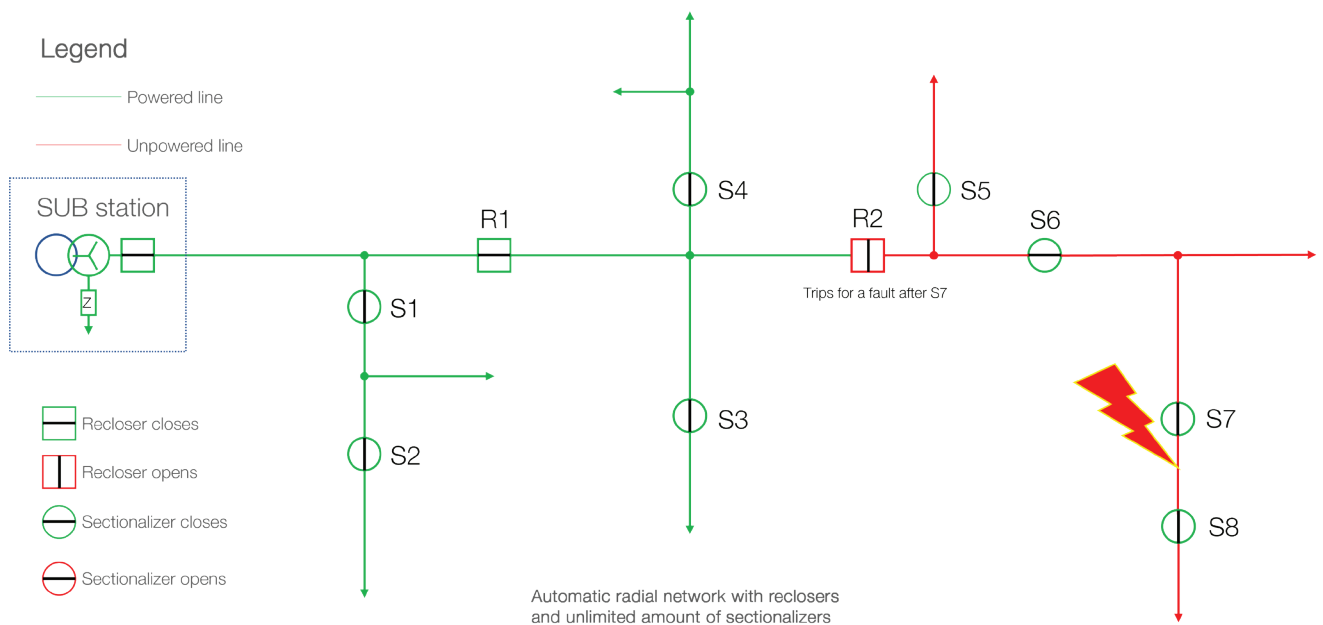
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OPERATION PRINCIPLE

- A recloser has almost the same function as a substation breaker. One of the differences is that a recloser can automatically change its settings due to the power flow.
- When a fault is sensed by the recloser's current transformer and voltage sensors, the recloser trips after its first parameter setup. It recloses again after a pre-programmed time and tests if the fault is still remaining. When the recloser closes after the initial trip, a reset timer starts. If the fault occurs within the reset time, the recloser counts it as the same fault and trips after its second reclosing sequence. If the fault occurs again after the reset time, the recloser sees it as a new fault and starts with its initial trip sequence. If the fault is permanent, the recloser goes into lockout after its pre-programmed reclosing cycles.
- Below is Hughes recommended placement of reclosers and time voltage sectionalizers in a radial network.



VXR SERIES FOR KIOSK RECLOSERS MODEL RANGE

- **VXR120** has the VX4-12 vacuum circuit breaker switch equipped with 12kV bushings;
- **VXR240** has the VX4-24 vacuum circuit breaker switch equipped with 24kV bushings;

GENERAL DESCRIPTION

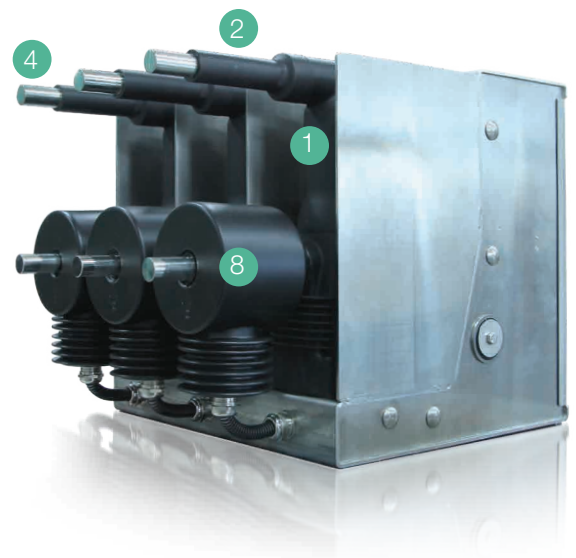
VXR KIOSK RECLOSER COMPONENTS AND ADVANTAGES

