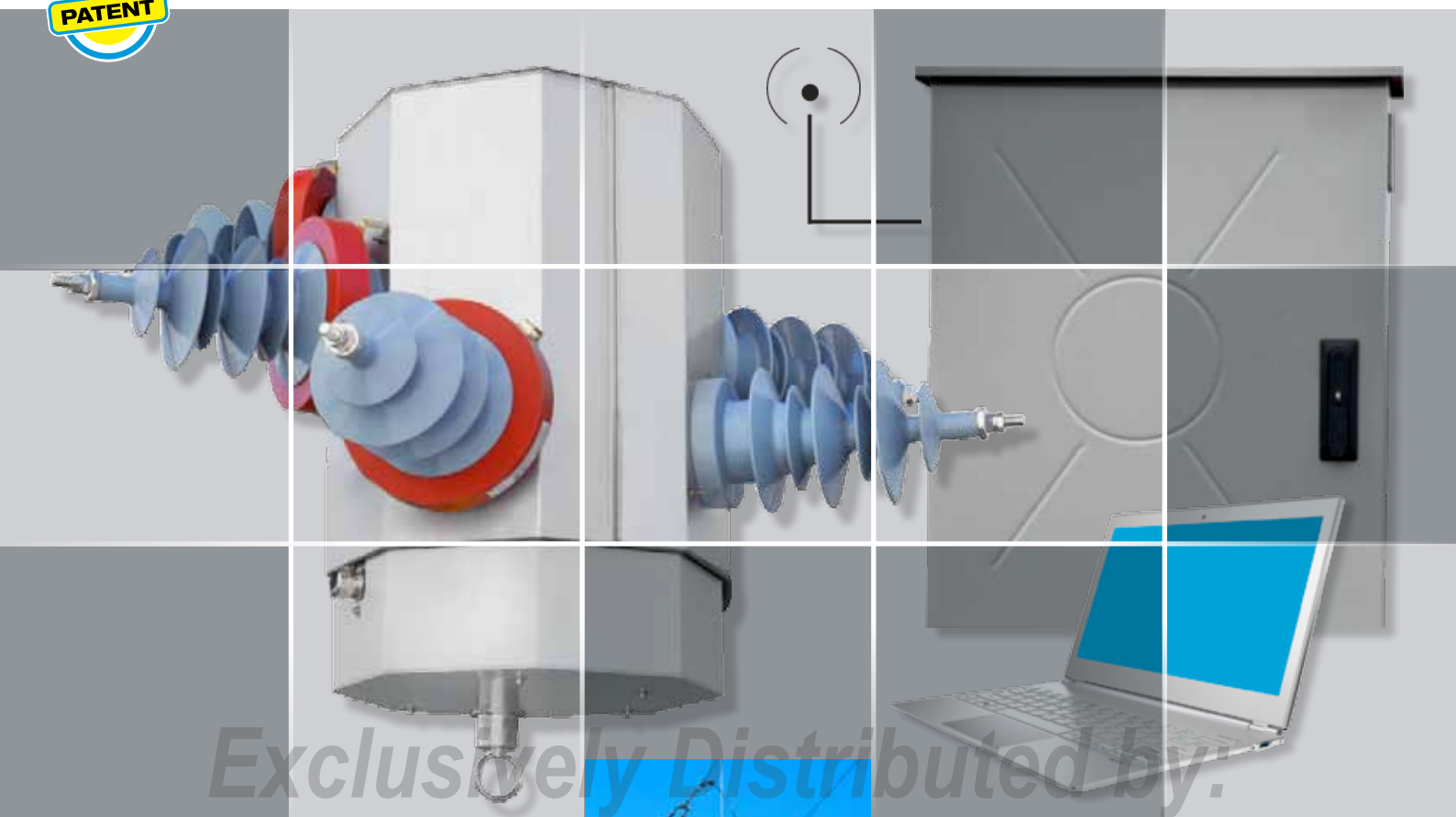




# THO-RC

AUTOMATIC- RECLOSER



*Exclusively Distributed by:*  
**MONTELEC INC.**



For overhead lines  
For demanding environments  
Vacuum breaking  
Dry air or SF6 insulation  
Magnetic actuator  
Automatic opening and closing  
Granted protection  
Remote control

INSPIRED SOLUTIONS...PREFER THE ORIGINAL



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# THO-RC

## GENERAL DESCRIPTION

The Contactplasma s.r.l. profound knowledge of the breaking and isolation electromechanical equipment and the long experience in the manufacturing of switch-disconnectors for overhead lines and circuit breaker, has led to the implementation of an automatic recloser: THO-RC.

The THO-RC is intended for use in three-phases distribution networks having rated voltage up to 27 kV (THO-RC27) or 38 kV (TH-RC38) and 50 or 60 Hz frequencies. It can be used as part of the overhead

lines systems or inside substation. The complete THO-RC automatic three pole vacuum recloser is composed by a recloser/circuit-breaker unit (Fig. 1) plus the relevant SRC-1 control unit (Fig. 2) connected through cable (Fig. 3).

The control unit is a device that has automatic protection, measurement, communication, events and data recording functions and can be integrated into remote protection systems of the medium voltage distribution and transmission.

Fig. 1 Vacuum recloser THO-RC

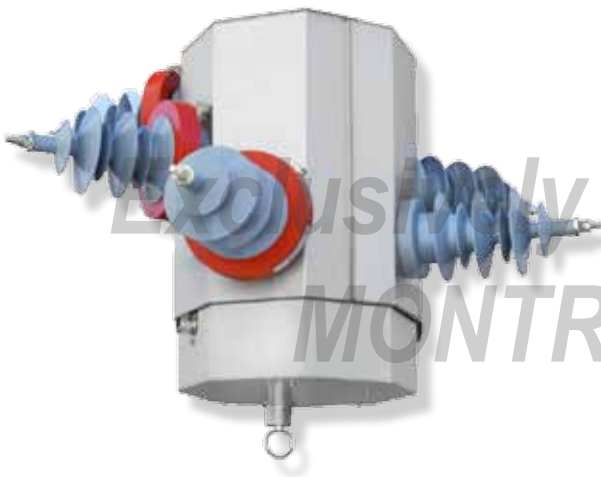


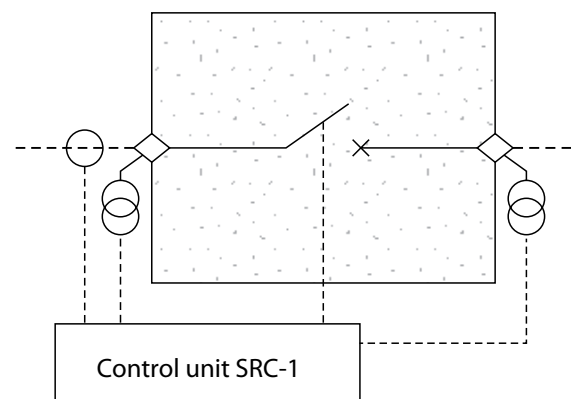
Fig. 2 Control unit SRC-1



Fig. 3 Connecting cable THO-RC recloser control unit SRC-1



Fig. 4 One-line diagram



# THO-RC

## STANDARDS AND CERTIFICATES

THO-RC is manufactured in accordance with the following international standards

IEC 62271-111: High-voltage switchgear and control gear  
Part 111: Automatic circuit reclosers and  
fault interrupters for alternating  
current systems up to 38 kV

IEEE C37.60: High-voltage switchgear and control gear  
Part 111: Automatic circuit reclosers and  
fault interrupters for alternating current  
systems up to 38 kV

IEC 62271-1: High-voltage switchgear and control gear  
Part 1: Common specification

