Cable test vans and systems
Prepared for anything
Maximum security of supply – the primary objective in the field of power supply. In order to guarantee this, extensive expertise is required, as the network infrastructure is complex and demanding. The energy transition also presents us with considerable challenges in ensuring a distributed power supply.

As part of ongoing network expansion, new installations - but also existing cable systems in particular - must be tested and evaluated efficiently, and any problems in the network must be identified and rectified as quickly as possible. Working in partnership with BAUR, you can benefit from our experience, expertise, and innovations. Together, we can ensure that power keeps flowing efficiently and cost-effectively.

Our responsibility: a stable power network

BAUR – supporting operators

Ever greater demands are being placed on measurement engineers for them to be equipped, trained, and prepared to handle every type of call-out case. Our approach is to support operators as best as possible in their day-to-day work, with optimally adapted systems that are easy to operate, and through individual processes and measurement methods that can be optimally integrated. For user-friendly and precise cable fault location as well as cable testing and diagnostics. For productive and effective ways of working.
BAUR cable fault location and diagnostics systems

A system with additional value
The complexity of cable networks means that individual measurement engineers are required to perform a wide range of tasks. Even at the resource planning stage, it is often still unclear which equipment will actually be required on site. This is where the systems from BAUR come in. By adapting the equipment to customer-specific requirements and controlling the devices via the intelligent BAUR Software 4, measurement engineers are optimally prepared for whatever activities need to be performed on site.

Every measurement engineer can rest assured that all the requirements in their system are reliably met. The system carries out the work in an efficient manner – without restricting the operator’s freedom to make decisions. Flexibility is our highest priority; this means each step suggested by the system can be selected freely. The cable test van is becoming indispensable for every measurement engineer, as it ensures they are optimally equipped to handle any call-out.

BAUR offers four types of system solutions for single- and three-phase cables: the titron® and transcable cable test vans, the Syscompact series, and systems for cable fault location that are specifically intended for very long cables.
Process steps and methods

**FAULT ANALYSIS**

Fault analysis is used to ascertain the fault characteristics and determine the subsequent procedure and selection of methods for fault location.

- **Insulation resistance measurement** to determine the faulty phase and the type of fault.
- **Voltage test and breakdown detection** to test the dielectric strength of the cable insulation.
- **Cable sheath testing** to detect damage to the outer cable insulation (cable sheath faults).

**PRE-LOCATION**

The objective of pre-location is to determine the fault position as precisely as possible so that the subsequent pin-pointing activities can be implemented as quickly and efficiently as possible.

- **DC-SIM/MIM**
  Secondary/multiple impulse method in DC mode for pin-pointing intermittent faults. DC voltage is applied to the cable until breakdown. The cable capacitance is used to increase the available surge energy.

- **ICM**
  Impulse current method for locating high-resistive faults and breakdown faults. The fault distance is determined by analysing the impulse current diagram. Particularly suitable for use on long cables.

- **DC-ICM**
  Impulse current method used in DC mode for locating chargeable breakdown faults for which the cable capacitance is used in conjunction with a surge voltage generator.

- **Conditioning-SIM/MIM**
  Difficult to locate or wet faults are first conditioned with surge voltage before a SIM/MIM measurement is carried out.

- **Decay**
  Voltage-coupled decay method for locating breakdown faults with high voltage. The oscillating voltage reflection waves are evaluated automatically to determine the fault distance.

**Measurement mode with envelope curve display**
In this process, even small, intermittent changes to impedance can be made visible by means of an envelope curve and saved automatically.

- **TDR**
  Time domain reflectometry for locating low-resistive faults and cable breaks, and for determining the cable length.

- **SIM/MIM**
  The secondary/multiple impulse method is the most well-established and precise cable fault pre-location method. High-resistive faults and breakdown faults are ignited by a single HV pulse and the fault distance is measured very precisely several times via the TDR technology and automatically evaluated.
Testing and diagnostics are used for the comprehensive condition evaluation of cable routes in order to identify weak points in the cable, before they result in failure – for maximum network availability while keeping maintenance and repairs costs to a minimum.

