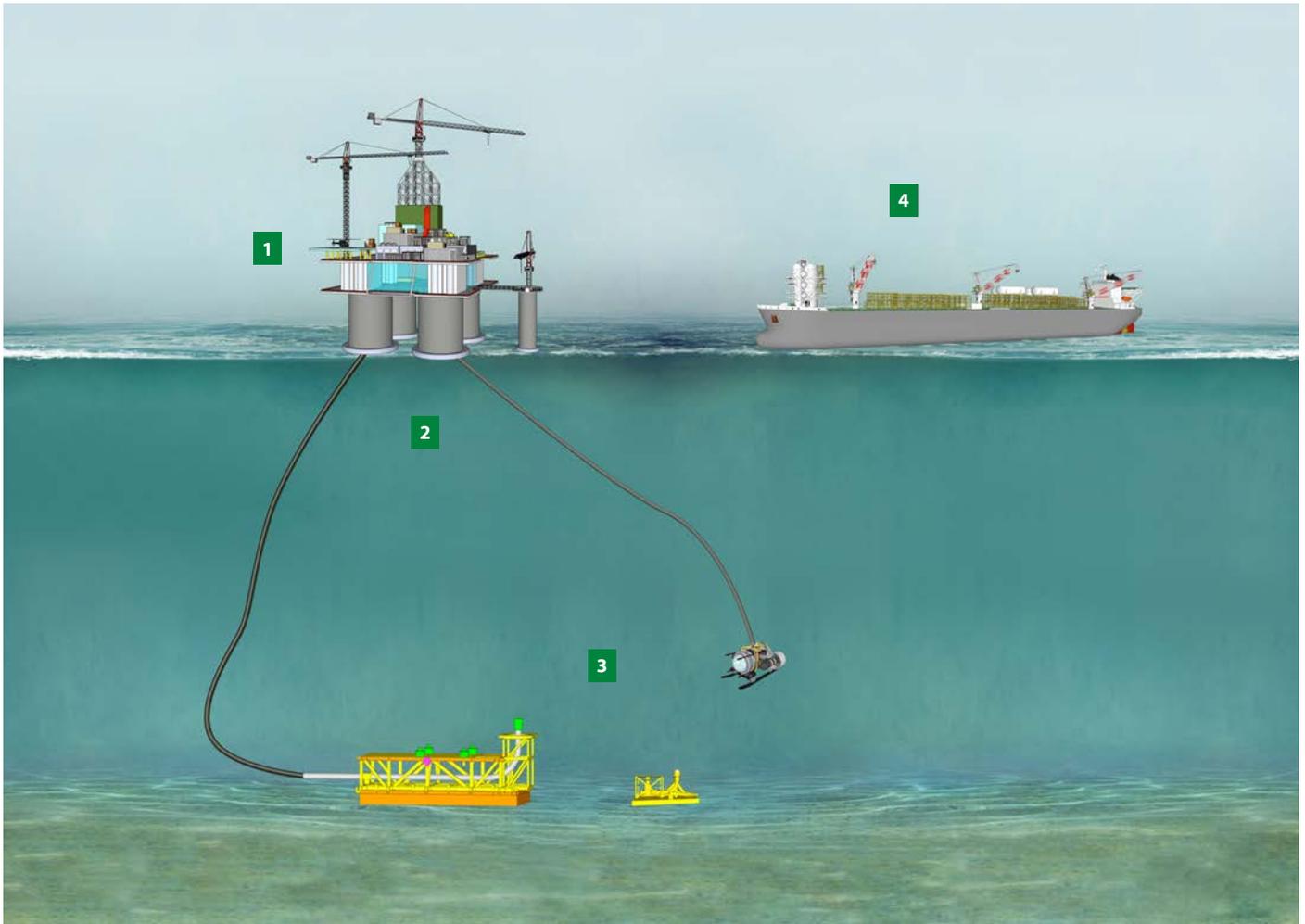


Electrical Safety Solutions for Offshore and Subsea Production Facilities



Avoid costly downtime in offshore facilities.

An acronym well known throughout the oil and gas industry, nonproductive time (NPT) accounts for substantial losses in time and revenue in petroleum production. NPT is estimated to cost upwards of \$100 to \$500 million annually. Equipment such as blow-out preventers (BOPs) and top drives can account for 51% - 75% of all equipment related NPT.

