ensuring the flow

Каталог продукции BAUR

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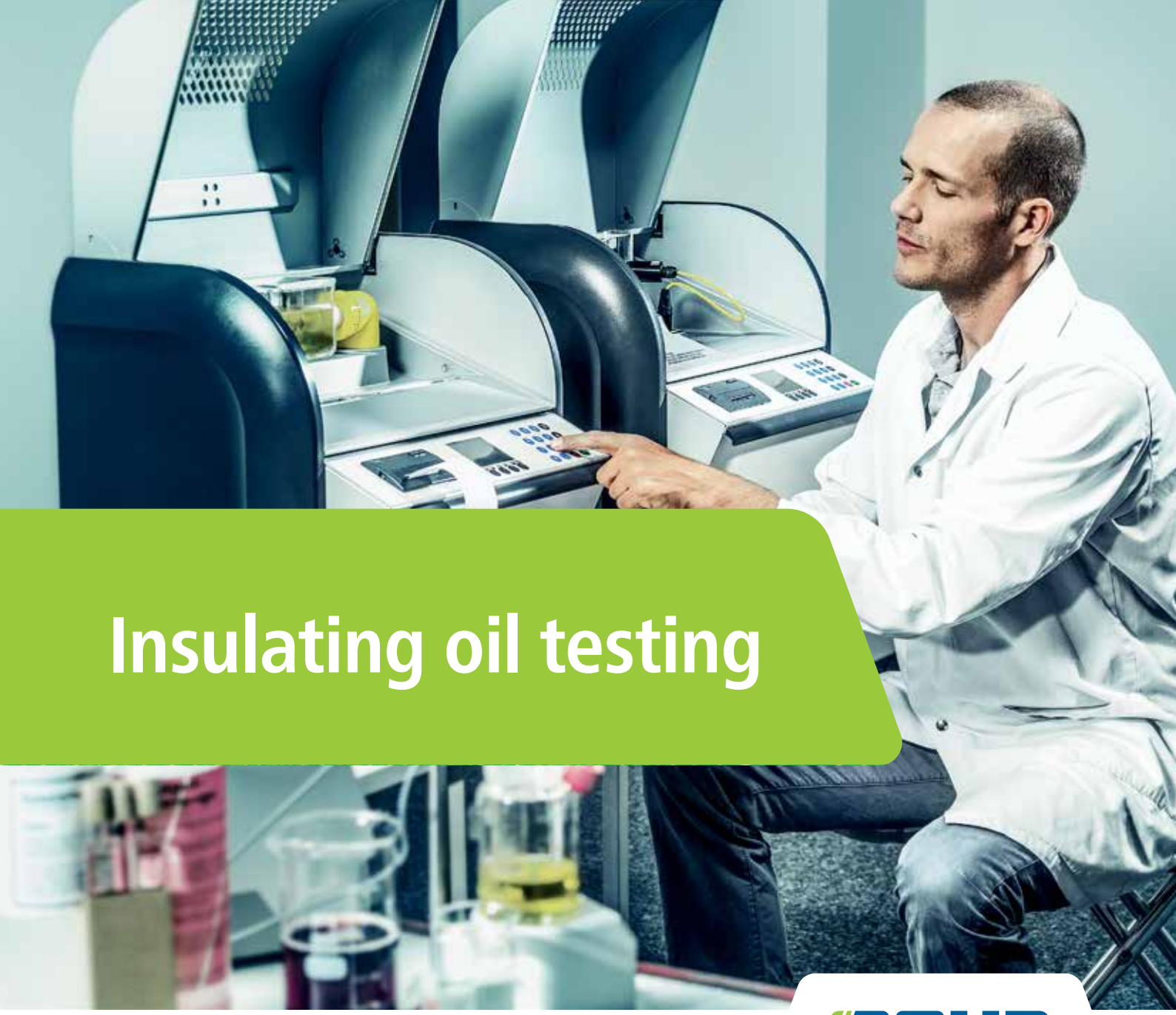

Insulating oil testing

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Precise and reliable

Devices for determining the breakdown voltage

Efficient and reliable

The insulation capacity of insulating liquids is assessed using breakdown voltage testing. The test results indicate whether any ageing of the oil has taken place, e.g. due to excessive water content, impurities or oxidation of the oil.

