SURETECH VI-x Monitoring System
Voltage, Current, Phase, Quadrant, kWH, kVAH, kVARH… etc.
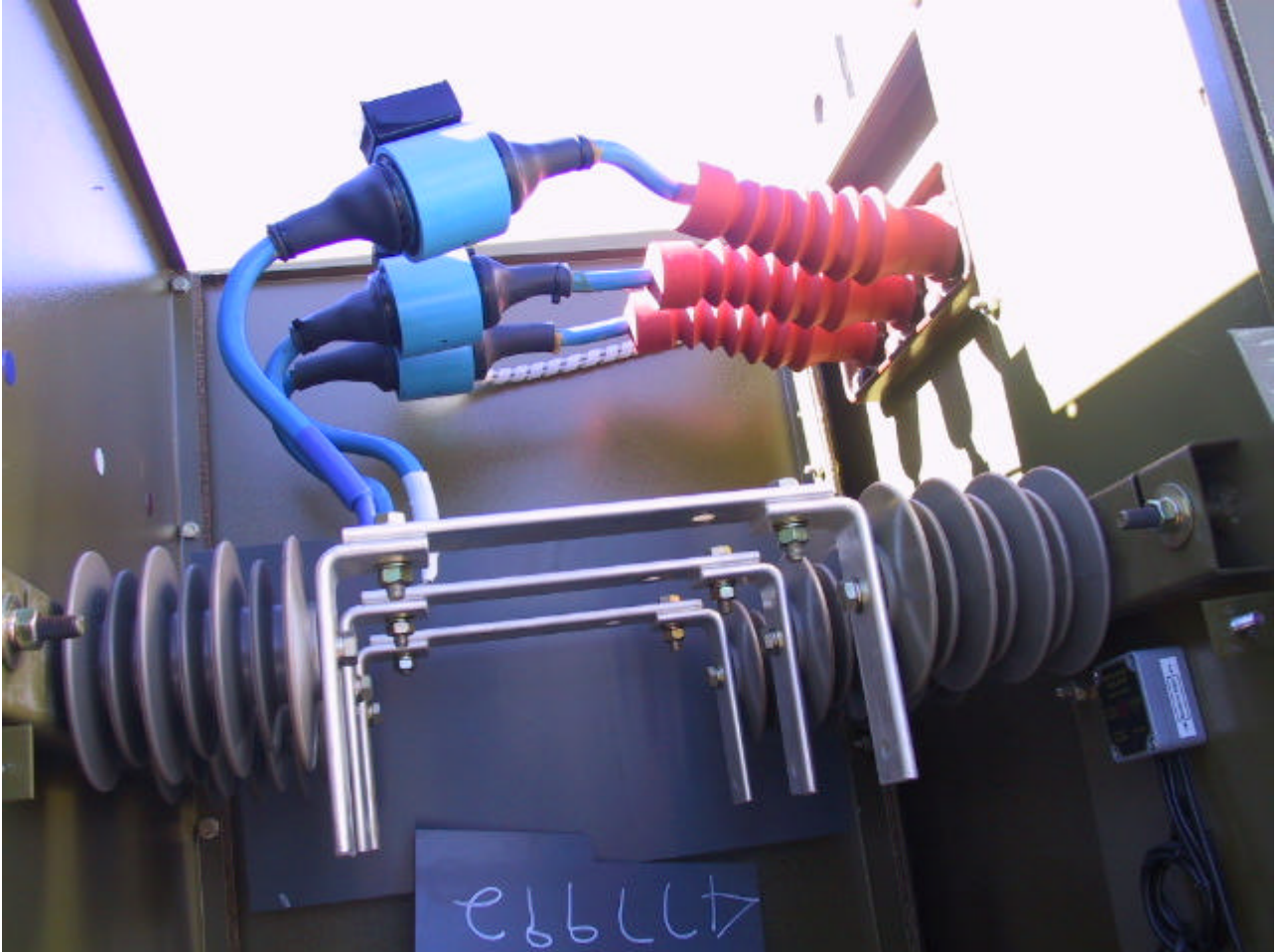
The SURETECH Vix monitoring system senses, processes and logs electrical parameters to data flash memory, on MV (Medium Voltage) equipment. Sensor outputs are fed to a SURETECH SLP (Smart Load Processor), which samples Voltage, Current, Phase angle and Quadrant, and processes all electrical parameters including Import / Export of: kW, kVA, kVARs, kWH, kVAH, kVARH; Power Factor, Phase angle, Frequency and others if required. All of this is available in THE SAFEST, most compact, and most cost-effective package.