With over 70 years of electrical safety experience, Bender is a worldwide leader in providing electrical safety equipment to the oil and gas industry. Bender's advanced ground fault protection equipment continuously monitors system integrity, and provides advanced notification of potential ground faults and system insulation breakdown.

Bender's ground fault location system significantly reduces system downtime and technician time by locating ground faults down to the load level - all while the system remains online. Fault location can take place automatically, or manually with portable equipment. Remote communication solutions allow Bender equipment to be integrated into modern communication systems, such as Modbus.

- Products for virtually any offshore application - platforms, umbilicals, ROVs, and FPSO vessels
- Advanced notification of ground faults and insulation breakdown using the latest in ground fault monitoring technology for AC and DC systems, and systems with variable speed drives
- Significantly reduce system downtime with automatic ground fault detection and location
- Communication solutions allow for remote notification of technicians, or integration into modern industrial communication networks

1 Offshore platform control systems

Ungrounded systems



iso685 ground fault detector
Reduce downtime on faulty equipment with advanced AC/DC ground fault detection



EDS440 ground fault locator
Quickly and automatically locate ground faults in ungrounded systems



EDS3090 portable fault location
Quickly locate ground faults down to the individual faulty load with portable location equipment

High resistance grounded systems



RCMS series ground fault monitors
Monitor individual branches for AC and DC ground faults, including circuits with drives

Analysis and communication solutions



Advanced power quality metering
Class 0.2S power quality metering equipment with remote communication capabilities



Communication solutions
Monitor individual branches for AC and DC ground faults, including circuits with drives

2 Subsea umbilical cabling



iso685 series
Monitor the integrity of subsea umbilical cables using the latest in insulation monitoring technology

3 Subsea facilities and ROVs



OEM solutions
Bender's ground fault technology in small form factor, integratable devices

4 FPSO vessels

Ungrounded systems



iso685 ground fault detector
Reduce downtime on faulty equipment with advanced AC/DC ground fault detection



EDS440 ground fault locator
Quickly and automatically locate ground faults in ungrounded systems

The iso685 - advanced ground fault detection

For ungrounded AC/DC systems

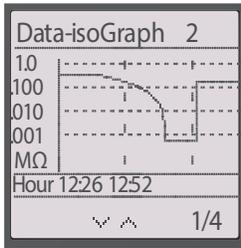


iso685 series ground fault detector

The Bender iso685 utilizes the latest in monitoring technology to detect ground faults in ungrounded AC/DC systems, as well as systems with variable frequency drives (VFD). The iso685 monitors the system's insulation resistance, and alarms when a breakdown is detected. Troubleshooting equipment has never been easier with the new isoGraph feature, which trends the system's insulation resistance over time.

Features:

- Minimize equipment downtime with advanced notifications of AC/DC ground faults, both symmetrical and asymmetrical
- Ideal for systems with variable frequency drives
- Digital display with real-time readout and trending over time via isoGraph
- Adjustable alarm values up to 10 MΩ
- Built-in web server - connect to the iso685 via Ethernet to view device status and change settings
- Built-in Modbus/TCP support



Applications:

- Topside equipment
- BOP control systems
- Integrity monitoring of subsea umbilicals
- Variable frequency drives
- FPSO vessel equipment
- General purpose AC/DC distribution

Feature	iso685-D	iso685-S + FP200	iso685-D-B	iso685-S-B + FP200	iso685-D-P	iso685-S-P + FP200
Ground fault detection Ungrounded AC/DC systems 10 kΩ - 10 MΩ insulation range	■	■	■	■	■	■
DIN rail or screw mounted	■		■		■	
Front panel mounted with detachable, low voltage display		■		■		■
Automatic decoupling capability for systems with tiebreakers			■	■	■	■
Controls ground fault location system					■	■

