



Dear Valued Customer,

We trust this finds you, your families and your teams well and safe in these unprecedented times.

As part of our ongoing email campaign to showcase the technology, capabilities and value-differentiators that makes Virginia Transformer – Georgia Transformer (VT – GT) the preferred choice for your Power Transformer needs – please see attached information on our VCM portfolio of monitoring and diagnostic modules that enable maintaining your transformers for Data Center installations in prime operating condition, and deliver 60-year service life.

The VCM technology is available in the following product versions:

- 1. VCM2:** This module provides comprehensive monitoring of transformers' key operating parameters and provides actual and on-line diagnostics with DCIM-compatible output. Parameters monitored include Winding Temperature, Oil Level, Pressure, PRD/SPR activation, fan control alarms etc.
- 2. VCM3:** VCM 3 is our most advanced transformer monitoring and protection solution. It provides all the functions of VCM2 plus loss of life analysis, dissolved H2 gas analysis, moisture in oil, moisture in paper insulation, LTC tap position, LTC differentiated temperature, LTC Off-Tap, Low N2 pressure alarm etc. All values of measurement can be charted, analyzed and can be integrated into DCIM and smart grid intelligence
- 3. VCM Sentry:** VCM Sentry is the latest addition to the VCM family and provides a cost-effective solution that provides real-time monitoring of basic operating parameters. In addition to local alerts, features include remote alerting and reporting and proactive maintenance support (through a subscription service). VCM Sentry will be factory-installed for no-charge on all liquid-filled transformers from 5MVA to 30MVA shipped after April 1st, 2020

We look forward to an opportunity to discuss how we can support your need for Power Transformers equipped with effective monitoring and diagnostics capability, on your ongoing and upcoming Data Center Projects. You can contact our Sales Leaders on their phone as below, or via e mail:

Steve Park – Sales Director – Commercial & Industrial Market: 540.988.3037
Brian McCarrick - Regional Sales Manager - 540.581.2825

By email at: sales@vatransformer.com

For quote request please go to: <https://www.vatransformer.com/rfq/>

To order spare parts please go to: <https://www.vatransformer.com/services/#replacement-parts>

To learn more about “Genesis of a Perfect Transformer” please go to:
<https://www.vatransformer.com/resources/documentation-brochures/>

To read our White Papers on various aspects of technological excellence at VTC - GTC please to our library of White Papers on our website at:



VCM
VIRGINIA CONTROL MODULE

VIRGINIA - GEORGIA TRANSFORMER
ONE SOURCE-ONE COMMITMENT

TRANSFORMER MONITORING – SECURE AND EXTEND TRANSFORMER LIFE

Comprehensive monitoring of transformers' key operating parameters provides control outputs and diagnostics for long life of the transformer. With integrated intelligence, and analysis of the transformer's condition from VT-GT, maintaining the transformer in prime operating condition is made easier and the life of the transformer is extended. This value added protection of the asset serves as an intelligent transformer physician.

VCM KEY BENEFITS:

While the VCM2 monitors all the essential operating parameters of the transformer, VCM3 adds additional protection by enabling:

- *Detects Moisture in Oil*
- *Evaluates Moisture in Insulation*
- *Loss of Life Algorithmic Projection*
- *Measures H₂ Dissolved Gas*
- *Records Short Circuit Occurrences*
- *SCADA compatible; DNP3 or Modbus Protocol*



VCM2

A Second Generation, PLC based Transformer Monitoring and Diagnostic Module developed by Virginia Transformer Corp. This device monitors all essential transformer operating parameters, providing actual and on-line diagnostics with SCADA output.

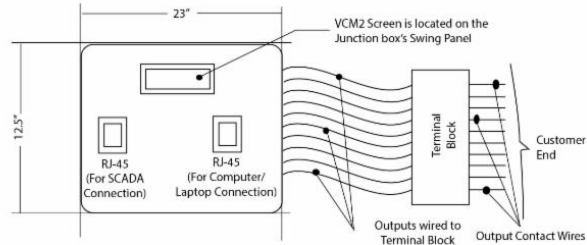
VCM 2 provides transformer monitoring and protection

The VCM-2 is an integrated module for all essential transformer parameters with accurate monitoring, control and data collection.

Virginia Transformer Corp offers VCM2 state of the art technology to provide comprehensive monitoring and protection for Class I power transformers.

