MATTINA Class A Transformer Monitor and Logger

The ***MATTINA*** Class A permanent installation power quality recorder, specifically designed for transformer monitoring, is a precision instrument that offers comprehensive and reliable LV side transformer monitoring. The MATTINA, measures three phase voltages, four currents (three phases and neutral) and two temperatures; and with integrated remote cellular communications (3G/4G) and DNP3, is ideally suited for network asset management.

Large scale network monitoring solutions utilising multiple MATTINA instruments can be implemented (as shown in figure 3); and can provide planning and network engineers with information for planning, operations, maintenance and network modelling.

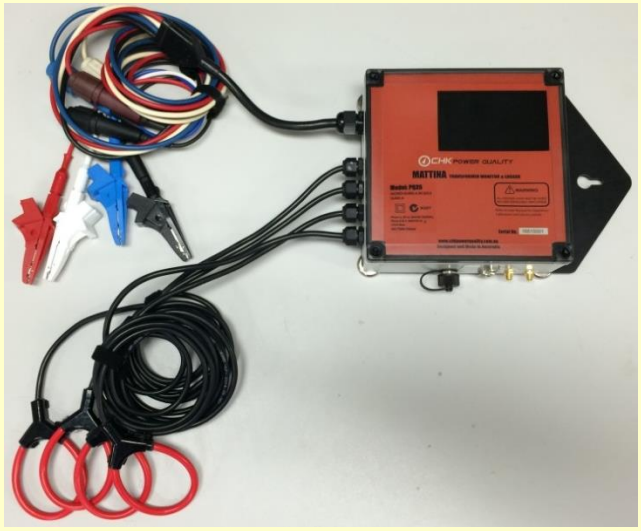

Figure 1: MATTINA - Three phase transformer monitor and logger; Dimensions: (180 x 180 x 60) mm

The MATTINA incorporates permanently attached current sensors, temperature probes and voltage leads. The current sensors (Clamp on CTs or Rogowski coils) can be customised to the transformer rated load. The MATTINA incorporates a back-plate and four magnetic feet for quick and easy installation on to transformer chassis. The weatherproof design (IP66) enables installation on pole-top transformers.

Automatic DNP3: Limited data points polled periodically by a DNP master, stored in third party database, viewed by third party viewer for interrogation and analysis.

Automatic FTP uploads: Full PQ data including event captures pushed periodically to FTP server, to be viewed by proprietary Citrus software or converted to PQDIF format for use with third party analysis tools.

Figure 2: MATTINA - Installed on a distribution transformer

Scalable asset management systems

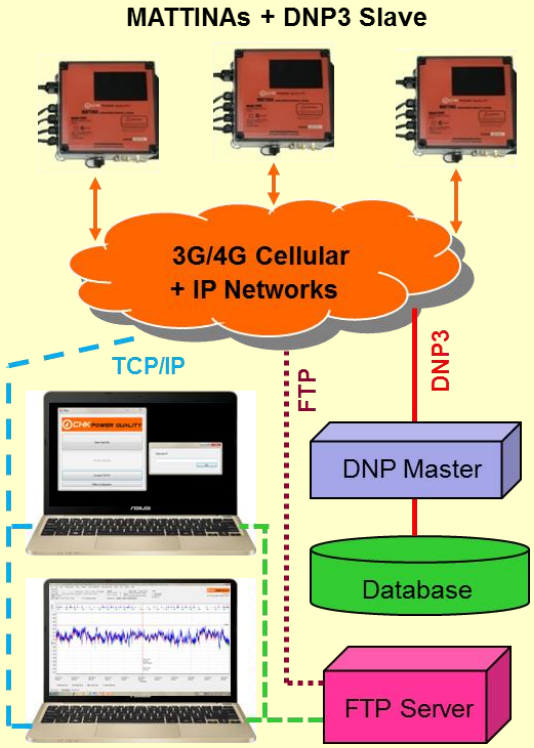

Figure 3: MATTINA - Scalable asset management systems. Remote connections to the MATTINA can be manual or automatic

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Manual TCP/IP: Connect using CITRUS TCP/IP connection, inserting a static IP address which provides a transparent connection and allows configuration, download of logged data and firmware updates.

The above systems can be deployed anywhere within cellular coverage and can support multiple MATTINA instruments.

Key hardware features

- Certified to IEC61000-4-30, Class A
- AC and DC voltage and current measurements.
- Two temperature probes.
- Expansion port (optional) allows for system expansion to include additional sensors, input/output controls and custom interfaces which broaden the MATTINA system platform. Example interfaces include DGA, Hydrogen and Bushing monitors.
- Powered from Phase A to Neutral.
- Starts logging on power up.
- Concurrent logging at multiple log intervals: 10/12 cycles, 150/180 cycles, 10s (freq.), 10m, 2h, and user settable.
- Gapless logging: User can download data, clear log memory and configure the device with no interruption to logging.
- Internal backup battery: 5 minute back up time as standard, with option to extend upon request.
- GPS and external GPS antenna (optional).
- Cellular communications options (2G/3G/4G) are integrated within the enclosure - no additional peripherals required other than an external antenna.
- Graphical colour display
  - Voltage and current waveforms.
  - Phasor diagrams.
  - Measurements.
  - Status information.
  - User defined screen.
- Logged memory: 8GB.