The perfect device for all applications
The BAUR DPA 75 C is a breakdown voltage tester designed for both laboratory and mobile use. The larger DTA 100 C unit is designed for continuous operation in the laboratory. The latter is also available in the form of the DTA IL for the constant monitoring of the insulation capacity.

You can rely on top quality with all breakdown voltage testing devices, for example:
- Measurement technology and power electronics designed for long service life
- Glass test vessels
- Precise, reliable and reproducible measurement results over very long periods

↗ Test cell according to IEC 60156 with micrometer to set the electrode distance.

DPA 75 C
The mobile DPA 75 C device is optionally available with a battery. This makes it suitable for use in a laboratory as well as for in situ measurements on power transformers. The device delivers a maximum test voltage of 75 kV_{rms} symmetric.

DTA 100 C and DTA IL
The DTA 100 C is intended for use in a laboratory and provides a maximum test voltage of 100 kV_{rms} symmetric. This device is therefore also capable of testing oils used in transformers of the transmission network. As an inline version (IL), the DTA 100 C also tests the breakdown strength of insulating liquids during production, making it an ideal choice for manufacturers of insulating liquids.

Simple and stable

Easy and accurate test cycles are guaranteed for all BAUR breakdown strength test devices. The testing is carried out completely automatically based on current, global test standards. It is also possible to save and call up user-specific test sequences.

Automatic test sequences
The combination of extremely short switch-off times during breakdowns and the easy oil sample handling facilitate high quality statements and conclusions on the insulating oil quality. Furthermore, features such as temperature measurement of the insulating liquid, the precise setting of electrode distances according to the standard and automatic self-testing ensure robust measurement results.

Precise voltage control
The voltage is measured directly at the device's high-voltage generator, meaning that very precise measurement results can be achieved. It also permanently monitors the voltage rise. Our "Real Breakdown Monitoring" (RBM) has proven itself excellent in practice.

Devices for dissipation factor measurement

Condition evaluation through analysis

The well-founded analysis and diagnostic testing of insulating liquids with the BAUR DTL C device play an important role in research and development, and in practical applications. Knowledge on the current state of insulating materials is gaining importance for cost-optimised, safe mains operation. The values measured using the BAUR DTL C device can be used to detect contamination of the oil, as well as undesired oxidation by-products or the presence of internal partial discharges in the equipment.

Automatic analysis results
The device measures the dissipation factor, the specific resistance and the relative permittivity of insulating liquids in a fully automatic manner. The BAUR DTL C device comes with twelve different test sequences corresponding to the standards (most common according to IEC 60247 as well as to IEC 61620) for quick, comprehensive analysis results. It is also possible to programme up to ten individual test sequences.

Perfection in detail
The dissipation factor measurement (tan δ) can be determined with a level of accuracy of up to
1 x 10^{-6}. The analysis devices have rapid cell induction heating with very accurate temperature control that ensures extremely reliable, precise and standards-compliant results. The automatic calibration of the empty cell and the provided test sequences enable a swift analysis process.

Additional product properties:
- Measurement of the specific resistance with positive or negative voltage up to 100 TΩm
- Cell draining for multiple measurement via magnet discharge valve
- Contactless sample exchange at operating temperature

Function matrix

		Application/measurement methods			
		Insulating oil testing			
		Breakdown voltage testing	Dissipation factor measurement / specific resistance measurement	Inline measurement (continuous testing during production)	Measured data management with ITS Lite software
Products					
Mobile device	DPA 75 C	■			■
Laboratory equipment	DTA 100 C	■			■
	DTA IL	■		■	■
	DTL C (tan δ)		■		■

Professional consultation and service worldwide

We offer reliable service by competent experts and a comprehensive range of services. We are happy to offer assistance in the following areas:

- Technical support for questions on devices, software or applications
- Maintenance and repair of devices
- Calibration and measurement
- Training

Cable testing and diagnostics

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To ensure the flow

Cost-optimised maintenance through cable diagnostics

The sheath and cable testing supports you in assessing whether a cable system is safe and ready to operate at the time of testing. More and more mains operators emphasise the importance of cable diagnostics as it provides important information on the hidden faults on the systems and, in particular, on the cable network.

