GE
Grid Solutions

BWatch
Digital Bay Monitoring for GIS up to 800 kV

GE makes the most of 50 years of experience in design, material selection, development, engineering, manufacturing, servicing of Gas-Insulated Substations (GIS) and Lines (GIL).

BWatch3 monitors gas density and switchgear status during operation and maintenance.

Environment Friendliness

• Continuous monitoring, valid for leakage rate down to 0.1 % per year
• Valid for SF₆ and gas mixtures such as g³ (green gas for grid)

High reliability and availability

• Extensive experience: 18,000 compartments monitored with BWatch3
• Internal arc localization for shortest unavailability
• Digital sensor and communication for real-time monitoring and auto-control
• Direct (pipeless) enclosure-to-sensor connection for accurate metering
• Phase-by-phase monitoring for faster event localization
• Recording of gas losses and top-ups for trend analysis

Advanced Modularity

• User-adjustable products (Optimum / System) with a large range of features
• Several types of alarms and thresholds for maintenance scheduling
• Monitoring of switchgear (circuit-breaker, disconnector, earthing switch)

Smart Grid Features

• Digital communication with SCADA
• Remote access for customer's and OEM's experts
• IEC® 61850 capabilities
• Possible coupling with PDWatch (partial discharge assessment system)

Customer Benefits

• Personnel safety
• Savings via continuous gas monitoring
• Substation availability
• Asset management
• User-friendly HMI
• Remote access for customer's and OEM's experts

imagination at work
**BWatch3 Range**

**BWatch3 Optimum** enables condition-based asset management, through gas monitoring.

**BWatch3 System** goes a step forward, with remote supervision, advanced data analysis and switchgear condition monitoring.

<table>
<thead>
<tr>
<th>General Features</th>
<th>Optimum</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas density monitoring</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Gas temperature monitoring</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Embedded GIS parameter setting</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Density recording period</td>
<td>Day 30</td>
<td>Infinite</td>
</tr>
<tr>
<td>Density analysis period</td>
<td>Year</td>
<td>1 / Infinite*</td>
</tr>
<tr>
<td>Event recording period</td>
<td>Day</td>
<td>Infinite</td>
</tr>
<tr>
<td>Modbus/RTU communication to DCS</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Ethernet communication (OPC server)</td>
<td>-</td>
<td>Optional</td>
</tr>
<tr>
<td>Internal arc localization</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Time synchronization</td>
<td>-</td>
<td>Optional</td>
</tr>
<tr>
<td>Switchgear monitoring</td>
<td>-</td>
<td>Optional</td>
</tr>
</tbody>
</table>

**Acquisition and Process Unit (APU)**

| Maximum number of connected sensors    | 3 x 10  | Up to 64 |
| Digital inputs                         | -       | Up to 16 |
| Digital outputs                        | -       | Up to 128 |
| Output setting                         | 16      | ✓       |
| Density sets                           | 2       | Up to 8 |

**HMI**

| Local                                   | ✓       | Optional |
| Mobile PDA                              | -       | Optional |
| Bluetooth                               | Optional | Optional |
| Wired                                   | -       | Optional |
| Mobile tablet (wired or Wi-Fi)          | -       | Optional |
| Supervision panel                      | -       | ✓       |
| Remote (substation room/OEM's expert)  | -       | Optional |

Local HMI

Supervision HMI

Mobile PDA

Mobile tablet

BWatch3 Optimum APU with relays
Digital Gas Sensors

Each sensor, which measures both pressure and temperature, is installed directly on the enclosure. It guarantees the best accuracy and prevents major failure.

GE’s gas sensors are compatible with all GIS products on the market, be they single-or three-phase, and can be installed on existing substations (retrofit).

Derivation Box

Gas sensors are gathered by derivation boxes in daisy chain. They form a field bus connected to the APU, greatly simplifying wiring.

The APU, in the local control cubicle, can be connected to up to 30 sensors. Derivation box can be used to check any sensor with a reference sensor, without removing / unplugging any sensor.

Expert Manager Tool

To ensure the best asset management, BWatch3 users can also rely on our expert manager tool.

Lowest density variations are assessed with sophisticated algorithms. For instance phase data are analyzed to avoid temperature impact.

Switchgear Monitoring

BWatch3 monitors CB mechanical operations and electrical wear:
• Travel curve recording of each operation, including time and speed calculation
• Electrical wear computation ($\Sigma t$)
• Operation counting by current range
### Technical Features

<table>
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<th>EMC immunity standards</th>
<th>Emissions standard</th>
<th>Communication standards</th>
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<tr>
<td>IEC 61000-4-2, 4, 5, 8, 16 Level 4</td>
<td>EN55022 Class A</td>
<td>IEC 61869-1, -6, -7, -8, -9</td>
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<tr>
<td>IEC 61000-4-3, 6, 17 Level 3</td>
<td></td>
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<table>
<thead>
<tr>
<th>Test description</th>
<th>Source standard</th>
<th>Gas sensor</th>
<th>Travel sensor</th>
<th>APU</th>
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<tr>
<td>Low temperature</td>
<td>IEC 60068-2-1</td>
<td>-40 °C</td>
<td>-20 °C</td>
<td>-40 °C</td>
</tr>
<tr>
<td>Dry heat</td>
<td>IEC 60068-2-2</td>
<td>110 °C outdoor</td>
<td>80 °C</td>
<td>55 °C inside cubicle</td>
</tr>
<tr>
<td>Protection index</td>
<td>IEC 60068-2-30</td>
<td>IP67 indoor / IP68 outdoor</td>
<td>IP65</td>
<td>IP20</td>
</tr>
<tr>
<td>Shocks</td>
<td>IEC 60068-2-27</td>
<td>50 g</td>
<td>40 g</td>
<td>25 g</td>
</tr>
<tr>
<td>Vibrations</td>
<td>IEC 60068-2-6</td>
<td>1 g / 10 - 150 Hz</td>
<td>1 g / 10 - 150 Hz</td>
<td>1 g / 10 - 150 Hz</td>
</tr>
</tbody>
</table>

### Ratings*

#### Gas sensor

- **Pressure**
  - Full measurement scale (FS): abs bars 0-16
  - 1 minute overpressure withstand: abs bars 20
  - Measurement resolution: % of FS ±0.01
  - Long term stability: % of FS 0.1
  - Accuracy: % of FS ±0.1
  - Repeatability at 25 °C: % of FS <0.05
  - Endurance (0...100 % of FS at 25 °C): Nb of cycles 1,000,000
  - Temperature Measurement resolution: °C 0.1

#### Travel sensor

- Measurement angle: ° 0-90
- Independant linearity at 20 °C: % <±0.25

#### APU

- Sensor bus length: m up to 800
- Acquisition cycle time
  - Pressure: ms 300
  - Temperature: min 1
  - Density calculation time: s 2
  - Alarm forecast time: days 90
- Communication speed (Modbus/RTU)
  - Gas sensors: kbyte/s 115
  - Local HMI: kbyte/s 19.2
  - Distributed control system (optional): kbyte/s 9.6

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### Internal Arc Localization

BWatch3 provides reliable localization of internal flashover if any. Most of the substation can be safely re-energized within a few minutes for optimum GIS availability.

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*Other data available on request.*

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**For more information please contact**

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