FEATURES

- ◆ VCM2 uses solid state devices for best reliability
- ◆ Unlike other ETM's, VCM doesn't require any external RTD's and other components. VCM2 includes sensors for measurement
- ◆ Sensors used in the VCM2 are more accurate compared to conventional mechanical gauges
- ◆ Contacts generate messages if exact set points are fixed, but the user can change the set points locally on the VCM2 screen or remotely from the customer's computer or laptop
- ◆ Set Points can be changed through the wired connection with a secure user ID and password
- ◆ Output Contacts can be tested (locally) in the field using the screen
- ◆ SCADA compatible: DNP3 or Modbus protocol
- ◆ Life time data is available for download anytime
- ◆ Analyze transformer performance based on saved measurements and data
- ◆ Capability to communicate the data between the VCM2 and the user through wired connection
- ◆ 110/ 220 VAC 50 /60 cycle power
- ◆ No maintenance required



Output Controls

Based on the measurements, the following set points are activated:

Winding Temperature

Fanstage 1 Fanstage 2
Alarm Trip

Oil level

Low level, Low-low level, High level

Pressure

Hi tank pressure, Low Tank Pressure

Outputs and Measurements: Oil Temperature, Tank Oil Level, Tank Pressure, Winding Temperature, Ambient Temperature

Other controls and outputs:

PRD activation, SPR activation, Fan Control Alarms

Display/Reporting:

All measurements and alarms are displayed locally on screen. Set points for fan operation and alarms can be changed locally for start up and testing. The measurements and historical data are available locally and through SCADA connection

VCM2 Package

Components:

1. Sensor box

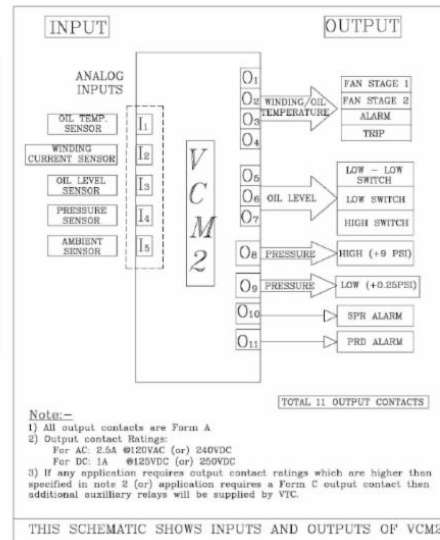
- Top oil temperature sensor
- Liquid level sensor
- Pressure sensor
- Ambient temperature

2. Current Transmitter Sensor

to measure the load current.

3. SCADA Connection

Modbus or DNP3 Protocol





Provides all the functions of VCM2 plus loss of life analysis, dissolved H₂ gas analysis, moisture in the oil, moisture in paper insulation, LTC Tap Position, LTC differential temperature, LTC Off-Tap, Low N₂ Pressure Alarm

VCM 3 provides the ultimate in transformer monitoring and protection

For the first time in the industry all the values of measurements can be charted and analyzed for abnormal heating and gassing condition to schedule maintenance and achieve an extended life of the transformer, providing an early warning of impending failure. When integrated into the smart grid intelligence, this feature will protect the transmission system against a brown out or a black out.

Only VTC transformers offer VCM3 state of the art technology to provide comprehensive monitoring and protection of Class II power transformers with or without LTC, essentially making an Intelligent Transformer. Service interruptions are avoided with status reports of operating parameters. In the event of a potential condition, the VCM3 displays a warning locally on screen and sends an alarm to the user's computer when connected.



FEATURES

Solid-state Sensors and Set Points, 25 Point Annunciator

- ◆ Moisture in Oil and Paper Insulation
- ◆ Measures H₂ Dissolved Gas
- ◆ Low nitrogen pressure alarm
- ◆ Loss of Life Evaluation
- ◆ LTC Monitoring
- ◆ Detects, displays and records the number of short circuit fault current events on the transformer, magnitude and time of occurrence
- ◆ Fast response pressure sensors sense the Rapid Pressure Rise to latch the rapid pressure relay contact
- ◆ Fail Safe Operation - fans will turn on
- ◆ All data is compatible to SCADA through Modbus/DNP3 protocols
- ◆ Solid-state sensors with analog outputs and comparator circuits replace the mechanical gauges
- ◆ Output Contacts can be tested (locally) in the field changing the set points on the screen
- ◆ Should any sensors become disabled, an alarm message is sent and displayed locally
- ◆ A touch screen annunciator provides a local display of all parameters