Making target-oriented investments
With cable diagnostics you will solve the problem of providing maximum mains availability whilst ensuring minimum maintenance and repair costs. We provide the appropriate tools with our diagnostics systems that make it possible to realise condition-based and cost-optimised maintenance.

Reducing repair costs
Knowledge and understanding of the cable condition make it possible for you to carry out expensive modification and maintenance measures only where they are really necessary. Preventive measures or exchanging unnecessarily long cable routes are now all in the past.

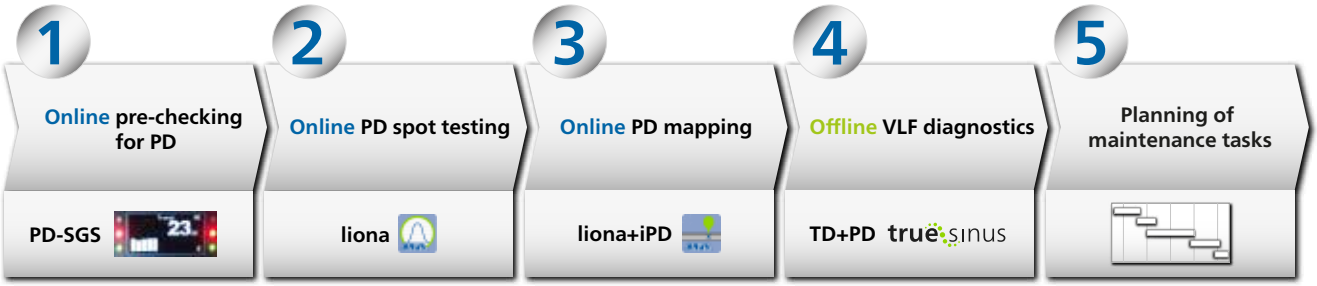
Quality control on new systems
Today, diagnostics procedures are increasingly being used – even on new cable sections – to evaluate the quality of a joint assembly, for example. This can prevent costly complaints or subsequent damage.

↗ The breakdown/fault rate can be decreased and the maintenance costs can be reduced through condition-based maintenance that is based on cable diagnostics.

Wide range of devices for testing and diagnostics

BAUR offers you products that make it possible to quickly and reliably perform cable and cable sheath testing and condition evaluation diagnostics.

From testing devices with AC or DC voltage, from low to high voltage, condition evaluation, online or offline partial discharge detection: BAUR offers you suitable devices and systems for use, in accordance with the applicable standards, on cables, switchgear, isolators, overvoltage arresters, bus bars, transformers and generators.



↗ Example of possible application steps for efficient cable testing and diagnostics based on the combination of various methods and devices

Meaningful results and standard compliant

Testing and diagnostics in accordance with the standard

Intensive research, international practical experience and an open dialogue with operators and associations have led to the VLF cable testing and diagnostics on medium voltage systems to be recognised by all important bodies, boards and associations. For you, this means that cable and sheath testing as well as diagnostic measurements are effected in a standard compliant manner. You don't have to concern yourself with standard compliant work procedures as we've already taken care of that for you. You decide which standard you would like to follow; our devices come with the according procedures.