Hughes **VX4** series of vacuum circuit breaker has the following components and advantages:

- **Low maintenance.** Hughes reclosers are built to remain in operation for more than 30 years without major maintenance due to the highest quality materials used in its construction;
- **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;
- **Long operational life time.** Up to 20,000 interruptions (one of the longest operating life on today's market) of the well proven VX4 vacuum circuit breaker;
- **Solid epoxy insulation** of bushings (2) and insulators is environmentally friendly, does not contain harmful SF6 gas or oil;
- **Highest quality stainless steel** (3) is used for most of the parts 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 recloser;
- **Electrical circuit** (4) made of high-grade copper;



VX4-24 vacuum circuit breaker, front view



VX4-12 vacuum circuit breaker, back view

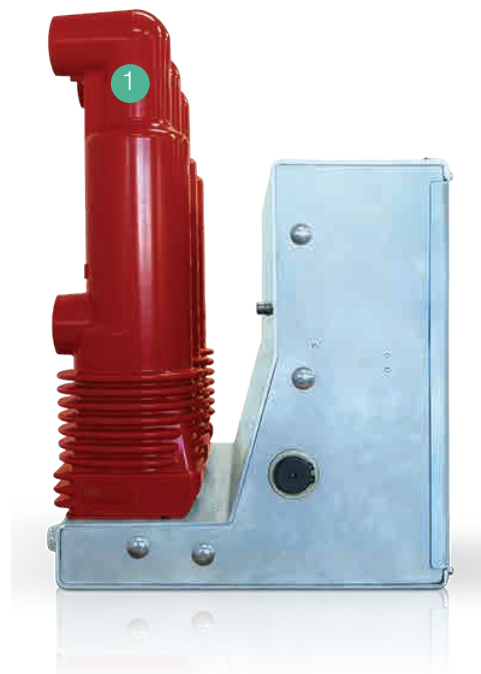
- **Vacuum interrupter bottles** (1) can handle 25kA faults for 3s guarantee long term problem free operation in networks with many high current faults;
- **Spring stored energy operating mechanism** provides turning On and Off the switch module even in the complete absence of power supply (voltage transformer malfunction, full battery discharge);
- **Manual charging** (5) of the spring mechanism as well as switch operation On and Off are possible with the help of maneuvering arms located on a switch body. The spring capacity is enough for the full reclosing cycle (Off - On - Off);
- **Padlock facility** (6) for mechanical blocking of operation;
- **Advanced protection relay** with functions of directional fault detection, low earth fault detection, intermittent earth fault detection, automatic reverse power flow setting change;
- Same footprint as **ABB NAL** load break switch and **ABB VD4** circuit breaker;
- **Truck mount** (7) for simple maintenance (optional);
- **Simple connection to the bus bar** or cable (several custom options);
- **Simple installation** in existing switch bays and kiosks;

OPTIONAL COMPONENTS

- **Phase current transformers** (8). The VX4 can be fitted with phase current transformers with different winding ratio and with multiple tapings;



VX4-12 vacuum circuit breaker on truck mount, front view



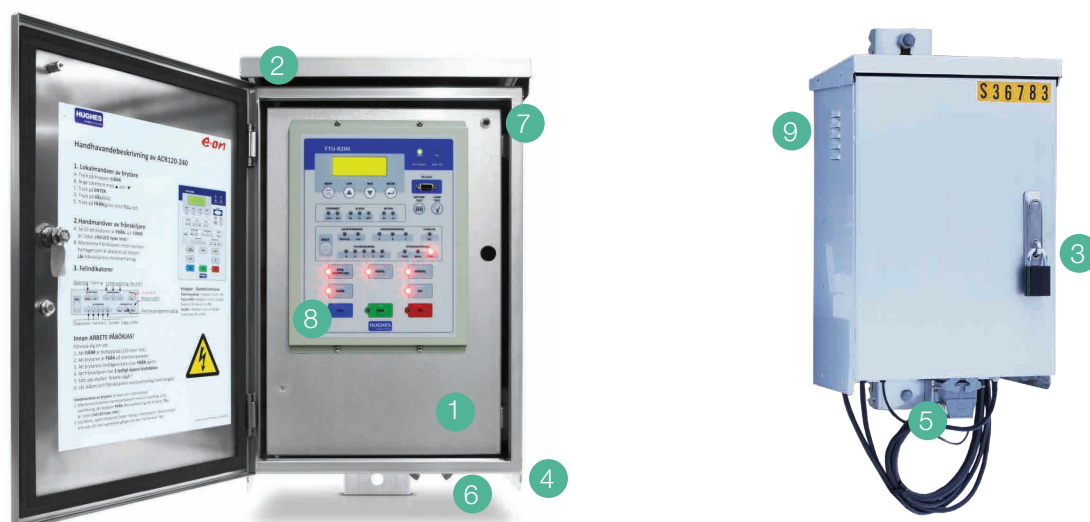
VX4-24 vacuum circuit breaker, side view

