



**Treetech®**



# SDV

**Smart Device for Voltage  
Regulation**

**PRODUCT  
CATALOG**

[treetech.com.br](http://treetech.com.br)

## HAVE ALL THE CONTROL AND MONITORING OF YOUR ASSETS AUTOMATED!



### Certification



### Agency Recognition

#### APPROVALS

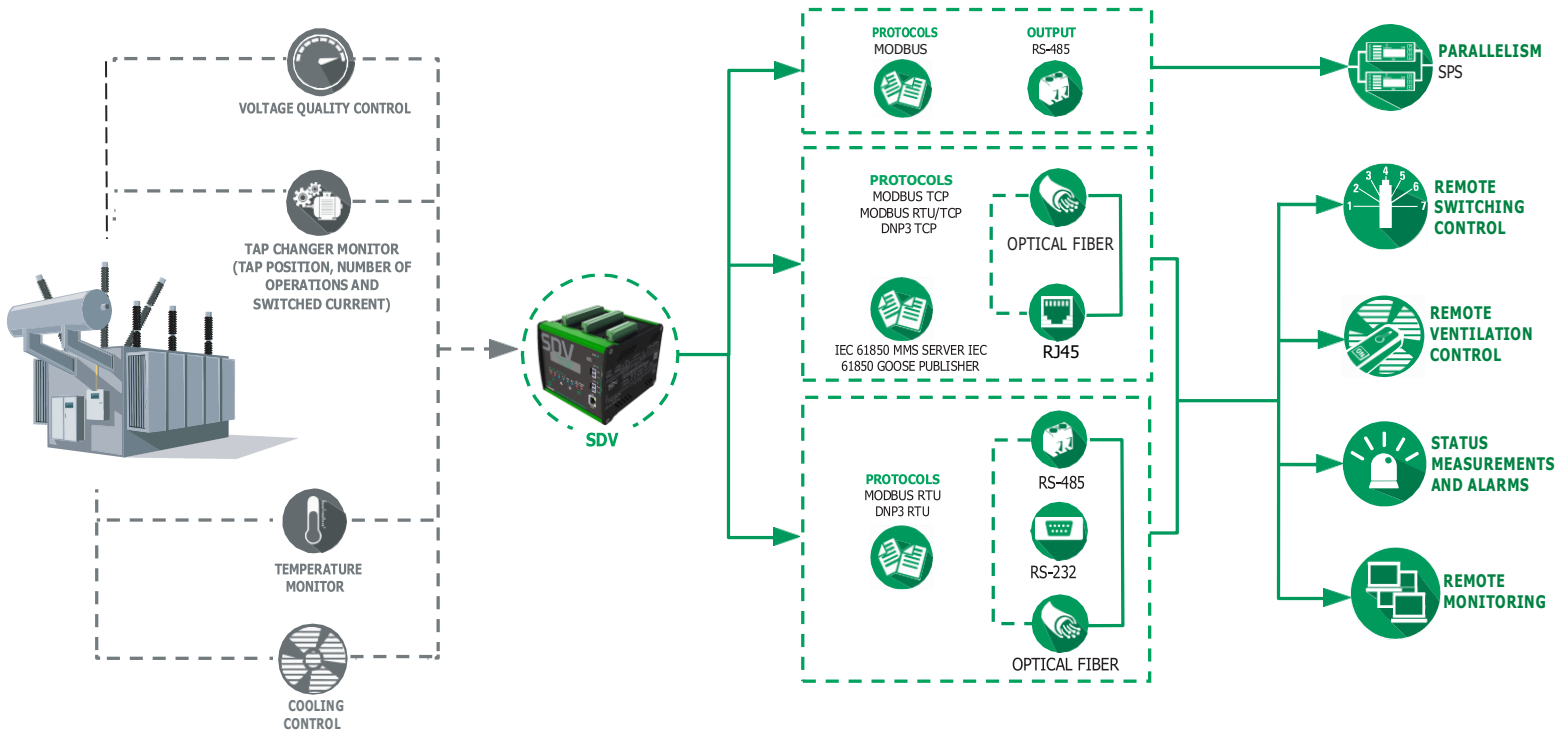
UL	Model	Description	File number
	FOFO	2 Ethernet fiber optic	E542165

The Smart Device for Voltage Regulation - SDV, is an equipment that brings together the main functionalities of a voltage regulator relay combined with thermal control and protection.

