POWER TRANSFORMER MONITORING and AVR

DIGITAL SUBSTATION

General Information

Company ROCON provides most modern solutions for Power Transmission & Distribution network, comprising wide range of world-class numerical Intelligent Electronic Devices (IEDs) - Protection relays, Bay control units (BCUs), Transformer Monitoring and Automatic Voltage Regulation (MAVR) systems and Annunciators.

MAVR systems as a part of Digital substation

MAVR provides full scale of monitoring and control functions especially intended for HV Oil immersed Power Transformers:

- Measuring and monitoring of electrical and technological parameters;
- Automatic Voltage Regulation (AVR) of Single/Parallel operating Power Transformers.

Treating MAVR as a part of the Digital Substation is possible is achieved through its distributed atchitecture with main device and Merging units (MUs). They are installed near the primary equipment and are functionally selected in the following typical groups:

- MU for technological variables – temperature, pressure, OLTC current position;
- MU for Transformer bushing monitoring;
- MU for electrical variables - current and voltage from Power Transformer CTs and VTs;
- MU for Transformer cooling system;

System architecture

Typical MAVR for Digital substation is given on Fig.1 and the technical parameters are available in Table 1. In case of parallel operating transformers the necessary information exchange between the RTUs of the transformers is realized via Station bus - FO or electrical Ethernet and IEC 61850 protocol. On-line data regarding the transformer electrical and technological parameters are available for the main unit RTU (subscriber) from the MUs (publishers) through the Process bus - FO Ethernet ring topology and IEC 61850_2LE protocol.

MAVR main features

Maximum operational reliability and data security

The years of experience, high level of R&D team and the application of the Digital substation concept with high level of redundancy is a guarantee for the reliability and security operation of MAVR systems.

Individual customer solutions

On request, our experts are able to develop special solutions for customer specific requirements.

Easy updates and remote access

Firmware and configuration updates are available via Ethernet and/or USB connection with PC based MMI program.