The iso685 - additional features

Front panel mounting, tiebreaker support, and fault location

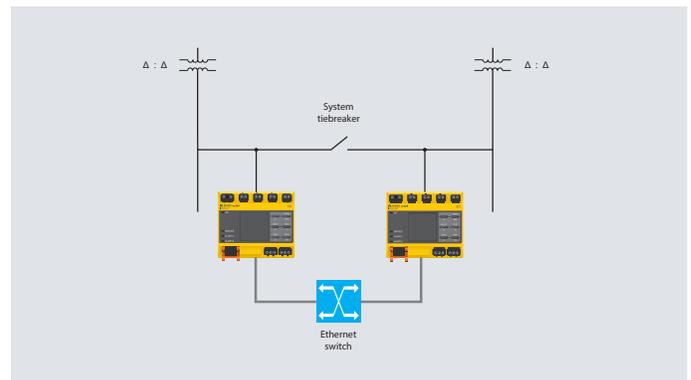


Detachable front panel mounting - "S" models

- Duplicates all displays and push buttons on a detachable front plate
- Designed for flush mounting (other options available)
- Maintain low voltage at the panel front - system voltages remain with the core device
- Simple, low voltage connection with RJ45 cable

Tiebreaker support: "B" models

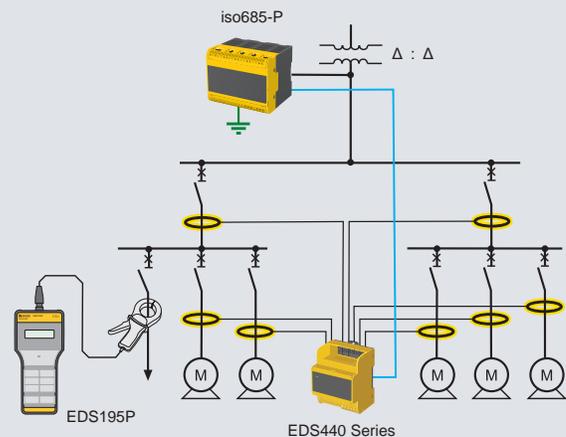
- Allows connection of multiple iso685 ground fault detectors to systems connected via tiebreaker
- Ensures all sides of a tiebreaker are continuously monitored
- Devices can be connected to tiebreaker logic to enable proper functionality when tiebreaker is open / closed
- Simple interconnection with a single RJ45 cable or through a standard Ethernet switch



Online, automatic ground fault location - "P" models

Reduce maintenance, costs, and NPT with Bender's ground fault location system

- Automatic detection and location of ground faults down to the load level with EDS440 ground fault location modules
- Greatly reduce time required for ground fault hunting
- Supports branch sizes from small to large with varying current transformer sizes
- Modular system allows for easy retrofitting / upgrading, such as adding future branches
- Additional portable fault location system (EDS3090 series) allows for ground fault location with a handheld device - perfect for ground fault hunting in virtually any system or during scheduled maintenance



Mitigate downtime and locate ground faults quickly

With Bender's ground fault location equipment for ungrounded systems



The EDS440 uses the latest in monitoring technology to locate ground faults in ungrounded AC and DC systems. Fault location takes place automatically while the system remains online, without the need to open branch breakers or disconnect equipment. Up to twelve branches can be continuously monitored from a single device.

Features:

- Greatly reduce maintenance times with advanced, automatic ground fault location while the system remains online
- Monitor for AC/DC ground faults on up to twelve separate branches from one device, down to individual loads
- View fault location status from EDS440 modules or connected iso685 ground fault detectors
- Modular design allows for simple installation and system design
- Remote communication support for advanced, browser-based interfaces and Modbus/TCP system integration

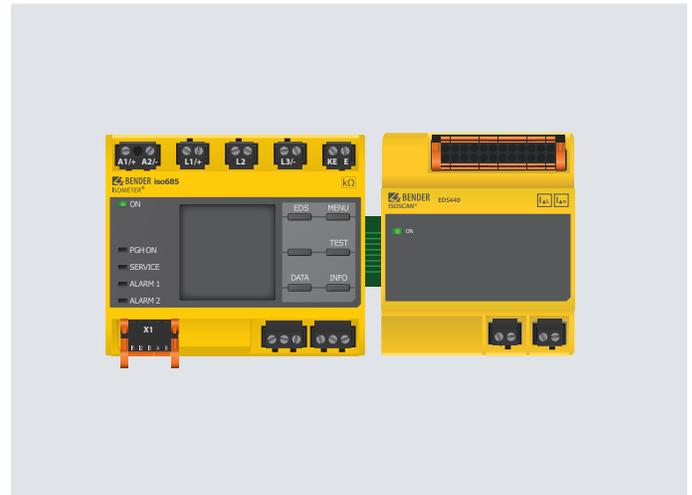
Applications:

- Offshore facility control and equipment systems
- FPSO vessel systems
- Systems with variable frequency drives (VFD)
- General purpose main distribution networks



Easy to install

- Snap in fault location modules to the iso685 easily using Bender's new backbone bus - snap more in to add more monitoring channels
- Remotely installed EDS440 devices require no connection back to the ground fault detector - optional two wire connection provides indication on the master iso685
- Locate ground faults on up to twelve separate branches per single EDS440 module - modular device system allows for simple system design
- All setup and status notifications take place centrally from the iso685 ground fault detector
- Simple two-wire connections for current transformers



Notify staff and technicians faster

- Outputs for alarm notification
- View the status of the iso685 and connected EDS440 devices remotely through Ethernet
- Clear identification of fault location by branch / channel using Bender's easy-to-use, browser-based interface built into the connected iso685, or with a connected COM4651P / CP700 communication gateway
- Custom names for individual EDS440 branches
- Integrate fault location into industrial ethernet networks with Modbus

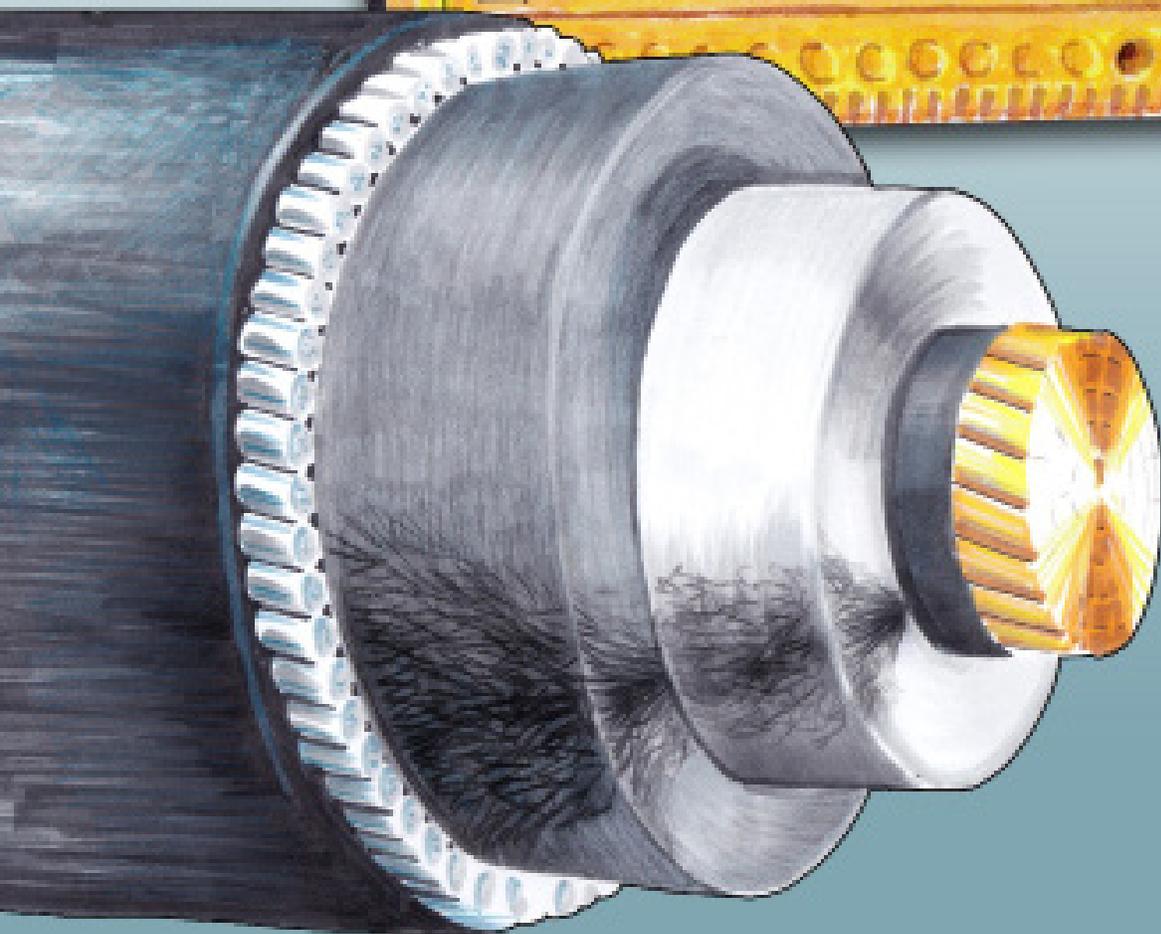
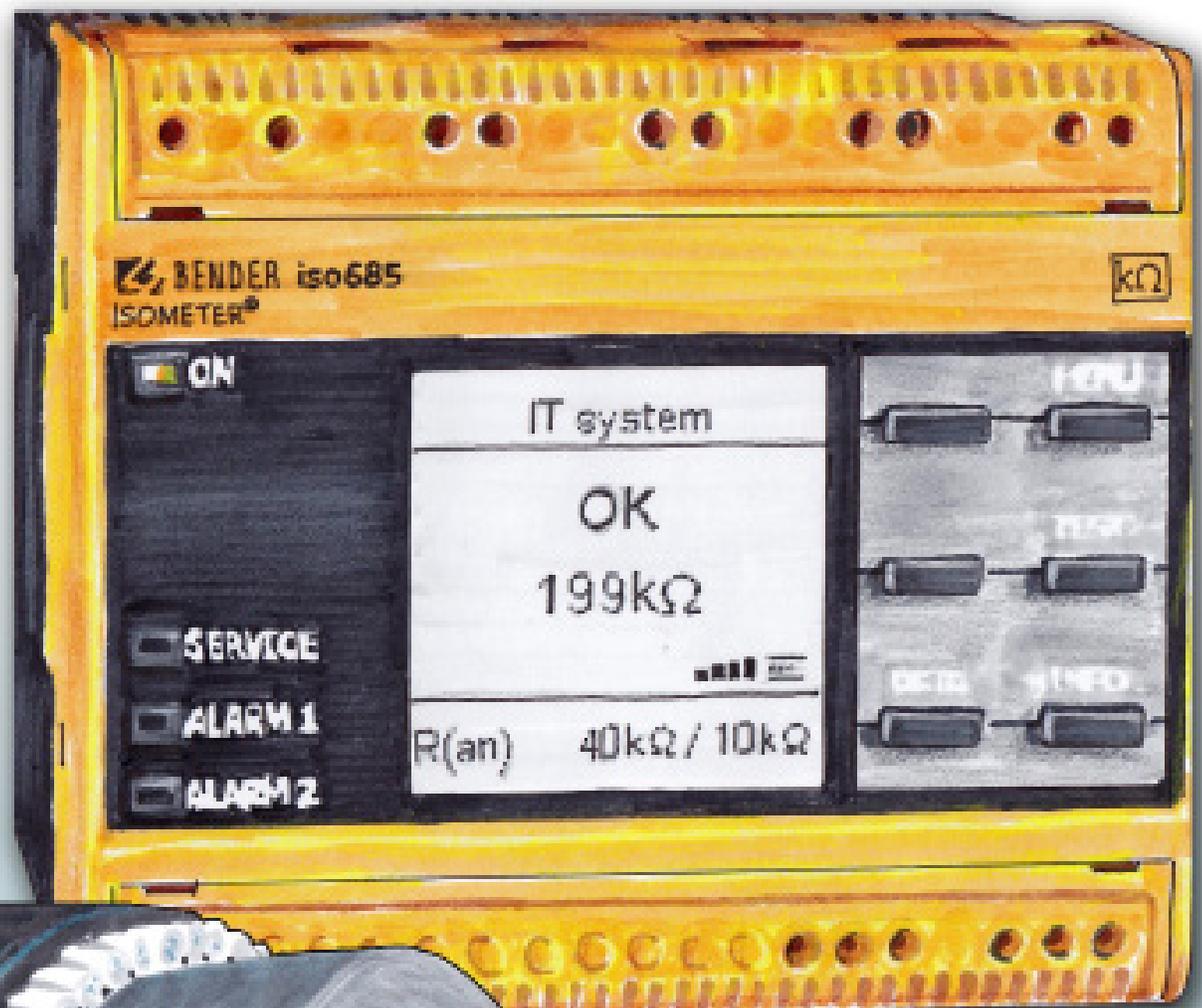
#	Alarm	Test	Channel description
1	✓	--	Residual current PDP-01 MCC-1 Ground Fault
2	! Alarm Ground Fault	--	Residual current PDP-01 MCC-2 Ground Fault
3	! Alarm Ground Fault	--	Residual current PDP-01 MCC-3 Ground Fault
4	✓	--	Residual current PDP-01 MCC-4 Ground Fault
5	! Alarm Ground Fault	--	Residual current PDP-01 MCC-5 Ground Fault
6	✓	--	Residual current PDP-01 MCC-6 Ground Fault
7	✓	--	Channel disabled PDP-01 MCC-7 Ground Fault