The purpose of the device is to maintain the load within a range of values determined by the user and to manage the machine's temperature using calculations that accurately measure the temperature of the windings and insulating oil.

The SDV was created to fully aggregate information from any equipment compatible with Modbus and/or DNP3 protocols and redistribute it in a highly customizable way in these protocols and even in those of the IEC 61850 standard.

## SYSTEM TOPOLOGY



### INDEPENDENT COMMUNICATION PORTS

- ✓ The SDV is equipped with independent communication ports, each associated with a specific IP.



### PROTOCOLS FOR CLOCK SYNCHRONIZATION

- ✓ The equipment has different time protocols for clock synchronization, which are:
  - NTP (Network Time Protocol);
  - PTP (Precision Time Protocol).

**01** Real-time measurement values

Clock and synchronization configuration via NTP or PTP protocol **04**

**02** Access security via HTTPS


Download of logs **05**


**03** Profiles with different operating permission levels


Communication status and error statistics **06**




## FEATURES AND FUNCTIONS


-  **IED**
- ✓ This IED (Intelligent Electronic Device) was designed with a modern and compact design specifically for application in substations and industrial or commercial installations.

-  **REMOTE INFORMATION**
- ✓ All product management and configuration are done directly through a friendly web interface, making updates simple and intuitive, and the best: all this without the need for a license or proprietary software installation.

-  **EXTENDED COMMUNICATION**
- ✓ High-speed communication via Ethernet or serial;
  - ✓ Redundancy or distribution to various systems through its multiple outputs:
    - FO FO – 2 Ethernet F.O. \*;
    - FO SR – 1 Ethernet F.O. + 1 serial F.O. \*;
    - RJ45 – 2 Ethernet RJ45 \*;
    - 1 RS-485/RS-232 serial communication port;
    - 1 RS-485 serial communication port;
    - 1 RS-485 Parallelism concentrator.
  - ✓ Standard supply communication protocols:
    - Modbus® RTU, Modbus® TCP, Modbus® RTU/TCP;
    - DNP3 RTU, DNP3 TCP;
    - IEC 61850 MMS Server;
    - IEC 61580 GOOSE Publisher.

\* Customer must choose only one of the 3 configurations.

-  **ALARMS AND SELF-DIAGNOSIS**
- ✓ Issuance of alarms in case of abnormalities and self-diagnosis to detect internal faults and integration with other sensors.

-  **STANDARD IP ACCESS BUTTON**
- ✓ The Smart Device for Voltage Regulation (SDV) includes a user-available button that allows the use of the factory default IP when network parameters are forgotten.



### INTERNAL CLOCK

- ✓ Adjustment maintained for at least 3 days in case of power failure, without the use of batteries – maintenance-free equipment.



### OLTC COMMAND

- ✓ The user selects the on-load tap changer command mode between Local/Remote and Manual/Automatic.



### COMMUNICATION PROTOCOL

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



### MASS MEMORY (Default)

- ✓ Non-volatile memory for storing measurements and alarm events, shutdowns and others. User programming of the interval between recordings and temperature variation.

## FUNCTIONALITY

### Pre-cooling

It extends the useful life of the insulation by activating the cooling groups when load levels previously selected by the user are reached. Forced cooling is triggered before the temperature rises excessively, providing greater efficiency and safety. The features/functions are:

- ✓ Load percentage for individual activation of each forced cooling stage;
- ✓ Hysteresis adjustment to turn off forced cooling stages when loading decreases.

### OLTD – OLTC temperature differential

This function makes it possible to compare the temperature of the transformer oil with that of the on-load tap changer, so that abnormal temperature differentials can be detected. Monitoring is carried out in two different modes:

- ✓ Instantaneous Differential Monitoring – Provides alarms with quick response in the event of major defects, even if of short duration;
- ✓ Filtered Differential Monitoring – By subjecting the Instantaneous Differential to a low-pass filter, it is possible to detect evolution trends that indicate permanent defects of small intensity.

