



Treotech®



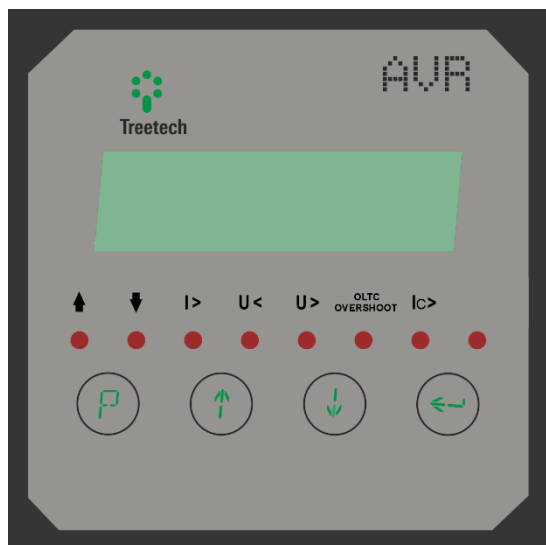
AVR

**Automatic Voltage
Regulator**

**PRODUCT
CATALOG**

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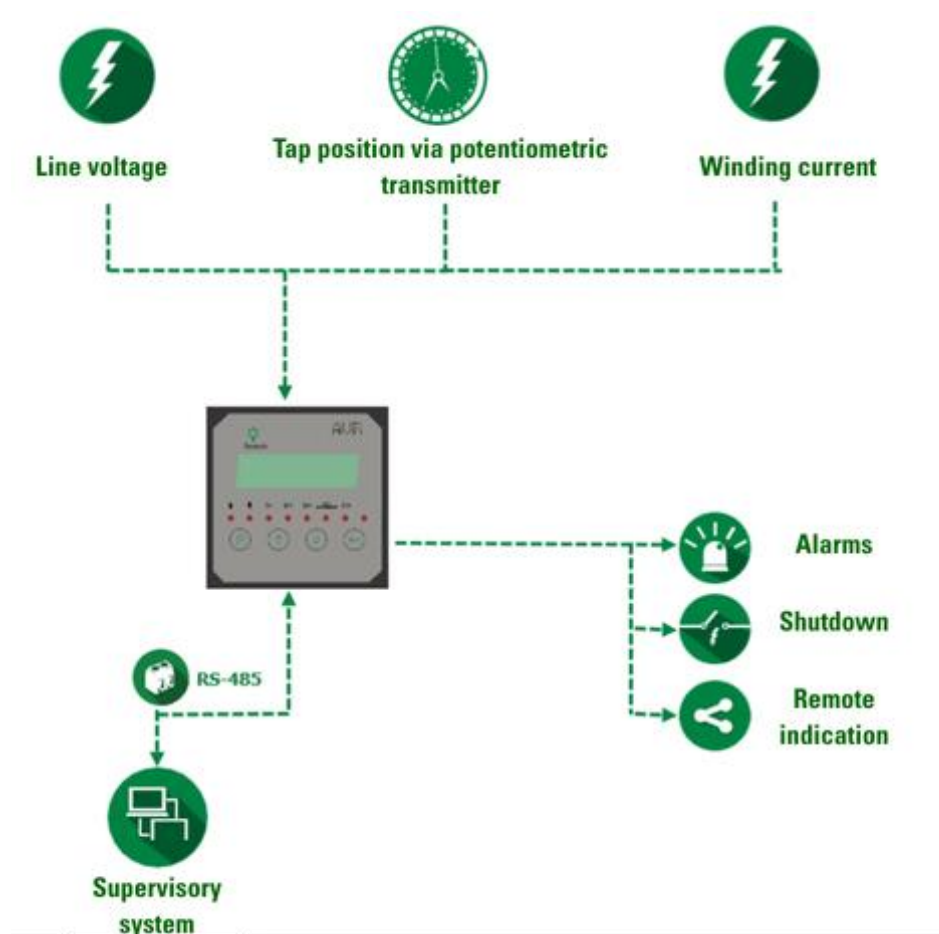
AUTOMATIC VOLTAGE REGULATOR



In a market that is increasingly demanding regarding Electric Power Quality—and subject to ever-stricter rules defining acceptable supply parameters and limits—there is a need for tools capable of adapting to this reality and enabling proper voltage regulation.

