Cathodic Protection (CP) is an important method of preventing corrosion on buried metal pipelines, but it must be applied at the correct level. Every pipeline operator must carry out regular measurements of CP – at rectifiers or solar stations and at CP test points (in impressed current systems) and at sacrificial anodes (in galvanic systems). Some key pipelines – crossing main roads, rivers or centres of population – may have additional protection against corrosion in the form of a sleeve filled with an inert gas (nitrogen). The gas pressure in the sleeve has to be maintained above a specific threshold, which requires regular checks.

Collecting and analysing field measurements is labour-intensive and costly. And (very importantly) they can only be reactive – problems can lie undetected for long periods, during which the pipeline is insufficiently protected.

**INTRODUCING MERLIN™**

Abriox has developed the MERLIN system with input from pipeline operating companies and independent CP consultants. The MERLIN system remotely monitors cathodic protection levels at rectifiers and test points along pipelines, and also the pressure within nitrogen sleeves. All measured data is automatically transmitted in a management report to the system HQ where it is displayed and archived in Abriox’s iCPSM/CPSM software. The system is proactive – identifying potential corrosion problems wherever and whenever they occur and alerting the operator immediately.

**MERLIN Remote Cathodic Protection Monitors** (also known as Remote Monitoring Units - RMUs) are commonly used at:

- **Rectifiers and Solar Stations** - measuring electrical supply, voltage output, current output, ON and OFF potentials and also interrupting the current output for above ground surveys
- **Test Stations, CP Posts and Riser Posts** – measuring pipe to soil ON potentials, instant OFF potentials, coupon currents
- **On-shore Tanks, Sacrificial Anodes, Isolation Joints and Critical Bonds**
- **Nitrogen filled sleeves** - measuring nitrogen pressure to ensure sleeve integrity
- **Pipeline sleeves** - ensuring sufficient isolation between the pipeline and the sleeve

**INNOVATIVE DESIGN**

Through careful consideration of what pipeline operators require from a monitoring system, Abriox has been able to combine low power consumption electronics with remote telemetry to create a compact, affordable package offering all the key CP measurements. Our design is intelligent, yet practical. Some of the points our customers repeatedly comment on are:

- The ease of installation of our monitors. No specialist equipment is required, simply standard tools and a mobile phone.
- The ability to get readings in the field from our monitors. Transformer Rectifier monitors are continuously powered, so technicians can get readings sent directly to their mobile phone on demand.
- Reliability is ensured by extensive testing during production – all units are 100% tested – with particular attention to ingress and lightning protection.

**BENEFITS**

With installations across the globe, MERLIN offers major economic, operational, safety and environmental benefits; providing significant cost savings and make our customers’ operations more efficient by:

- Reducing the cost of data collection and pipeline surveys
- Improving the quality of data
- Reducing health and safety risks to technicians
- Increasing the efficiency of Integrity teams
- Offering zero carbon footprint for data collection
- 24/7 proactive monitoring
- Elimination of data loss through product failure
- Reputational benefit to network from faster resolutions leading to increased customer satisfaction

**TECHNICAL SUCCESS**

MERLIN has been installed on across the globe and has been proven over time to offer the following advantages:

- Reducing the cost and time for installation
- Automatic and on-demand transmission of data
- Visit us online at www.abriox.com for further information on how our remote monitoring systems can improve your network management
MERLIN DX
Transformer Rectifier Monitor

OVERVIEW
The MERLIN DX Transformer Rectifier Monitor is a compact Remote Monitoring Unit (RMU) that can be housed within the rectifier cabinet or supplied in a separate enclosure ready for mounting externally. It carries out the functional checks of rectifier output (voltage and current) and complies with regulatory guidelines.

The unit checks that the rectifier remains powered by its external electrical supply. If the power fails, an alarm is transmitted and the unit’s internal batteries take over monitoring for up to 2 years. They quickly repay their capital cost when compared to monthly manual checks.

The MERLIN DX Transformer Rectifier Monitor offers additional CP measurements (ON and OFF potentials) as well as the facility to synchronize remotely with other rectifiers on a pipeline for CIPS (Close Interval Potential Surveys) or DCVG (Direct Current Voltage Gradient) surveys.