### OLTC position measurement

One input for measuring the OLTC position via potentiometric transmitter, with cable resistance compensation and error detection.

Associated functions:

- ✓ Current output programming for remote tap indication;
- ✓ Manual control of the local OLTC (front panel) and by communication via protocol;
- ✓ Limitation of the OLTC excursion range (minimum and maximum taps allowed) and memorization of the minimum and maximum positions reached;

OLTC blocking in case of carrying out operations not initiated by the SDV.

### Wet Contacts (Digital inputs)

Six wet contacts inputs for remote control: OLTC configuration (Automatic/Manual and Local/Remote), OLTC commands (raise/lower tap) and enable/disable parallelism concentrator.

## OLTC Maintenance Assistant

This optional item expands the functionality of the SDV, e.g.:

- ✓ OLTC operations counter, with maintenance warning by number of operations;
- ✓ Integration of squared switched current, with maintenance warning due to high  $I^2$  sum;
- ✓ Estimated remaining time for maintenance;
- ✓ Maintenance alarms are issued with a programmable advance.

## Checking switching success enabled

This function allows the SDV to check the success of the switching by means of voltage changes after the regulation command (increase/decrease voltage). It works through algorithms that identify voltage levels corresponding to the sensitivity of the circuit, confirming whether or not the switching is active. If the tap changer is inactive, it generates regulation failure warnings.

## Insulation aging monitoring

This function performs the online monitoring of the winding insulation life loss, providing important information for the diagnosis and prognosis of the condition of the equipment:

- ✓ Current Percentage of life remaining, 100% (new insulation) to 0% (end of life of insulation);
- ✓ The average insulation loss rate, in % per day, calculated over a user-selectable time period;
- ✓ Extrapolation of the remaining lifetime for the insulation, calculated as a function of the variables above (percentage of remaining life and average rate of loss of life).

## Parallelism concentrator

It interfaces Treotech's SPS sensor with a data acquisition system, adding the functionality of another Treotech device - the Serial Communication Module - COMM-04.

## Fan activation

The fan exercise function prevents fans and / or pumps from being inactive for long periods on transformers with low load or during periods of low ambient temperature. This prevents axle locking by dirt accumulation or grease drying. Cooling equipment is activated daily, according to the equipment internal clock, as user selections made:

- ✓ Fan start time (hour and minute);
- ✓ Total daily fan operation time, from 0 to 999 minutes.

## TECHNICAL DATA

### HARDWARE

Supply voltage Tension d'alimentation	85...250 Vac/Vdc, 50/60 Hz
Maximum consumption Consommation maximale	< 12 W
Operating temperature Température de fonctionnement	-40... 85°C
Degree of protection Degré de protection	IP20
Case material Matériau du boîtier	Aluminum
Fixation	DIN Rail or Panel Rail DIN ou Panneau
Humidity Humidité	5 % to 90 % non-condensing humidity 5 % à 90 % sans condensation
Altitude	1000 meters 1000 mètres
Pollution degree Degré de pollution	II
Overvoltage category Catégorie de surtension	II
Open Equipment Équipement ouvert	✓

### INPUTS

1x High tension (PT) 1x Mesure de tension (TP)	0...185 Vrms
1x Potentiometric transmitter 1x Transmetteur potentiométrique	2 to 50 (Until 960 Ω) 2 à 50 (Jusqu'à 960 Ω)
3x Current CTs (1 setting + 2 for thermal imaging) 3x TC de courant (1 régulation + 2 pour image thermique)	TC external 0...10 Aac rms TC externe 0...10 Aca rms

3x RTD 's	Pt100 $\Omega$ a 0 °C of 3 wire, track: -55...250 °C
3x RTD (Sondes de température)	Pt100 $\Omega$ à 0 °C, 3 fils, plage : -55...200 °C
4x TC's ventilation	CT external 0...10 Aac rms
4x TC de ventilation	TC externe 0...10 Aca rms
1x BCD	7 dry contact inputs 7 entrées à contact sec
6x Wet Contacts	Maximum input voltage: 250 Vac/Vdc
6x Contacts mouillés	Tension d'entrée maximale : 250 Vac/Vdc

