



P2 Engineering Oy is a smart grid automation company founded in 2016. The founding members of the company have long-standing and versatile experience in demanding electrical engineering as well as commissioning work and R&D projects.

In addition to the high level of electrical engineering expertise, P2 Engineering Oy's focuses on knowing and using modern communication protocols in our own products.

All of our products are result of own product development and the products are manufactured in Finland.

“AAPELI” – SECONDARY SUBSTATION AUTOMATION

There are standard versions of 0+1 (number of a load break switched + transformer feeder), 2+1, 3+1, 4+1 and 5+1 secondary substations, but we also implement customized versions.



The system enables a real time remote controlling and monitoring of the substation by using modern communication protocols. The heart of the hardware is Wago 750 series programmable logic controller, which is specifically designed for power distribution automation. Wago 750 offers versatile protocol mixture, software libraries, high-end

product support and wide-range of interface modules. A standard automation delivery includes simultaneous operating IEC 60870-5-101 and IEC 60870-5-104 protocols.

Aapeli automation system can be equip with a variety of options, including:

- 20 kV fault passage indicators (FPI) (Horstmann)
- local operating panel display, HMI
- 0,4 kV electric quality analyzer accordance with EN50160
- transformer temperature measurement
- IP-modem or radio communication

The battery backup time is approximately 3 days. The battery size is about 20 Ah (24 V) and it is equipped with a variety of protection and control functions including low voltage alarm, discharge protection and automatic battery testing. Ensuring the long life of the battery, the system is equipped with separate temperature compensated battery chargers for both 12 V batteries (2x12 V).

Fault passage indicators, FPI's, (option) can detect MV line short circuit faults as well as permanent and transient/intermitted earth faults in solidly grounder or tuned networks with Petersen coil.



The system fulfils SFS 6000 (IEC 60664-1) over voltage category class IV by using insulation transformer and varistor type surge arrester.

An enclosure is a polycarbonate case 700x500x300 mm or 600x400x210 mm.



“ONNI” – MOTOR DRIVE FOR MV OHL DISCONNECTORS

The motor drive is designed for controlling overhead line medium voltage disconnectors. It is equipped with user-friendly control functions, modern data communication and versatile self-supervision.

Particular attention has been taken into account to usability, fast installation and commissioning as well as safety and longevity.

Three types of motor drives are available:

- **Onni Master**, includes main controller and communication. Possibility to operate totally four disconnectors (1xmain + 3xslave)
- **Onni Lite**, includes main controller and communication. Can operate one disconnector without possibility to expand.
- **Onni Slave**, is a separate controlling unit and needs always Onni Master for controlling.

Onni motor drive has lot of different controlling functions as follows:

- Time delayed control for maximizing the safety when operating a disconnector locally.
- “Shaking control” when the disconnector is rusted, frozen or rigid.
- Electrical bypass control when the battery has low voltage.
- Manual control with mechanical equipment.

SETTING OF STROKE LENGHT

Onni has a strong linear actuator manufactured by Linak. A maximum stroke length is 200 mm and the stroke length can be set locally by using cam switches.



A movement of the motor drive is directly guided to a disconnector controlling arms without levers, so that the mechanical force of the motor drive is fully in use at all time.

CONTROLLER AND PROTOCOLS

The hardware is based on Wago 750 series programmable logic controller and a standard delivery always includes IEC 60870-5-101 and IEC 60870-5-104 protocols.

HIGH LEVEL USABILITY

Our component selection and device programmability have made possible to use new features considering usability, easy installation and commission as well as safety.

The system fulfils SFS 6000 (IEC 60664-1) over voltage category IV by using insulation transformer and varistor type surge arrester.

The device battery and the battery protection and testing procedures are similar like in our Aapeli systems. The battery backup time is approximately 3 days.

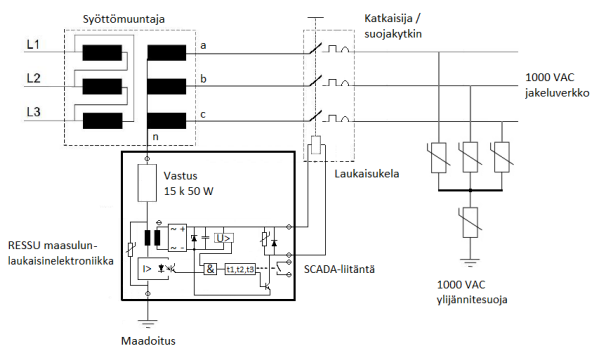


Onni motor drive has a web browser-based maintenance bus allowing versatile setting tools and having wide range information about a status of the device.

“RESSU” – 1 kV earth fault relay and circuit breaker

Ressu 1 kV earth fault relay is designed for detecting and tripping a ground fault of up to 1 kV non solidly grounded IT-type networks. The Ressu earth fault relay is connected between a star point and a ground potential of the 1 kV main supply transformer.

