altea technical specification

CVS-24-O

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INDEX

1. SCOPE OF THE DOCUMENT

The scope of the present document is the definition of technical characteristics of the Electronic Current and Voltage Transducer (ECT+EVT) Altea CVS-24-O in accordance with reference documents listed in Chapter 3. In the present document the term 'Transducer' will be replaced by the term 'Sensor'.

2. CVS-24-O DESCRIPTION

The device under specification (Fig.1) is a combined MV ECT + EVT for OUTDOOR use. The main electrical and mechanical characteristics are reported in the table below, while the dimensions of the device are shown in Fig. 1.

* parameter customizable upon request.

EVT CHARACTERISTICS	
Rated primary voltage, Upr *	20/√3 kV
Rated secondary voltage, Usr *	1 V
Rated voltage factor, Ku	1,9 for 8h
Rated transformation ratio, Kru *	11547 / 1
Accuracy class *	0.2
Bandwidth (-3dB)	30 Hz – 20 kHz
Primary terminal capacity (average value)	20 pF
ECT CHARACTERISTICS	
Rated primary current, Ipr *	300 A
Rated short time withstand thermal current, Ith	12,5 kA / 1s
Dynamic nominal current, Idyn	31,5 kA
Rated Extended Primary Current Factor, Kprc	1,2
Rated Continuous Thermal Current, Icth *	360 A
Rated secondary voltage, Usr *	0,2 V
Rated transformation ratio, Kra *	300 A / 0,2 V
Accuracy class *	0.2S

Bandwidth (-3dB)	30 Hz – 5 kHz
PRODUCT CHARACTERISTICS	
Rated insulation level	24/50/125
Maximum voltage, Um	24 kV
Withstand voltage under wet conditions	50 kV
Impulse voltage (dry conditions)	125 kV
Rated frequency	50 / 60 Hz
Supply voltage	±12 Vdc
Maximum Supply Current	15 mA
International Protection Code	IP65 level
Creepage distance	740 mm
Weight	3 kg
Applicable Standards	IEC 60044-7, IEC 60044-8, ENEL DY1059-A70
Mechanical STL	10 kN
Mechanical SCL	2 kN
Mechanical MDCL	3 kN