H₂ Gas, Moisture, Loss of Life Monitoring

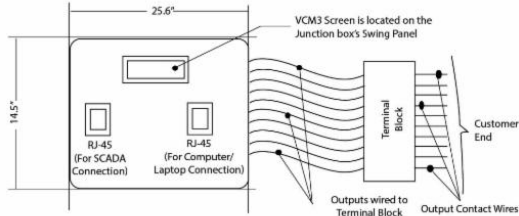
- ◆ VCM3 performs on-line Dissolved Gas Analysis (DGA) for Hydrogen utilizing a state-of-the-art gas detector module. It measures the moisture in oil in PPM, evaluates % moisture in paper insulation using a VTC proprietary algorithm. This combines to evaluate Loss-of-Life in the transformer

LTC Monitoring

- ◆ For transformers with an On-load Tap Changer, VCM3 includes the feature of monitoring LTC position, number of operations, LTC Differential temperature, and provides contacts for 16L, 16R, N and Off-Tap position indication

Display/Reporting

- ◆ All measurements and alarms are displayed locally on a touch screen monitor. Set points for all monitored parameters and alarms can be changed locally or from a connected laptop/computer. The measurements and lifetime historical data are available locally and downloadable to a computer; SCADA compatible, DNP3 or Modbus options.



VCM3 Package

Components:

1. Sensor box

- Top oil temperature sensor
- Liquid level sensor
- Pressure sensor
- Ambient temperature

2. Current Transmitter Sensor to measure the load current.

3. Short Circuit Fault Current Detector.

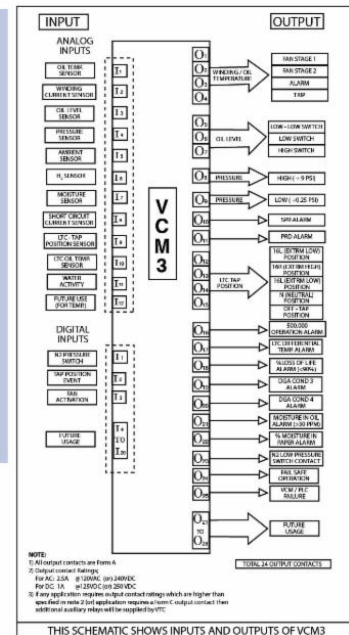
4. Gas & Moisture Sensor.

5. LTC Oil Temperature Sensor.

6. LTC Tap Position Sensor Assembly.

7. N₂ Pressure Switch

8. SCADA Connection Modbus or DNP3 Protocol



VCM Comparison to other monitoring devices

FEATURES	VCM2	VCM3	Qualitrol ETM 509	Dynamic Rating ETM	SEL 2414	Advanced TTC 1000
Pressure Transducer	Yes (i)	Yes (i)	No	No	No	No
Ambient Temperature Transducer	Yes (i)	Yes (i)	No	No	No	No
Level Transducer	Yes (i)	Yes (i)	No	No	No	No
Top Oil Temperature Transducer	Yes (i)	Yes (i)	No	No	No	No
LTC Temperature Transducer	No	Yes (i)	No	No	No	No
Load Current Monitoring Sensor	Yes (i)	Yes (i)	No	No	No	No
Short Circuit Fault Current Sensor	No	Yes (i)	No	No	No	No
LTC Position Sensor	No	Yes (i)	No	No	No	No
Oil Temperature Monitoring	Yes	Yes	Yes – Optional			
Winding Temperature Monitoring	Yes	Yes	Yes – Optional			
Load Current Monitoring	Yes	Yes	Yes – Optional			
Ambient Temperature Measurement	Yes	Yes	Yes – Optional			
Pressure Monitoring	Yes	Yes	Yes-Optional		No	No
Liquid Level Monitoring	Yes	Yes	Yes-Optional		No	No
Periodic Fan Bank Exercise	No	Yes	Yes	Yes	Yes	Yes
LTC Differential Temperature	No	Yes	Yes – Optional			
LTC Tap Position Display	No	Yes	Yes – Optional			
LTC (Off-Tap)	No	Yes	Yes – Optional			
(16L, 16R, Neutral)	No	Yes*	No	No	No	No
LTC Operation Position Counter	No	Yes	Yes – Optional			
Output Contacts	11	25	8	5	8	8
# Annunciation	Yes (11 Point)	Yes (25 Point)	Yes (8 Point)	Yes (5 Point)	Yes (8 Point)	Yes (8 Point)
Fan Failure Detection	No	Yes	No	No	No	No
Dissolved Gas in Oil - Measurement	No	Yes (H ₂ Only)	No	Yes (H ₂ Only)	No	No
Transformer Loss of Life Tracking	No	Yes	Yes	Yes	Yes	Yes
Measurement of Moisture in Oil (in PPM)	No	Yes	No	Yes - Optional	No	No
Moisture in Insulation (%)	No	Yes	No	No	No	No
Duration and Magnitude of Short Circuit Fault Current	No	Yes	No	No	No	No
Nitrogen Cylinder Low Pressure Switch	No	Yes	Yes – Optional			
SCADA Protocol: Modbus, DNP3	Yes	Yes	Yes	Yes	Yes	Yes
Supports Ethernet Connection	Yes	Yes	Yes	Yes	Yes	Yes
Supports Fiber Optic Connection	No	No	Yes	No	No	Yes
Historical Data Storage and Download Available	Yes 60 Years	Yes 60 Years	Yes 2 Years	Yes 2 Years	Yes 2 Years	Yes 2 Years

