Digital control range for
extraction steam turbines

Si-TEC *Xtend* CGC ET

DATA SHEET

Models

Si-TEC *Xtend* CGC ET turbine control is available in three variations:

CGC-ET

Controlled Extraction Turbines

CGC-ETX

Controlled Extraction Turbines
with extended I/Os (via PCU)

CGC-TSX

Controlled Extraction Turbines
Split Range Dual HP Actuators
with extended I/Os (via PCU)

Description

Si-TEC (Smart Integrated Turbine & Engine Control) is the world's only digital governor fully integrated with an automatic synchroniser and kWatt/kVAr control, and was developed in 1991.

With more than 4000 systems now in operation throughout Australia, Asia & internationally, the Si-TEC *Xtend* control Provides a further enhancement of this already successful product.

Designed for use with all sizes of generator, the Si-TEC *Xtend* can be used for Islanded or Co-generation on a wide range of steam turbines including Condensing, Backpressure and Controlled–Extraction applications.

Key features

- Precise speed governing
- Dual MPU for redundancy
- Automatic turbine start sequence
- Driving wide range of actuators (incl. HEINZMANN all-electric)
- Wide range of PIDs
- Interfacing wide range of AVR systems
- Auto synchronising
- kW control & load share
- kVAr/PF control & load share
- Extraction control (pressure or flow)
- Process control (inlet pressure)
- Actuator/valve linearization curves
- Flexible configuration
- User-friendly tuning software (PC tune)
- Extensive system diagnostics
- Optional I/O expansion