In this context, Treotech's new AVR (Automatic Voltage Regulator) relay offers a solution that goes beyond traditional, well-known "90" relays, featuring innovative capabilities for superior control of load voltage limits and enabling compliance with the sector's most stringent regulations (such as ANEEL Resolution 505).

SYSTEM TOPOLOGY



FEATURES AND FUNCTIONS



IED

- ✓ This IED (Intelligent Electronic Device) features a modern, compact design and is specifically engineered for transformer applications in substations and industrial or commercial facilities.



ADJUSTABLE CT/PT PHASE SHIFT

- ✓ Angle adjustments available from 0 to 330 degrees, enabling the use of any type of connection between the PT and CT.



MULTI-METER

- ✓ Monitoring of transformer and load voltages, voltage deviation, current, active/reactive/apparent power, load percentage, power factor, and frequency are some of the monitoring features offered by the equipment.



ALARMS AND SELF-DIAGNOSIS

- ✓ Issuance of alarms in the event of abnormalities;
- ✓ Self-diagnosis for internal fault detection and integration with other sensors.



COMMUNICATION PROTOCOL

- ✓ RS-485 serial communication port for integration with supervisory or remote monitoring systems. Open communication protocols: Modbus® RTU or DNP3.



INTERNAL CLOCK

- ✓ Setting retained for at least 3 days in the event of a power failure, without the use of batteries – maintenance-free equipment.



VOLTAGE DROP COMPENSATION

- ✓ The platform performs this function in two ways: Resistance and Reactance (RX) adjustments or the simplified voltage drop percentage method (Z compensation).



OLTC BLOCKING

- ✓ The OLTC can be blocked in cases of overcurrent, overvoltage, undervoltage, tap changer trip, and/or power flow reversal.



OLTC CONTROL

- ✓ The user selects the tap changer's control mode between Local/Remote and Manual/Automatic.

**MASS STORAGE (Default)**

- ✓ Non-volatile memory for storing measurements, OLTC operations, and alarm events. The user selects which variables to store (up to 30 variables) and whether the stored data represents the instantaneous, average, minimum, or maximum value for the interval.

OPTIONAL FUNCTIONS

Option 1 – DNP3 Protocol

User-selectable communication protocol between Modbus® RTU and DNP3.

Option 3 – Position Measurement

Input for OLTC position measurement via potentiometer transmitter, with cable resistance compensation and error detection. Associated functions:

- ✓ Current output programming for remote tap indication;
- ✓ Manual control of the tap changer—local (front panel) and via serial communication;
- ✓ Limitation of the tap changer operating range (minimum and maximum allowed taps) and storage of the maximum and minimum positions reached since the last reset;
- ✓ Protection against improper tap changer operation: blocking of the tap changer in the event of operations not initiated by the AVR.

Option 4 – OLTC Check

It operates using algorithms that identify voltage levels corresponding to the circuit's sensitivity, detecting whether tap changing activity is occurring and signaling a fault (Alarm). It does not require information from the potentiometer transmitter.

Option 6 – Circulating Current Parallel Operation

Parallel operation control for up to 6 transformers using the Minimum Circulating Current method, with blocking due to excessive circulating current.

Option 7 – Tap Changer Maintenance

When used in conjunction with Option 3, it adds:

- ✓ OLTC operation counter, with alert for high number of operations;
- ✓ Squared switched current integration, with alert for high accumulated I^2 value.