Overview of standards

Testing standards for MV cables	Content	Acceptance tests	Maintenance test
IEC 60502.2-2014 1 kV - 30 kV cables	New IEC standard that describes how to use VLF testing as an acceptance test	VLF testing 3 x U_0, 15 min., 0.1 Hz, TD or PD monitoring recommended	Not covered
Cenelec HD 620 1996, VDE 6 - 30 kV cables	Harmonization document of IEC, VDE European standard for acceptance tests since 1996	VLF testing 3 x U_0, 1 hour, 0.1 Hz	Not covered
IEEE 400-2012 6 - 36 kV cables	Guide for field testing and evaluation of the insulation of shielded power cable systems rated 5 kV and above. Detailed overview on testing and diagnostic methods and technologies	VLF testing: simple withstand test and monitored withstand test	VLF testing: simple withstand test and monitored withstand test
IEEE 400.2-2013	Guide for field testing of shielded power cable systems using very low frequency (VLF). Detailed guide for VLF testing and diagnostics	VLF testing: monitored withstand test, VLF TD diagnostics, VLF PD diagnostics, detailed evaluation criteria	VLF testing: monitored withstand test, VLF TD diagnostics, VLF PD diagnostics, detailed evaluation criteria
IEC 60060-3	Describes the requirements on the characteristics of the VLF wave form	Mandatory, truesinus®	Mandatory, truesinus®
IEC 60270	Describes the measurement of partial discharges	Mandatory	Mandatory
IEC 60229	Cable sheath testing	Recommended for MV cables	Recommended for MV cables
IEEE 433	Recommended practice for insulation testing of AC electric machinery with high voltage at very low frequency	Accepted, VLF testing for rotating machines	Accepted, VLF testing for rotating machines

Compact and powerful – our truesinus® voltage sources

The BAUR truesinus® voltage sources are handy and suitable for all relevant daily tasks: whether cable testing or diagnostics. They ensure highly reliable results and thanks to the truesinus® technology developed by BAUR they offer an ideally formed, low-frequency sine voltage as well as the DC voltage required for the sheath testing.

Highly accurate tan δ measurement

Thanks to the ideally formed truesinus®, you can rely on highly accurate measurements of the tan δ and meaningful results with partial discharge measurement, as well as on good reproducibility and comparability of the measured values.

This following speaks for the truesinus® technology

The VLF 0.1 Hz sine voltage is significantly more suitable for the tan δ measurement that is important for the condition evaluation than other usual voltage shapes or frequencies. The ideal, long-waved sine makes it possible to acquire TD measurement results with the highest resolution. With these results, small rises and detailed properties can be recognised and evaluated. With regard to the dissipation factor measurement, the measurement with truesinus® is more sensitive than a measurement with operating frequency.

The advantages of truesinus®

- Load-independent measurement results
- Highest tan delta accuracy
- Reproducible, precise measurements
- Possible to carry out testing and diagnostic measurement in parallel (MWT)
- Short measuring time
- Compact voltage sources

The dissipation factor measurement (tan delta measurement)

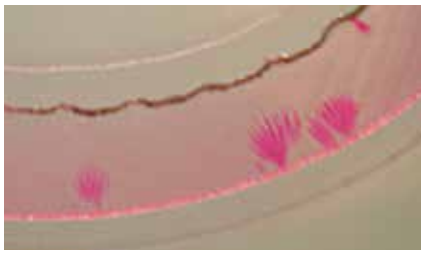
The dissipation factor measurement (tan δ measurement) is a non-destructive and integral procedure that serves to evaluate the condition of an entire cable route. With the dielectric dissipation factor tan δ, the relation of effective power to reactive power of the cable is measured. The measurement provides clear information on the condition of the cable insulation and its ageing condition.

With the dissipation factor measurement you will discover

- areas in the insulation of XLPE cables that are damaged by water (water trees) which lead to electrical trees and represent the natural cause of a cable fault;
- faults in the insulation of paper-insulated mass-impregnated cables due to drying;
- insufficient insulation of paper-insulated mass-impregnated cables due to dampness;
- moisture in accessories (joints/terminations) and
- possible partial discharges.

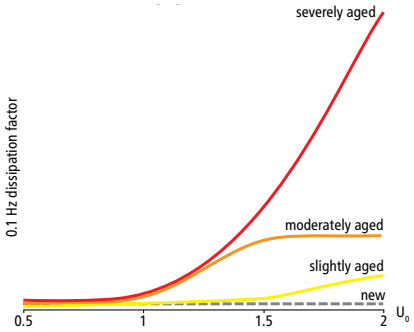
The tangent delta diagnostics process

The tan δ measurement is effected through multiple voltage steps that are provided in our devices. With aged cables, a characteristic increase in dissipation factor can be seen with increasing measurement voltage. A classification of the cables is possible, which proves highly valuable when planning the maintenance measures.