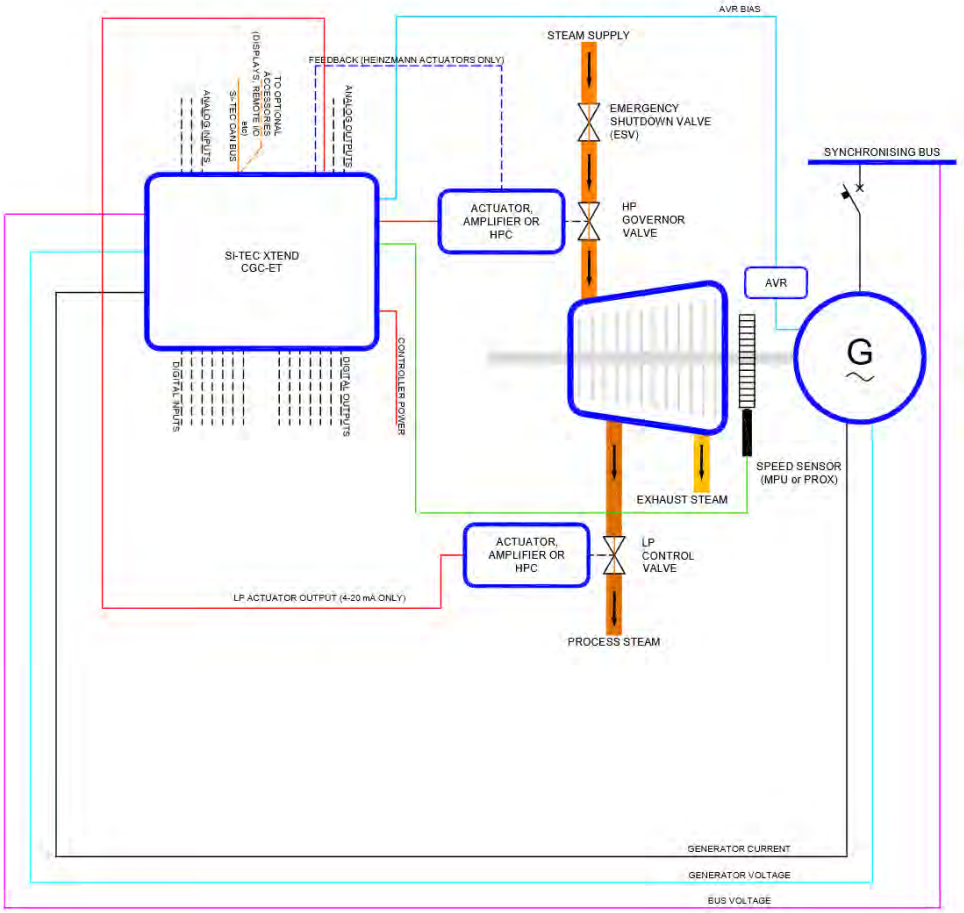
Features

- Precise speed governing less than (<) 0.1 % of operating (rated) speed at steady state
- Dual MPU (or prox.) speed sensors for redundancy
- Automatic start/stop sequence initiated by a single logic input to give fuel limited "Guaranteed Start®"
- Typically interfaces with HEINZMANN all-electric actuators, that provide "instantaneous" position feedback
- Capable of driving wide range of actuators including electro-hydraulic (eg. 0-200 mA, 4-20 mA, 0-5 V, +/-10 V etc.), electric, and pneumatic actuators
- Multi-point linearization curves (HP & LP actuators)
- Multiple and wide range PIDs (includes 6 x speed PIDs, extraction PID, kWatt PID, voltage bias control, synchronising control, kVAr/PF control, etc.)
- CAN Bus interface with PCU module (driving LP actuator for controlled extraction)
- Expansion of existing I/O via PCU module (doubling of logic inputs, relay outputs, analogue inputs & outputs)
- Noise and harmonic issues eliminated by design
- 3-phase AC RMS voltage and current sensing
- Configurable alarms can be multi-functional
- Bump®* feature to optimise tuning of governor
- Graphical display (via pcTune) of Live live steam map and control overview (speed & extraction control)
- Accumulated data recording of turbine running hours, kWatt hours, kVAr hours, etc.
- Extensive diagnostic functions
- Turbine monitoring via Opal Generator Annunciator