TECHNICAL DATA

HARDWARE	RANGE/DESCRIPTION
Supply voltage	38...265 Vac/Vdc
Frequency	50/60 Hz
Maximum consumption	8 W
Operating temperature	-40...+85 °C
Protection rating	IP20
Mounting	Panel
Connections (excluding PT and CT inputs)	0.3 to 2.5 mm ² , 22 to 12 AWG
Connections (PT and CT inputs)	One or two 1.5 to 2.5 mm ² (16 to 12 AWG) with appropriate ring terminals
MEASUREMENT RANGES	
Voltage	0...160 V
Current	0...10 A
MAXIMUM ERROR	
Voltage	0.5% of the reading in the 0...160 V range
Current	1% of full scale
DRY CONTACTS AND RELAYS	
Dry contact inputs	3
Relay outputs	7 Normally Open (NO) 1 Normally Closed (NC) - self-diagnosis
Maximum switching power	70 W (DC) / 220 VA (AC)
Maximum switching voltage	250 VDC / 250 Vac
Maximum carrying current	5 A
ANALOG OUTPUT	
Analog output	1 in current loop
Variable	Programmable
Output range	Programmable: 0...1, -1...1, 0...5, -5...5, 0...10, -10...10, 0...20, -20...20, 4...20 mA
Maximum error	0.5% of full scale
Maximum load	10 V
SERIAL COMMUNICATION	
Serial communication ports	1 RS-485/RS-232 (for supervisory system)
MASS MEMORY	
Mass memory	Non-volatile FIFO (First-In, First-Out) type
Recording interval	1 to 120 minutes

Capacity	406 to 1,928 records (depending on the number of variables selected by the user for recording—from 30 to 0 variables, respectively)
OPTIONAL FEATURES	
Tap measurement input	Potentiometric, 3-wire, Class 1% resistors or better
Number of OLTC taps	2 to 50
Total resistance of the potentiometer transmitter	9.4 to 1000 Ω
Resistance per step of the potentiometer transmitter	4.7 to 20 Ω
Serial communication port	1 RS-485 (for interconnection between AVRs for optional paralleling functions)