### OUTPUTS

1x CDC Relay	<ul style="list-style-type: none"> <li>• NO contacts (Normally Open) Contacts NO (Normalement Ouvert)</li> <li>• Dielectric strength: 4000 Vac Rigidité diélectrique: 4000 Vac 5 A at 125 VAC (NA) 5 A at 250 VAC (NA) 5 A at 30 VDC (NA)</li> </ul>
1x Relais OLTC (Régleur en charge)	
1x Self-diagnosis Relay	<ul style="list-style-type: none"> <li>• NC contacts (Normally Close) Contacts NC (Normalement Fermé)</li> <li>• Dielectric strength: 4000Vrms Rigidité diélectrique: 4000 Vrms 3 A at 125 VAC (NF) 3 A at 250 VAC (NF) 3 A at 30 VDC (NF)</li> </ul>
1x Relais d'autodiagnostic	
4x Ventilation relays	<ul style="list-style-type: none"> <li>• NC contacts (Normally Close) Contacts NC (Normalement Fermé)</li> <li>• Dielectric strength: 4000Vrms Rigidité diélectrique : 4000 Vrms 5 A at 125 VAC (NA) 5 A at 250 VAC (NA) 5 A at 30 VDC (NA)</li> </ul>
4x Relais de ventilation	

11x Signaling relays and commands for switch or TRIP

11x Relais de signalisation et commandes (Déclenchement/TRIP)

- NO contacts (Normally Open)  
Contacts NO (Normalement Ouvert)
- Dielectric strength: 4000Vac  
Rigidité diélectrique: 4000 Vac  
3 A at 125 VAC (NF)  
3 A at 250 VAC (NF)  
3 A at 30 VDC (NF)

## NETWORK INTERFACES

Serial communication ports  
Ports de communication série

2 RS-485 (TIA-485-A),  
1 RS-485 (TIA-485-A) or 1 RS-232 (TIA-232-F)

Communication ports IEEE 802.3 (10/100 Mbps)<sup>1</sup>  
Ports de communication Ethernet (IEEE 802.3)

Available in models:  
RJ45: 2 Ethernet RJ45 (10/100BASE-T);  
FOFO: 2 Ethernet Fiber Optic (10/100BASE-FX; MM 1310nm LC connector) (UL certified);  
FOSR: 1 Ethernet Fibra Óptica (10/100BASE-FX; MM 1310nm conector LC) + 1 Serial Fibra Óptica (MM 850nm conector SC).

RJ45: 2x RJ45 Ethernet (10/100BASE-T)  
FOFO: 2x Ethernet Fibre Optique (10/100BASE-FX ; MM 1310nm, connecteur SC)  
FOSR: 1x Ethernet Fibre Optique + 1x Série Fibre Optique (MM 850nm, connecteur SC)

Service port (parameterization)  
Port de service (Paramétrage)

RJ45: 1 Ethernet RJ45 (10/100BASE-T)

Master / Client protocols  
Protocoles Maître/Client

Modbus<sup>®</sup> (RTU and TCP) and DNP3 (RTU and TCP)

Slave / Server protocols  
Protocoles Esclave/Serveur

Modbus<sup>®</sup> (RTU and TCP) and DNP3 (RTU and TCP)  
IEC 61850 (MMS server / GOOSE Publisher)<sup>2</sup>

