



CTO

Current Transformer with Optical sensors 72.5 to 765 kV



AREVA T&D's motivation to develop and utilize "non conventional instrument transformers" (NCIT) is driven by several significant advantages foreseen by the utilities and manufacturers in terms of:

- > Cost reduction
- > Switchgear integration and potential substation size reduction
- > Concern for the environment
- > Intrinsic safety
- > Improved measurement performances
- > Simplification of installation, commissioning, settings and maintenance
- > Many other advantages following from the Digital Communication of Sample Values

AREVA T&D has been working in this very promising domain since the early 1990s and offers a full range of products in various applications. The CTO described in this brochure is the result of our commitment in this new generation of instrument transformers.



CTO 69 kV installed at Kunitz substations for LCRA, USA

MAIN FEATURES

- > **Improved measurement performances**
Extended dynamic range, no saturation, higher bandwidth and possible readjustable outputs are all possible with NCIT technology.
- > **Significant cost reduction**
Direct or indirect financial gains can be achieved by taking advantage of compact design, reduced wiring, as well as the possible integration of switchgear devices -- all offering a more compact substation.
- > **World-wide standard for interconnection**
It is a very important point to guarantee the interface connection between various technologies and manufacturers.
- > **Reliability - Availability - Safety**
The High Voltage insulation is simplified. Electronic signal processing offers possibilities of redundancies, self-monitoring, predictive and reduced maintenance.
- > **Environmentally friendly**
As there is no oil nor gas inside assures a much longer life, total safety and no maintenance at all.

Customer Benefits

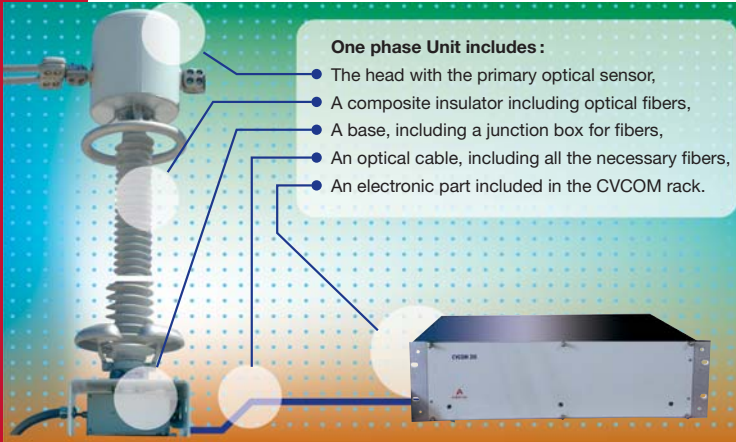
- Improved measurement performances
- Significant cost reduction
- Environmentally friendly
- World-wide standard for Interconnection
- Reliability, availability, safety



A New Generation of Current Transformers

The "CTO" (Current Transformer with Optical sensors), is a "standalone" range of devices able to measure the current of High Voltage lines for revenue metering application, as well as for protection purposes.

We use a product derived from HV line insulator and manufactured with a central fibreglass epoxy rod, covered with a silicone helical shed. The optical fibres are integrated between the rod and the silicone.



THE OPTICAL CABLE

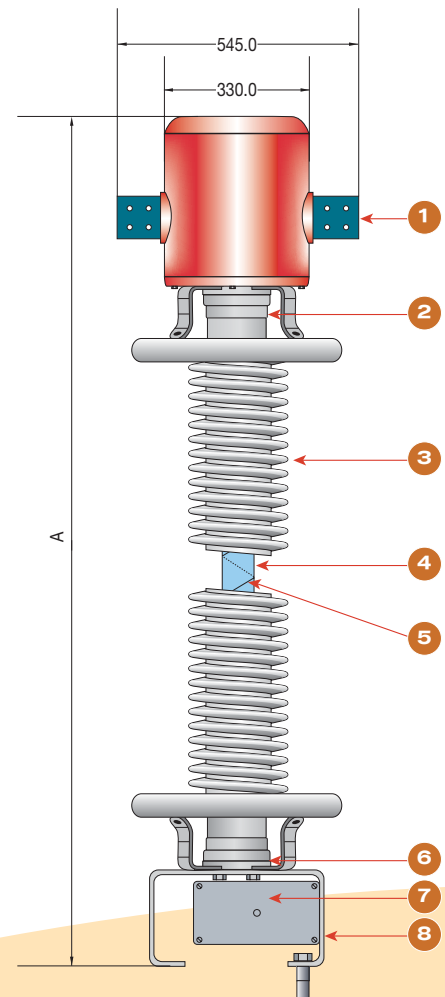
The optical cable packages all the necessary optical fibers, plus some redundancies.