IEC 62271-100: High-voltage switchgear and control gear  
Part 100: Alternating-current circuit-breakers

CERTIFIED BY ACCREDITED INTERNATIONAL LABORATORIES

# THO-RC

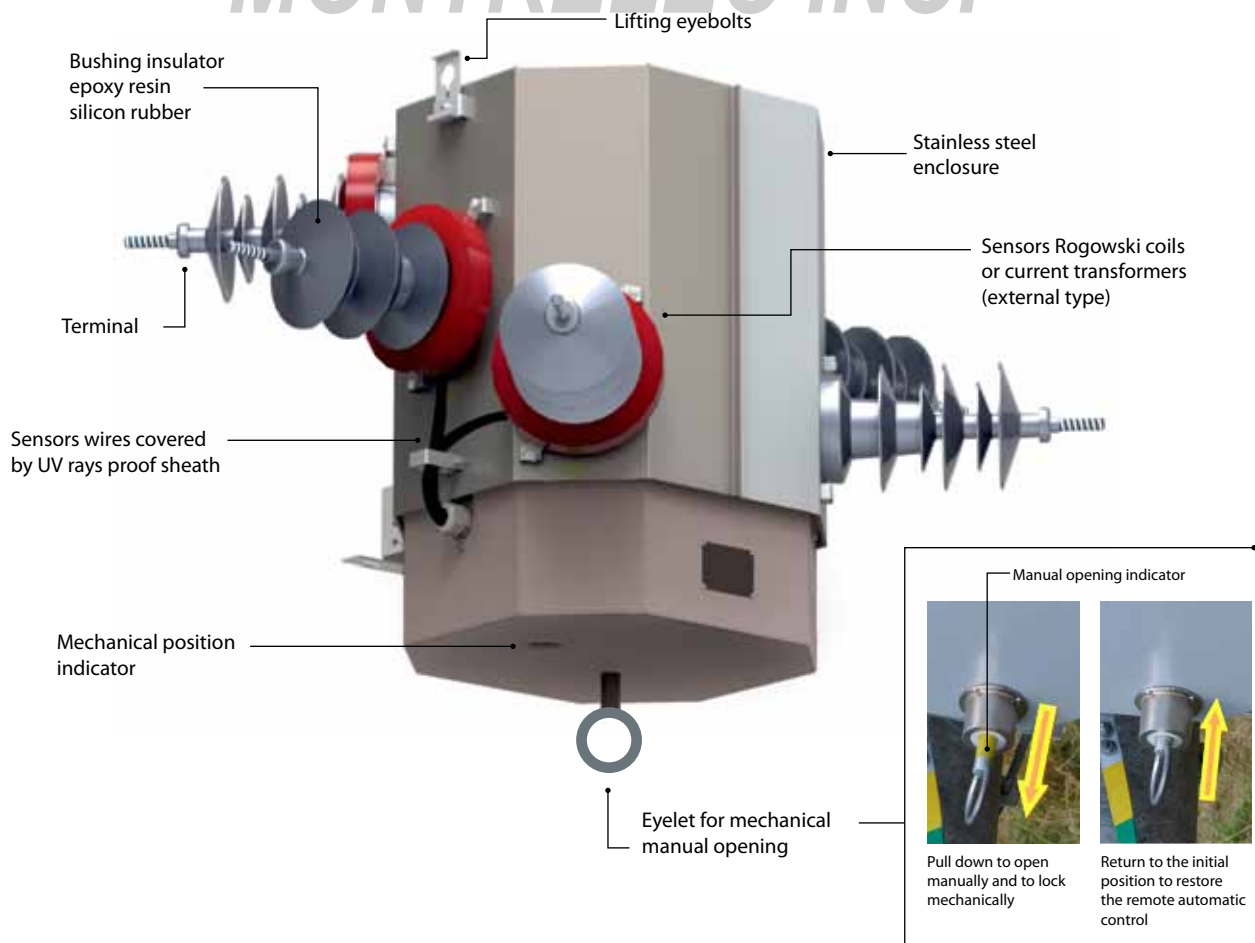
## AUTOMATIC VACUUM RECLOSER UNIT

The pole mounted automatic vacuum recloser THO-RC consists of three poles. Each pole has its own chamber with vacuum interrupter. All poles are coupled mechanically in synchronization to a shaft, which ensures correct operation. The opening and closing of the vacuum interrupter is determined by a simple electro-magnetically operated mechanism that works effectively, ensuring excellent performances. The electromagnetic actuator is operated by the energy stored in the capacitors contained in the control unit and is realized with only one mobile part. The stainless steel enclosure of the recloser, which contains the vacuum chambers and the electro-magnetic actuator, has IP65 degree of protection, guaranteeing high resistance to all the severe atmospheric agents and the possibility of installation in demanding environments. In the event of an emergency, the main contacts of the recloser can be opened manually me-

chanically by hook stick (hook stick excluded from the supply). After the manual opening, the recloser remains mechanically and electrically blocked in OFF and it is possible to return to the remote control only once the manual mechanical opening device has been restored to its initial position. The status of the recloser is visible thanks to the mechanical indicator at the bottom of the unit. Auxiliary contacts allow remote monitoring through the control unit and the eventual signalisation. The bushing insulators, externally protected by a hydrophobic silicone rubber layer, are complete with capacitive dividers connected to the SRC-1 control unit. Current measurements are obtained by means of Rogowski coils (conversion factor 1 mV/A, optional 5 mV/A) or current transformers (secondary 1 A) suitable for external installation and applied on silicon insulators or internally to the metallic enclosure.

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Fig.5 THO-RC automatic vacuum recloser general view