Key software (CITRUS) features

- The CITRUS platform is powerful, easy to use and intuitive application software that supports all CHKPQ products. It provides tools for: device management; data analysis; and reporting.
- Configurations
  - Pre-defined configurations for easy setup.
  - Create and store different configuration files for quick retrieval.
- Online monitor, with event trigger option.
- View different log file data on the same graph to compare PQ measurements (use GPS to time synchronise loggers).
- Event type filter included, to view only desired events.

- Analysis and Compliance reporting
  - Voltage compliance profiles available;
  - User definable voltage compliance profiles.
  - Harmonic compliance report available.
  - Energy; Daily Min/Max; ITI (CBEMA) curve.

- Customised reports (available upon request).

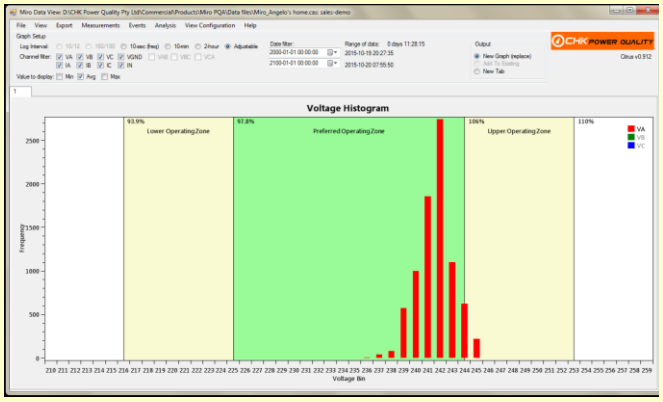

Figure 4: CITRUS - Voltage compliance report as per AS61000.3.100

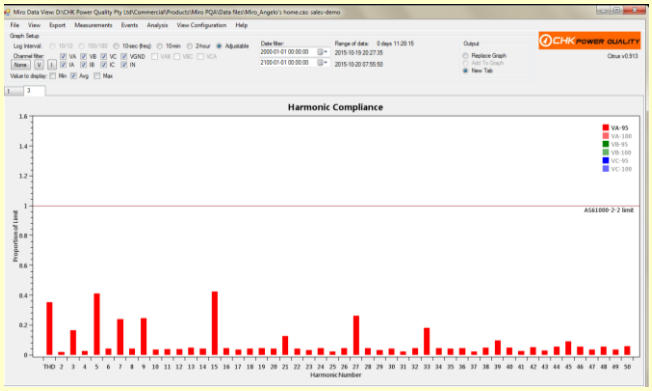

Figure 5: CITRUS - Harmonic compliance report as per AS61000.2.2

- Views
  - Ability to edit an active view: Text and arrow annotation and title options available.
  - Generate a PDF, CSV file, or table.
  - Save and Print view.
  - Split or combine voltage and current graphs.
  - Multiple measurements on a single graph.
  - Horizontal and vertical cursors for accurate measurements.

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  - Horizontal and vertical axes zooming functions.
- PQDIF export - 'PQView' compatible.
- Automatic FTP uploads.

Hardware specifications

PARAMETER	DESCRIPTION
Power quality parameters	
Class A declared/nominal input	230V 50Hz/60Hz
Power frequency	IEC61000-4-30 (section 5.1).
Magnitude of the supply voltage	IEC61000-4-30 (section 5.2).
Supply voltage dips and swells	IEC61000-4-30 (section 5.4).
Voltage interruptions	IEC61000-4-30 (section 5.5).
Supply voltage unbalance	IEC61000-4-30 (section 5.7).
Voltage harmonics	IEC61000-4-30 (section 5.8).
Measurement	
A to D Conversion	16 bits.
Samples per cycle	384 @ 50 Hz; 320 @ 60 Hz.
Sampling Rate	Nominal: 19.2kHz synchronised to mains.
Anti-aliasing	High-frequency components attenuated by at least 50dB so as not to interfere with harmonic measurements.
Measurement metrics	
Frequency	Range: 50Hz nominal (42.5-57.5)Hz, 60Hz nominal (51.0-69.0)Hz; Full range: (40-70)Hz. Measurement: 10s; Accuracy: ±5mHz referenced to RTC, ±1mHz referenced to GPS.
Magnitude of the supply voltage (true RMS)	Measurement: 10/12 cycle rms Range: 10% to 150% of nominal value with accuracy of ±0.1% of nominal value under conditions specified in IEC61000-4-30 section 6.1.
Dips and swells	Measurement: 1-cycle rms updated every half cycle. Accuracy: ±0.2% of nominal value, ±1 cycle. Range (magnitude) 0 to 200%. Range (duration) minimum 0.5 cycles by definition. No upper limit.
Voltage interruptions	Measurement: 1-cycle rms updated every half cycle. Accuracy: ±1 cycle. Range (duration) minimum 0.5 cycles by definition. No upper limit.
Voltage and current unbalance	Applicable 3 phase systems and evaluated using the method of symmetrical components. Metrics: u_2 = (U2/U1) and U_0 = (U0/U1). U0, U1 and U2 are sequence components. Range: 0.5% to 5% of U_2 and U_0. Accuracy: ±0.15%.
Power meter	Power-kW, Power-kVA, Power-kVAR, True Power Factor (TPF), Displacement Power Factor (DPF).
Voltage harmonics	IEC61000-4-7, Class I (up to 50th harmonic). Range: 10% to 200% of Class 3 electromagnetic environment in IEC 61000-2-4. Metrics: voltage and current magnitude and angle. 51st to 100th: Indication only.
Total harmonic distortion (THD)	IEC61000-4-7, THDS (up to 50th harmonic)
Crest factor	Indicates peak-to-rms ratio of waveform. ±1%.
Temperature	Two temperature channels measured each second, recording at adjustable, 10-min and 2-hour intervals. Measurement:-50°C to +150°C. Accuracy: ±1°C.
High speed event recording	
Triggers	User defined. Sliding reference, Dip/Swell, transient (dv/dt), manual (via Online Monitor)