RECLOSER CONTROL CABINET

FTU RECLOSER CONTROL CABINET COMPONENTS AND ADVANTAGES

Hughes VXR series of kiosk reclosers uses **FTU** recloser control cabinet with the following advantages:

- **Low maintenance.** Hughes products are built to remain in operation for more than 30 years without major maintenance due to the highest quality materials used in the construction;
- **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 recloser cabinet;
- **Special double roof** (2) prevents water / snow accumulation and protects the internal parts from overheating in hot climates;
- **Padlock facility handle** (3) protects from unauthorized access.
- **Protection lips from rain water** (4);
- **Connector for antenna remote control** (5);
- **IP67 connector** for switch head remote control (6);
- **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;
- **Advanced protection relay** (8). The FTUR200 relay is fitted with multiple microprocessors and digital signalling processors for high end performance. On top of the protection functionality, the FTU unit has also built-in RTU functionality for easy SCADA integration. Protection relay is available in English and Spanish languages.
- **Inventive climate system** (9) 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;



Hughes FTU recloser control cabinet has the following components:

- **FTUR200** (1) protection relay;
- **Standard lead acid AGM type battery** (2) 2 x 12 V 20 AH;
- **Temperature compensated battery charger** (UPS) (3);
- **Disconnectable terminal blocks** (4) for easy test of functions;
- **Internal ventilation system** (5) with special filter;
- **Heating system** (6) to prevent condensation and to give the electronics a long life and a good working environment;



OPTIONAL COMPONENTS:

- **Lightning protection** for the antenna gland;
- **Li-Ion batteries** for high temperature climate zones, 2 x 12.8 V 20 AH;
- **Input power** (110 or 230V) surge arresters;
- **Communication unit option A: GIO-100**
GSM/4G/LAN Router with IEC60870-5-104 signaling protocol and IPsec encryption and IP filtering;
- **Communication unit option B: GIO-200**
GSM/4G/LAN Router with IEC60870-5-104 signaling protocol and IPsec and Open VPN encryption and IP filtering;



GIO-200



GIO-100



Li-Ion battery



Lightning protection for antenna

PROTECTION RELAY

HUGHES FTUR200 PROTECTION RELAY KEY FEATURES

The **FTUR200** model of protection relay supplies the intelligence to the network and handles the network protection and in many cases even 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. Panel is available in English, Spanish and other languages.

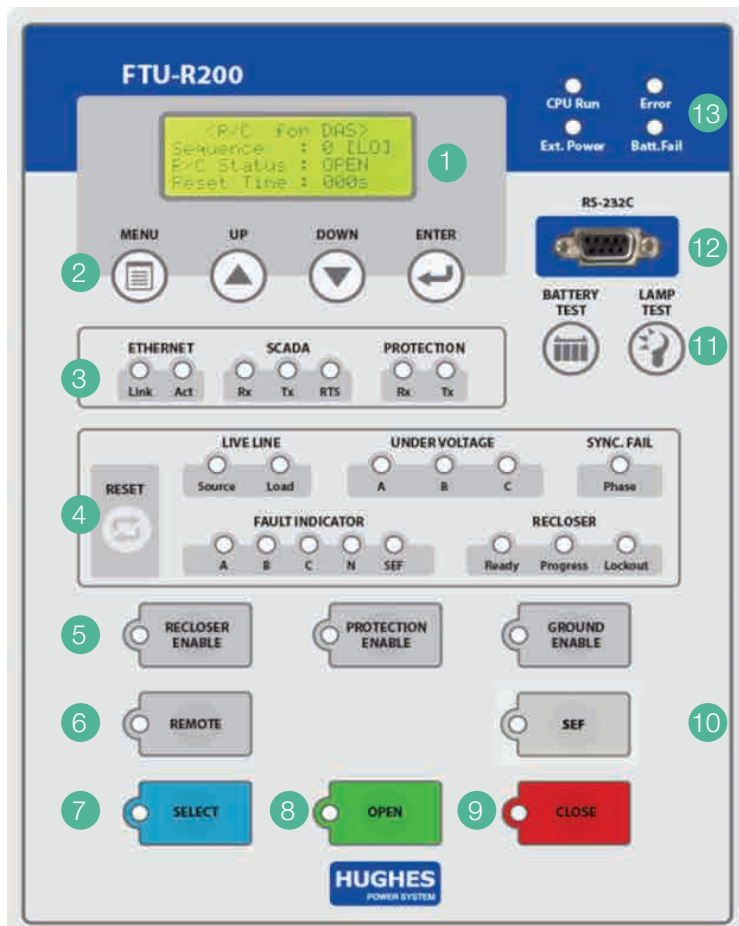
- **Integrated multi-functions** on new microprocessor based platform - Fault detection & Protection, Metering, Control, Status monitoring, Power quality monitoring;
- Directional protection, Negative sequence protection, SEF and lots of built-in over-current protection curves including IEC, ANSI/IEEE, Recloser curves and customized curves;
- **Distance to fault function**;
- **4 setting groups** and automatic setting group change function;
- **4 quadrants** energy metering & load profiling;
- **Multi-port, multi-protocol** communication support (DNP3.0, DNP3.0 over TCP/IP, IEC60870-5-101/104), modem control & dial-up function for SCADA;
- **DNP3.0** subset level 3 with information index mapping & class assignment;
- Built-in **Protocol monitor** for integrating FTU with SCADA system;
- Built-in **Fault simulator** with multiple sequences;
- **Large size memory** for load profiling, event and fault recording. Available Disturbance waveforms with COMTRADE format;
- Configurable **digital inputs and outputs**;
- **Intelligent power supply** & battery charger with built-in self-diagnosis & test function;