↗ Water trees, made visible through colouring

↗ Electrical trees



↗ tan δ trajectory of cables that have aged differently

Evaluation criteria for cables aged through operation according to the IEEE

Condition assessment	VLF-TD time stability (VLF-TDTS) measured by standard deviation at U_0 [10^{-3}]			Differential VLF-TD (VLF-TDT) difference in mean VLF-TD between 0.5 U_0 and 1.5 U_0 [10^{-3}]			Mean VLF-TD at U_0 [10^{-3}]	
	XLPE cables	Paper-insulated mass-impregnated cables		XLPE cables	Paper-insulated mass-impregnated cables		XLPE cables	Paper-insulated mass-impregnated cables
No action required	< 0.1	< 0.1	and	< 5	-35 to 10	and	< 4	< 85
Further study advised	0.1 to 0.5	0.1 to 0.4	or	5 to 80	-35 to -50 or 10 to 100	or	4 to 50	85 to 200
Action required	> 0.5	> 0.4	or	> 80	< -50 or > 100	or	> 50	> 200

↗ Classification of XLPE cables aged through operation and paper-insulated mass-impregnated cables by means of tan δ, selection from IEEE 400.2-2013

Partial discharge measurement

Partial discharge measurement is effected in accordance with standard IEC 60270. Partial discharges (PD) occur at faults in the cable, e.g. at electrical trees, joints and terminations. Amongst other things, the following can be detected through partial discharge measurement:

- Defects in new and old fittings, for example, defective joints or even fittings
- Defects affecting the insulation effect in the insulation of plastic-insulated cables, such as electrical trees
- Insufficient insulation of paper-insulated mass-impregnated cables due to dried-up insulation
- Mechanical damage to the cable sheath

The following properties can be diagnosed with BAUR PD measuring devices:

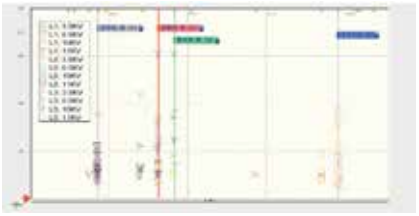
- PD localisation
- PD level
- PD inception voltage / extinction voltage
- PD in cable termination, joints und cables (also mixed cables)

Supporting functions:

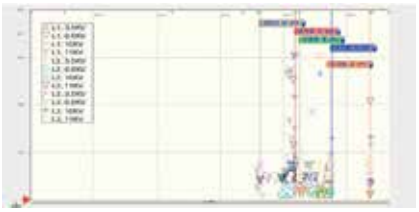
- Phase-resolved display per fault
- PD interference filter function
- Joint localisation

Phase-resolved display (PRPD)

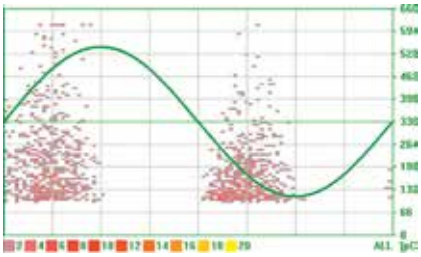
The phasing of partial discharges can be determined through state-of-the-art analysis methods. This makes it possible for you to assign the fault to diverse types of fault and to plan subsequent measurements as well as repair measures in a target-oriented and time- and cost-saving manner.



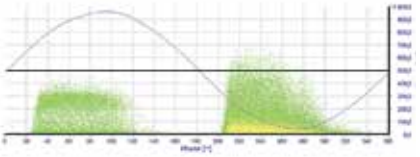
↗ Result of a partial discharge measurement on an XLPE cable