## DIMENSIONS

Dimension 131mm x 134mm x 156mm

Weight 1,300 kg

Poids 1,300 kg

## TEST REPORTS

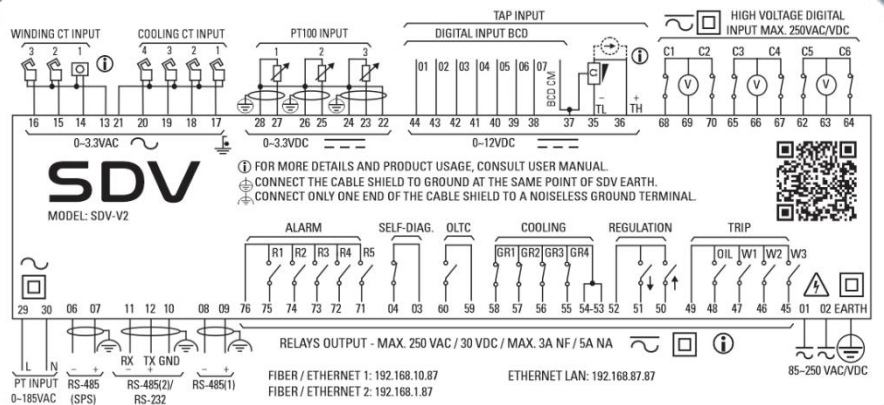
### TEST REPORTS

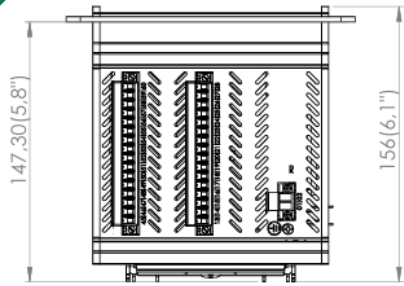
IMMUNITY TO HIGH ENERGY SURGES (IEC 60255-26:2023)
IMMUNITY TO ELECTRICAL TRANSIENTS (BURST 1 MHz, IEC 60255-26:2023)
APPLIED VOLTAGE (IEC 60255-26:2023)
IMMUNITY TO RADIATED ELECTROMAGNETIC FIELDS (IEC 60255-26:2023)
IMMUNITY TO CONDUCTED ELECTROMAGNETIC DISTURBANCES (IEC 60255-26:2023)
IMMUNITY TO INDUSTRIAL FREQUENCY MAGNETIC FIELDS (IEC 61000-4-8)
ELECTROSTATIC DISCHARGES (IEC 60255-26:2023)
IMMUNITY TO FAST ELECTRICAL TRANSIENTS (IEC 60255-26:2023)
CONDUCTED EMISSION (IEC 60255-26:2023)
IRRADIATED EMISSION (IEC 60255-25)
POWER FAILURE (IEC 61000-4-11)
COLD WITHSTAND (IEC 60068-2-1)
DRY HEAT WITHSTAND (IEC 60068-2-2)
HUMID HEAT WITHSTAND (IEC 60068-2-78)
THERMAL CYCLE (IEC 60068-2-14)
VIBRATION RESPONSE (IEC 60255-21-1)
VIBRATION DURABILITY (IEC 60255-21-1)