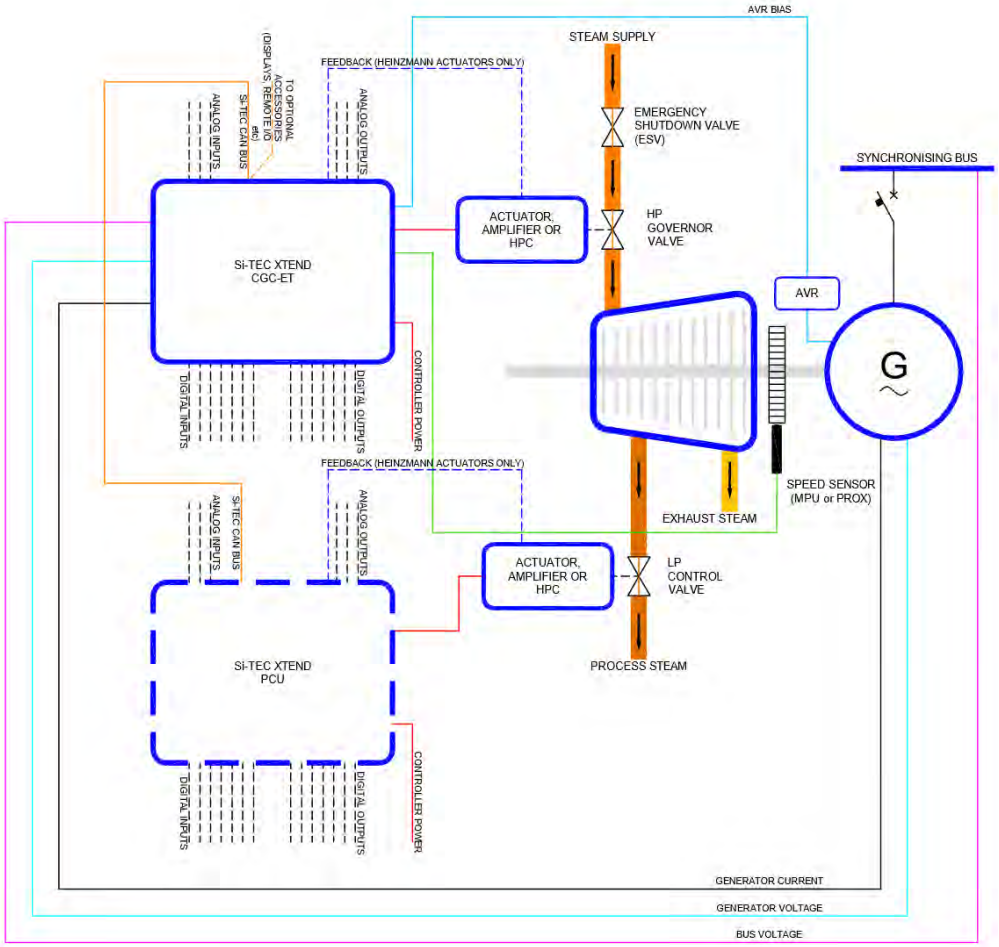
Application range

- Power generation applications where up to 24 generators can be paralleled together. Multiple groups can be combined via GSM (Generator System Master) modules.
- Single or multiple GSMs for more complex applications, e.g. multiple bus and/or feeders and applications for more than 24 nodes
- Co-generation operation – parallel to the grid for:
  - Soft "bumpless" transfer of loads
  - Peak shaving – set max. limit for import power
  - Base loaded to the grid
  - Export excess power to the grid
  - Prime power – only export to grid
- Systems requiring high quality power based upon precise frequency and calculations of active and reactive power
- Generating sets in power stations, sugar, paper, petrochemical & other process industries, mining sites and townships, rural & remote communities, hospitals, government & commercial buildings, defence & telecommunications facilities, marine & shipping, as well as oil & gas industry