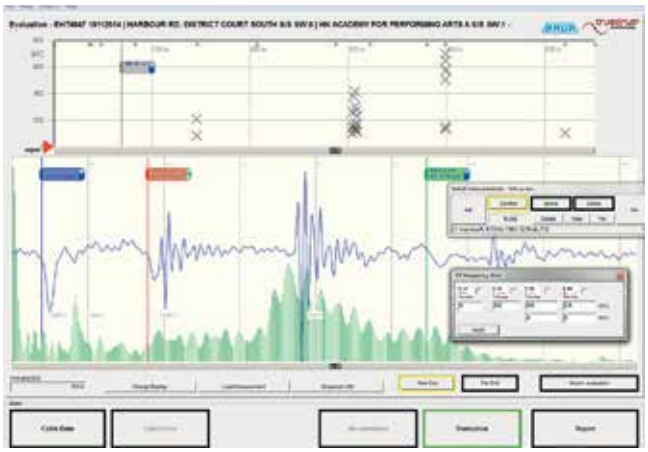
↗ Result of a partial discharge measurement on a mixed cable



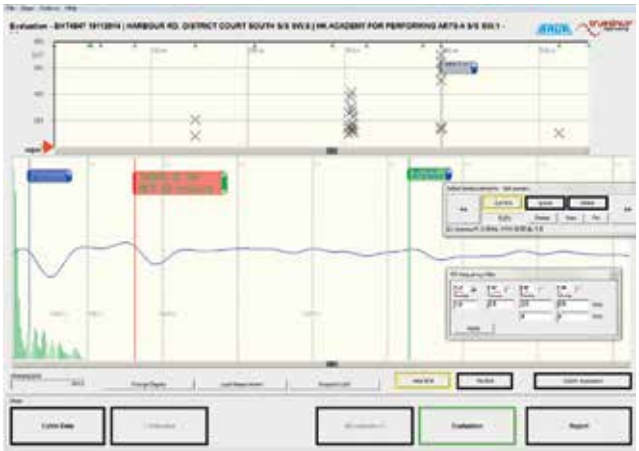
↗ Phase-resolved display of a partial discharge at 0.1 Hz



↗ Phase-resolved display of a partial discharge at 50 Hz



↗ Partial discharge measurement unfiltered



↗ Partial discharge measurement with interference filter function

Combine diagnostics procedures meaningfully

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. You will obtain valuable, additional information and increase the certainty in the condition evaluation and in the search for faults.

Monitored Withstand Test – more information in less time

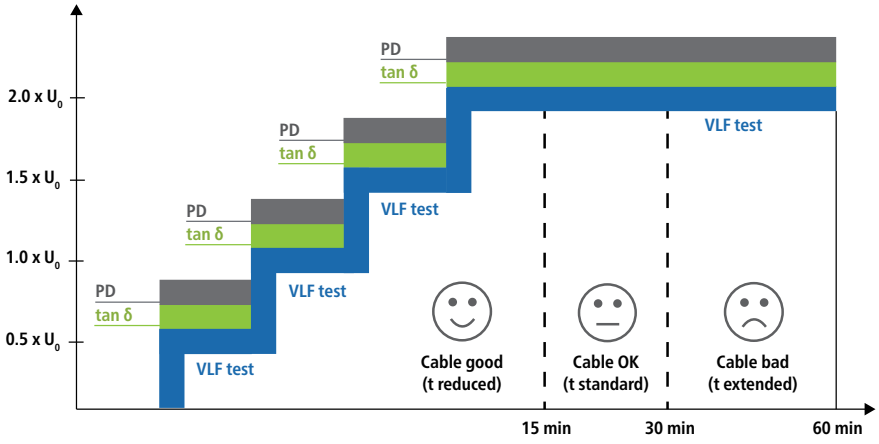
The time-saving combination of testing and diagnostics is known as the Monitored Withstand Test (MWT). The MWT provides significant information for the condition evaluation and allows for the required test duration to be adapted to the cable condition. The combined procedure is approved by the IEEE and recommended as a meaningful measurement method for cable systems aged in operation.

Condition evaluation with very low voltage
The procedure programmed in the BAUR devices for the MWT is split into two: The diagnostic measurement takes place in the build-up stage so that you can get an idea of the condition of the cable; overaged cables are detected and you are able to react in a timely manner to ensure that pre-damaged cables are not unnecessarily exposed to the test voltage.