Portable ground fault location

Integrate ground fault troubleshooting into predictive maintenance programs with the EDS3090 series

- Quickly locate and identify ground faults with portable equipment
- Works either as a standalone portable system, or in combination with Bender's installed ground fault monitoring equipment
- Multiple sizes of split-core clamps included
- Allows integration of ground fault troubleshooting into predictive maintenance programs
- Ideal for technicians with regularly scheduled equipment maintenance periods





Topside AC/DC ground fault protection

Multi-branch protection for topside systems, including VFDs



RCMS series multi-channel ground fault monitor

Bender's RCMS460 and RCMS490 monitor for ground faults in grounded and high-resistance grounded AC/DC systems, as well as systems with variable frequency drives. Up to twelve separate branches / loads can be monitored in parallel, with individually set alarm levels. The device's LCD display shows the status of each branch in real-time.

Features:

- Multi-channel ground fault monitoring for up to 12 separate AC/DC branches
- Individually set alarm levels for each branch - as low as 6 mA, and as high as 20 A
- Display shows each branch's measured ground fault level in real-time
- Harmonics analysis
- Option for individual output relays for each branch / load (RCMS490 series)
- Compatible with Bender's remote communication system

Applications:

- Topside equipment, when system is specified as high-resistance grounded
- General purpose solidly- and high-resistance grounded systems, both AC and DC

The multi-channel advantage

Monitor up to twelve branches for AC and DC ground faults from a single device

- Monitor up to twelve branches from a single device
- Modular design allows for individualization - each channel has its own trip level, current transformer size, and more
- Simple bar graph indication shows the alarm status of each channel
- RCMS490 devices feature individual contact outputs for each branch - individually notify or interrupt
- Connect to Bender's remote communication system - remotely view alarm status, measured values, and more



Communicate and integrate

Advanced communication tools to quickly locate, inform, and analyze



COM465IP communication gateway

Standard features:

- Adds supported Bender and third party devices to modern industrial communication networks
- Modern, responsive web interface working in virtually any web browser
- Connects to standard Ethernet networks
- Check the status of devices and alarms across multiple communication protocols on a single screen
- Third party device support - connect third party Modbus/TCP devices to view specified data points
- Supports virtual setpoints - create custom alarms using conditional or mathematical alarms, combine multiple devices, and integrate third party devices