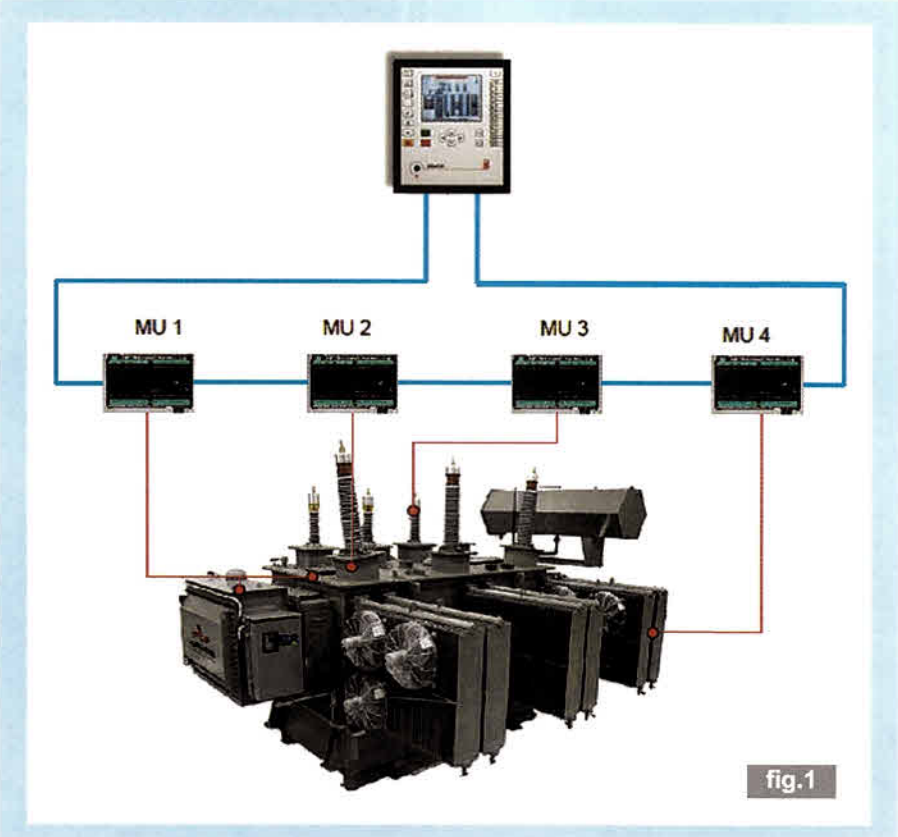

fig.1

№	TECHNICAL PARAMETERS for DIGITAL SUBSTATION	Availability
1	**Measurement & Monitoring**	
1.1	OLTC Tap position	•
1.2	Top oil temperature in the transformer tank	•
1.3	Load current	•
1.4	Busbar voltage	•
1.5	Technological limits – user defined logical equations with settings	•
1.6	Binary inputs (BIs) and Binary outputs (BOs) status monitoring	•
2	**Calculations and statistics**	
2.1	OLTC switching operations – registration, number, type	•
2.2	Winding insulation hot-spot temperature (HST) calculation and monitoring acc. IEC 60076-7	•
2.3	Transformer loss of life calculation acc. IEC 60076-7	•
2.4	Number of OLTC operations as a function of the load current	•
2.5	Transformer working hours monitoring	•
2.6	Event recorder	•
3	**Visualization, control, signalization, settings**	
3.1	Visualization of stored information and settings via Alpha numerical/Graphical display, Functional and System keypad and LEDs indication	•
3.2	OLTC local/remote control	•
3.3	OLTC Warning signalization/blocking	•
4	**Automatic voltage regulation**	
4.1	Type	
	• Single	•
	• Parallel	•
4.2	Line drop compensation mode	
	• R & X compensation	•
	• Z compensation	•
5	**Communication**	
5.1	System interface with SAS	
	• FO/Electrical Ethernet	•
	• Electrical RS485	•
5.2	Communication protocols	
	• IEC 61850 Edition 1 and 2, Server & Client, GOOSE	•
	• MODBUS ASCII / RTU / TCP	•
	• IEC60870-5-101/103/104	•
	• DNP 3.0	•
	• Redundancy protocols RSTP, PRP and HSR	•
5.3	Process bus between Main and Merging units - 100BASE FX ST/LC optical Ethernet and IEC 61850_2LE protocol	•
5.4	Interface for PC based MMI program IrDA, FO cable	•
5.5	Time synchronization	
	• Manual	•
	• Remote - via Station bus	•
6	**HARDWARE Main unit RTU D**	
6.1	**Power supply range** 110-220VDC/VAC	•
6.1.1	Power consumption - max 17 W at 220VDC	•
6.2	Binary inputs	•
6.3	Binary outputs	•
6.4	User configurable LED indication – 24+1 Ready	•
6.5	Functional buttons 4 Nos; Operational Buttons 12 Nos.	•
6.6	Working language - English, Russian, Bulgarian	•
6.7	**Additional parameters**	
6.7.1	Protection degree Front panel acc. to BDS EN 60529 - IP52	•
6.7.2	Protection degree - terminals acc. to BDS EN 60529 - IP20	•
6.7.3	Operating temperature -25÷+55°C	•
6.7.4	Dimension and weight (225x266x 133) 3.4 kg	•
7	**HARDWARE Merging units RTB D**	
7.1	**Power supply** 110-220 VDC/VAC	•
7.2	AC analog inputs – current 1A/5A, voltage (100V/110V)	•
7.3	DC/AC analog inputs – currents, voltages, resistance, 4÷20mA	•
7.4	Binary inputs	•
7.5	Binary outputs	•
7.6	**Additional parameters**	
7.6.1	Protection degree acc. to BDS EN 60529 - IP20	•
7.6.2	Operational temperature - 25÷+55°C	•
7.6.3	Dimension and weight (W x H x D) - 224x165.5x100/1.4kg	•

• Standard function • optional