Cable testing
Based on international research as well as decades of practical experience, VLF cable testing and diagnostics on medium-voltage systems is now a recognised method among leading bodies and associations. What this means for you is that cable and sheath testing as well as diagnostic measurements with VLF voltage are performed in compliance with standards. You don't have to concern yourself with standard-compliant work procedures as we've already taken care of that for you.

Partial discharge diagnostics
Partial discharges occur at fault locations in the cable, e.g. at electrical trees, joints, and terminations. Partial discharge diagnostics is used to determine possible fault locations in cables and accessories before they lead to failure. This makes it possible to rectify the problem in a timely manner and prevent any uncontrolled failures. Partial discharge testing with BAUR devices is performed in accordance with standard IEC 60270.

Dissipation factor measurement (tan δ measurement)
The dissipation factor measurement (tan δ measurement) is a non-destructive and integral procedure that serves to evaluate the condition of an entire cable route. With the dielectric dissipation factor tan δ, the relation of effective power to reactive power of the cable is measured. The measurement provides clear information on the condition of the cable insulation and its ageing condition. Possible replacement activities can be controlled in a targeted manner within the framework of professional asset management.

Full Monitored Withstand Test
Whether dissipation factor or partial discharge measurement - both diagnostics methods have their advantages. However, individually, neither of them can detect all weak points. For this reason, it is worthwhile combining both procedures - whether carried out subsequently or together in one procedure. This gives you valuable, additional information, ensuring greater accuracy during condition evaluation and trouble-shooting. The time-saving combination of testing and diagnostics is known as the Monitored Withstand Test (MWT). The MWT also allows the required test duration to be adapted to the cable condition.

TRACING AND PIN-POINTING

As precise as pre-location is, it is never able to detect or recognise the existing deviations of a cable route in the ground. These can only be detected by precise pin-pointing.

Acoustic pin-pointing
is the most common method used to determine the precise location of high-resistive faults and breakdown faults. High-voltage pulses create electromagnetic pulses on the way to the fault location and generate a breakdown with an audible bang.

Step voltage method
to determine the precise location of cable sheath faults. A voltage drop is generated at the fault which can be located using earth spikes and a receiver.

Tracing
to precisely determine the cable route. Precise cable tracing is essential, particularly with unknown or imprecise cable routes, and saves both time and money.

Twist method or minimum distortion method
used when pin-pointing short-circuits depending on the cable type. In this process, the disturbance in the otherwise homogeneous magnetic field that is caused by the fault is measured and located precisely.

CABLE IDENTIFICATION

Usually, multiple cables are laid in a cable route. Once the exact position of the fault has been determined and exposed, the defective cable must be identified reliably.

Cable identification
is used to identify single- and multi-core cables in a cable loom. The measurement engineer is provided with precise information as to which cable needs to be tested and, where necessary, cut.

Testing and diagnostics from page 12 onwards
Cable test vans and systems
Cable test vans and systems

titron®
State-of-the-art technology

The titron® automatic cable fault location system is characterised by efficient technology and intuitive operation. The new generation high-performance system is based on state-of-the-art technology and provides efficient and reliable cable fault location, cable testing, and cable diagnostics through software support.

Central automatic control with complete system monitoring

The titron® system software with a high-performance industrial PC controls the phase and device selection and simultaneously monitors all safety-related functions and parameters. The optimally adapted measurement process and modern digital signal processing achieve maximum efficiency and measurement precision.

Easy and convenient to operate

You can work conveniently as usual with a mouse and keyboard in the proven Windows 10 operating system. Office programs such as MS Office, in-house ERP systems, GIS, and web applications can be installed to assist you with logging and reporting, for example.

SSG 40 high-performance surge voltage generator
Surge energy up to 3000 J with a fast 3-second surge sequence.

Cable Mapping Technology (CMT)
Overview of cable accessories and faults proportional to the cable length presented graphically.

Conditioning-SIM/MIM
Cable-friendly technology for fault conditioning instead of burning.

BAUR cable database
The cable database makes it possible to compile your own database which can contain all the cable details, including those relating to the cable history.

Smart Cable Fault Location Guide
The intelligent cable fault location assistant leads the operator to the fault quickly and reliably by means of fully automated processes.