# THO-RC

## AUTOMATIC VACUUM RECLOSER UNIT

Fig.6 THO-RC automatic vacuum recloser electromagnetic operating mechanism

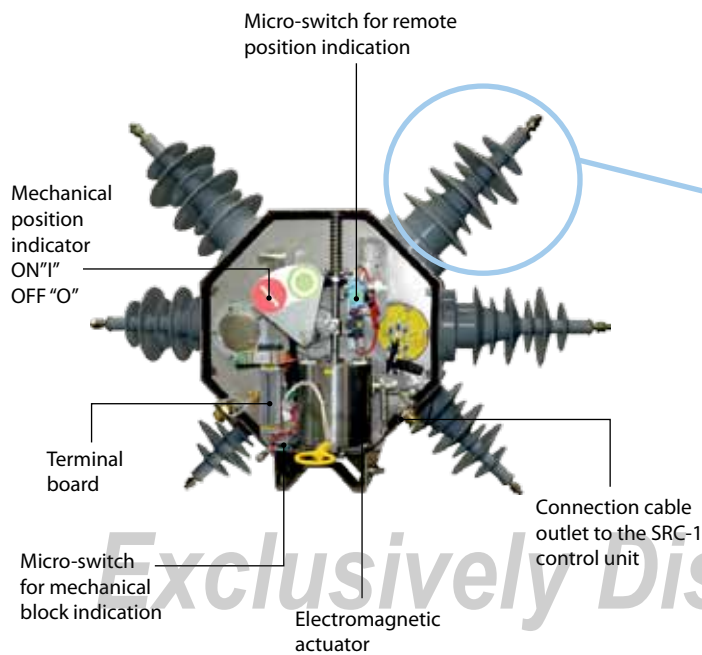


Fig. 7 THO-RC automatic vacuum recloser bushing insulator internal view

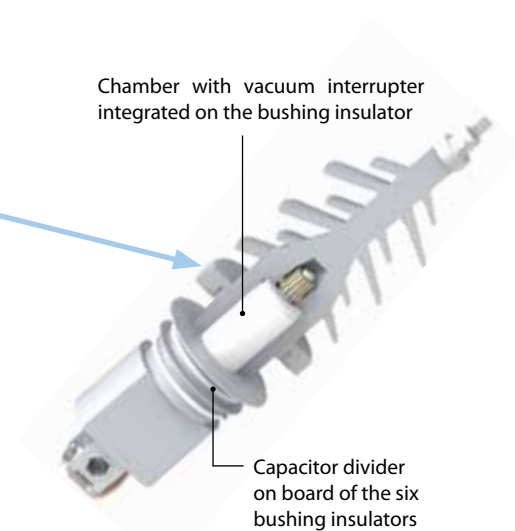
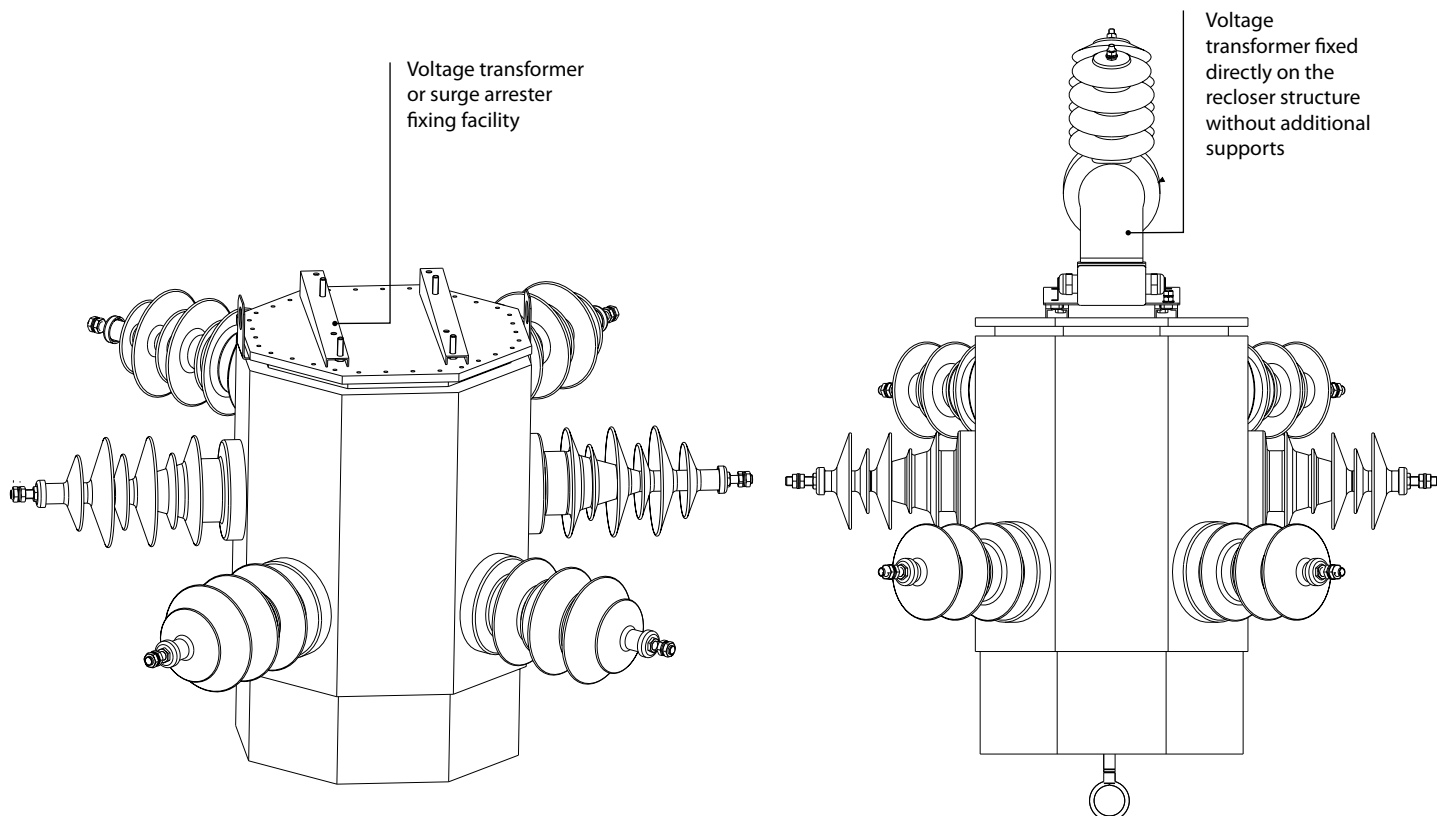


Fig.8 THO-RC automatic vacuum recloser voltage transformer



# THO-RC

## VERSIONS

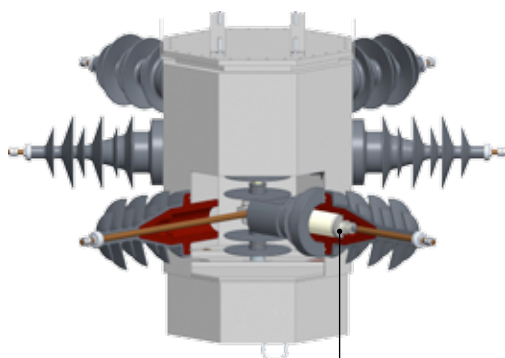
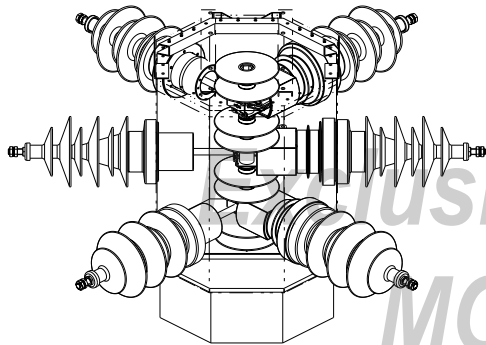
Contactplasma proposes three versions of THO-RC that differ from each other for maximum operating voltage and insulation system. All versions use vacuum technology for the breaking of the electric arc.

**THO-RC27 with dry air insulation:** SF6 free having minimum environmental impact and without problems relating to the disposal of gas, for M.V. distribution networks up to 27 kV.

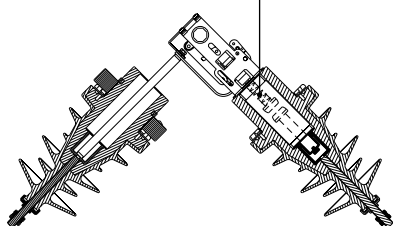
**THO-RC27 with SF6 insulation:** for M.V. distribution networks up to 27 kV, having the same electrical characteristics of the version with dry air insulation, but having more compact dimensions.

**THO-RC38 with SF6 insulation:** for M.V. distribution networks up to 38 kV. It adopts the same technology already present in THO-RC27 but using 2 Vacuum Interrupters installed in series.