HUGHES FTUR200 PROTECTION RELAY FRONT PANEL

The **FTUR200** protection relay front panel has the following components:

- **Information display** (1);
- **Menu buttons block** (2) with the function to select different menus and levels;
- **Remote communication indicators block** (3) displaying communication activities;
- **Fault indicators block** (4) with fault indicators in phases, under voltage etc;
- **Reclosing functions enabling buttons block** (5) with the function to turn on and off reclosing function;
- **Local/Remote button** (6) with the function to switch between local and remote control of the recloser;
- **Select button** (7) is a switch operation button with function Select before execute;
- **Open button** (8) with the function to open the OVX vacuum circuit breaker;
- **Close button** (9) with the function to close the OVX vacuum circuit breaker;
- **SEF Enable button** (5) with the function to turn On and Off Sensitive Earth Fault detection;
- **Battery and Lamp test buttons** (11) with the function to test all LED's and the battery function;
- **Local programming socket** (12) is for the local programming via a USB or RS-232 cable;
- **Power supply indicators** (13) informing that the line has lost the power;



PROTECTION RELAY

HUGHES FTUR200 PROTECTION RELAY KEY FUNCTIONS

Control functions:

4 contacts output, 2 high-speed outputs:

- Open (Trip), Close, Spares;
- Configurable : Name, Pulse width Features;
- External Trip inputs;

Switch Control:

- Operator place: Remote, Local (Front Panel/PC Tool);
- Interlocks: Control Lock, Mechanical Lock, Current Switch status;
- Close interlock conditions (Selective): Live load, Phase sync. fail;

SBE (Select Before Execute):

- Secure switch operation;
- SBE timeout (settable);

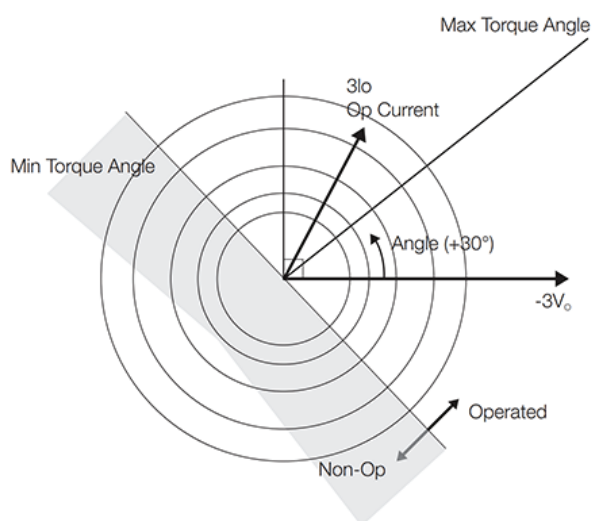
Auto reclosing:

- Recloser On/Off;
- Protection On/Off;
- Ground protection On/Off;
- SEF protection On/Off;

Battery Test, Reset Indicators

Protection functions:

- 3-stage over current protection (directional or non-directional);
- Fast and delayed TC trip elements for phase and earth fault;
- 67 types of built-in TC Curves (IEC, ANSI, Recloser curves) and 4 Customized TC Curves;
- Definite time over-current element;
- Definite time HCT (High Current Trip);
- Negative sequence over-current protection;
- Earth fault detection Directional or Non directional;
- SEF (Sensitive earth fault) detection $3I_0$;
- $3I_0$ Cos detection active earth fault detection;
- Intermittent earth fault protection ($>150\mu s$ min peak);
- Adjustable protection zone $\pm 30^\circ - 90^\circ$;
- Cold load protection (pickup adjustment);
- Magnetizing inrush restraints;
- Sequence coordination;
- Open line detection;
- Phase synchronisation fail detection;
- Over voltage, under voltage, under /over frequency;
- Auto reclosing (up to 4 shots) Operated;
- Auto sectionalizing;
- 4 setting groups, automatic setting group change depending on power flow;
- Protection fault simulation;



Phasor diagram of SEF

Communication functions:

- DNP3.0 Subset level 3 serial, DNP over TCP/IP;
- IEC60870-5-101 serial, IEC60870-5-104 TCP/IP;
- MODBUS RTU serial, MODBUS over TCP/IP;
- IEC 61850 over TCP/IP*;
- Index mapping & class assignment;
- SMS to Cell phone;
- Built in protocol monitor;
- Built in SCADA master simulator;
- IRIG-B external synchronization time*;
- PRP (Parallel Redundancy Protocol), HSR (Highly Seamless Redundancy) IEC 62439-3*;
- Dual IP fiber or TCP connection*;