TYPE TESTS

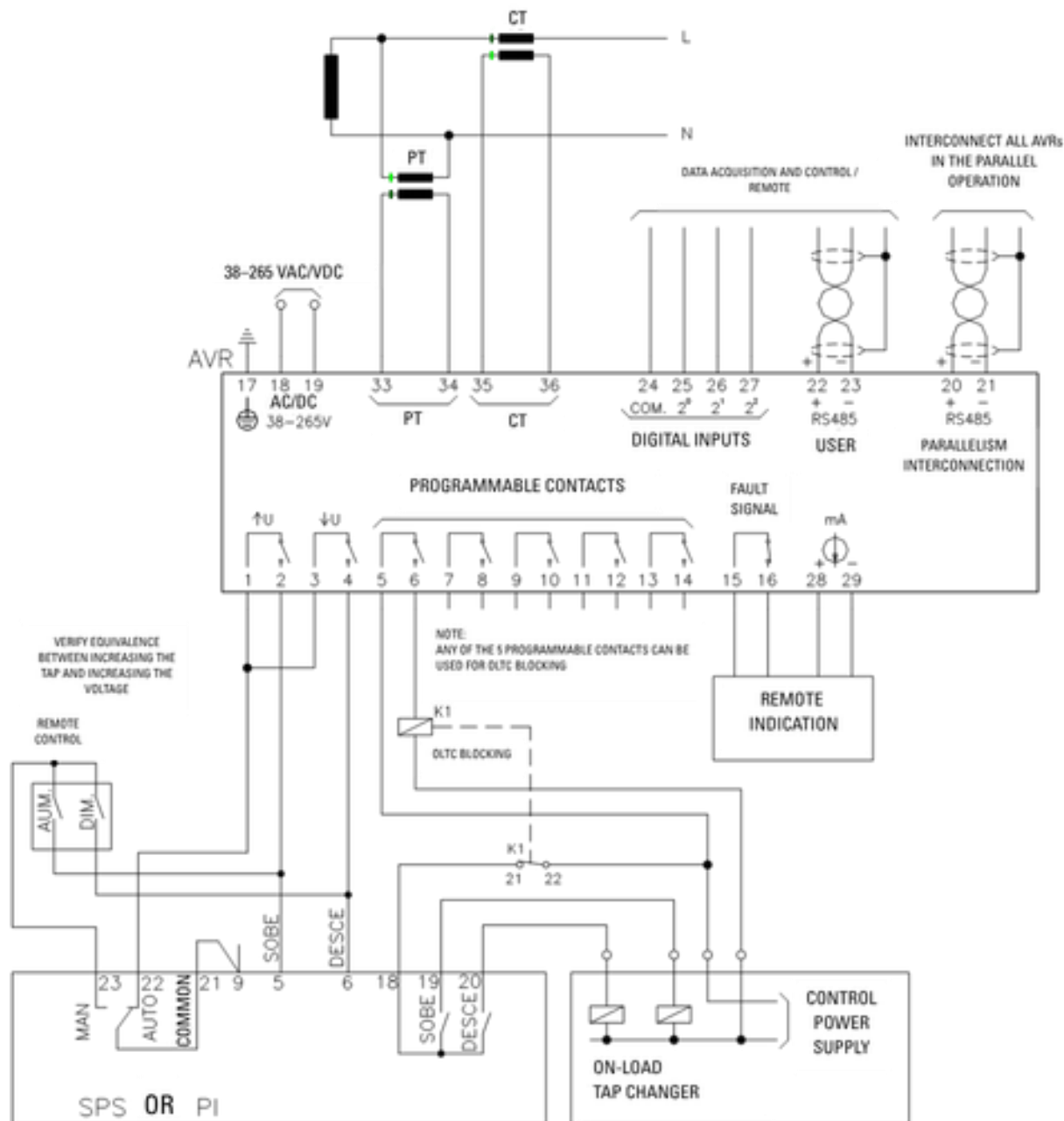
Immunity to Surges (IEC 61000-4-5)	
Phase-to-neutral surges	1 kV, 5 per polarity (+/-)
Phase-to-earth and neutral-to-earth surges	2 kV, 5 per polarity (+/-)
Immunity to Electrical Transients (IEC 60255-22-1)	
1st cycle peak value	2.5 kV
Frequency	1.1 MHz
Repetition time and rate	2 seconds, 400 bursts/sec
50% decay	5 cycles
Voltage Impulse (IEC 60255-5)	
Waveform	1.2 / 50 sec
Amplitude and energy	5 kV
Number of pulses	3 negatives and 3 positives, 5-second interval
Applied Voltage (IEC 60255-5)	
Power-frequency withstand voltage	2 kV 60 Hz, 1 min. to ground
Immunity to Radiated Electromagnetic Fields (IEC 61000-4-3)	
Frequency	26 to 1000 MHz
Field strength	10 V/m
Immunity to Conducted Electromagnetic Disturbances (IEC 61000-4-6)	
Frequency	0.15 to 80 MHz
Field strength	10 V/m
Electrostatic Discharge (IEC 60255-22-2)	
Air mode	8 kV, ten discharges per polarity
Contact mode	6 kV, ten discharges per polarity
Immunity to Fast Electrical Transients (IEC 61000-4-4)	
Power supply, input, and output test	4 kV
Serial communication test	2 kV
Climatic Test (IEC 60068-2-14)	
Temperature range	-40 to +85°C
Total test time	96 hours
Vibration Response (IEC 60255-21-1)	
Application mode	3 axes (X, Y, and Z), sinusoidal
Amplitude	0.075 mm from 10 to 58 Hz 1 G from 58 to 150 Hz
Duration	8 min/axis

Vibration Resistance (IEC 60255-21-1)

Application mode	3 axes (X, Y, and Z), sinusoidal
Frequency	10 to 150 Hz
Intensity	2G
Duration	160 min/axis