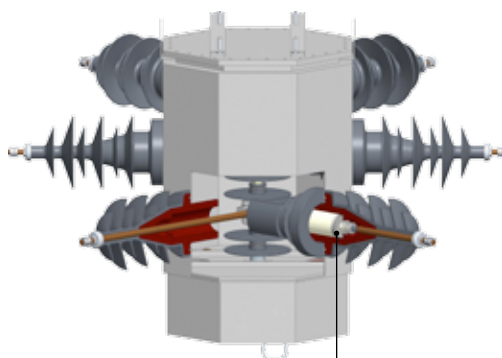
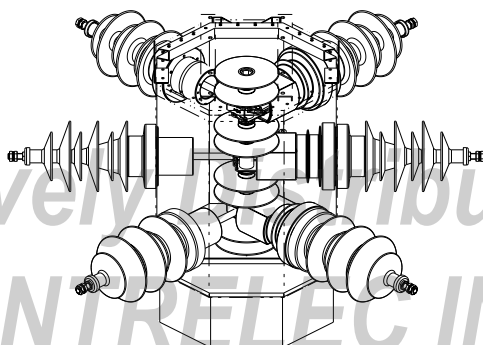
**THO-RC27**  
DRY AIR



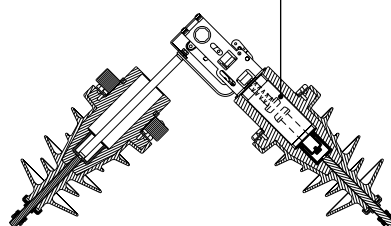
One chamber with vacuum interrupter each phase



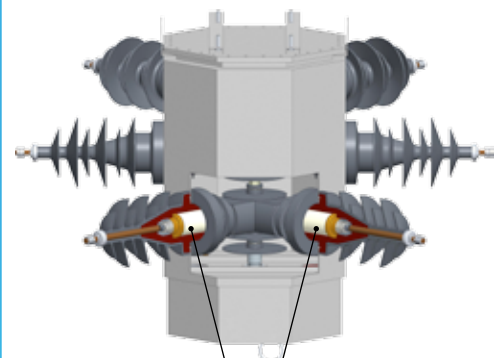
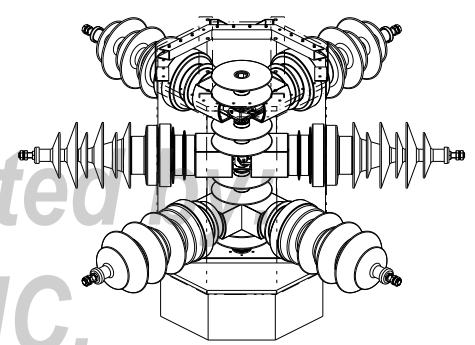
**THO-RC27**



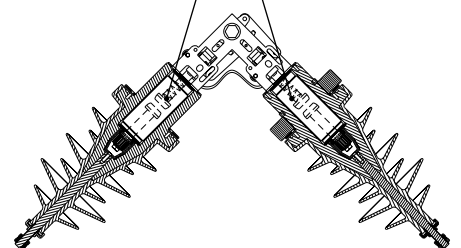
One chamber with vacuum interrupter each phase