During the MWT stage, in which the diagnostics are carried out in parallel to the cable testing, you will identify the time response of tan δ. During the so-called Full MWT, the partial discharge measurement is also effected and PD faults can be simultaneously presented and precisely localised.

Condition-based test duration
The condition-based test duration is a big advantage for you as the operator. Based on positive diagnostics measurement values, the cable testing can be reduced to 15 minutes.

VLF Test + tan δ + PD = Full MWT

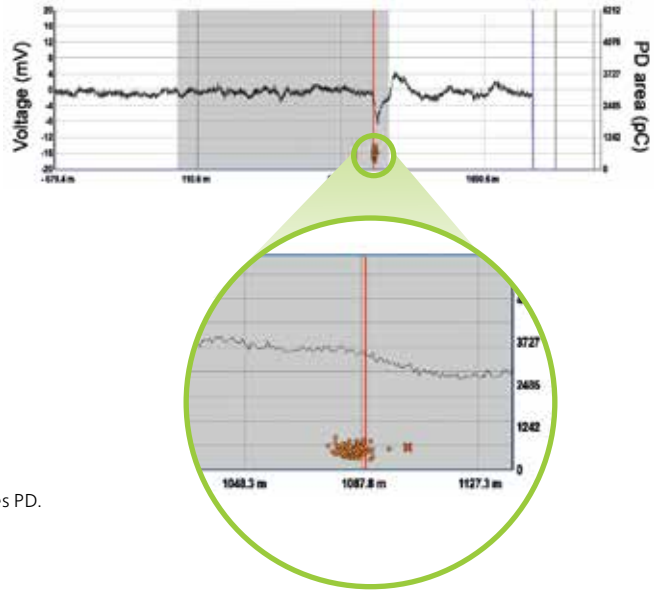


smart✓testing

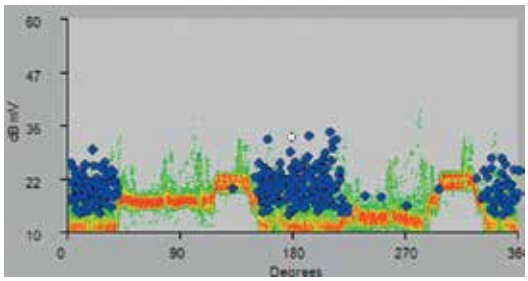
↗ Carrying the cable testing and cable diagnostics out in parallel (with tan δ measurement or partial discharge measurement) in the Monitored Withstand Test saves time and provides valuable information for asset management.

Cable check whilst energised

With the help of the portable BAUR online PD spot tester liona, cables can also be quickly tested, in an uncomplicated manner, for partial discharges whilst live (online). The DeCIFer® algorithm supports the detection of partial discharge signals from noise signals. The online PD test helps to detect approximate weak points without switching off the system and, if required, to localise faults.



↗ In combination with the iPD transponder, liona accurately and reliably locates PD.



↗ Online PD spot testing result: partial discharges are shown in blue

Locate partial discharges with a handheld device

With the PD-SGS, BAUR offers a handheld device for the quick initial detection of partial discharges in switchgear and cable accessories. The device has two safe procedures for detecting partial discharges that can be applied whilst live and without attaching sensors to the cable. Instead, it uses capacitive couplers to detect PD activities occurring along the metal exterior of the switchgear. The second method works acoustically and makes it possible to observe Corona discharges or discharges along insulator surfaces.

↗ PD-SGS for acoustic and capacitive location of partial discharge in switchgear

Overview of our product portfolio

Offline testing and diagnostics in medium-voltage networks

Our well-thought-out and cleverly devised testing and diagnostics systems enable fully automatic VLF cable testing and dissipation factor measurement (Full MWT) in a single flow. This saves time and cost, and delivers precise statements. This is where the BAUR smart testing best demonstrates its strengths.

↗ VLF tester and diagnostics devices viola/viola TD and frida/ frida TD

↗ VLF test generators

↗ Portable PD diagnostics systems PD-TaD 80 and PD-TaD 62

↗ Partial discharge inductor tracy

Online diagnostics in medium-voltage networks

The liona and PD-SGS measuring devices detect existing partial discharges during normal mains operation in a reliable and cost-saving manner. This initial estimation on the condition of a cable route or switchgear makes effective planning of additional precise offline diagnostic measurements possible.