WIRING DIAGRAMS

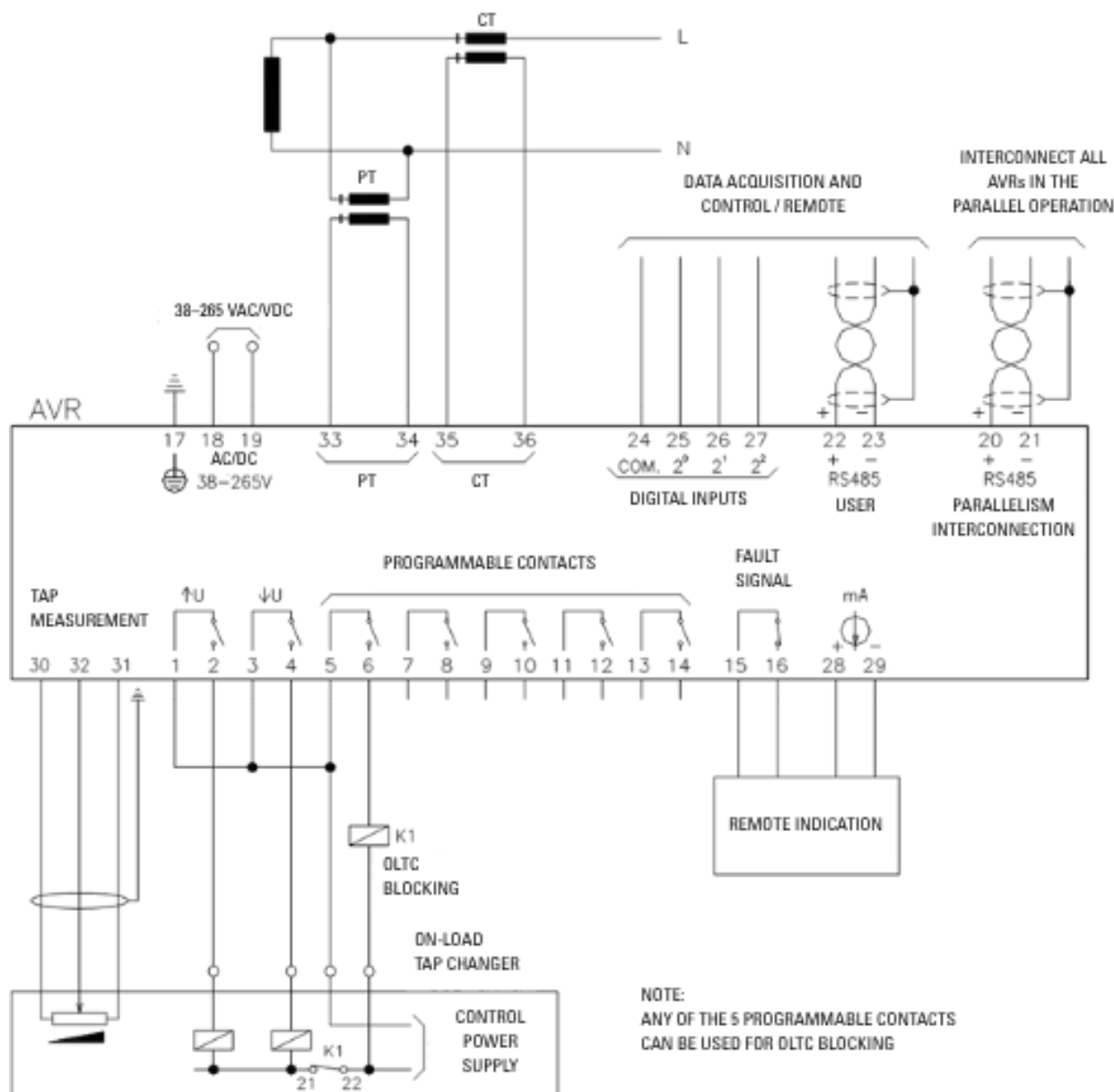
Application with PI Position Indicator or SPS Synchronous Parallelism Supervisor.



Notes:

1. Qual Any of the five programmable contacts can be used for OLTC blocking;
2. All contacts shown with AVR, SPS, and PI de-energized;
3. The connection between terminals 20 and 21 is required only if the AVR is equipped with the optional Circulating Current Parallel Operation function.