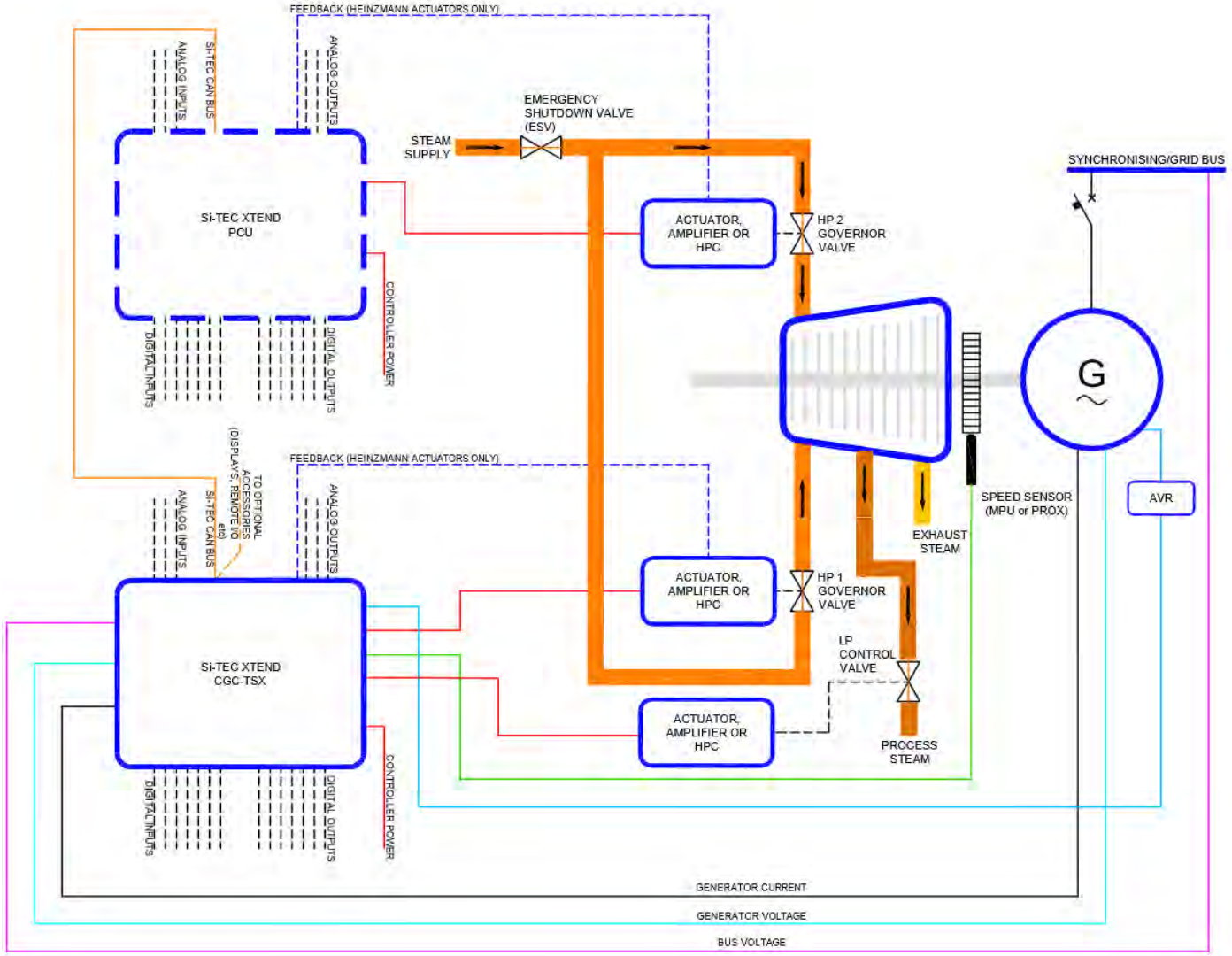
Si TEC *Xtend* CGC ET System Overview



Si TEC *Xtend* CGC ETX System Overview



Si TEC *Xtend* CGC TSX System Overview



Synchroniser

- Digitally integrated with governor
- Better than 10 secs (typically within 5 secs for 0.1 Hz, 1.0 % V & 5° phase match) for most applications
- Phase rotation check during synchronising
- Integrated independent “Sync Check” (3-ph bus & gen check) hardware
- Optional “Permissive” synchronising function
- Intelligent “Dead Bus” detection and closure
- Menu adjustable synchronising parameters