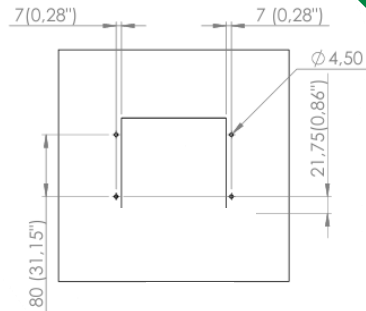
**PRODUCT DIMENSIONAL**

**ELECTRICAL DIAGRAM**

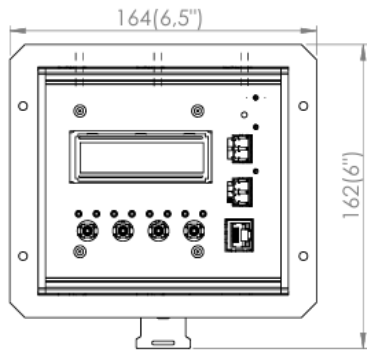




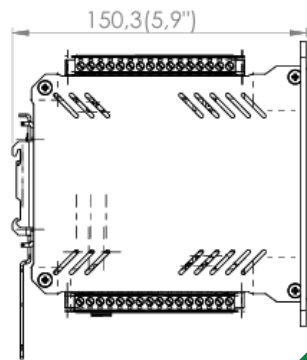
**BOTTOM VIEW**



**SLOT IN THE PANEL FOR INSTALLATION**



**FRONT VIEW**

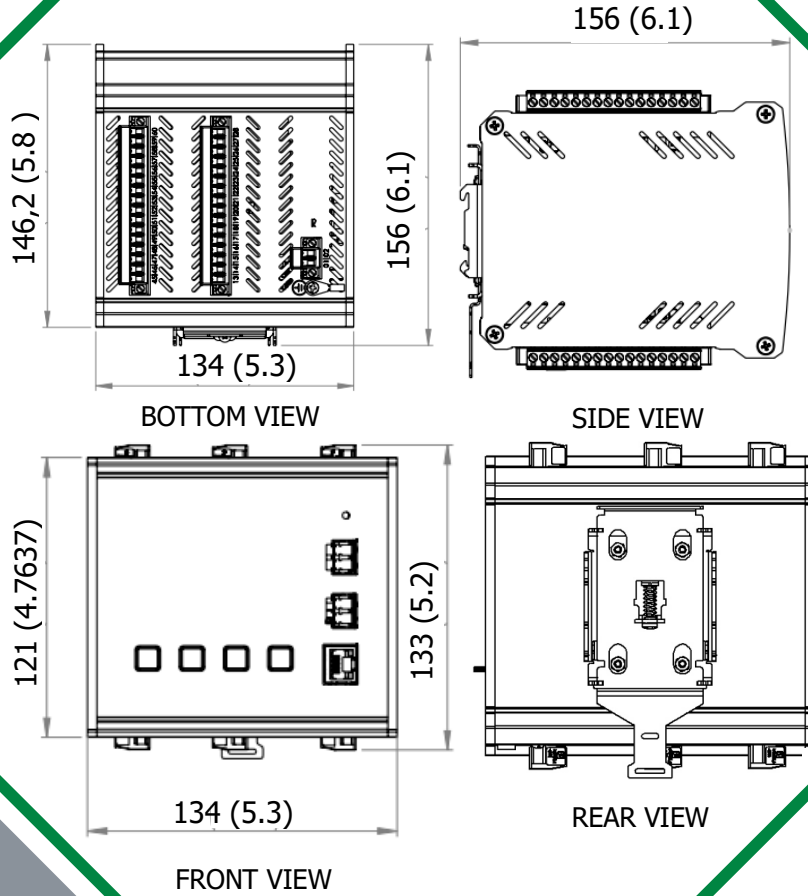


**SIDE VIEW**

Dimensions shown in millimeters and (inches)

**PRODUCT DIMENSIONAL (PANEL)**

Dimensions shown in millimeters and (inches)



**PRODUCT  
DIMENSIONAL  
(DIN Rail)**

**ESSENTIAL ACCESSORIES****TEMPERATURE SENSOR Pt100  $\Omega$  AT 0 °C**

Essential for measuring the temperature at the top of the power transformer oil, OLTC temperature, ambient temperature and other measurements in general.

**EXTERNAL SECTIONABLE WINDOW TYPE CT**

The use of external window-type CTs with sectionable cores is required to read the transformer load currents.

**REGULATION CT**

The use of an auxiliary external CT is required for the transformer voltage regulation system and for the IED.



## RECOMMENDED ACCESSORIES

**SIGMA ECM® MONITORING SOFTWARE**

In addition to online monitoring of the temperature of your assets, with our monitoring system and our specialized team, it is possible to monitor the status of your assets beyond reading data.

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

**WEATHER SHELTER**

If ambient temperature measurement is desired in unsheltered locations, a meteorological shelter must be used to protect the Pt100 sensor, minimizing errors that exposure to sun, rain, wind, etc. would cause to the measurement.



## ORDER SPECIFICATION

In the product purchase order, it is necessary to specify:

- ✓ Product name:
- ✓ Quantity;
- ✓ Model:
  - **FOFO:** 2 Ethernet fiber optic (UL certified);
  - **FOSR:** 1 Ethernet fiber optic + 1 Serial fiber optic;
  - **RJ45:** 2 Ethernet RJ45.
- ✓ Accessories.



**Treotech<sup>®</sup>**

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See the list of our distributors at:

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