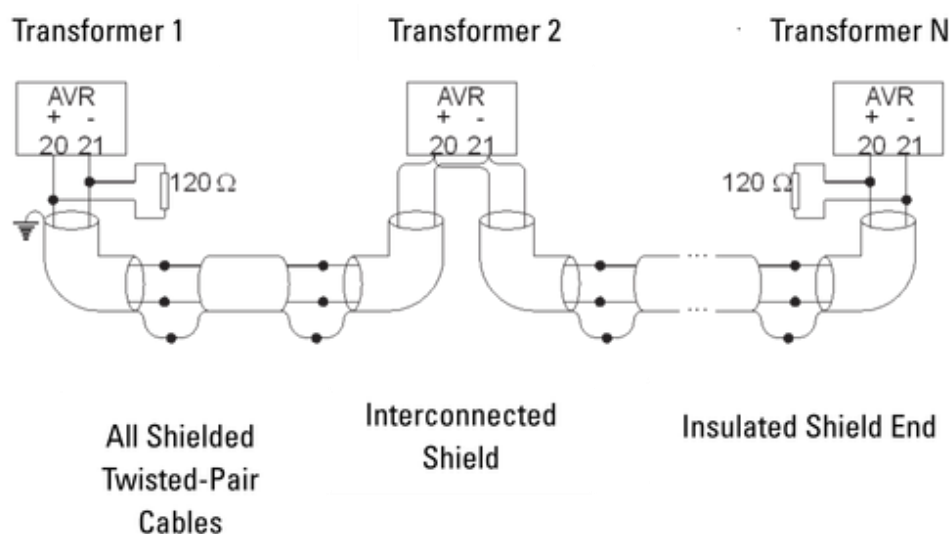
AVR with Tap Position Measurement (optional 3).



Notes:

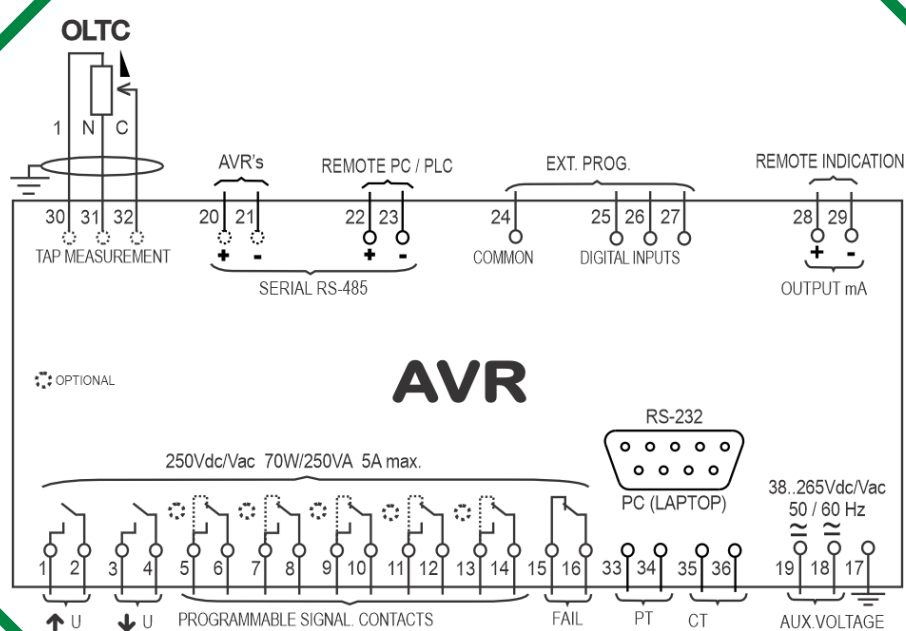
1. Any of the five programmable contacts can be used for OLTC blocking;
2. The tap changer resistors for remote tap indication must have an accuracy of 1% or better;
3. All contacts are shown with the AVR de-energized;
4. The connection of terminals 20 and 21 is required only if the AVR is equipped with the optional Circulating Current Parallel Operation function.

AVR with Circulating Current Parallel Operation (optional 6).