The factory setting of the earth fault tripping unit is 440 V (76%) earth fault voltage and a tripping time <5 s. If the circuit breaker does not open with the first pulse, Ressu earth fault relay will give new tripping pulse sets until the circuit breaker is opened.



BENEFITS OF THE SYSTEM

Ressu earth fault relay does not need external auxiliary power supply, however it can always generate a strong 24 VDC tripping pulse to the breaker by using large capacitor, which is charged from earth voltage during a fault.

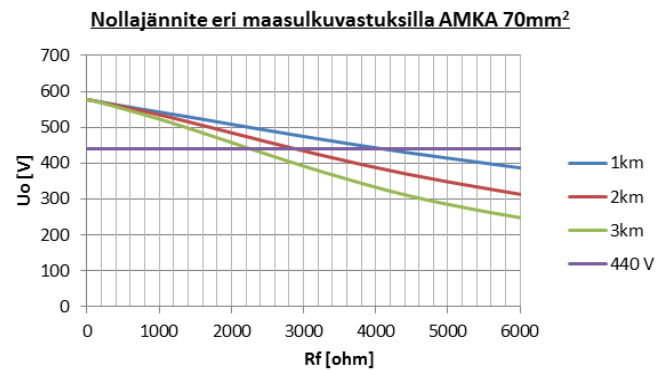
The tripping circuit electronics and the tripping voltage are galvanically isolated from the main circuit. RESSU is designed to withstand all network over voltages and switching oscillations.

1 kVAC SURGE PROTECTION DEVICE

Ressu product includes a surge protection device rated for 1 kVAC IT systems and it fulfills overvoltage class IV requirements according SFS 6000-4-44 Table 44B or IEC 60664-1 Table F.1.

RESSU PRODUCTS

- New 1 kVAC circuit breaker (incl. enclosure, ABB S803HV circuit breaker, RESSU earth fault tripping unit, surge protection device and necessary terminals up to 95 mm² cables)
- Upgrade kit for existing 1 kV circuit breakers (incl. RESSU earth fault tripping unit and surge protection device).
- 1 kV surge protection device in separate component.





TRAINING SERVICES

P2 Engineering Oy provides training services to network companies, designers and utility contractors.

An uninterrupted power distribution usually means increasing cabling to medium voltage networks. Increasing cabling, however, causes new phenomena to be deployed on the network, which will need to be managed as cabling proceeds and in the future.

CHALLENGING ELECTRICAL NETWORK

Changes in the electricity distribution network includes:

- the effect of increasing cabling to earth fault current and touch voltages,
- complexity with earth fault detection in a modern cabled and tuned network with Petersen coil,
- increased capacitance of a network and causation to relay protection,
- network power factor and voltage level management,
- use of parallel reactors,
- managing distributed power generation,
- utilization of network automation and fault passage indicators.

TRAINING CONTENT

We focus on training to the effects of changes in a electricity distribution network, but our course offer also covers the basics of general power transmission technology.

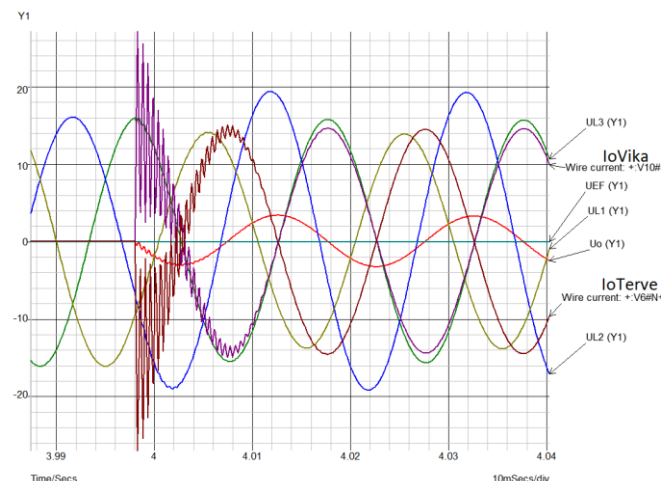
BENEFIT OF THE TRAINING

Training deepens participants' own professional skills. Educational topics help to better understanding of network complex phenomenas on distribution networks and

thus enable network companies and service providers to make more self-sufficient and cost-effective solutions to improve network availability.

REFERENCES

We have trained several utility companies and organizations. We tailor the contents of the training to meet the requirements of the organization being trained.



TECHNICAL CONSULTING

- Network troubleshooting and disturbance analysis,
- technical studies of electrical network components,
- technical suitability evaluation,
- supervision of factory acceptance tests (FAT) according corresponding standards,
- product development and design services.