i = All sensors/transducers included, No other hardware required

* Additional auxiliary relays will be supplied with VCM3, if FORM C contacts are required

The **VCM** is a proprietary PLC based monitoring and diagnostic module developed by Virginia Transformer Corporation, fitted exclusively on VTC Transformers and a single point service provided by VTC.

VCM FREQUENTLY

ASKED QUESTIONS

Q: How is the transformer protected in case the SRI function is not operating due to failure of the pressure sensor?

A: There are four levels of protection provided in VCM3:

1. The Solid-State sensors used are the finest quality. These sensors are made with a semiconductor quality control system similar to phones and TV's
2. If the PLC is not receiving a signal from any sensor for any reason, the VCM3 displays an error message on the local screen and on the remote monitoring that the sensor is disconnected. An inactive sensor alarm is also activated. (All sensors can be changed without draining oil)
3. In the event the VCM3 fails to show the Sensor Failed Alarm, the transformer is still protected by the mechanical Pressure Relief Device (PRD) set to open at 10 PSI.
4. In the event of a sudden pressure build up from gas generation, the sudden pressure relay will latch. This event will be registered by the Dissolved Gas Sensor and an alarm condition 1, 2, 3, 4 (depending on the amount of gasses) is displayed on the monitor via SCADA.

Q: Can VCM3 be used when a UL rated transformer is requested?

A: Yes, All components in VCM3 are UL listed.

Virginia Transformer Corp

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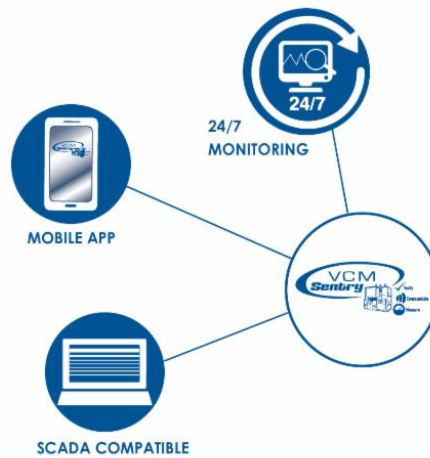
Information included in this manual was correct at the time of printing.
Virginia -Georgia Transformer reserves the right to discontinue products or
change specifications without prior notification.

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VCM Sentry provides cost-effective transformer monitoring, remote alerting and reporting

VCM Sentry is the latest addition to the VCM family of PLC-based monitoring and diagnostic modules and provides a cost-effective solution that provides real-time monitoring of basic operating parameters. In addition to local alerts, features include remote alerting and reporting and proactive maintenance support (through a subscription service).



FEATURES

- ◆ Liquid Level monitoring and reporting
- ◆ Liquid Temperature monitoring and reporting
- ◆ Ambient Temperature monitoring and reporting
- ◆ Tank Pressure monitoring and reporting
- ◆ Winding Temperature monitoring and reporting
- ◆ Sudden Pressure monitoring and reporting
- ◆ Pressure Relief Relay monitoring and reporting
- ◆ LED Alerts
- ◆ Ethernet Connectivity
- ◆ Industrial Cellular Telephone Connectivity
(When required and cellphone coverage available)
- ◆ PC-based Application
- ◆ Mobile Applications
- ◆ Remote Administration Application
- ◆ VTC Monitoring Service

Building on the success of VCM2™ and VCM3™ control modules, VCM Sentry brings the basic monitoring and diagnostic capabilities of its predecessors to the broader transformer market in a highly affordable solution available directly from the manufacturer.

In addition, Virginia Transformer Corporation (VTC) is offering a remote monitoring service capability linked to VCM Sentry that will deliver peace of mind to customers by continuously monitoring their transformers' performance and providing reports and alerts on key parameters.

VTC's remote monitoring service allows customers to link their VCM Sentry to VTC and receive reports and alerts that fit the customer's needs. Whether it's periodic performance readouts or real-time alerts on out-of-nominal conditions, VTC's service team will be there 24/7/365 to monitor all VTC Sentry-equipped transformers across the customer's sites.