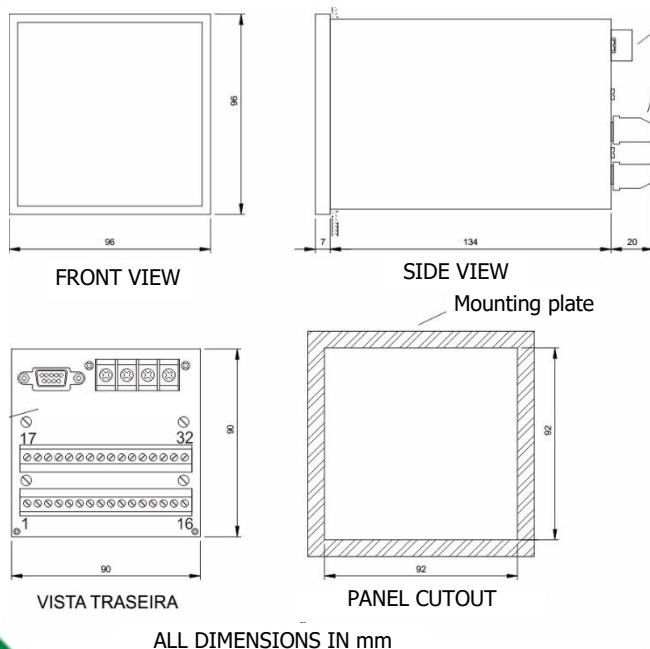


Notes:

1. The RS-485 communication port for interconnecting AVRs is connected only if the Circulating Current Parallelism function (optional 4) is used;
2. The RS-485 interconnection ports feature internal pull-up and pull-down resistors within the AVRs, eliminating the need for external resistors. The maximum distance of 1200 meters between the ends of the communication network must be observed;
3. Use shielded twisted-pair cables and connect the shields if splicing is required. Ground one end of the shield and keep the other end isolated;
4. Connect a 120Ω resistor in parallel at the ends of the communication network, as shown in the figure above.

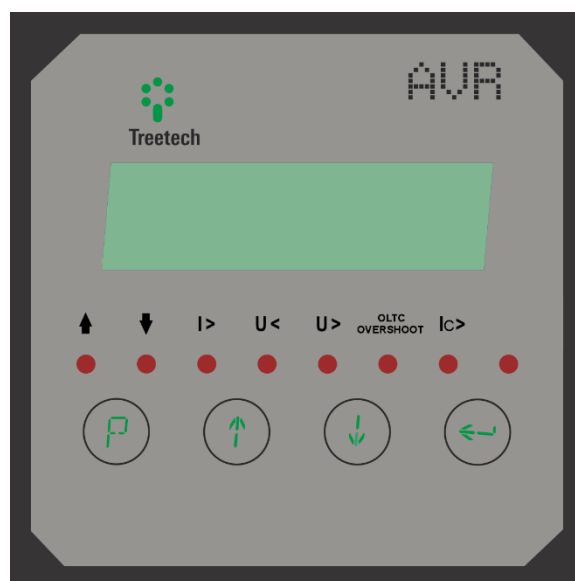


**WIRING
DIAGRAM**



PRODUCT DIMENSIONS

PRODUCT FRONT VIEW



RECOMMENDED ACCESSORIES

**SIGMA ECM® MONITORING SOFTWARE**

In addition to online temperature monitoring of your assets, our monitoring system and specialized team enable you to track the exact condition of your assets—going beyond mere data readings.

Monitoring based on analyses of information collected by IEDs installed on your assets.

ORDER SPECIFICATION

When ordering the product, it is necessary to specify:



- ✓ Product name;
- ✓ Quantity;
- ✓ Optional functions;

Optional Functions	Combination 1	Combination 2
DNP3 protocol		
TAP reading		
Tap changer check		
Circulating current parallel operation		
Tap changer maintenance		

Legend	
	Allows
	Does not allow

- ✓ Accessories.

**Treotech®**

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Check the list of our distributors at:

www.treotech.com.br/contato/representantes/