**THO-RC38**



Two chambers with vacuum interrupter in series each phase

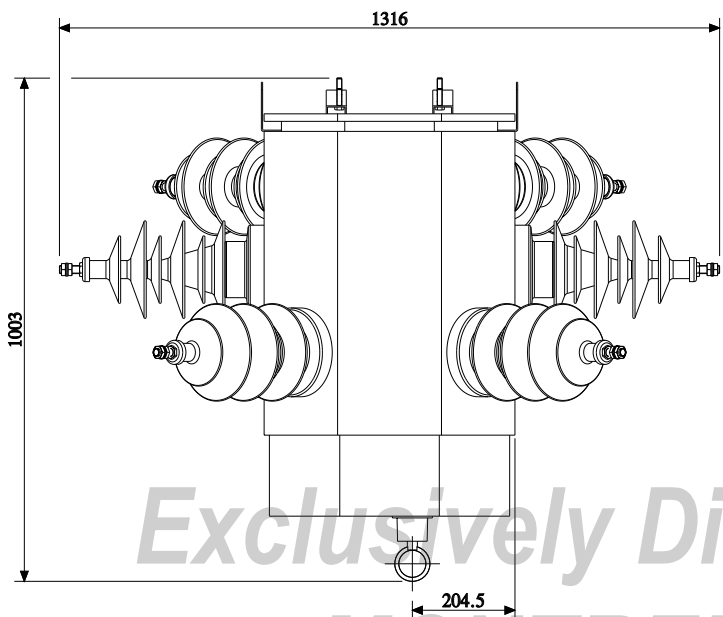


# THO-RC27 DRY AIR

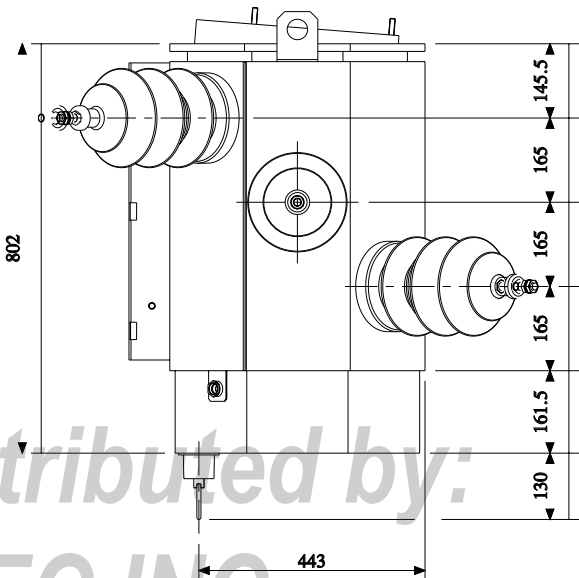
OVERALL DIMENSIONS



Frontal view

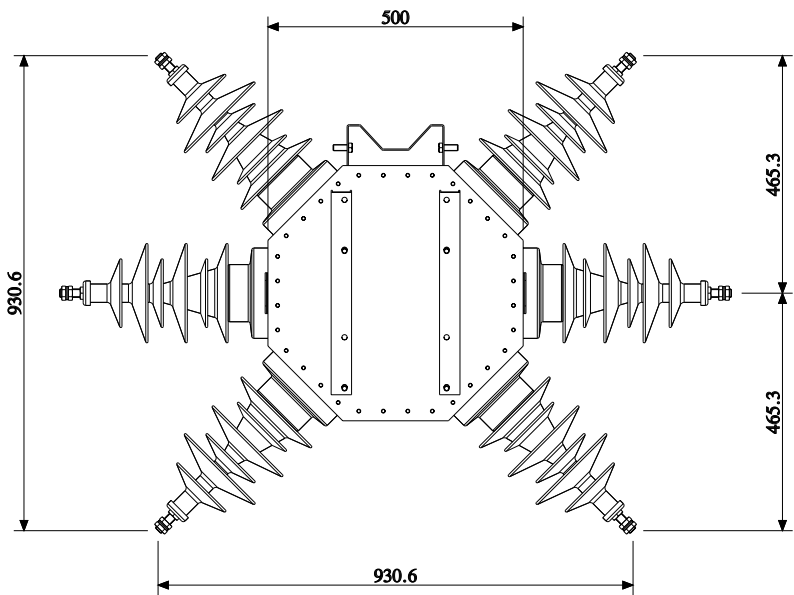


Side view



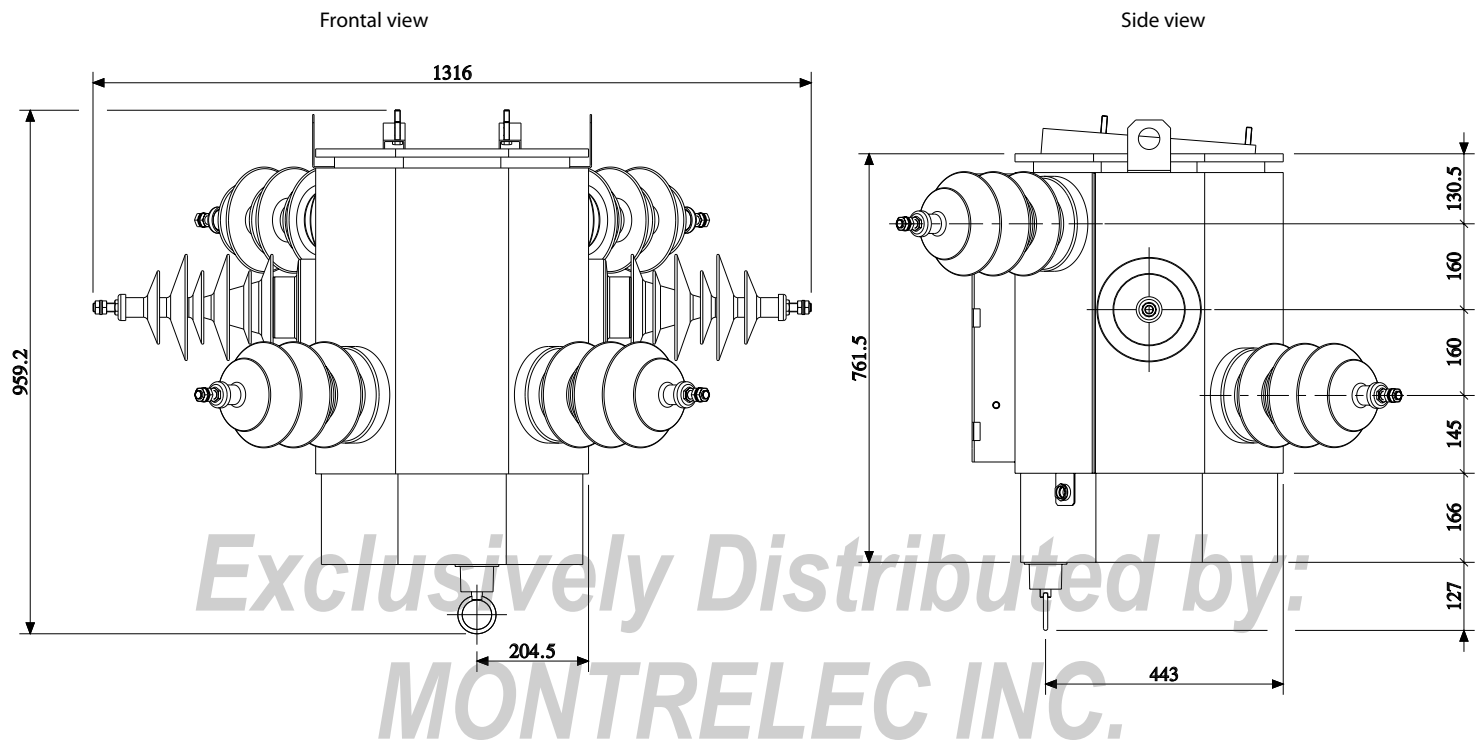
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Top view



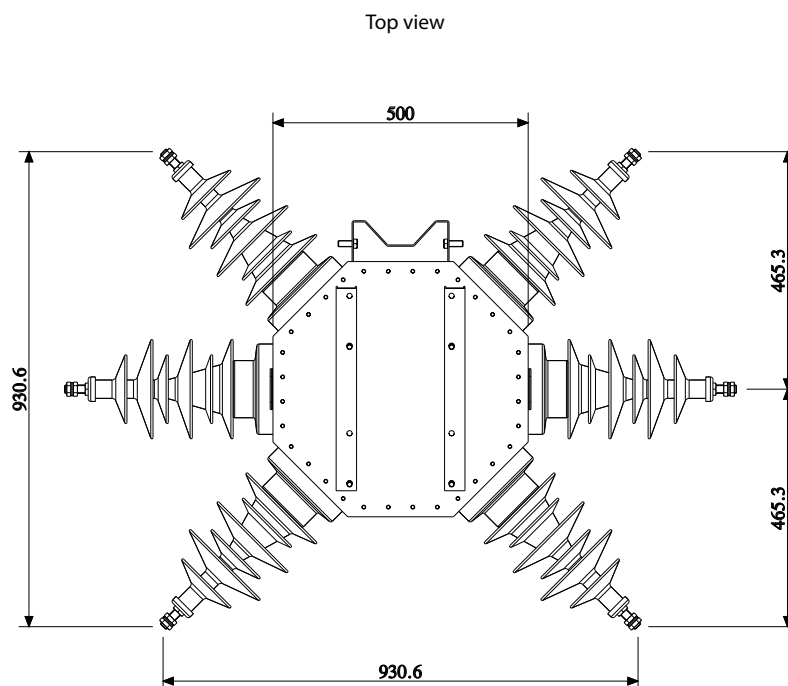
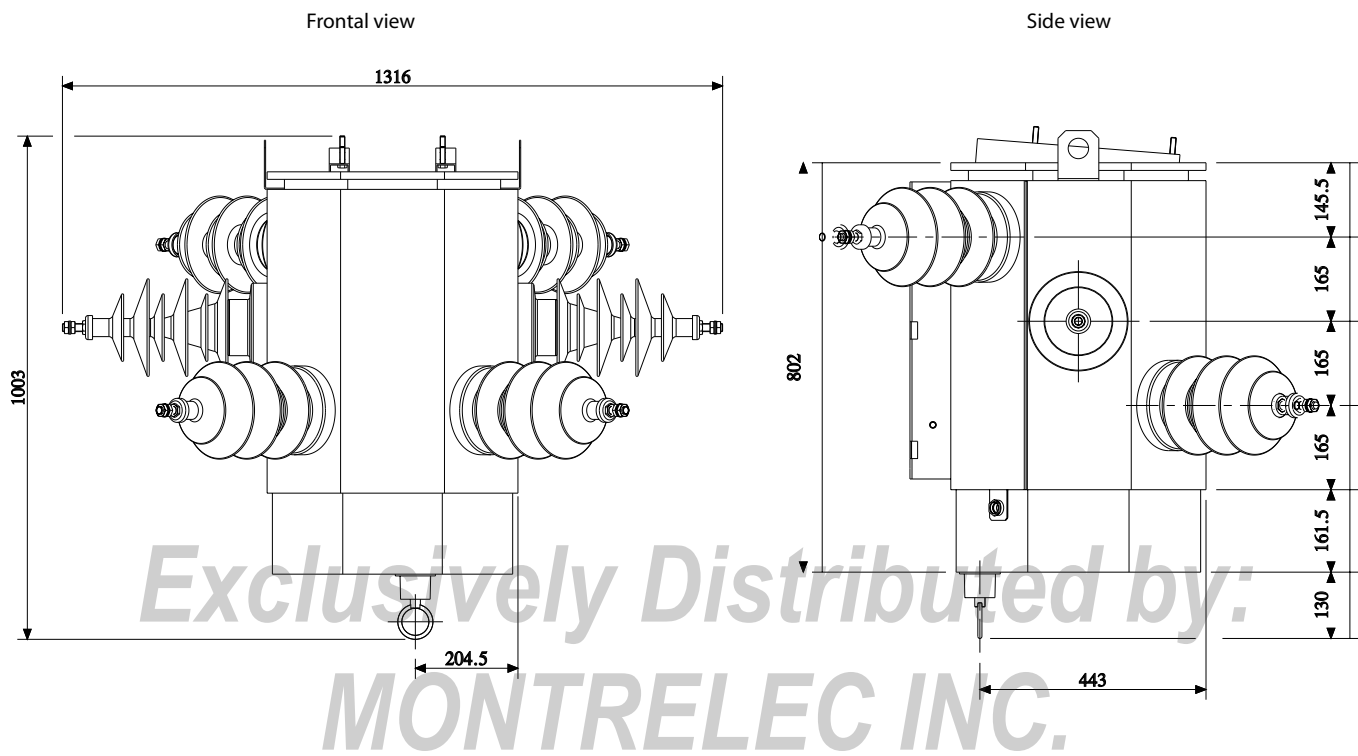
# THO-RC27