CP700 communication gateway and HMI

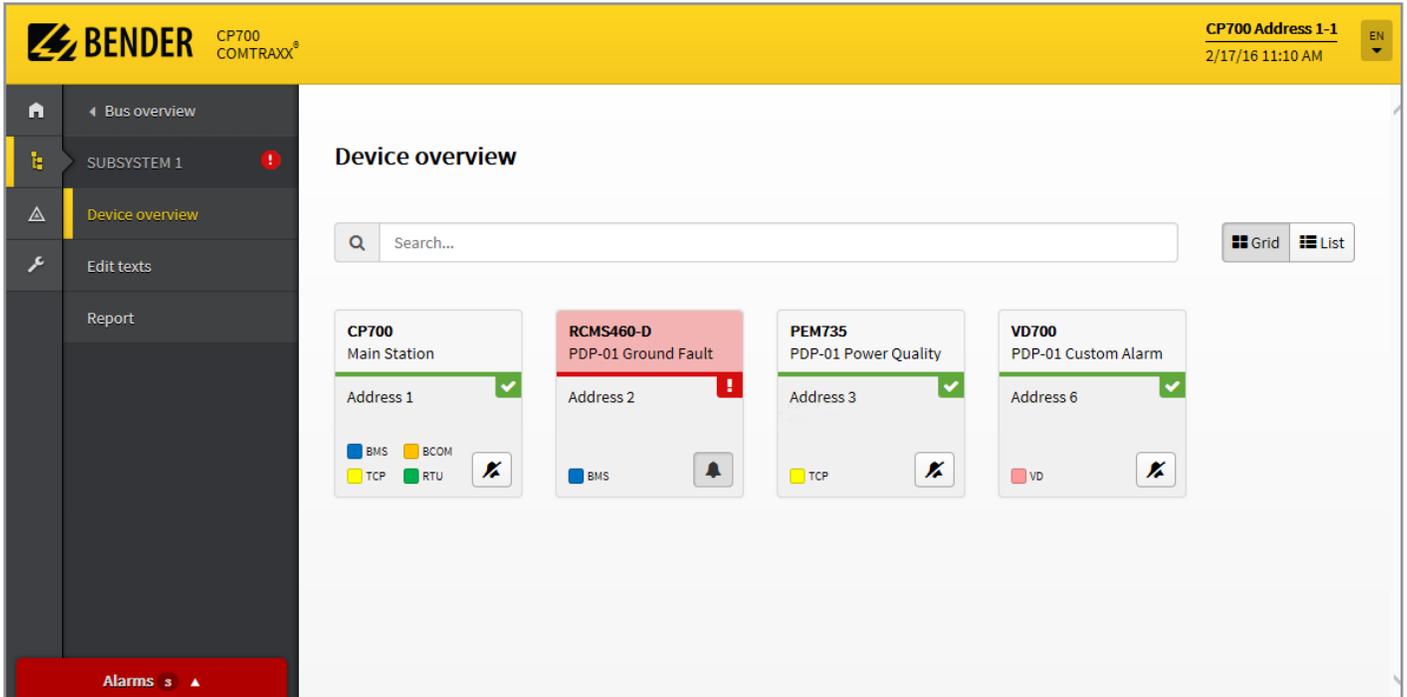
Key additional options:

- Identify devices and alarm channels with custom names
- Receive e-mail notifications on specified trigger events
- Connect Bender devices to Modbus/TCP networks
- Remotely modify settings for connected Bender equipment
- System visualizations - visual overviews of systems with equipment locations; identify physical locations of alarms with no programming required

CP700 features:

- All of the features of the COM465IP
- Touch screen interface showing device status and alarms, including features available through the web interface right on the device



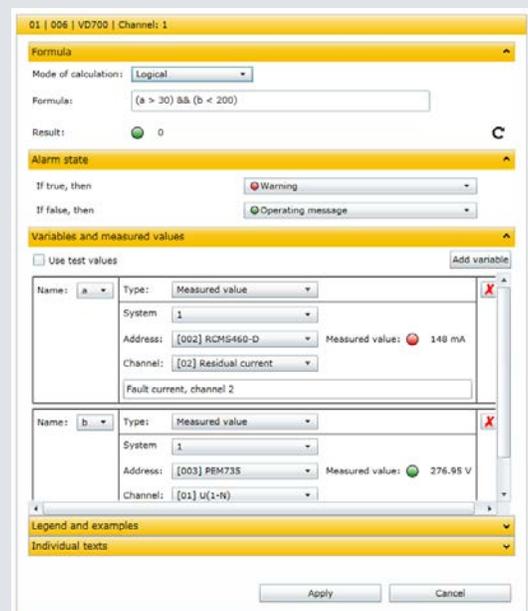


- Easy to use status indication for connected devices
- Unified status screen for devices connected across multiple communication buses (Bender RS-485 bus, Bender Ethernet bus, Modbus/RTU, Modbus/TCP)
- Drill-down for each device shows detailed readings, including values and alarms for all single- and multi-channel devices
- Modern design - HTML5-based interface, works in virtually all web browsers
- Touch-friendly, responsive layout for mobile devices
- Grid-type and list-type views available
- Custom alarms created with virtual setpoints appear in the same list as connected devices