FEATURES & BENEFITS
- Compatible with 3G and 2G (GSM) networks
- Mobile phone test is set up, on-demand readings and control of rectifier output relay
- 2 year life, replaceable battery module
- Sealed, weatherproof unit with robust lightning protection and wide operational temperature range
- AC powered (110V to 230V) with 2 year battery backup. DC power option for solar stations
- Hourly check of rectifier outputs, ON/OFF potentials
- Synchronization enables close interval surveys to be carried out more quickly with no rectifier setup
- Pipeline locate (offered on Excel model)
- Immediate alarm generation (user pre-set thresholds on all channels)
- Alarms when protection inadequate or power fails at rectifier
- Weekly report gives min, max and average of all channels for the week

MODEL LIST

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Electrical Quality</th>
<th>Rectifier Voltage</th>
<th>Rectifier Current</th>
<th>ON/OFF Potential</th>
<th>Rectifier 2nd Current</th>
<th>Remote Sync</th>
<th>Pipeline Locate</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
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</table>

MERLIN XT
Transformer Rectifier Monitor

OVERVIEW
The MERLIN XT Transformer Rectifier Monitor is an externally mounted durable Remote Monitoring Unit (RMU) that monitors the operation of a transformer rectifier or solar station. It can carry out the functional checks of rectifier output (voltage and current) required in order to ensure a continuous CP supply to the pipeline and to comply with regulatory guidelines.

The unit checks that the rectifier remains powered by its external electrical supply (including from a solar station or wind turbine). If the power fails, an alarm is transmitted immediately and its internal batteries take over monitoring for up to 2 years. Because they are usually deployed in remote locations, they will very quickly repay their capital cost when compared to monthly manual checks.

The MERLIN XT Transformer Rectifier Monitor offers additional CP measurements (ON and OFF potentials) as well as the facility to synchronize remotely with other rectifiers on a pipeline for CIPS (Close Interval Potential Surveys) or DCVG (Direct Current Voltage Gradient) surveys.

FEATURES & BENEFITS
- Full global satellite coverage with fast messaging
- Sealed, weatherproof unit with robust lightning protection and wide operational temperature range
- Fully automatic test and set-up (no laptop required)
- AC powered (110V to 230V) with 2 year battery backup - DC power option
- Hourly check of rectifier outputs, ON/OFF potentials
- Control of rectifier output relay for remote synchronized interruption
- Pipeline locate (offered on Excel model)
- Immediate alarm generation (user pre-set thresholds on all channels)
- Weekly report gives min, max and average of all channels for the week

MODEL LIST

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Electrical Quality</th>
<th>Rectifier Voltage</th>
<th>Rectifier Current</th>
<th>ON/OFF Potential</th>
<th>Rectifier 2nd Current</th>
<th>Remote Sync</th>
<th>Pipeline Locate</th>
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<tr>
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</tr>
</tbody>
</table>

TECHNICAL SPECIFICATIONS

**Dimensions (H x W x D):**
- 85mm x 125mm x 51mm

**Ingress Protection:**
- IP65

**Temperature Range:**
- -40°C to +85°C 100% condensing humidity

**Communications:**
- Compatible with 3G and 2G (GSM) networks

**Battery Backup:**
- 2 year life, replaceable battery module

**Lightning Protection:**
- Surge protection on all external inputs and outputs
- Rectifier output current (using shunt) ≤ 100mA DC 0.1mV resolution
- ON potential of the pipe
  - ≤ 4V DC with AC rejection
  - ≤ 1mV resolution
  - ≤ 10 MOhm input impedance
- OFF potential of the pipe (using optional relay)

**Outputs:**
- Fail-safe relay drive, 0.43A maximum at 12V DC nominal
- Interruption drive, 0.43A maximum at 12V DC nominal
- Output patterns from Is to 60s with 0.1s resolution
- Short circuit and surge protection
- Synchronization error less than 1ms

Specifications are subject to change without prior notice.