OVERALL DIMENSIONS



# THO-RC38

OVERALL DIMENSIONS



# THO-RC

## AUTOMATIC VACUUM RECLOSER CHARACTERISTICS

| Version                                                           |                          | THO-RC27                            |      | THO-RC27                            |      | THO-RC38                            |
|-------------------------------------------------------------------|--------------------------|-------------------------------------|------|-------------------------------------|------|-------------------------------------|
| Insulation                                                        |                          | Dry Air                             |      | SF6                                 |      | SF6                                 |
| Breaking                                                          |                          | Vacuum interrupters                 |      | Vacuum interrupters                 |      | Vacuum interrupters                 |
| International Standards                                           |                          | IEC 62271-111<br>IEEE C37.60        |      | IEC 62271-111<br>IEEE C37.60        |      | IEC 62271-111<br>IEEE C37.60        |
| Rated voltage                                                     | Ur [kV]                  | 24                                  | 27   | 24                                  | 27   | 38                                  |
| Rated current                                                     | Ir [A]                   | 630                                 |      | 630                                 |      | 630                                 |
| Rated short-duration power frequency withstand voltage 1 min dry  | Ud [kV]                  | 50                                  | 60   | 50                                  | 60   | 70                                  |
| Rated short-duration power frequency withstand voltage 10 sec wet | Ud [kV]                  | 50                                  |      | 50                                  |      | 60                                  |
| Rated lightning impulse withstand voltage                         | Up [kV]                  | 125                                 |      | 125                                 |      | 150                                 |
| Rated frequency                                                   | [Hz]                     | 50/60                               |      | 50/60                               |      | 50/60                               |
| Rated short-time withstand current                                | I <sub>k</sub> [kA]      | 16                                  | 12,5 | 16                                  | 12,5 | 12,5                                |
| Rated peak withstand current                                      | I <sub>p</sub> [kA]      | 40                                  | 31,5 | 40                                  | 31,5 | 31,5                                |
| Rated duration of short circuit                                   | t <sub>k</sub> [s]       | 3                                   |      | 3                                   |      | 3                                   |
| Rated symmetrical interrupting current                            | I <sub>sc</sub> [kA]     | 16                                  | 12,5 | 16                                  | 12,5 | 12,5                                |
| Rated line charging interrupting current                          | [A]                      | 5                                   |      | 5                                   |      | 5                                   |
| Rated cable charging interrupting current                         | [A]                      | 25                                  |      | 25                                  |      | 40                                  |
| Rated minimum tripping current                                    | I <sub>&gt;min</sub> [A] | 4                                   |      | 4                                   |      | 4                                   |
| Mechanical endurance                                              |                          | 10000<br>30000 (*)                  |      | 10000<br>30000 (*)                  |      | 10000<br>30000 (*)                  |
| Rated operating sequence                                          |                          | O-0,5s-CO-2s-CO-4s-CO               |      | O-0,5s-CO-2s-CO-4s-CO               |      | O-0,5s-CO-2s-CO-4s-CO               |
| Excercise temperature                                             |                          | -40 °C÷+55 °C                       |      | -40 °C÷+55 °C                       |      | -40 °C÷+55 °C                       |
| Protection degree                                                 |                          | IP 65                               |      | IP 65                               |      | IP 65                               |
| Humidity                                                          |                          | < 100%                              |      | < 100%                              |      | < 100%                              |
| Weight                                                            | [Kg]                     | 100                                 |      | 100                                 |      | 110                                 |
| Current measurement                                               |                          | Rogowski coils/current transformers |      | Rogowski coils/current transformers |      | Rogowski coils/current transformers |
| Voltage detection                                                 |                          | By 6 capacitor deviders             |      | By 6 capacitor deviders             |      | By 6 capacitor deviders             |
| (*) On request                                                    |                          |                                     |      |                                     |      |                                     |

# THO-RC

## CURRENT TRANSFORMERS CHARACTERISTICS

|                                    |      |                                   |
|------------------------------------|------|-----------------------------------|
| Rated primary voltage              | [kV] | 0,66                              |
| Maximum voltage                    | [kV] | 0,72                              |
| Rated short-time withstand current | [kA] | 30                                |
| Rated voltage of isolation         | [kV] | 3                                 |
| Rated dynamic current              | [kA] | 75                                |
| Ratio                              | [A]  | 100:1; 200:1; 300:1; 400:1; 600:1 |
| Performances                       |      | 5(10)VA; 5P; ALF 5                |
| Exercise temperature               |      | -40°C÷+55°C                       |
| Weight                             |      | 2Kg +10%                          |
| Conformity                         |      | EN-61869-1:2009; EN-61869-2:2013  |

## ROGOWSKI COILS CHARACTERISTICS

|                                    |        |                                                |
|------------------------------------|--------|------------------------------------------------|
| Rated primary voltage              | [kV]   | 0,66                                           |
| Maximum voltage                    | [kV]   | 0,72                                           |
| Rated short-time withstand current | [kA]   | 30                                             |
| Rated voltage of isolation         | [kV]   | 3                                              |
| Rated dynamic current              | [kA]   | 75                                             |
| Measurement range                  | [A]    | 0,5÷2000 A                                     |
| Transmission                       | [A/mV] | 300 A/300 mV                                   |
| Sensitivity                        |        | 1 o 5 mV / 1 A                                 |
| Accuracy                           |        | ± 1%                                           |
| Rated load                         |        | R carico > 50 kOhm                             |
| Exercise temperature               |        | -40 °C÷+55 °C                                  |
| Weight                             | [Kg]   | 2,5                                            |
| Conformity                         |        | EN-61869-1:2009; EN-61869-2:20132, IEC 61869-8 |

## CAPACITOR DIVIDERS CHARACTERISTICS

|                                    |      |                         |
|------------------------------------|------|-------------------------|
| Capacity                           | [pF] | 31                      |
| Accuracy                           |      | ± 1%                    |
| Exercise temperature               |      | -50 °C÷+80 °C           |
| Capacity coefficient – temperature |      | (100-150) ppm [10-6/°C] |



# SRC-1

## CONTROL UNIT

The SRC-1 control unit is specifically designed and developed to provide a complete service to the THO-RC recloser, to manage the automatic breaking operations and the data transmission. SRC-1 is equipped with SO-54SR-111-REK digital protection and control device having MSG-701 communication module, both of Mikronika's manufacturing and incorporates the following features:

- Measurements
- Protections
- Interruption tele-control
- Recloser control
- Automation
- Multi-channel noise recording
- Distribution networks information and parameter registration and processing
- Displaying and recording events