Virtual setpoints

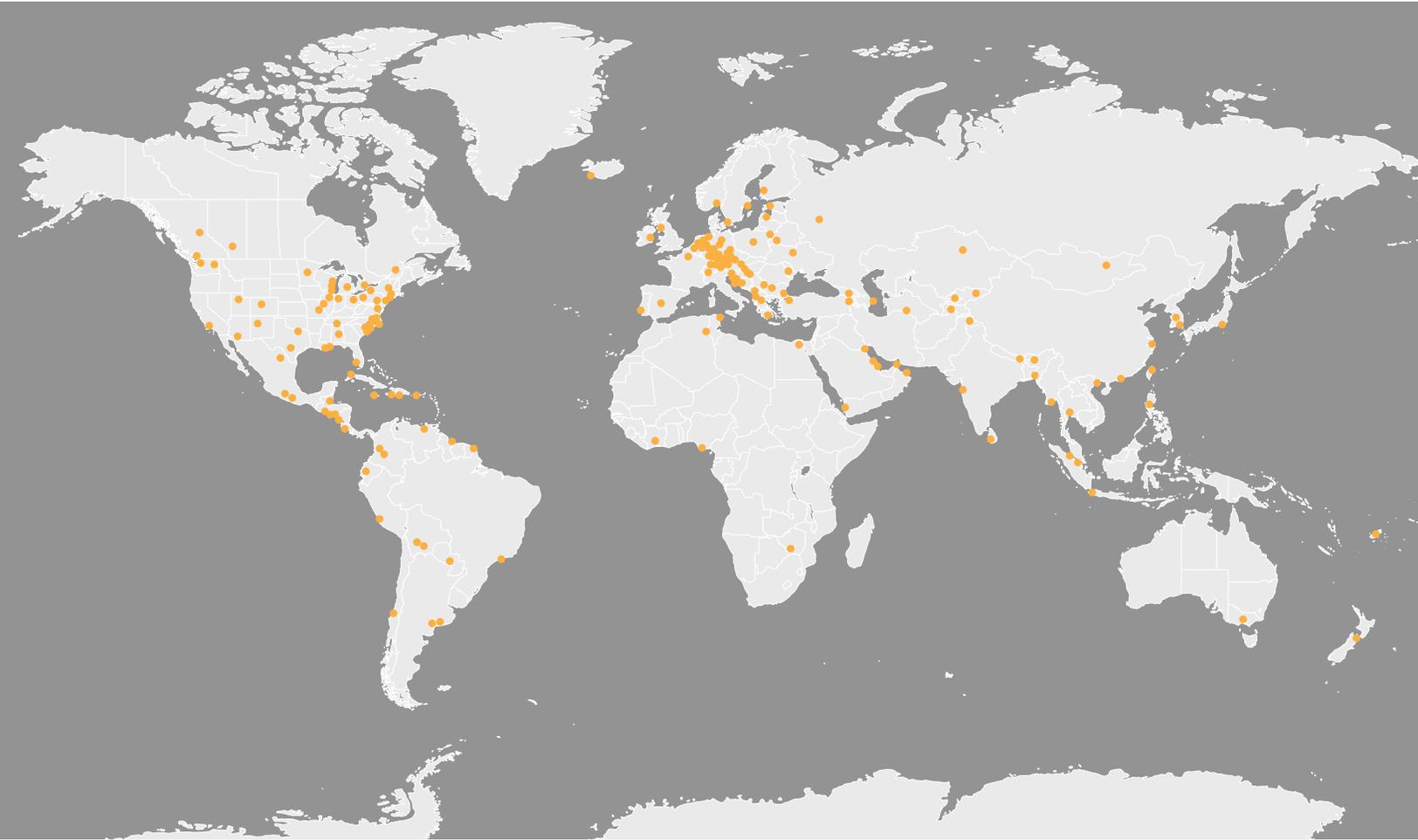
Create custom alarms tailored to specific applications

- Create custom conditional or mathematical alarms
- Combine multiple devices or specific channels into a single alarm
- Tailor alarms to specific locations or applications
- Integrate third party Modbus devices into custom alarms
- Custom alarms appear as any other device type on the main screen, including custom naming





Bender is located in over 70 countries around the world



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