Typical Applications:

- ✓ MV equipment (voltage, current etc) indications, data logging & reporting
- ✓ MV equipment (voltage, current etc) telemetry, SCADA
- ✓ MV equipment fault monitoring, protection
- ✓ MV system energy monitoring, energy management and control
- ✓ MV network operating, network management
- ✓ MV networks fault location

- ✓ MV network QOS sensors
- ✓ MV network planning and maintenance
- ✓ MV generation equipment monitoring and control
- ✓ MV motor equipment phase rotation, phase sequence monitoring and control
- ✓ MV Power factor monitoring and control
- ✓ MV equipment protection systems can be configured
- ✓ Extremely easy to install

General Features:

- ✓ Ultra SAFE, Ultra compact, Ultra cost-effective
- ✓ Technology can be used on MV voltages from 1kVac to 33kVac (11kV & lower available now)
- ✓ Cable ends can be used with existing cable, or add-in cable to mount sensors
- ✓ Cable ends can be supplied to users length requirements with integrated sensors (recommended)
- ✓ For use on 50Hz and 60Hz systems
- ✓ Can be configured to measure metering and fault currents from ONE current sensor coil
- ✓ Typical fault current FSD can be around 50 times higher than rated FSD
- ✓ Withstands any level of fault current indefinitely without damaging sensor
- ✓ Immune to lightning discharges e.g. 95kV on 11kV cables

- ✓ Cylindrical sensor has resin potted components for long life, and stability
- ✓ Integral cable connections between sensors and LV panel mounted SLP (Smart Load Processor)
- ✓ SLP is DIN rail clip on, and can be powered from a wide range of PSU sources
- ✓ Transient suppression on input and outputs
- ✓ Wide selection of input and output options including relays, opto-isolated, analogue and RS232
- ✓ Galvanic isolation from HV source
- ✓ Isolation from HV source to earth can be pressure tested to 2.5 times operating voltage
- ✓ Engineering backup to provide you support for design, applications information, installation, calibration & maintenance
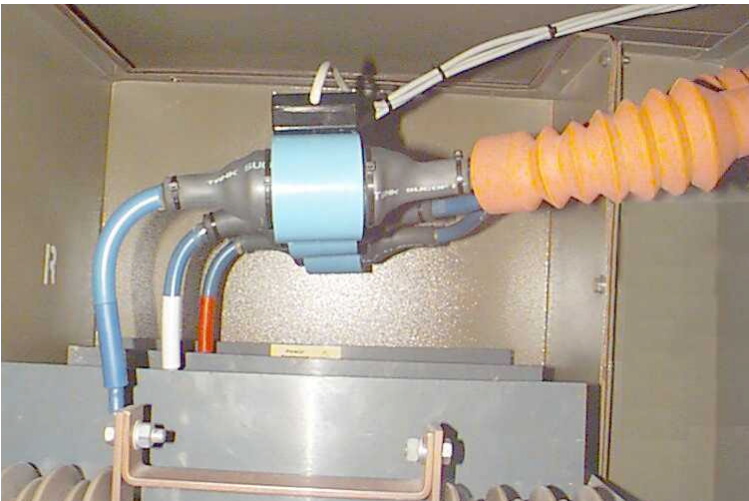- ✓ Patents pending

Above left: Alstom type Mini-sub top view

Above right Alstom type Mini-sub HV chamber

Below left: Desta type Mini-sub HV chamber

Below right: Desta type Mini-sub LV chamber
(Note: the SLP on the right, is a little larger than a conventional amp meter)
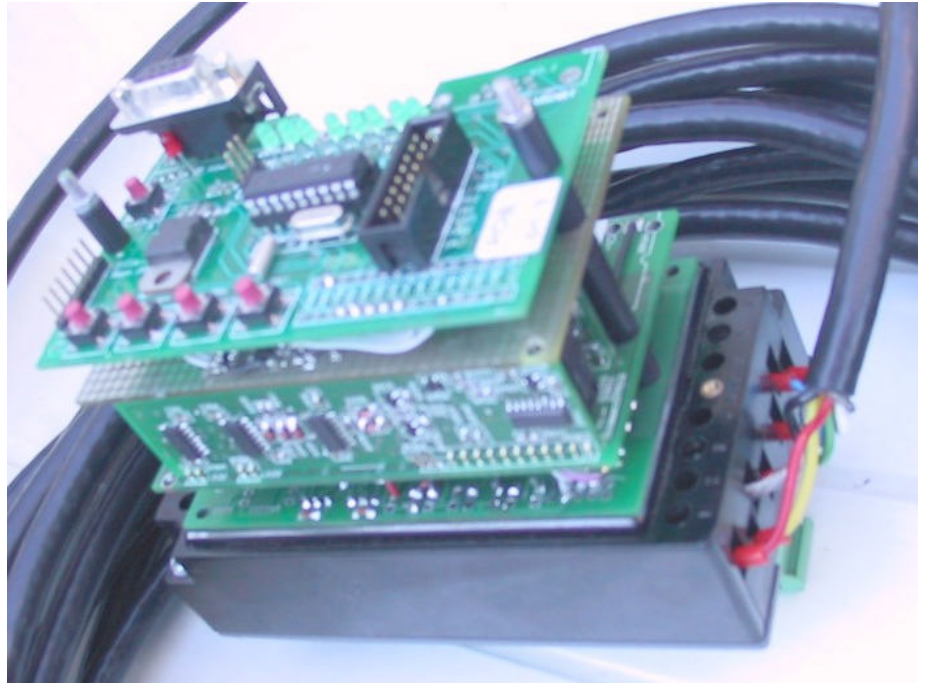
Sensor technology used:

- ✓ Maximum Electric Field stress within sensor is less than 800 Volts per mm, leading to no partial discharge within sensor, and hence extremely long life expectancy (normal MV bushings have higher stress levels than this)
- ✓ Current Sensors use Rogowski coil technology which has the following characteristics:
  - ✓ ultra linear (air does not saturate at high magnetic fields)
  - ✓ accurate
  - ✓ wide bandwidth
  - ✓ wide dynamic range (metering and protection
- ✓ Voltage sensors are capacitively coupled to HV source through air, or factory fitted dielectric material having following characteristics:
  - ✓ ultra linear
  - ✓ accurate
  - ✓ wide bandwidth
  - ✓ wide dynamic range (metering and protection
  - ✓ immune to fault voltages and lightning discharges e.g. 95kV on 11kV cables
- ✓ Cylindrical sensors have resin potted components for long life, and stability
- ✓ Integral cable connections between sensors and control enclosure
- ✓ Galvanic isolation from HV source
- ✓ Field proven

SLP (Smart Load Processor):

The SLP has the following features:

- Voltage and current transducers
- Microprocessor
- Battery backup for real time during power downs
- 1 MByte of Data flash memory for non-volatile data storage
- Serial communications to external logger or communications link
- power supply circuits required for the monitoring system
- Output from the sensors are fed by screened multi-core cable, to a junction box, and then to the SLP where the user's required functionality is determined.
- Sensors are factory calibrated on current and voltage as indicated on the sensor's lable.
- After installation, voltage and current can easily be re-calibrated should this be required, via RS232 port at the SLT. This can be done live at any time from a computer terminal.

Typical Configuration options:

Feature	Typical Ranges	Description
Current Inputs (FSD)	• 0-50, 100, 200, 500, 1000, 2000, 5000 Amp AC • Any others, please enquire	• PVC / poly-carbonate enclosed sensor • Measures - 50 or 60Hz • Sensor accuracy after calibration: 0.5%
Voltage Inputs (FSD)	• 0 - 4kV 12kV, 36kV MV sensors • Others also available	• Phase accuracy: < 1 degree • Bandwidth: 20Hz to 5kHz
Aux PSU (normally on SLP)	• Battery 12 - 30Vdc • 90V-260V ac/dc	• Power consumption 4VA • Temperature range: -10 to +60 degrC

Software functionality:

The SURETECH VIx monitoring system is being developed and adapted to meet a range of user needs. The following functionality can be

```
2003 220 23:59:00  T=015 DFct=02 PPtr=0852 PLst=0695  Per=01 Uno=2 Set=0
U=4153 3706 3744  I=03254 03258 03253  P=0409 0549 0572  Q=0 0 0
UAs=02710 05981  02405 44492  02430 24023
Wat=02577 16919  02223 13990  02245 16184
UAR=64903 08225  64793 36610  64784 24920

2003 221 00:00:00  T=015 DFct=03 PPtr=0852 PLst=0695  Per=01 Uno=2 Set=0
U=4157 3710 3744  I=03257 03257 03253  P=0408 0548 0572  Q=0 0 0
UAs=02758 25791  02448 55008  02473 57267
Wat=02623 12459  02263 05572  02285 28698
UAR=64891 55162  64780 13797  64770 60523
```

adapted to meet specific user requirements. The following features are typical of what the system can provide now:

- RS232 output to laptop computer in ASCII at 9600Bd
- Output record rate is once per second: data output is: year, day number, time, temperature, sampling period, V, I, Ph, Quadrant, Acc VA, Watts, and VARs
- Data flash sampling periods can be set: 1, 2, 5, 10, 15, 20, 30 and 60 minutes
- ASCII output is directly imported into Excel or other spreadsheets, to yield graphs of many parameters such as:
- Top graph shows current over one week for each phase
- Second graph shows hourly integration of kVAH over one week
- Third graph shows hourly integration of kWatts over one day
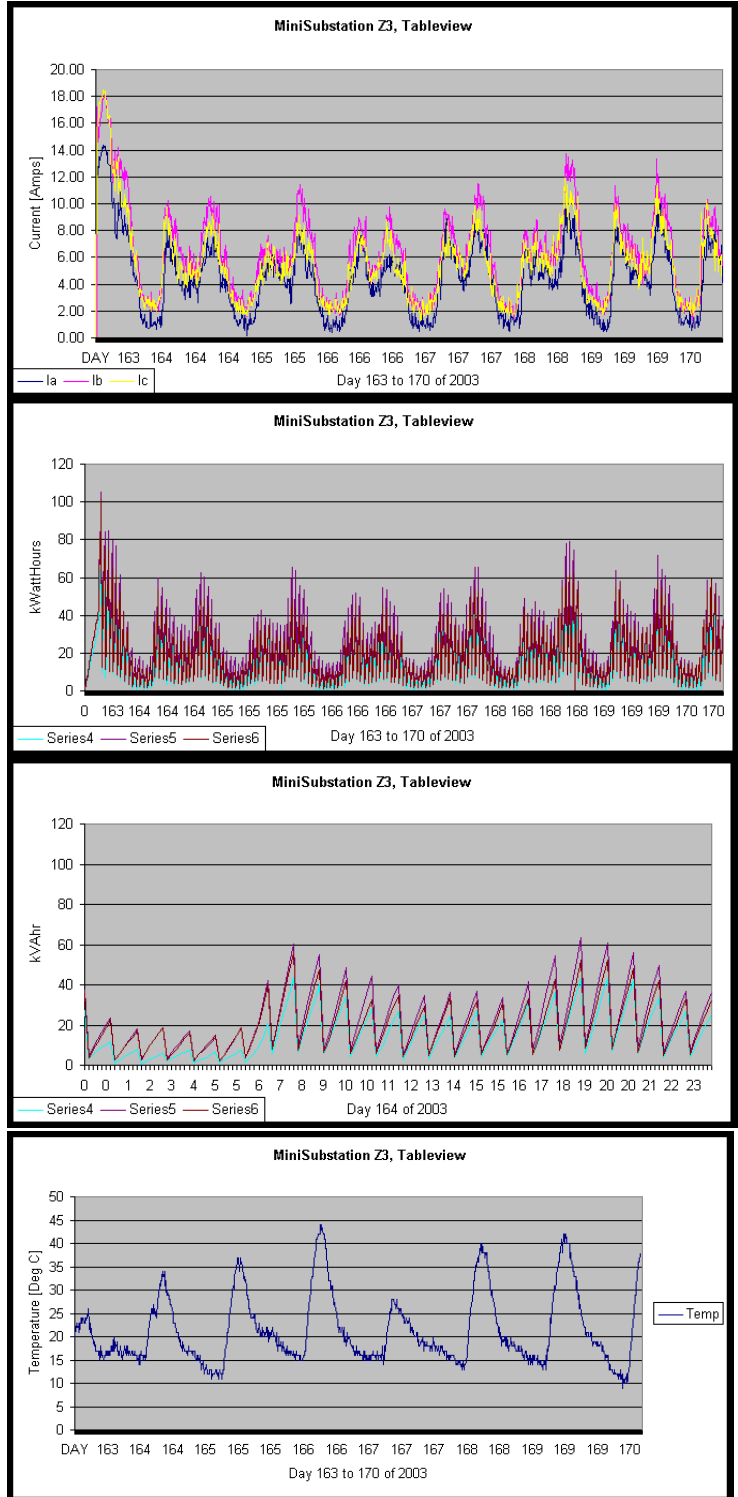- Bottom graph shows temperature of one sensor over a week

Website display of data:

A website is available to authorised end users who can obtain this information on-line. This is an option available to users not wanting to extract their own information. Call us to view this website.

Future functionality:

Ongoing developments will provide for upgrades to features such as:

- Wireless collection of data using GSM Mobile phone data services
- On-line website data for end users
- Fault logging down to 10ms, on-line

MiniSubstation Z3, Tableview

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