The optical connections in the base of the CTO are FC connectors and we are using multimode 200/230 fibers.

CTO COMPOSITE INSULATOR

The composite insulator has the following functions:

- To hold up the sensor head, withstanding the mechanical forces specified by the application (in any position: vertically, horizontally or suspended);
- To insulate the CTO upper part from the base. Depending on the voltage system, the height of the insulator is specifically adapted;
- To include the optical fibers needed by the current optical sensor, and its eventual redundancies.



Designation	Unit	CTO 69	CTO 138	CTO 230	CTO 345	CTO 400	CTO 500	CTO 765
Maximum system voltage	kV rms	72.5	145	242	362	420	550	800
Nominal system voltage; ph-ph	kV rms	69	138	230	345	400	500	765
Nominal system voltage; 0-ph	kV rms	39.8	79.6	132.8	199.2	230.9	288.6	441.6
BIL (Basic Insulated Level)	kV cret	350	650	1050	1300	1425	1800	2050
Power Frequency applied voltage test	kV rms	140	275	460	575	630	800	920
Switching impulse insulation level; wet	kV cret	Not req'd	Not req'd	Not req'd	825	1050	1175	1425
Arcing distance	mm	618	1156	1849	2339	3064	3830	4560
	inch	1070.50	2006.17	3208.82	4059.19	5317.38	6646.72	7913.59
Creepage distance	mm	1850	3470	5648	6900	8800	11000	18000
	inch	3210.56	6021.97	9801.75	11974.51	15271.84	19089.81	31237.86
A - Total height	mm	1440	1979	2676	3365	4426	4860	5592
	inch	2499.03	3434.43	4644.03	5835.75	7681.04	8434.22	9704.56
Total weight	kg	100	120	130	150	160	165	180
	lbs	221	265	287	331	353	364	397

- 1 High voltage terminal
- 2 Aluminum top fitting
- 3 Silicone sheds
- 4 Fiberglass epoxy tube
- 5 Optical fibers
- 6 Aluminum bottom fitting
- 7 Junction box
- 8 Base

ELECTRONICS AND INTERFACE

AREVA T&D has developed a merging unit (called CVCOM 300S) applicable for all AREVA type of NCIT technology used in AIS and GIS substations.

The main functionality includes:

- > signal processing (analogue and digital) for all types of sensors;
- > merging and synchronization of 3 phase sensors line (3Ip, ΣIp, 3Up, ΣUp);
- > supply standardized interface: analogue and digital;
- > multicast distribution to several IED equipment;
- > self-monitoring of sensors and electronics; maintenance assistance;
- > display of sensor settings; possible modifications.

ANALOGUE INTERFACE FOR METERING

Amplified output for Revenue Metering.

For "revenue metering" application only, it is possible to provide amplified solutions due to the low dynamic of measurement, limited bandwidth, and limited output power. These outputs are compatible with electronic meters.