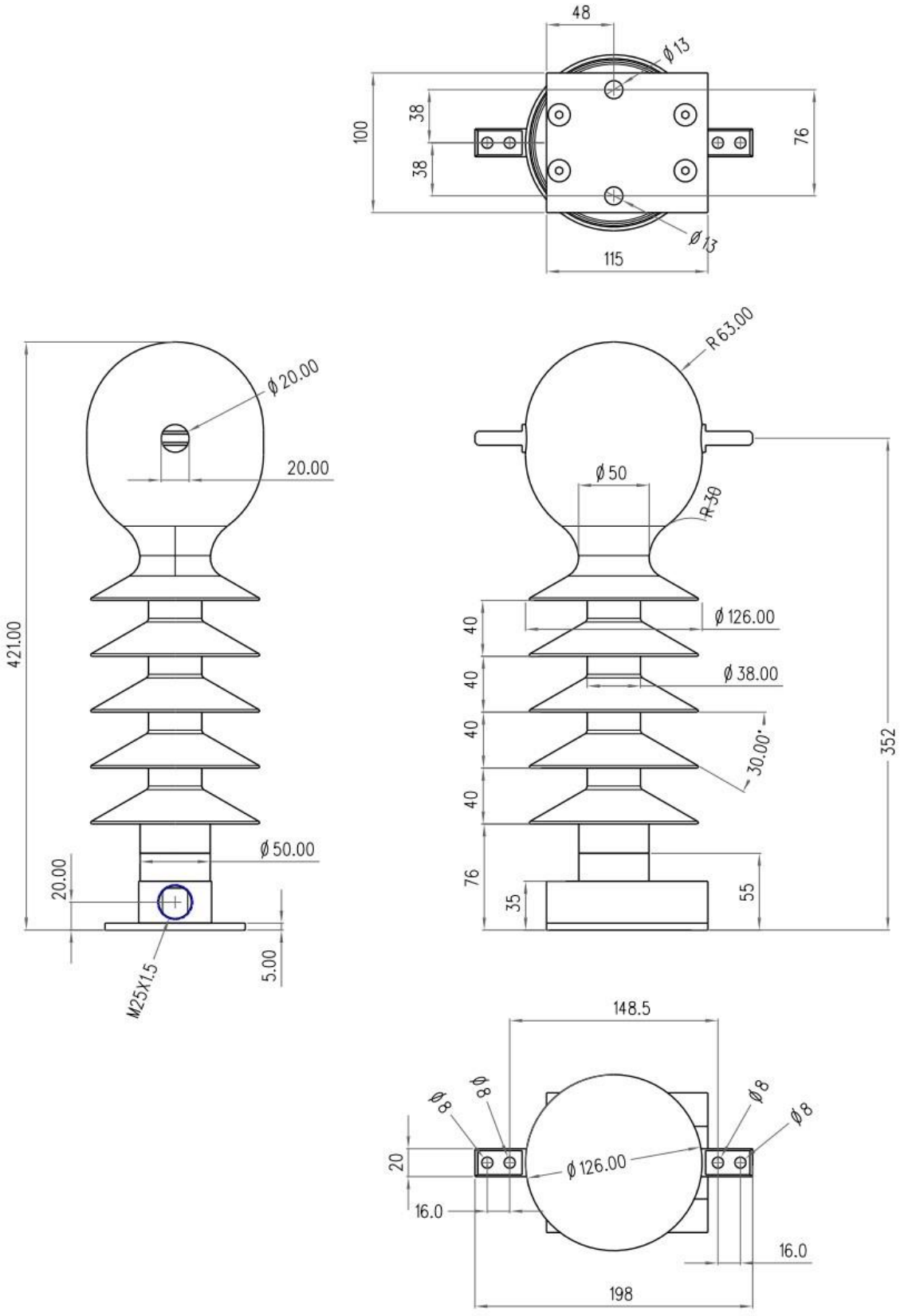

Fig.1 – Electronic outdoor combined current voltage sensor CVS-24-O

3. REFERENCE DOCUMENTS

The following reference documents were taken into consideration for the definition of Altea CVS 24-O operational characteristics:

1. **IEC 60044**-7 (1999-12) "Instrument transformers - Part 7: Electronic voltage transformers";
2. **IEC 60044**-8 (2002) "Instrument transformers - Part 8: Electronic current transformers";
3. **IEC 60060**-1 (2010) “High test voltage techniques – Part 1: General definitions and test requirements”;
4. **IEC 60815** (1986) “Guide for the selection of insulator in respect of polluted conditions”
5. **IEC 60071**-2 (1996) “Insulation co-ordination - Part 2: Application guide”
6. **ENEL DY1059**-A70 (2014) “prescrizioni per la costruzione e il collaudo del rivelatore di guasto direzionale e di assenza tensione (RGDAT A70) per cabina secondaria MT/bt (IMS su palo) telecontrollata”.

4. SERVICE CONDITIONS OF THE ALTEA CVS-24-O

According to [1] the electronic voltage and current sensor Altea CVS 24-O is suitable for both measuring and protection purposes.

4.1 Service conditions

4.1.1 Ambient Air Temperature

The ambient air temperature belongs to the standard range [-40 °C; + 55 °C].

4.1.2 Altitude

For installations at an altitude higher than 1000 m, the arcing distance under the standardized reference atmospheric conditions is determined by multiplying the withstand voltages required at the service location by a factor k in accordance with Figure 3 of [1].

4.1.3 Vibrations or earth tremors

Typical vibrations to the electronic sensor due to external causes or earth tremors do not affect the operation of CVS 24-O.