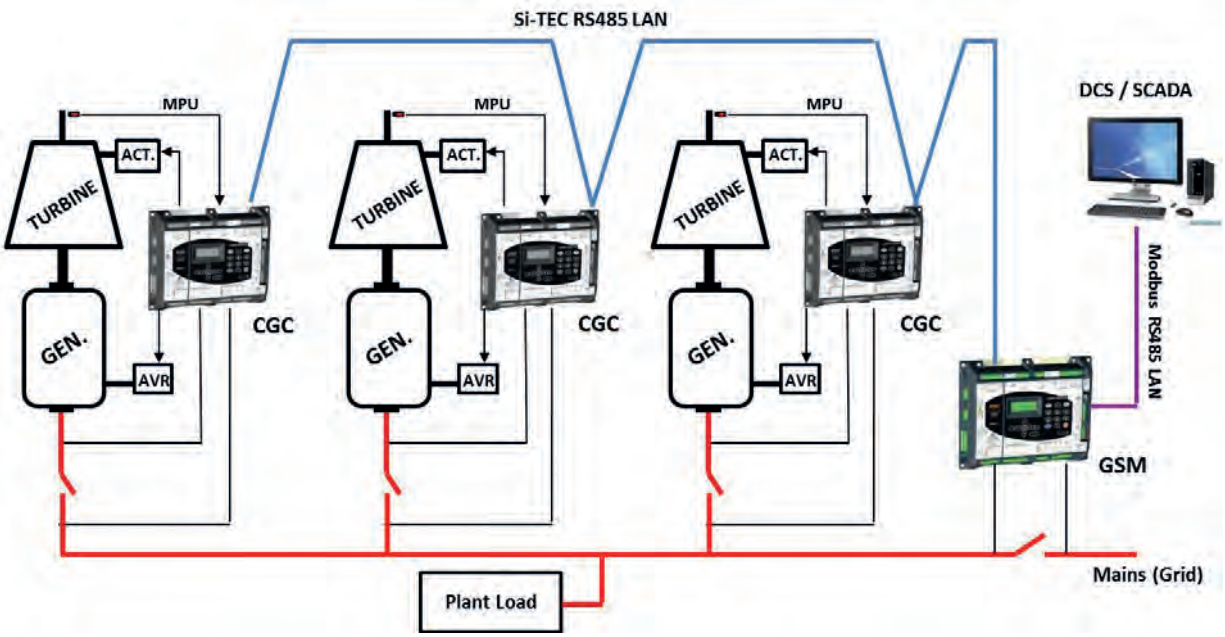
Load sharing & load control

- Digitally integrated with governor
- Automatic and isochronous (islanded) kWatt and kVAr load sharing
- Load sharing accuracy to better than 0.5 %
- True RMS AC measurement (3-phase voltage & current) better than 0.25 % accuracy
- Optimum control of active power (kWatts) and reactive power (kVAr/PF) when grid paralleled
- “Bumpless” transfer of active and reactive power
- Mains/grid droop function for larger turbine applications
- Process control (e.g. inlet pressure control)
- Adjustable load/unload ramp rates
- Multi-mode kWatt/kVAr power factor control
- AVR bias to directly interface wide range of AVRs (digital outputs or +/- 8.4 VDC) for PF sharing/ control
- 4-20 mA and Modbus® RS485 referencing available
- Power factor or kVAr control when base loaded
- Vector disturbance feature senses loss of grid within 40 mSec to maintain full operation of station

Display features via Opal Turbine Annunciator

- 4 x 20 character LCD display, with “back-light flash” feature for active alarms
- Metering of essential generator information (e.g. voltage, frequency, real power and power factor)
- Multiple “Short-Cut” keys to display useful data (e.g. peak hold, running hours, control status & alarms)
- Turbine monitoring parameters including inlet pressure, exhaust pressure, lube oil pressure, etc.
- Various alarms and shutdown conditions (e.g. low inlet, high exhaust, low lube oil, overspeed etc.)

Si-TEC *Xtend* CGC ET turbine used for mains (grid) parallel application



I/O features (CGC and PCU units combined)