VCM Sentry will be factory-installed for no-charge on all liquid-filled transformers from 5MVA to 30MVA shipped after April 1st, 2020. For transformers outside of this range, VCM Sentry will be available at a cost-effective price of \$2995. At no-charge, 6-month introductory monitoring subscription is included with all VCM Sentry units. Continuation of this service after the introductory period will be available for \$100 per month per transformer. Volume discounts are available on the service – check with your VTC representative.

About Us

Virginia – Georgia Transformer is a US-based and owned Corporation that has been in business for nearly 50 years with 4 plants in North America designing and manufacturing a full line of Power Transformers from 500 kVA to 500 MVA, and up to 500 kV class.

Our Value Proposition: We promise to supply the most "Resilient" Power Transformer designed for 60 years life, that will meet 24/7/365 resilient power needs of the Customer.

Our value proposition is based on three key process philosophies:

Robust Design developed by expert engineers with over 300 years of electrical design experience using proprietary digital design tools, verified by off-the-shelf arsenal of digital simulation tools and executed with efficient proven processes

1. Flawless Execution based on 3T-Pillars: Training, Technology and Transformer Manufacturing Processes
2. Continuous Monitoring of Transformers using VCM Technology supported by 24/7 full-fledged Service Organization
3. Continuous monitoring of the critical parameters in operation, providing knowledge and analysis to achieve 60 yrs life.

Virginia – Georgia Transformer takes pride in being a Minority Business Enterprise - equipped with cutting edge technology, state of the art equipment, most qualified & experienced engineers and processes – which results in the reliability, and the shortest lead time in the Industry.

NOTE: VCM requires internet connection available on transformer to establish connection to server

VCM Sentry FAQs

What is VCM Sentry?

The Virginia Control Module (VCM) Sentry is a Programmable Logic Controller (PLC) device that monitors sensors placed within the tank of a liquid-filled transformer and captures and reports the status of key operating parameters. VCM Sentry is the 3rd product in VTC's family of monitoring solutions, following the launch of VCM2, and VCM3.

What functions does VCM Sentry perform?

VCM Sentry monitors liquid level, temperature and pressure by default, while optional monitoring of winding temperature, Sudden Pressure Release (SPR) and Pressure Relief Device is also available.

How does VCM Sentry work?

Sensors placed in the transformer tank during manufacturing are connected to the "brains" of VCM Sentry. Software programming on the PLC translates signals from these sensors into level, temperature and pressure values and continuously compares these values against parameters provided by the customer. If any value goes outside set limits, VCM Sentry generates an alert that notifies the customer that the transformer needs attention.

How much does VCM Sentry cost?

VCM Sentry is included at no-charge on all VTC liquid-filled units greater than 5MVA and less than 30MVA. If your transformer falls outside this range then VCM Sentry can be added at time of manufacture for \$2995.

I don't want the no-charge VCM Sentry on my transformer, can I order without it?

Yes. When ordering your transformer specify that you do not require VCM Sentry and it will be manufactured without it.

I already have a VTC liquid-filled transformer, can I add VCM Sentry to it?

If your VTC transformer has been equipped with liquid level, temperature and pressure sensors then your VTC Service team can install VCM Sentry onto the transformer.

How do I set VCM Sentry parameters for each transformer?

When you receive your transformer, VTC Service Team will work with you to complete a setup form that lists all parameters and will customize the settings to your requirements. These settings will then be programmed into VCM Sentry, which will trigger alerts based on those levels.

Can I upgrade from VCM Sentry to VCM2 or VCM3?

No. VCM2 and VCM3 require additional sensors that are not included with VCM Sentry.

Can I add the monitoring subscription at any time in the future?

Yes. Contact your VTC Service representative for more information.

How much is the monitoring service?

The monitoring service is \$100 per month per monitored transformer. Discounts are available for connecting 5 or more units to the service – contact VTC Service for more information.

I didn't want VCM Sentry when I originally ordered my transformer. Can I get it added now for no-charge?

No. If your transformer is ordered without VCM Sentry the necessary sensors will not be included in the tank so VCM Sentry cannot be added later.



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 CHIHUAHUA, MX 15 MVA 115 kV 0.5 MVA 4.1 kV	 ROANOKE, VA 30 MVA 138 kV 5 MVA 34.5 kV	 POCATELLO, ID 100 MVA 230 kV 12 MVA 69 kV	 RINCON GA 400 MVA 525 kV 30 MVA 115 kV
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Detailed specifications for all VTC VCM products and the remote monitoring service can be found at www.vatransformer.com/VCM.

VTC SERVICE: 1-800-882-3944

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