Visit us online at www.abriox.com for further information on how our remote monitoring systems can improve your network management.
**MERLIN DX**

**CP Monitor**

**OVERVIEW**

The MERLIN DX CP Monitor is a compact Remote Monitoring Unit (RMU) housed within a test post. MERLIN monitors collect CP data automatically, checks the measurements against specified alert criteria and reports immediately if an alarm threshold is exceeded. MERLIN monitors can be deployed anywhere on the pipeline network where it is important to record ON/OFF pipe-to-soil potentials, native coupon potentials and measurements of bonding or interfering currents.

**FEATURES & BENEFITS**

- **Compact with 3G and 2G (GSM) networks**
- **Mobile phone test & set-up**
- **5 year life, replaceable battery module**
- **Compact size, sealed weatherproof unit for deployment inside test posts**
- **Robust lightning protection and wide operational temperature for all extremes**
- **Daily CP level check (hourly optional for problem solving)**
- **DC and AC monitoring for full corrosion prevention**
- **ON / OFF / Native Potentials and coupon current monitoring channels**
- **Alarms reported immediately (user pre-set thresholds for all channels)**
- **Weekly report gives min, max and average of all channels for the week**

**MODEL LIST**

<table>
<thead>
<tr>
<th>Pipe-to-Soil 1</th>
<th>Pipe-to-Soil 2 or Instant OFF</th>
<th>Coupon Current or Bond Current</th>
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</thead>
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<tr>
<td>DC</td>
<td>DC (OFF)</td>
<td>AC</td>
</tr>
<tr>
<td>DC</td>
<td>DC (OFF)</td>
<td>AC</td>
</tr>
<tr>
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<tr>
<td>3 Channel</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4 Channel</td>
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</tbody>
</table>

**MERLIN TX**

**Solid State Interrupter**

**OVERVIEW**

The MERLIN Interrupter TX is designed for precise solid state interruption of rectifiers connected to a buried pipeline. Used in conjunction with specific MERLIN DX and MERLIN XT Transformer Rectifier Monitors, it enables interruption (switching of the current output) at a rectifier to be controlled remotely.

Rectifier interruption is used to carry out Close Interval and DCVG (Direct Current Voltage Gradient) surveys, major ON/OFF tests at CP test posts and pipeline maintenance work.

Compatible with industry standard interruption patterns, the Interrupter TX may be switched on-off or the cycle changed, from the control via our dedicated software.

The MERLIN Interrupter TX is suitable for switching a current of 40A at -40°C to +25°C or 20A at +25°C to +85°C. When coupled with a MERLIN Excel Transformer Rectifier Monitor the Interrupter TX can also be used for pipeline location.

The Interrupter TX will transmit a user defined frequency between 30Hz and 2000Hz. This will provide a signal range far greater than portable transmitters with minimal additional cost over your remote monitoring system, all controlled by either SMS text messaging in the field or from the office via our dedicated software.

**FEATURES & BENEFITS**

- **Compact size for ease of installation within most rectifier enclosures**
- **Robust unit housed in metal casing**
- **Quick and easy to install, with labelled connections to MERLIN monitor**
- **Wide operational temperature for all extremes**
- **Can be used worldwide - unlike mercury relays (which cannot be used in certain countries)**
- **Designed for all interruption cycles and extended use**
- **Precision solid state switching**
- **Less than 500us switching delay**
- **Electromechanical fail safe**
- **Short circuit and surge protection on output**
- **Switches up to 20A current (40A below +25°C)**
- **Compatible with all industry recognised Close Interval and DCVG survey patterns and most portable above-ground survey equipment**
- **Outputs a pipeline locate signal when used with MERLIN ‘Excel’ Transformer Rectifier Monitors**

**TECHNICAL SPECIFICATIONS**

- **Dimensions (H x W x D):** 174mm x 218mm x 106mm
- **Ingress Protection:** IP40
- **Temperature Range:** -40°C to +85°C
- **Control Input Terminals:** Suitable for M6 ring terminals (included)
- **Maximum Switching Voltage:** 100V peak
- **Maximum Switching Current:**
  - 40A @ -40°C to +25°C
  - 20A @ +25°C to +85°C
- **Maximum Turn-on/ Turn-off Time:** 500us
- **Locate Frequency Range:** 30Hz - 2000Hz
- **Fail Safe:** Electromechanical
- **Control Voltages:**
  - 12VDC ± 10% 320mA max for fail safe
  - 12VDC ± 10% 25mA max for solid state relay
- **Output Protection:** Short circuit and surge

Specifications are subject to change without prior notice.