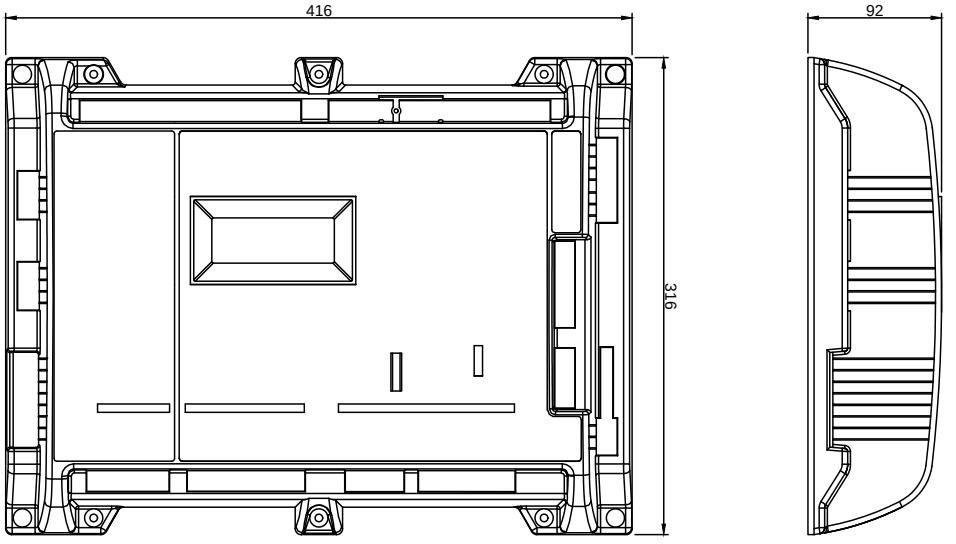
- 2 actuator driver outputs (HP & LP actuators)
- 2 MPU speed sensor inputs
- 32 logic inputs, with LED status indication, of which 28 are user defined for a wide variety of uses, including, “Hot Start”, “Sequence Hold”, “Speed Raise/Lower”, “Voltage Raise/Lower”, “Base Load”, “Overspeed Test”, “Extraction Enabled”, “Extraction Priority”, etc.
- 18 relay outputs, with LED status indication, of which 16 are user defined for a wide range of application

  Typical control functions include:
  - “Turbine Started”
  - “AVR Priming”
  - “Synchronising”
  - “Generator C/B” close & trip
  - “kW & kVAr” switches

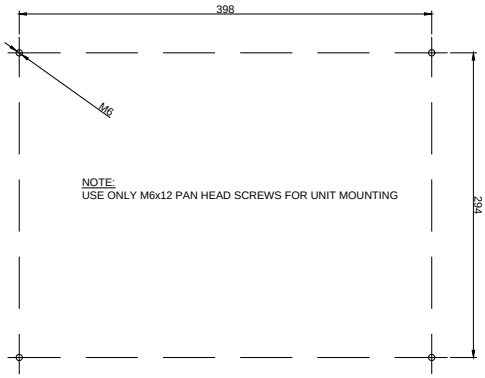
  Typical alarm functions include:
  - “Speed Sensor” failure
  - “Loss of Actuator Feedback” (HEINZMANN actuators)
  - “Extraction Signal” failure
  - “CAN Bus Comms.” failure (CGC & PCU)
  - “Reverse kW/kVAr” load
  - “High kW/kVAr” load
  - “High/Low Frequency”
  - “High/Low Voltage”
- Individual output relays can have multiple functions by being assigned as “Combined Alarms”
- Each “alarm” can be selected to directly “Trip” the Generator C/B
- 8 analogue inputs (6 x 4-20 mA, 2 x RTD) for user selectable applications. E.g. kW, kVAr, & PF load references, extraction pressure & reference, etc.
- 6 analogue outputs (4-20 mA) for direct driving user applications, E.g. kW, kVAr, PF, RPM meters, actuator position, process reference, etc.

Dimensional drawing

Si-TEC *Xtend* Physical



FRONT VIEW SIDE VIEW



MOUNTING DETAIL

Communications

- RS232 Diagnostic port for Si-TEC support software
- "Customer RS485 LAN" has read/write facility for a wide range of registers. Standard LAN protocols are Modbus®* RTU and ASCII.
- "Si-TEC LAN" for inter-module communications for up to 24 Si-TEC *Xtend* modules of any type combination
- "CAN Bus" port for CGC to PCU & Opal interface

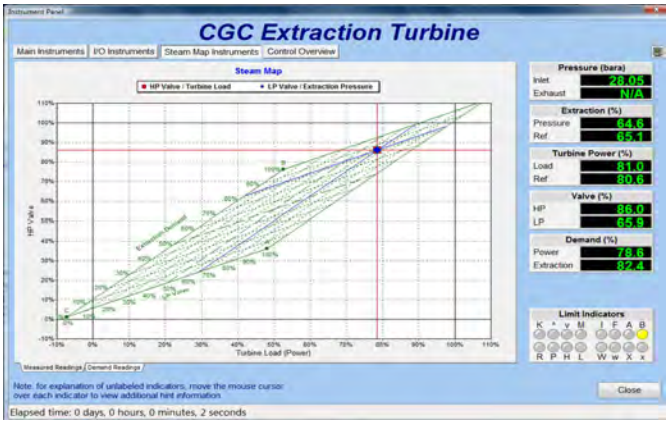
Software tools (Windows®* based)