4.1.4 Service conditions for the outdoor ALTEA CVS 24-O

Altea CVS 24-O is in compliance with the requirements of [2, 4.2.5] regarding the service conditions for outdoor use:

Table 4.1

Average value of the ambient air temperature	< 35 °C (measured over a period of 24 h)
Solar radiation	< 1000 W/m^2 (on a clear day at noon)
Pollution environment	According to the minimum creepage distance for given pollution levels, the
	classification is: medium 20 mm/kV
Wind pressure	< 700 Pa

4.2 Earthing system [1, 4.3 and 2, 4.3]

The Altea CVS-24-O is an earthed electronic voltage - current sensor. The output voltages of the Altea CVS-24-O are representative of the primary current and the phase to ground primary voltage. The base-plate of the sensor (see Fig. 1) must be grounded.

4.3 Safety

The Electronic voltage – current sensor Altea CVS-24-O has an intrinsically safe failure mode. In case of failure, avoids explosive shattering of the housing. The Supplier is able to provide sufficient service experience evidence to support that the design adopted is not associated with brittle fracture problems.

4.4 Material

The Altea CVS-24-O is in silicon "*Silic 1.75*" whose features are reported in Table 4.2. These features are relevant to vulcanized rubber samples after 30 minutes at 150 °C.

Table 4.2

Features of ***Silic 1.75***	**Value**	**Unit**	**Reference Standard**
Density	1,1 ± 0,2	kg/l	ISO 2811-ISO1183, at 20° ASTM 792
Hardness	40 ± 5	Shore A	ISO 7619 – ISO 868 ASTM D2240
Tensile strength	≥ 3,6	N/mm^2	ISO 1421 DIN 53504

Breaking elongation	≥ 260	%	ISO 1421 DIN 53504
Residual Elasticity	≥ 61	%	DIN 53512
Tearing strength	≥ 14	N/mm	ISO 34 D624-B
Dielectric strength	23 ± 3	kV/mm	DIN 53481
Resistance to leakage current	> 3	kV	VE0441 DIN 57303
Hot expansion coefficient (from 30 to 140 °C)	$44 \cdot 10^{-6}$	1/K	DIN 52612
Thermal conductivity (at 50 °C)	0,3	W/mK	DIN 52612 at 30 °
Minimal silicon content	> 55%		

5. RATING OF THE ALTEA CVS-24-O

5.1 Standard value of rated current [2, 5 and 1, 5]

5.1.1 Rated primary current

The Altea-CVS 24-O operates with rated primary current 300 A.

5.1.2 Rated secondary voltage

The output of the ECT of Altea-CVS 24-O is a voltage signal with 0.2 V rated value.

5.2 Standard value of rated voltage [1, 5.1]

5.2.1 Rated primary voltage

The Altea CVS 24-O operates with rated primary voltage value $20/\sqrt{3}$ kV.

5.2.2 Rated secondary voltage

The output of the EVT of Altea-CVS 24-O is a voltage signal with rated value 1 V.

5.3 Standard values of rated output

The accuracy class of the Altea CVS-24-O is validated for load impedances greater than 100 kΩ.

5.4 Standard values of auxiliary power supply

Power supply voltage value for the Altea CVS-24-O is ± 12 Vdc.

5.5 Standard reference values of other influencing parameters

5.5.1 Standard reference range of frequency
The accuracy class of the Altea CVS-24-O is assured for frequencies equal to the rated frequency ± 1,5 Hz.

5.5.2 Standard reference range of auxiliary power supply voltage
The accuracy class of the Altea CVS-24-O is assured for auxiliary power supply ranging from 90 % to 110 % of the rated auxiliary power supply voltage.

5.5.3 Standard reference range of temperature
The standard reference range of ambient air temperature is [-40; +55 °C].

6. DESIGN FEATURES OF THE ELECTRONIC VOLTAGE - CURRENT SENSOR CVS-24-O

6.1 Insulation requirements for primary voltage of CVS-24-O [2, 6.1 and 1, 6.1]

6.1.1 Rated insulation levels for primary terminals
The maximum primary voltage for the Altea CVS-24-O is 24 kV.

6.1.2 Power-frequency withstand voltage
Power-frequency withstand voltage is 50 kV in wet conditions.

6.1.3 Lightning impulse capability
The lighting impulse capability is 125 kV in dry conditions.

6.1.4 Partial discharges
The Altea CVS-24-O features partial discharge levels lower than 50 pC at 28,8 kV (equal to 1,2•24 kV) and lower than 20 pC at 16,6 kV (equal to 1,2•24/√3 kV).