BAUR GeoBase Map
Unique GPS-based combination of road maps with cable route and BAUR cable database.
BAUR Fault Location App
Non-destructive and safe pin-pointing

Remote control of titron® via smartphone or tablet

During pin-pointing, all the essential functions of titron® can be controlled remotely via the BAUR Fault Location App:
- Switching the surge voltage generator on and off
- Setting the surge voltage and surge sequence (5 – 20 pulses/min, single surge)
- Selecting the surge voltage range
This way, the operator has the possibility of only switching on the high voltage when he reaches the pre-located fault location. Once the fault has been located, the high voltage can be switched off again. Through this, the stress on the cable and the system is reduced to the necessary minimum and the level of safety is significantly increased.

Location and fault position at a glance

The cable data is transmitted from the cable fault location system to the Fault Location App and is displayed in the app in combination with the road map. This allows the operator always to have the latest information on the
- Cable route (if available)
- Pre-located fault position
- Location of the cable test van

Monitoring and adjusting the measurement parameters during the fault location

In the fault location mode, the operator always has an overview of the most important measurement parameters:
- High-voltage status
- Output voltage, max. permissible voltage
- Surge sequence, surge energy, duration of the measurement
- SSG capacitor charge and discharge curve

Comprehensive safety concept in accordance with the latest standards
- Safety concept in accordance with EN 61010-1 and EN 50191
- Monitoring of all safety-related parameters (protective and auxiliary earthing, rear door, and HV connection sockets)
- Partition between operating and HV area, red and green signal lamp
- Emergency off button in the operating area and optional external emergency off unit in accordance with EN 50191
- Key-operated switch against unauthorised operation
- All operation-related error messages are displayed in plain text on screen and are immediately visible to the operator

For installation in small vehicles as well

The compact and fully equipped titron® C testing and fault location system is specifically designed for installation in small vehicles.

BAUR Fault Location App

Supported devices
- iPhone, iPad, iPad mini, iPod touch (from iOS version 9.2 onwards)
- Smartphones or tablets with Android operating system (from version 4.0.3 onwards)

More detailed information and data sheets on titron can be found on our website at: baur.eu/titron
The BAUR Software 4 covers all the solutions for cable fault location, cable testing, and cable diagnostics, ensuring efficient and precise condition monitoring for cable networks when used in conjunction with BAUR hardware. It includes well-established measurement methods for cable fault location as well as innovative approaches such as Conditioning-SIM/MIM, enabling even faster and more effective localisation of wet cable faults that are difficult to locate.

The BAUR Software 4 scope of performance far exceeds standard features; the operator is also assisted by the intuitive operational concept and helpful support functions.

**Connect and go – the new operational concept**

- Intuitive modern user interface – no lengthy period of familiarisation
- Automated sequences for fast and reliable cable fault location
- Optimum operator support during cable fault location provided by the Smart Cable Fault Location Guide
- BAUR GeoBase Map*: Unique combination of road maps, including the cable route
  - GPS-based system location determination
  - Cable routes and cable faults displayed on the map
- Cable Mapping Technology CMT: Overview of cable accessories and faults in relation to the cable length
- All data on the cable route such as geographic position, voltage level, joints, all measured values, etc. are automatically saved and can be accessed at any time.
- Fast and easy compilation of clear and precise measurement logs – with freely selectable company logo, comments, and figures of the traces.
- Import and export of measurement data with available cable route data

**Step-by-step process with the Smart Cable Fault Location Guide**

- The Smart Cable Fault Location Guide leads the operator to the cable fault quickly and efficiently.
- A special algorithm continuously analyses the current measurement results, which it then uses to generate optimum recommendations for how the operator should proceed in order to reliably locate the cable fault.
- Automatic fault analysis with clear graphical presentation for a better overview.
- Test voltage assistant:
  - The system recommends voltage values according to the cable data and the fault type
  - The test voltages can be defined on a user-specific basis
- Automatic cursor positioning at the cable end and at the fault location
- Automatic settings of method-related parameters for fast and efficient fault location
- Clear graphical presentation of the measurement results with helpful functions for evaluation

All this with full flexibility for experienced operators! Experienced measurement engineers can draw on their expertise at any point during the measurement process and select their user-specific procedure.
BAUR Software 4 – for easy and comprehensive condition evaluation of cables

The new BAUR Software 4 allows you to quickly detect and evaluate the cable condition in accordance with your own diagnostics philosophy. The intuitive operational concept supports asset managers and measurement engineers working on site, firstly with the extremely efficient measurement process and secondly through precise condition monitoring of cable networks. Fast. The BAUR Software 4 elevates application and evaluation to a new level – thereby enabling further optimisation of the condition-based maintenance of cable networks.