Current

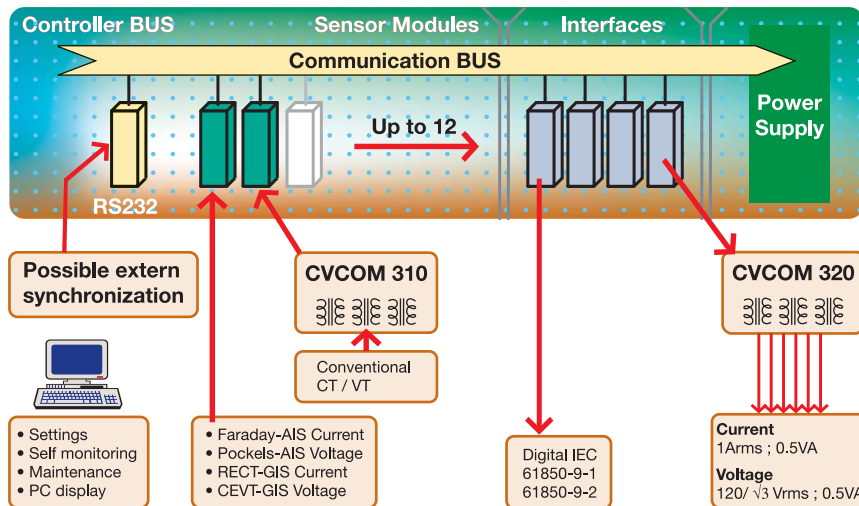
Metering class: 1 Arms for Nominal Current

Voltage

Metering class: 120/√3 Vrms for Nominal Voltage.

MERGING UNIT - CVCOM 300S

CVCOM 300S ; Rack 3U - 19"



DIGITAL INTERFACE FOR METERING AND PROTECTION

For digital electronic equipment, we have a "peer-to-peer" direct digital connection between the merging unit and the IED using a field network.

DIGITAL PROTOCOL

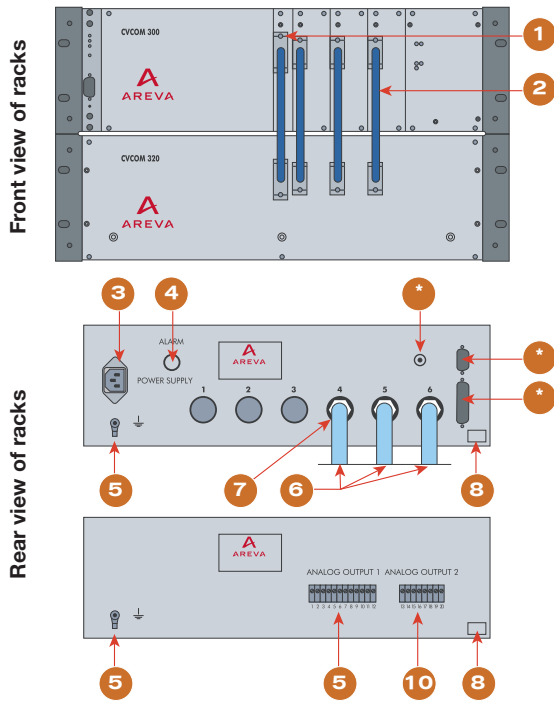
- > IEC 61850-9.2 LE
- > IEC 61850-9.1





Your Partner in Optical Technology

ANALOGUE INTERFACE



- 1 SubD 15
- 2 SubD 9
- 3 Mains connectors
110 VAC or 230 VAC
- 4 Remote alarm
DIN 41524 connector
terminal 1
- 5 Ground terminal
- 6 Optical cable phase A, B, C
- 7 Cable gland
- 8 Traceable label
- * Do not connect
- 9 Analog output 1
- 10 Analog output 2

DIGITAL INTERFACE



SUMMARY OF PERFORMANCE : CTO

> Primary Rated Voltage:	72.5 kV to 765 kV Other voltages: refer to factory
> Primary Rated Current:	1 A to 4000 A Other currents: refer to factory
> Secondary Rated Current: Amplified metering output Digital output	1 A; 0.5 VA IEC; 61850-9.2 / 9.1
> Dynamic and Accuracy Metering current Protection current Bandwidth	IEC; Class 0.2 S IEC; Class 5P20 0.5 Hz to 6 kHz
> Environment Operating temperature Outdoor equipment	-50° C; +55° C (Celsius degrees) -122° F; +131° F (Fahrenheit degrees)
Indoor equipment	-5° C; +50° C (Celsius degrees) -41° F; +122° F (Fahrenheit degrees)

Other specific requirements: refer to factory

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