Event / Fault log:

- SOEs are stored on non-volatile memory with 1ms time-stamp;
- Event history buffers are categorized by group;
- I/O Events, Function Events, System Events;
- Fault current Events;
- PQM Events;
- Demand I,P,Q;
- Daily Max. I,P,Q;
- Counter: Switch open, Fault, Restart;

Fault waveform recording:

- 8 faults, 6 PQM waveforms can be stored on non-volatile memory;
- 1 Manual triggered waveform;
- 128 samples/cycle, 20 cycles;
- Waveforms are stored as COMTRADE file format through PC maintenance software;
- Memory size: 2 Mbytes;

Metering functions:

- 128 Samples per cycle;(50Hz = 6400 times per second);
- Galvanic isolation through Aux. CT & Aux. PT;
- Secondary of 1000:1 CT ~ 12.5A > 12.5kA in short circuit current;
- Up to 200% of rated input voltage;
- Currents (A,B,C,N), Voltages (A,B,C/R,S,T): RMS, Phasors, Sequence components, Harmonics;
- Power: Apparent (kVA), Active (kW), Reactive (kVar), Power factor;
- Energy: 4-quadrant metering, import / export active energy, inductive / capacitive reactive energy;
- Frequency;
- Demand Profile;
- Report value by dead band;

Fault waveform recording:

Optional software functions:

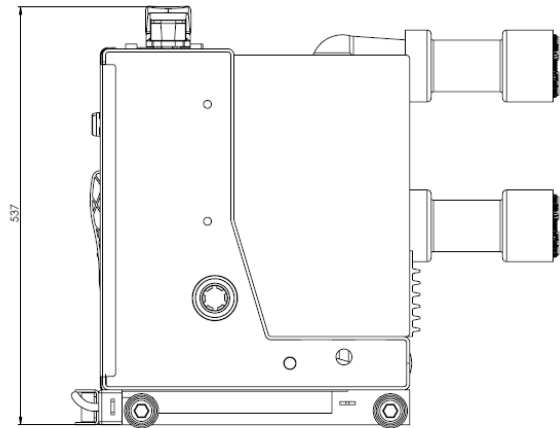
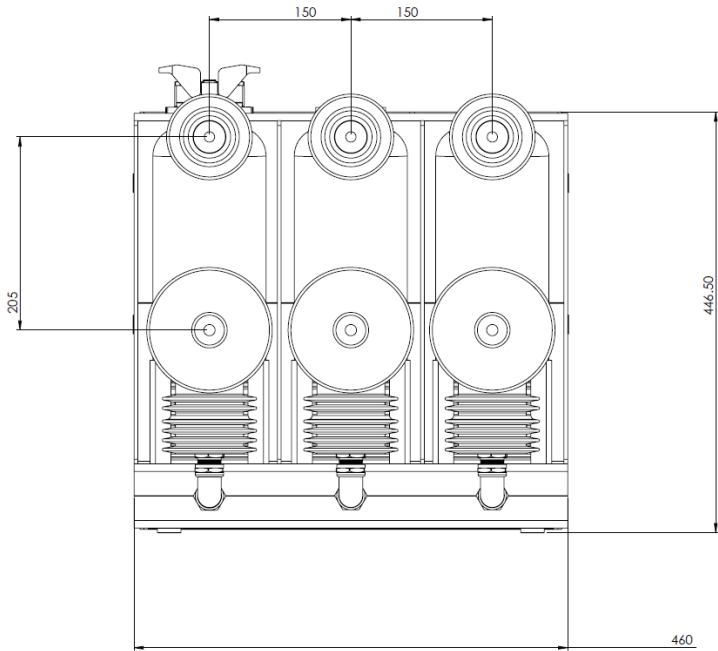
- IRIG-B external GPS timing protocol;
- IEC61850 communication protocol;
- PRP redundant communication protocol (requires 2 x LAN or 2 x Fiber ports);
- HSR redundant communication protocol (requires 2 x LAN or 2 x Fiber ports);

Optional communication boards:

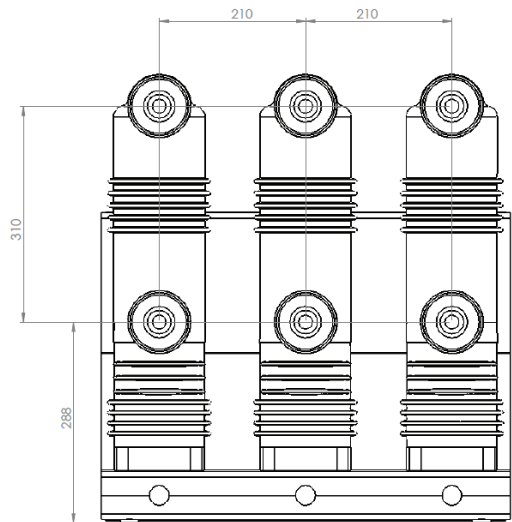
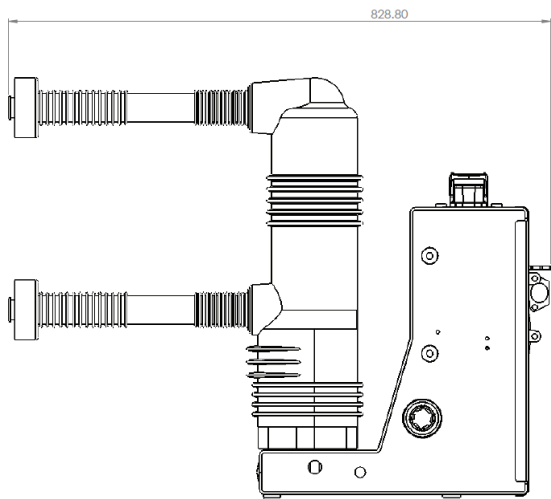
- 2 x 100Mbit LAN board;
- 1 x Fiber port;
- 2 x Fiber ports;

DRAWINGS

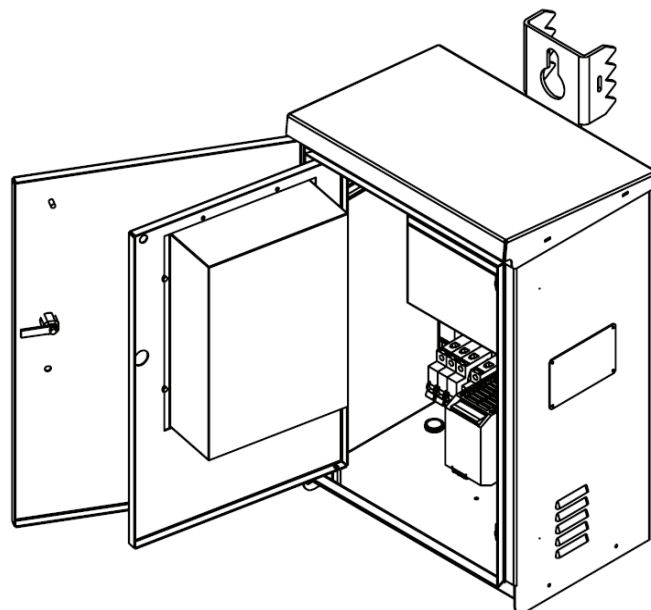
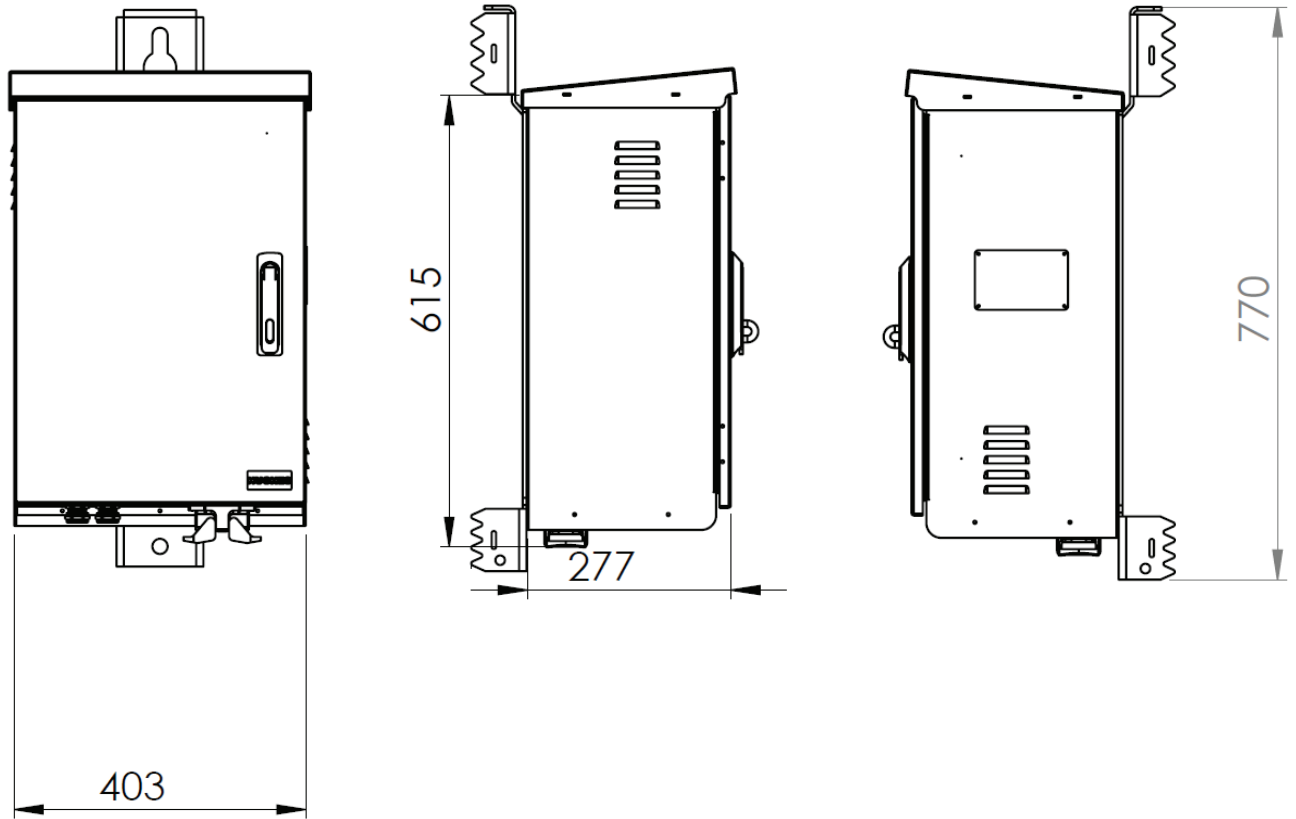
VX4-12