Visit us online at www.abriox.com for further information on how our remote monitoring systems can improve your network management.
**MERLIN DX**  
**Nitrogen Sleeve Monitor**

**OVERVIEW**

High and medium pressure pipelines passing under main roads, rivers or centres of population may require additional protection against corrosion. One of the methods used is to encapsulate the pipeline with a metal ‘sleeve’ filled with nitrogen, an inert gas that prevents the external pipe wall surface from corroding.

For this method to be effective, the pressure of the nitrogen in the sleeve has to be maintained. This means operators must check the pressure in the sleeve periodically to make sure that it is not leaking.

If the pressure has dropped to an unacceptable level, the sleeve must be refilled with nitrogen, which can be a very labour-intensive activity since the gas containers are heavy and bulky to carry and the fill points are often difficult to access.

Abbriox has developed two solutions for monitoring the pressure of the nitrogen gas in the sleeve remotely: the MERLIN DX Nitrogen Sleeve Monitor* (typically installed in a GRP cabinet) and the more compact MERLIN DX Communications Module with Nitrogen Sleeve Adapter* (typically installed in a plastic MD2 post or alternative sleeve fill point).

In both cases, the pipeline operator can check that the sleeve is maintaining the required pressure without undertaking a site visit.

The MERLIN measures the sleeve pressure automatically, checks that it is within specification and reports immediately if an alarm threshold is exceeded.

**FEATURES & BENEFITS**

- Compatible with 3G and 2G (GSM) networks
- Mobile phone test & set-up
- 5 year life, replaceable batteries
- Flexible installation options for cabinets and posts
- Sealed weatherproof units with wide operational temperature for all extremes
- Daily pressure check (hourly option for fault diagnosis)
- User selectable high and low pressure thresholds
- Refills can be scheduled in line with pressure drop
- Weekly report gives min, max and average of pressure readings for the week

**DATABASE SOFTWARE**

**iCPSM & CPSM**

**OVERVIEW**

Data from MERLIN monitors is automatically stored and transmitted in a management report to the system HQ where it is then accessed online via the internet based (iCPSM) or displayed and archived in the PC based MERLIN CPSM software. The software also provides full remote configuration of all MERLIN monitors. An iCPSM or CPSM package is required for every MERLIN monitoring network.

**FEATURES & BENEFITS**

- Remote access to rectifier and CP data
- Graphical and numerical data display
- Overview shows status of all monitors on a pipeline
- Configurable alerts to specified users
- Notes facility for locations and individual reports
- Plan scheduled interruptions for above ground surveys and maintenance
- Configurable data export and interface options
- Licences allow different authorisation levels to software/user options

**TECHNICAL SPECIFICATIONS**

**Dimensions (H x W x D):**  
*Nitrogen Sleeve Monitor: 227mm x 151mm x 80mm  
*Communications Module with Nitrogen Sleeve Adapter: 125mm x 135mm x 55mm

**Ingress Protection:**  
IP67

**Temperature Range:**  
-20°C to +85°C

**Communications:**  
Compatible with 3G and 2G (GSM) networks

**Battery Backup:**  
5 year life, replaceable batteries

**Software Management:**  
iCPSM (web-based) or CPSM (PC-based)

**Number of Pressure Channels:**  
1

**Input Range:**  
0 to 30bar gauge

**Over Pressure Limit:**  
20bar

**Sensor Burst Pressure:**  
150bar

**Sensor Drift:**  
± 0.25% per year

**Accuracy:**  
± 0.25% of Full Scale

**Thermal Error:**  
± 1% per 80°C

**Measurement Resolution:**  
0.0001bar

Specifications are subject to change without prior notice.
Specialists in Remote Monitoring

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