Event RMS capture (half cycle RMS)	2.5s pre trigger, 25s post trigger (50Hz)
Communications	
Wired data (standard)	USB 2.0.
Wireless (options)	Cellular remote communications integrated within the instrument.
Logging	
Logged data memory	8GB.
Logging intervals	All IEC61000-4-30 intervals simultaneously plus adjustable interval from 1s to 3600s.
Measurements	All measurements simultaneously.
GPS location (optional)	GPS location coordinates logged periodically.
General	
Circuit connections	Three phase delta, three phase Wye, split phase* & single phase.
Data file	PQA format binary with CSV export.
Data display	Real time measurements of basic parameters via LCD, all parameters via Online Monitor.
Software tools	CITRUS.
Inputs	
Voltage channels (AC/DC)	Isolated. 3 or 4 independent 2-wire inputs depending on model and voltage lead options.
Voltage range	Powered from phase A and Neutral: 400VACrms
Voltage surge protection (differential)	4kV Fast transients, 6kV 1.2/50us impulse – no effect. Recalibration may be required after impulses significantly exceeding 6kV.
Current channels (AC/DC)	4. Hall effect clamp-on sensor required to measure DC.
Current range	Dependent upon current sensor.
Temperature channels	2 x PT100 RTD Class B, M8 connectors.
Expansion Module Port	UART / SPI interface for future system upgrade. Allows for additional sensors (e.g. current, voltage, temperature, DGA), analogue I/O (e.g. 4-20mA/0-5V/0-10V), digital I/O and relays.
Instrument type	IEC61000-4-30, Class A.
Current Sensors	Flexible current probes or clamp-on current probes with automatic detection.
Accuracy	
Reference conditions	22ºC.
Current (instrument)	±0.2% of full scale. System accuracy depends on sensor.
Voltage	±0.1% of nominal value as specified above.
Voltage temperature coefficient	Approx. 25ppm/C
Environment and safety	
Use	Indoor and outdoor.
Altitude	Up to 2000m.
Operating Temperature	-20°C to +85°C.
Relative Humidity	20% to 99% Relative Humidity.
Degree of Protection	IP66 (all weather housing).
Certifications / type testing	
EMC	EN55022:1998 _A1:2000 +A2:2003 CLASS A.
Salt Spray (Corrosion)	MIL STD 810 G.
Outdoor weathering (UV)	IEEE 495:2007 or equivalent.
Random Vibration	MIL STD 810 G.
Impact Test	IEEE 495:2007 or equivalent.
Safety Category	IEC 61010-1, Pollution degree 3; CAT III 600V, >10kV withstand.
Power	
Power supply	Phase A voltage, range: (60-400)VACrms; 15VA typical.
USB powered (Mini USB)	Configuration and download.
Backup power	Rechargeable battery - $LiFePO_4$.
Backup battery duration	5 minutes. Longer duration (30 minutes with 24 hours recharge)

	available on request.
Timing	
Real time clock (RTC) battery	Non rechargeable Lithium backup battery. Functional life: > 10 years.
RTC	Typical ±3ppm from -15 to 60C. Drift <1 second per week.
GPS (internal)	Time accuracy: <1ms. External antenna required.
Mechanical	
Display	Colour graphic LCD (4.3” 480x272 Graphic TFT LCD); Dimensions: (97 x 56) mm.
Enclosure dimensions	(180 x 180 x 60) mm; Length side ports: Current and voltage channels; Width side ports: Data, temperature and expansion module i/o connectors.
Weight	1.05kg (instrument only).
Case material and colour	Polycarbonate, moulded in light grey.

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