VX4-24

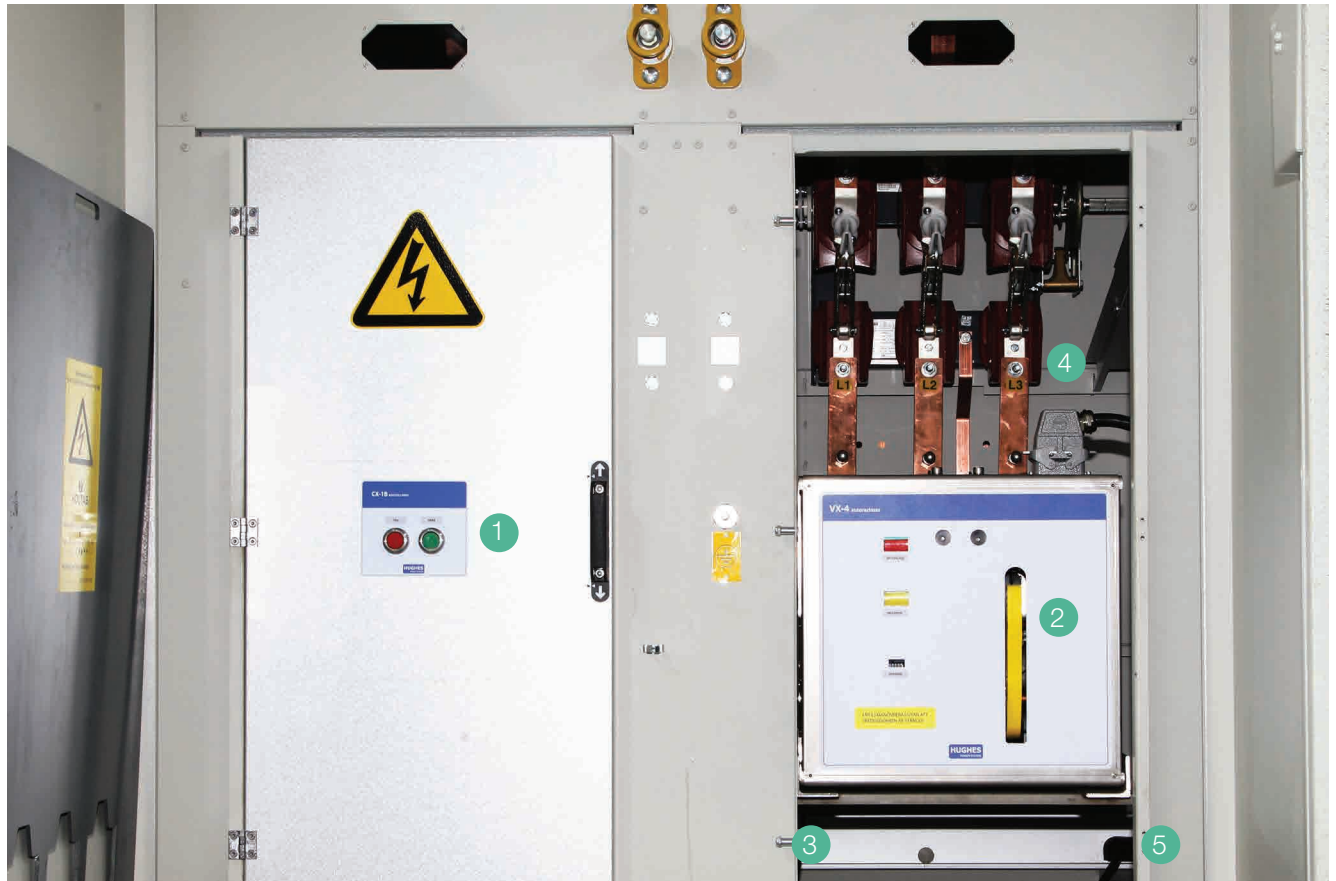


FTU



INSTALLATIONS

VXR120 / 240



VXR installation in a substation breaker bay.