The measurement methods
The BAUR Software 4 is used together with BAUR test and diagnostics systems for cable testing, cable sheath testing, and diagnostics with dissipation factor measurement or partial discharge testing.

Your own diagnostics philosophy as the basis
Operators can either use standardised diagnostics sequences or create their own company-specific diagnostics sequences. To do this, in-house specifications for various cables or various phases in the network lifecycle, such as commissioning or maintenance, are simply created within the diagnostics sequences. The criteria, ranging from current standards and guidelines through to company-specific specifications, are thus stored at the start of every measurement and the engineer starts the measurement procedure with just a few clicks.

Comparable results – better basis for decision-making
The sequences can be exported directly to all BAUR measurement systems used and can be adapted at any time as required. These standardised measurement cycles provide asset managers with reproducible and comparable measurement results that show not only the condition but also the ageing of a cable route over time – the ideal basis for making informed decisions concerning network planning and investment in maintenance.

Evaluation made easy
All measurements and tests (including all condition data for every cable route) are stored in the central cable database. The results are represented graphically during the process, even while evaluating the measurement. At the end of measurement, the overall condition of the cable route is displayed along with the results of the individual measurements.

All information at a glance:
The BAUR Software 4 automatically generates reports on the measurements that have been performed. The reports contain all the information about the tested cables and can be exported as a PDF file. The diagnostics results and condition evaluation can also be easily presented in graph and table format.

Our software – your benefits:
- Better decisions based on comprehensive condition evaluation of the cable network
- Saves time on site thanks to automated sequences and report generation
- Easy operation thanks to the intuitive operational concept

Cable testing
- Cable testing (VLF true sinus*, VLF square wave, DC voltage)

TD
- Dissipation factor measurement

PD
- Partial discharge testing

TD & PD
- Parallel dissipation factor and partial discharge measurement
- Monitored Withstand Test (MWT) with dissipation factor or partial discharge testing
- Full Monitored Withstand Test (Full MWT)
transcable
Flexible, individually configurable system for cable fault location and diagnostics

transcable is an automatic or semi-automatic, single- or three-phase cable fault location system. Through the modular design, the individually functional modules work independently from one another. This means that the transcable system can be easily extended at any time.

transcable offers a very diverse range of functions. In addition to the required testing technology for cable fault location and cable testing, the truesinus® technology enables precise and meaningful software-supported cable diagnostics with dissipation factor measurement and partial discharge testing.

Universal application
Due to its modular design, the transcable system enables the integration of multiple options such as a PHG VLF test system, surge voltage generators with different voltage ranges, or DC voltage testing up to 110 kV. The system therefore supports universal use, even on high-voltage cables and in offshore areas.

More detailed information on transcable can be found on our website: baur.eu/transcable
Cable test van equipment
Options that leave nothing to be desired

In terms of equipment and convenience, BAUR systems offer every option you can think of:

- Accessories for various fault location methods
- Diverse safety devices and protective equipment (e.g. isolation transformer)
- Cable drum rack with motor drive
- External emergency off unit according to EN 50131
- Heating or air conditioning systems

Our experts will be happy to help you plan and configure your individual system.
Contact us via baur.eu/contact
Mobile cable fault location to meet your needs
The devices in the Syscompact series are multifunctional cable fault location systems in modular 19 inch rack technology, making them an attractive alternative to large systems. These systems offer various cable fault location methods and deliver fast and reliable operation. The equipment and structure is designed individually according to your needs. Syscompact is available as a portable system on wheels or as block units for installation in a cable test van – the ideal basis for smaller budgets, without compromising on performance.