6.2 Limits of temperature rise [1, 6.4]

Altea CVS-24-O withstands the thermal effects caused by the following conditions:

– maximum specified ambient air temperature (+ 55 °C);
– rated frequency (50/60 Hz);
- Rated continuous thermal current (360 A)
– 1,2 times the rated primary voltage [1,2•20/√3 = 13,9 kV];
 the combination of auxiliary power supply voltage and secondary burden which causes the maximum internal power dissipation of the secondary converter.

6.3 Transmitted overvoltage requirements [1, 6.]

Alta CVS-24-O is protected against the transmission of overvoltage from the primary side to the secondary output or to the auxiliary power supply connections.

6.4 Electromagnetic compatibility requirements [1, 6.7]

Altea CVS-24-O is in compliance with all the requirements reported in [1] concerning either immunity and emission of Electromagnetic disturbances. The following tests have been carried out and passed.

6.4.1 Emission requirements

6.4.2 Immunity requirements
- Harmonic and interharmonic disturbance
- Slow voltage variation
- Voltage dips and short interruptions
- Surge immunity
- Electrical fast transient / burst
- Oscillatory wave immunity
- Electrostatic discharge
- Power frequency magnetic field immunity
- Pulse magnetic field immunity
- Damped oscillatory magnetic field immunity
 Radiated radio-frequency electromagnetic field immunity.

6.5 Reliability [1, 6.8]

The estimated MTTF of the Altea CVS-24-O is 250.000 h.

6.6 Earthing terminals [1, 6.12]

6.6.1 Earthing of the primary voltage and primary converter

Altea CVS-24-O is connected to earth potential trough the two clamping M12 screws mounted on the bottom of the insulator (see Fig. 1). The sensor is safely connected to ground potential only through the support rod.

7 TESTS FOR CVS-24-O

Altea CVS-24-O is compliant with Standard IEC 60044-7, IEC 60044-8 for the electrical features and the voltage and current sensors. Altea CVS-24-O is compliant with standard ENEL DY1059-A70 for mechanical features. In the following the Type tests and Routine tests performed for Altea CVS-24-O are listed.

7.1 Type tests for the current transformer [2, 7.2]

a) short-time current tests [2, 8.1];
b) temperature-rise test [2, 8.2];
c) lightning-impulse test [2, 8.3.2];
d) switching-impulse test [2, 8.3.3];
e) wet test for outdoor type electronic current transformers [2, 8.4];
f) transmitted overvoltage test [2, 8.6];
g) EMC tests: emission [2, 8.8.3];
h) EMC tests: immunity [2, 8.8.4];
i) accuracy test [2, 8.9];
j) additional accuracy tests for protective electronic current transformer [2, 8.10];
k) verification of the protection [2, 8.11];
l) tightness tests [2, 8.12];
m) vibration test [2, 8.13].

7.2 Routine tests for the current transformer [2, 7.3]

a) verification of terminal markings [2, 9.1];
b) power-frequency withstand test on primary terminals [2, 9.2];
c) partial discharge measurement [2, 9.2.2];
d) power-frequency withstand test for low-voltage components [2, 9.3];
e) accuracy tests [2, 9.4];
f) tightness tests [2, 9.5].

7.2.1 Additional routine tests for analogue output [2, 9.7]

a) measurement of secondary direct voltage offset (U_{sdc0}).

7.3 Special tests for the current transformer [2, 7.4]

a) accuracy test versus harmonics [2, 10.4].

7.4 Type tests for the voltage transformer [1, 7.1]

a) lightning impulse test [1, 8.1.2];
b) switching impulse test [1, 8.1.3];
c) wet test for outdoor type electronic voltage transformers [1, 8.2];
d) tests for accuracy [1, 8.3];
e) abnormal conditions withstand capability test [1, 8.4];
f) radio interference voltage test [1, 8.5];
g) transmitted overvoltage test [1, 8.6];
h) electromagnetic compatibility tests: emission [1, 8.7.1]
i) electromagnetic compatibility tests: immunity [1, 8.7.2]
j) transient performance test [1, 8.9]:

- primary short-circuit [1, 8.9.1].