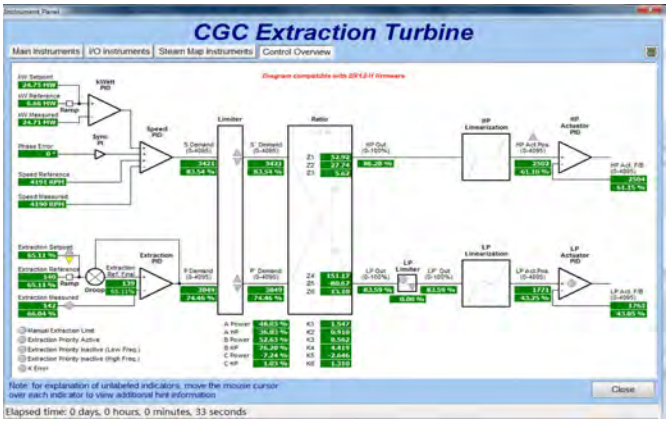
Si-TEC pcConfigure

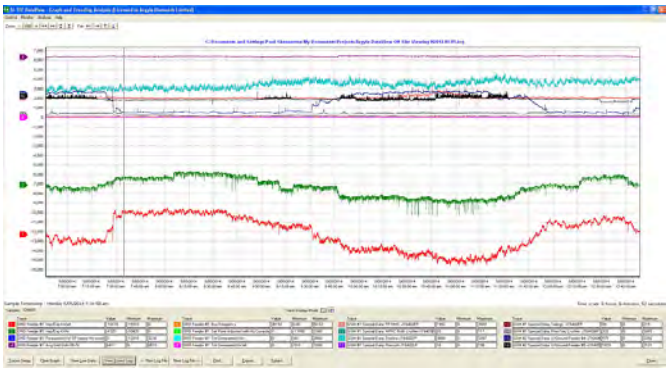
- Allow storage & retrieval of set point parameters to & from a Si-TEC *Xtend* module via a PC
- Graphical configuration of steam map and linearization curves (HP & LP actuators)
- Operates in a safe controlled environment
- Saves all set point parameters to disk
- Data can be sent by email
- Data can be printed for archival records
- Menu driven set-up & alarm configuration
- Software interface via PC or remote access

Si-TEC pcTune

- Allows generator tuning to be performed remotely and in a controlled environment
- Allows generator tuning to be performed with increased accuracy in true engineering values
- Provides 100 % repeatable results
- Recovery characteristics tested by inducing errors and recording results graphically
- 16 traces of user selected digital values can be selected for display
- Multiple PID tuning menus
- Other displays include "Digital Instrument Panel", "System Overview" and "Live Steam Map"
- Data can be sent by email
- Data can be printed for archival records
- Software interface via PC or remote access







Si-TEC DataView

- High speed power station monitoring system for PC, configurable for up to 24 nodes (including CGC, GSM, ADG, temp scanner, feeders, etc.)
- Includes extensive data logging (up to 100 data per node), event recording, and archiving (up to several years)
- Data extracted via Modbus RS485 or Ethernet (Modbus TCP/IP)
- Exporting of log file via CSV format for up to 20 parameters
- Operates independent of PLC/SCADA

Heinzmann Australia Pty Ltd | 10 Virginia Street | Geebung QLD 4034 | Australia | Phone +61 7 3868 3333
info.au@heinzmann.com | **www.heinzmann.com.au**