Syscompact
Compact and multifunctional

BAUR cable fault location – the advantages at a glance:
- Precise and reliable cable fault location
- Well-established fault location methods for every type of fault and various cables
- Modular system, can be easily extended for cable testing and diagnostics

More detailed information and data sheets on the Syscompact series can be found on our website at: baur.eu/syscompact
Long submarine and land cables for global power supply

Indispensable and robust, but sadly not indestructible.

Submarine power cables are indispensable for reliable power supply. Among experts, submarine cables are actually classified as critical infrastructure. This is on account of the harsh installation environment and mechanical stress caused by currents, fishing, and anchors.

When a submarine cable is damaged, cable fault location and repair is usually a complex and time-consuming process. The protracted downtime translates into losses in the millions for the cable operator – with the downtime costs growing day by day!

Many cable operators therefore invest in a suitable fault location system even before the cable is put into operation. Immediate availability is therefore a must for submarine cables.

The biggest threats to submarine cables:
External forces exerted by heavy ships’ anchors and trawl nets of fishing boats at all sea depths.

The XL-CFL systems are tailored to the system-specific requirements. This includes:
- Marine-grade containers
- Hermetically sealed HV and operating areas
- Air conditioning system for maritime climate, also for excess pressure in the container
- Screen to protect against spray
- Discharge unit adapted to the system size
- Pressure relief according to the spatial volume and possible arcing faults
- Appropriately dimensioned earthing cross sections

<table>
<thead>
<tr>
<th>Device type</th>
<th>Area of application</th>
<th>Advantages</th>
<th>BAUR solution</th>
<th>Additional info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portable devices</td>
<td>For cable fault location at multiple locations of use</td>
<td>Small and convenient</td>
<td>BAUR XL-CFL package</td>
<td></td>
</tr>
<tr>
<td>Mobile systems</td>
<td>For cable fault location at multiple locations of use</td>
<td>Fast transportation to place of use</td>
<td>BAUR XL-CFL package</td>
<td></td>
</tr>
<tr>
<td>Mobile systems</td>
<td>For cable systems with very high relevance – high costs in the event of cable failure, very high risk for security of supply</td>
<td>Compact all-cable fault location methods integrated into a single system</td>
<td>BAUR XL-CFL package</td>
<td></td>
</tr>
<tr>
<td>Mobile systems</td>
<td>For cable systems with extremely high relevance – extremely high costs in the event of cable failure, extremely high risk for security of supply</td>
<td>Fast transportation to place of use</td>
<td>BAUR XL-CFL package</td>
<td></td>
</tr>
<tr>
<td>Mobile systems</td>
<td>Tailored cable fault location systems integrated in a measurement container</td>
<td>Immediate availability when stored in the switchgear</td>
<td>BAUR XL-CFL package</td>
<td></td>
</tr>
<tr>
<td>Solutions for XL-CFL cable fault location in measurement containers</td>
<td>For cable systems with very high relevance – very high costs in the event of cable failure, extremely high risk for security of supply</td>
<td>Immediate deployment in the event of a cable system failure</td>
<td>BAUR XL-CFL package</td>
<td></td>
</tr>
<tr>
<td>Solutions for XL-CFL cable fault location in measurement containers</td>
<td>Tailored cable fault location systems integrated in a measurement container</td>
<td>Cable fault location within the shortest possible time / on the first day</td>
<td>BAUR XL-CFL package</td>
<td></td>
</tr>
<tr>
<td>Solutions for XL-CFL cable fault location in measurement containers</td>
<td>Measurement container</td>
<td>Suitable for very long cables</td>
<td>BAUR XL-CFL package</td>
<td></td>
</tr>
<tr>
<td>Solutions for XL-CFL cable fault location in measurement containers</td>
<td>Tailored cable fault location systems integrated in a measurement container</td>
<td>Precision</td>
<td>BAUR XL-CFL package</td>
<td></td>
</tr>
<tr>
<td>Solutions for XL-CFL cable fault location in measurement containers</td>
<td>Immediate deployment in the event of a cable system failure</td>
<td>Cost savings</td>
<td>BAUR XL-CFL package</td>
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Other BAUR Brochures

- Cable testing and diagnostics
- Cable fault location
- Insulating oil testing
- Product overview
- Company brochures

Further product information is available at:
baur.eu/brochures

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