7.5 Routine tests for the voltage transformer [1, 7.2]

a) verification of terminal markings [1, 9.1]
b) power-frequency withstand tests on primary voltage terminals [1, 9.2]

c) partial discharge measurement [1, 9.2.4];
d) power-frequency voltage withstand test for low-voltage components [1, 9.3]
e) tests for accuracy [1, 9.4]

7.6 Special tests for the voltage transformer [1, 7.3]

a) accuracy test versus harmonics.

In addition, for Combined electronic transformers integrating the use as post insulators for outdoor service in electrical installations, test foreseen by the standard [6] apply.

7.7 Type tests for outdoor post insulator installation [6, 17.3]

a) water absorption test;
b) dry lightning impulse withstand voltage test;
f) wet power-frequency withstand voltage test;
g) partial discharge extinction voltage test [6, 3.5];
j) test for deflection under load at normal ambient temperature conditions;
k) mechanical failing load test: bending test, tensile test, torsion test.

8 MARKINGS

8.1 Terminal markings

The connector is RJ45 type. Refer to Fig. 2 for the connections pin-out.

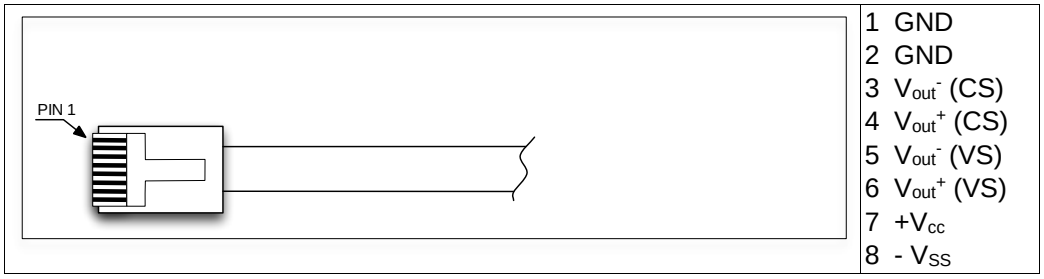

Figure 2 – RJ45 connector for auxiliary power supply, EVT output, ECT output

8.2 Record of the CVS

Altea B.V. maintains records of all produced devices for a minimum of 10 years. Records contain the information listed below:

– product code;
– year of manufacture;
- Serial number/s;
– type tests, date and results;
– routine tests, date and results.

8.3 Maintenance requirement

Altea Electronic voltage - current sensor CVS-24-O is a disposable device. No sub-parts can be replaced.

9. ACCURACY FOR SINGLE-PHASE ELECTRONIC VOLTAGE – CURRENT SENSOR ALTEA CVS-24-O [2, 12]

The Altea CVS-24-O belongs to the Accuracy class 0,5 in the ambient air temperature range [-40; + 40 °C].

As far as specific accuracy requirements for power metering are concerned, the performances of the electronic voltage and current sensors at harmonic frequencies are in the following tables:

Accuracy class	Percentage ratio error (±) at the harmonics shown below				Phase displacement (±) at harmonics shown below							
					Degree				Centiradians			
	2nd to 4th harmonic	5th to 6th harmonic	7th to 9th harmonic	10th to 13th harmonic	2nd to 4th	5th to 6th	7th to 9th	10th to 13th	2nd to 4th	5th to 6th7	to nth to 9t	10th to 13th
0,5	5 %	10 %	20 %	20 %	5	10	20	20	9	18	35	35

Accuracy class	Percentage ratio error (±) at the harmonics shown below	Phase error (±) at harmonics shown below	
		Degree	Centiradians

	1st to 2nd harmonic	3rd to 50th harmonic	1st to 2nd	3rd to 50th	1st to 2nd	3rd to 50th
Special quality metering	1 %	5 %	1	5	1,8	9

END OF DOCUMENT

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