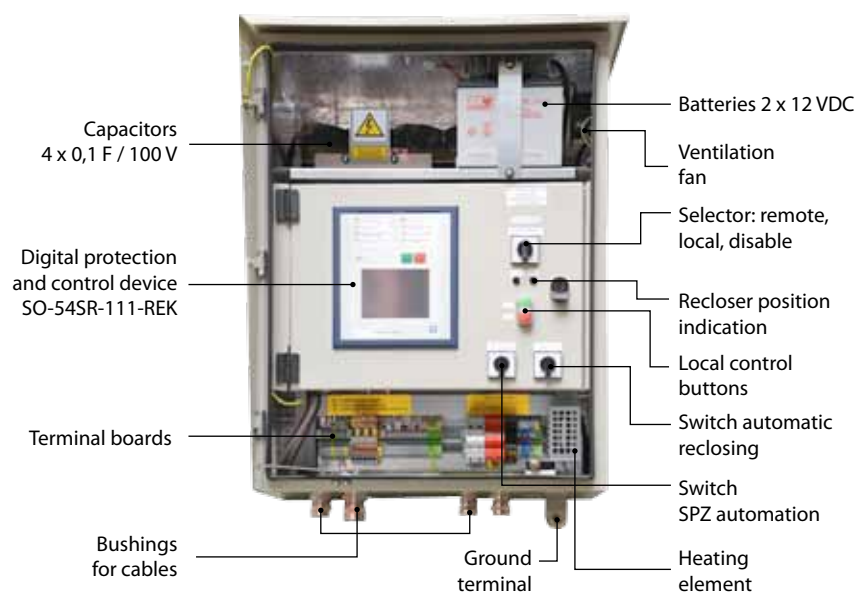
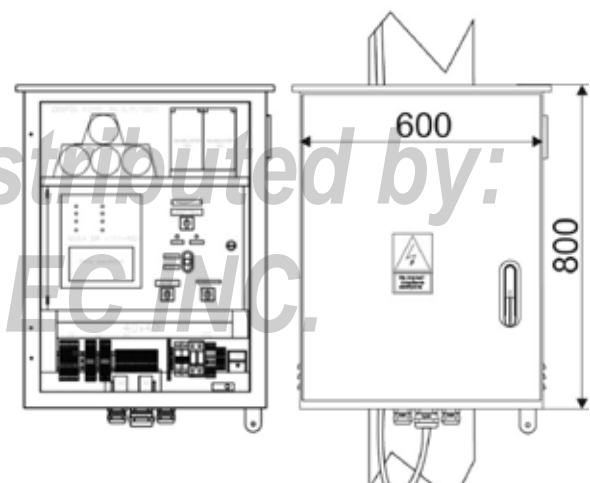
Optional other communication modules available; for more details on all features, protections and communication modules consult the separate documentation dedicated to the digital protection and control device SO-54SR-111-REK.

The enclosure of the SRC-1 control unit consists of powder-coated aluminium sheet, IP54 degree of protection (IP64 optional).

To allow access to internal parts of the control unit to authorized personnel only, the SRC-1 door is equipped with internal hinges and a lock with three locking points (Master Key System).

Inside the enclosure a terminal board for the control cable and power cable connection is provided. In the lower part of the housing are located metal bushes through which the control, power supply and antenna cables are inserted.

Dimensions of the control unit: height 800 mm, width 600 mm, depth of 250 mm.



# SRC-1

## CONTROL UNIT CHARACTERISTICS

The SRC-1 control unit consists of:

- Digital protection and control device  
SO-54SR-111-REK
- GPRS / UMTS-APN, TETRA, NetMan, communication module depending on your needs
- 24 VDC batteries with charging system
- Capacitors for electromagnetic actuation
- Local control buttons
- LED Indicating the position of the recloser
- Function mode selectors

- Switches and fuse-switches for protection
- Fault reporting
- Terminal boards
- Anti-condensate system with temperature regulator (hygrometer) at 230 VAC
- Service socket

The SRC-1 control unit is connected to the recloser via dedicated PS-control cable Y2x2.5 16x1.5 + 6x1.5C (4x2x1.5) C shielded inside a tube to further protect it from mechanical damages and UV rays.

Fig. 9 SRC-1 control unit output of the connecting cable



Fig 10 Metal bushings for SRC-1 cables



## CHARACTERISTICS

|                                      |      |                                                                                                                                   |
|--------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------|
| Rated voltage from AC power supply   |      | 230 VAC                                                                                                                           |
| Rated voltage of the internal system |      | 24 VDC                                                                                                                            |
| Degree of protection                 |      | IP54 (IP64 on request)                                                                                                            |
| Installation height above sea level  | [m]  | < 1000                                                                                                                            |
| Exercise temperature                 |      | -40 °C÷+55 °C                                                                                                                     |
| Weight                               | [Kg] | 4                                                                                                                                 |
| Relative humidity                    |      | < 100%                                                                                                                            |
| Autonomy without auxiliary supply    |      | 12 ÷ 72 H without external load                                                                                                   |
| Conformity                           |      | EN 61439-1:2011                                                                                                                   |
| Type of auto-reclosing               |      | SPZ 0-0,5s-CO-2s-CO-4s-CO automatic restart<br>PDZ Acceleration of short-circuit protection<br>B2H 2 <sup>nd</sup> harmonic block |

# SO-54SR-111-REK

## DIGITAL PROTECTION AND CONTROL DEVICE

The digital protection and control device (controller) SO-54SR-111-REK of MIKRONIKA having protection functions is designed to control the automatic interruption of the THO-RC recloser.

It is integrated into the SRC-1 control unit. The LCD touch screen with an additional 8 LED, module is an excellent interface for the operator and allows human interaction with the control device which dispatches

with the SCADA system standards through the MSG 701 external communication module, also produced by MIKRONIKA.

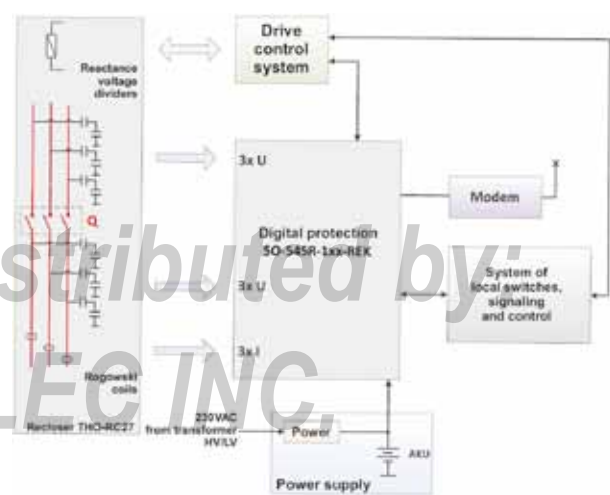
The configuration of the SO-54SR-111-REK is done via p.config. The software allows the configuration of the driver and control of its status.

Communication via the p.config program can be implemented locally or remotely.