- Left door: inner protection door closed. Circuit breaker operation buttons (1) extender is mounted on the door;
- Right door: VXR (2) installed in a mounting frame (3). Upper side connected to a disconnector (4) with visual open points. Lower side connected to an outgoing cable (5);

FTU



Installation of protection relays and circuit breaker operating panels in a small pre-manufactured substation.

- 4 protection relays (2, 3, 5, 6) for 4 outgoing lines;
- 2 circuit breaker operating panels (7, 8) for 2 incoming cables;
- 1 operating panel (4) for bus bar interconnection circuit breaker;

ADDITIONAL ACCESSORIES

NEW! FOR FTU RECLOSER CONTROL CABINET 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;

ADDITIONAL ACCESSORIES

FOR FTU RECLOSER CONTROL CABINET AND VX4 VACUUM CIRCUIT BREAKER



Multicore interconnection cable for
VX4 and FTU recloser control



Clip-on current transformer,
winding: 150/1;



Core balance transformer, winding: 20/1;



Hand crank operated truck mount
with interlock function;



Voltage transformer 1-phase connection
12 or 24/110 kV class1, 50 VA;



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;



Li-Ion batteries for hot climate
with LiFePO₄ chemical system 12.8V 20 AH

TECHNICAL DATA

CHARACTERISTICS	FTU recloser control cabinet
Dimensions (LxWxH), mm	403 x 293 x 630
Weight, kg	45 (including batteries)
Operating temperature, °C	-50 ... +60 Optional -10...+80
Enclosure	IP55-65, non-magnetic stainless steel, optional painted in RAL or ANSI colour
Climate system	35 W PTC element
Thermostat, °C	on at 5°C off at 15°C
Operation voltage	90– 250VAC 240 W, temperature compensation;
Batteries	2 x 12 V 22 Ah AGM Lead cell
Battery optional	2 x 12.8 V, 22 AH Li-Ion
Control interface	Parallel - Modbus
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
Control panel	• RS-232 or USB B type • Provided LCD • Self-Diagnosis LED • RS232/485/Ethernet (communication port) • SCADA communication status LED • Battery voltage low LED • Fault Indication LED • Local/Remote operation mode selection button • Reclosing enable/disable button • Protection enable/disable button • Close/open operation button • Hotline tag button • Phase/Ground fault • SEF • Under/Over voltage • Under /Over frequency

CHARACTERISTICS	FTU recloser control cabinet
Protection	• Phase/Earth/Negative Over Current • Harmonic Restraint Trip & Reclosing • Sensitive Earth Fault (SEF) • Intermittent Earth Fault(IEF) • Broken Conductor • Open Line Detection • Directional Tripping/Blocking • Under Voltage • Over Voltage/Ground Over Voltage • Under Frequency, Over Frequency • Synchronism Check • Loop Automation Scheme, • Fault Location • Sectionalizer • 4 Setting Groups with automatic change due to power flow
Time Current Curve	62 types curve including ANSI, IEC and user-customized curve
SCADA Communication port	• USB or RS232C(Maintenance Port) • RS232C(Modem Control Supports) • RS232C/485, Ethernet Port 10/100 Base-T • Fiber Optic* • PRP/HSR scheme (Parallel Redundancy Protocol)/(High Availability Seamless Redundancy)
Event recording	Event recording with 1ms time-stamp: • I/O changed events (1023) • Functional operating events (20,000)* • System related events (255) • Communication events (255) • Fault current (1,023) • PQM events (255) • Demand profile: current, voltage and power (6,143) • Daily maximum current, voltage and power (1,023) • Energy & Peak Demand Profile (63) • Current, Voltage, Power, Power Factor, Frequency, Energy, Harmonics, Demand, Internal Temperature.
Measurement	• Current • Voltage • Power • Power Factor • Frequency • Energy • Harmonics • Demand • Internal Temperature • Battery voltage

TECHNICAL DATA

CHARACTERISTICS	VX4-12 for 6/12kV	VX4-24 for 22/24kV
Dimensions LxWxH, mm	460x447x537	587x829x643
Weight, kg	75	95
Operating temperature, °C	-45 - +70	-45 - +70
Humidity	100% at 25C	100% at 25C
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
Bushing type	Epoxy core	Epoxy core
Phase to phase distance, mm	150	210
Max installation altitude at rated BIL, m	3000	3000
Rated operation voltage, VDC	24-48-110	24-48-110
Rated maximum voltage, kV	12	24
Rated basic impulse level, kV	95	125
Rated continuous current, A	630 / 1250	630 / 1250
Rated fault making current, kA	63	63
Rated fault breaking current, kA	25	25
Cable charging current,	20	40
Line charging current, A	5	10
Rated fault duration time, s	3	3
Contact resistance, VCB, $\mu\Omega$	< 35	< 35
Network frequency, Hz	50/60	50/60
Design min mechanical/electrical	20.000	20.000
Rated power, W	40	40
Design specification	IEC 62271-100	IEC 62271-100
Marking specification	IEEE std C37.60	IEEE std C37.60
Operation sequence, no charge	25ms trip - 50ms close - 25ms trip	25ms trip - 50ms close - 25ms trip



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