Fig 11 Digital protection and control device SO-54SR-111-REK



Fig. 12 Block diagram



### BASE PROTECTIONS FUNCTIONS

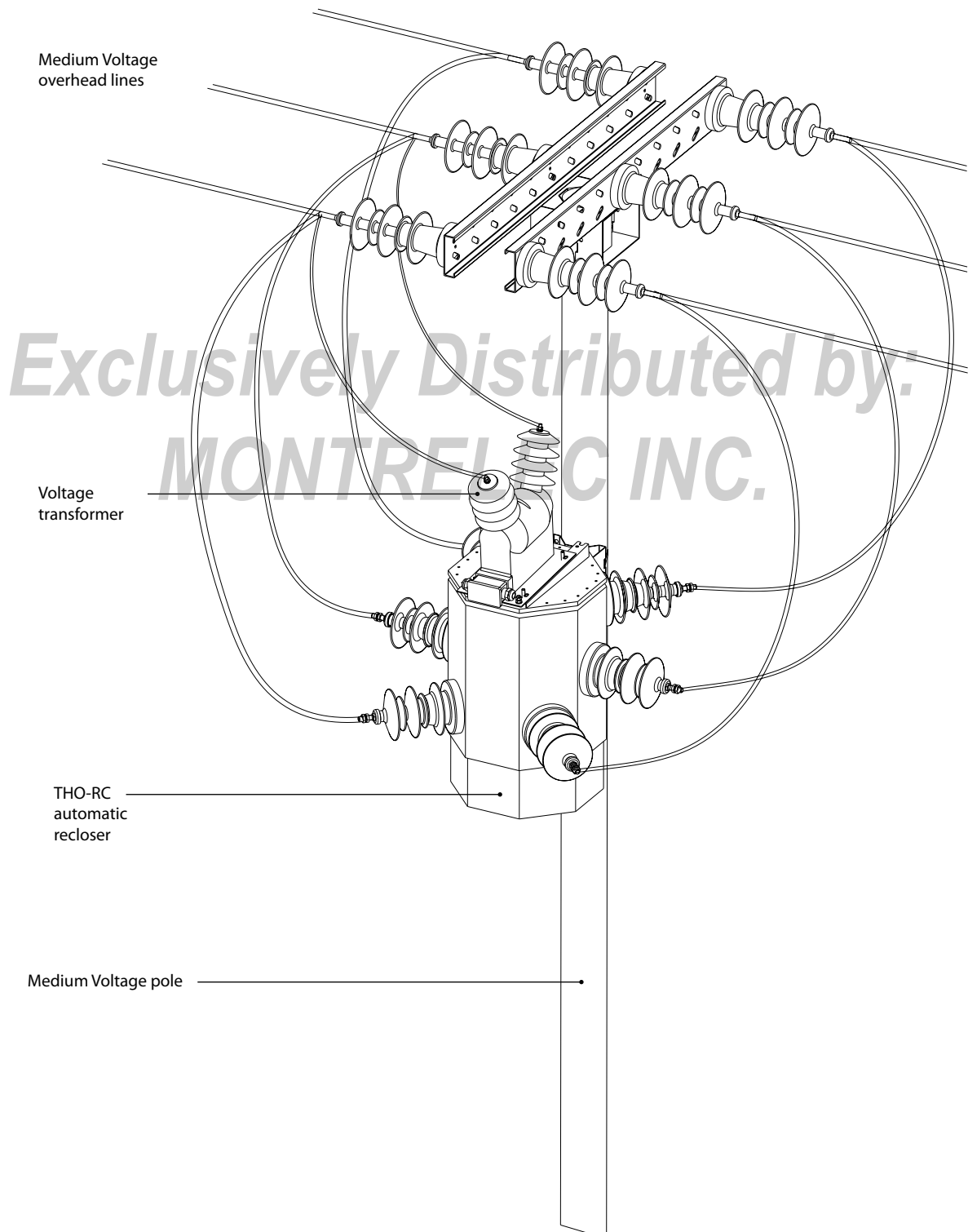
| Abbreviation | Name                                           | Symbol | ANSI Code |
|--------------|------------------------------------------------|--------|-----------|
| I1NP         | Independent overcurrent protection             | I1>>   | 50        |
| I2NP         | Independent overcurrent protection             | I2>>   | 50        |
| I4NP         | Independent overcurrent protection             | I4>    | 50        |
| I5NP         | Dependant overcurrent protection               | I5>    | 51        |
| UPN          | Independent undervoltage protection            | U<     | 27        |
| UNN          | Independent overvoltage protection             | U>     | 59        |
| I0NP         | Earth fault overcurrent protection             | I0>    | 50N       |
| PKIER        | Directional earth fault overcurrent protection | I0K>   | 67N       |
| PNG          | Conductance protection                         | G0>    | -         |
| PNB          | Susceptance protection                         | B0>    | -         |
| PNY          | Admittance protection                          | Y0>    | -         |
| FPC          | Underfrequency protection                      | f<     | 81U       |
| FNC          | Overfrequency protection                       | f>     | 81O       |

# INSTALLATION

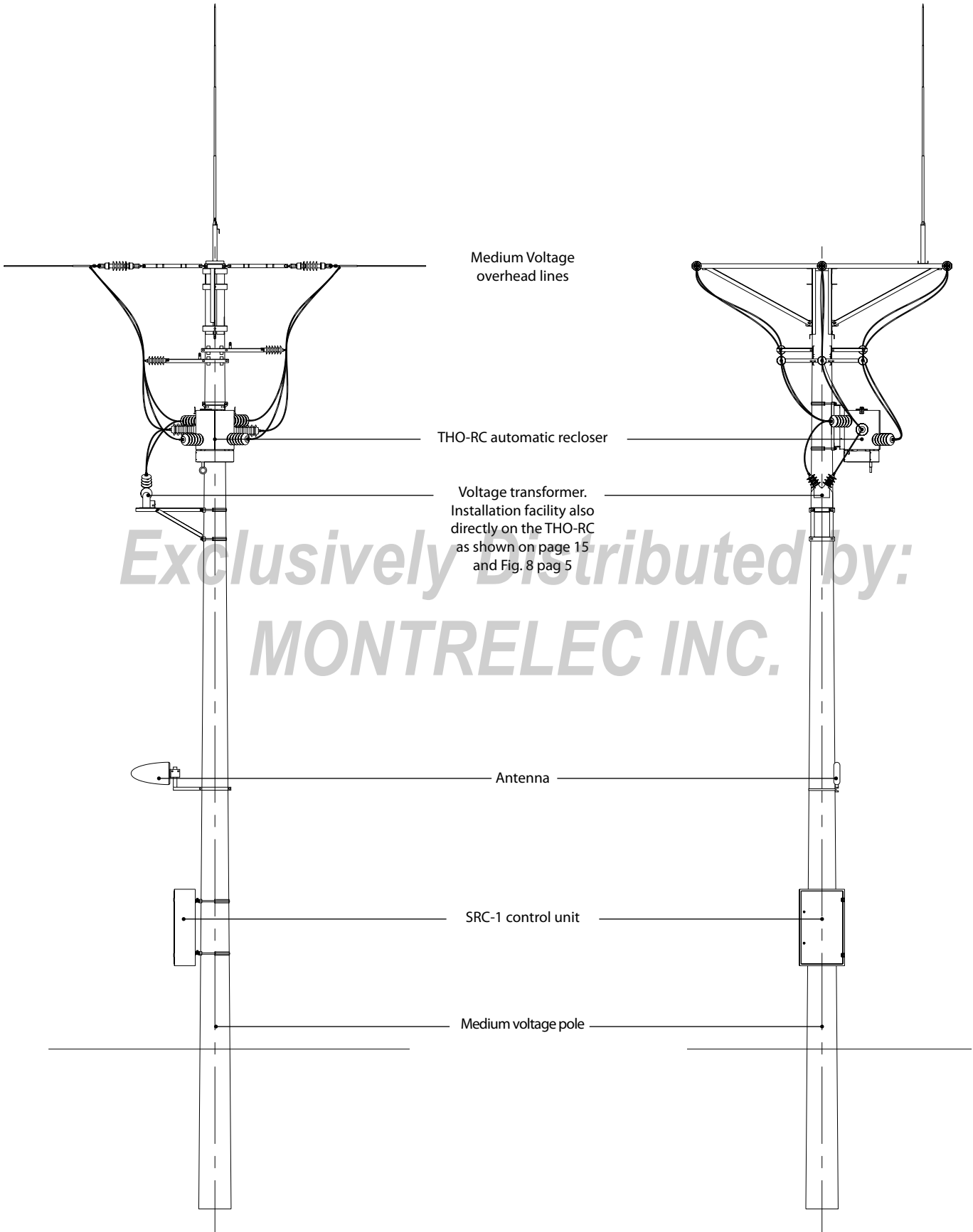
The THO-RC allows a simple, economic and safe installation directly to the pole, without the use of additional supports such as shelves or metal structures.

The centre of mass of the automatic recloser remains

very close to the pole. Furthermore, it is possible to fix the voltage transformer directly to the structure of the THO-RC unit without additional pedestals or perches.



INSTALLATION EXAMPLES



INSTALLATION EXAMPLES