↗ Online PD spot testers liona

↗ Handheld online PD detector PD-SGS

High-voltage test devices

The PGK series comprises compact DC voltage test devices for electric systems. The tried and tested AC/DC high-voltage test devices in the PGK HB series offer a broader functional scope with continuously adjustable test voltages for DC voltage testing with a selectable polarity up to 260 kV or for AC voltage testing up to 190 kV_{rms}.

↗ DC HV tester

↗ AC/DC HV test set

Product function matrix

		Application / measurement methods										
		Offline									Online	
	Products	Operating equipment test with AC	Operating equipment test with DC	Cable testing VLF 0.1 Hz sine in acc. with IEC, CENELEC, IEEE	Cable sheath testing	Dissipation factor measurement TD	TD MWT	PD measurement	Combination of TD and PD test, Full MWT	Confirmation of the PD position	Online PD spot testing/mapping, cable length measurement	Handheld online PD detector for switchgear
Testing	DC HV tester PGK 25		■		■							
	DC HV tester PGK 50-80		■		■							
	AC/DC HV test set PGK HB (70-260)	■	■		■							
	VLF testing and diagnostics device frida		■	■	■							
	VLF testing and diagnostics device viola		■	■	■							
	VLF test generator PHG 70/80		■	■	■							
Diagnostics	VLF testing and diagnostics device frida TD		■	■	■	■	■		■*			
	VLF testing and diagnostics device viola TD		■	■	■	■	■		■*			
	VLF test and diagnostics systems PHG 70/80 TD		■	■	■	■			■*			
	VLF test and diagnostics systems PHG 70/80 TD/PD		■	■	■	■		■				
	(Portable) PD diagnostics systems PD-TaD 62 and 80					■*	■*	■**				
	Partial discharge inductor tracy									■		
	Online PD Spot Tester liona + iPD transponder										■	
	Handheld online PD detector PD-SGS											■

* ... in combination with frida TD / viola TD + PD-TaD 62 or PHG 70/80 TD + PD-TaD 80 ** ... in combination with each VLF source
Abbreviations used: MWT ... Monitored Withstand Test, PD ... partial discharge, TD ... tan δ

Professional consultation and service worldwide

We offer reliable service by competent experts and a comprehensive range of services. We are happy to offer assistance in the following areas:

- Technical support for questions on devices, software or applications
- Maintenance and repair of devices
- Calibration and measurement
- Training
- Creation of a diagnostics philosophy

Cable fault location

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The shortcut to locating a fault

Reliable cable fault location with BAUR

Top quality supply is our utmost concern

You want to offer your customers a reliable power supply and to use your resources in an efficient manner?

BAUR's top quality cable fault location technology has been setting a global benchmark for decades. With over 70 years of experience in cable fault location, we offer the test engineer application-oriented solutions for all requirements, for all budget ranges and, most notably, all from a single source.

All of the technologies work together in an uncompromising manner, even in one single system. They are easy to use with the support of the new forward-looking software concept, making it possible even for less experienced users to operate their system in a professional manner.

Your investment in a reliable network

State-of-the-art fault location technology combined with easy, quick and efficient operation enable problems to be localised and solved as quickly as possible.


titron


shirla

Cable fault: basic conditions, causes and types

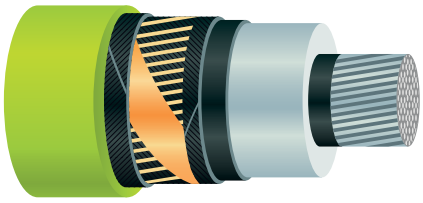
Cable routes are influenced by various ambient parameters. A cable route can consist of multiple diverse cable parts of diverse designs and types.

Depending on the voltage level, the required load capacity and available fitting and installation technology, cables are used with plastic insulation or mass-impregnated paper insulation. In practice, cable faults must be located at all voltage levels - from low voltage, medium voltage to high voltage.

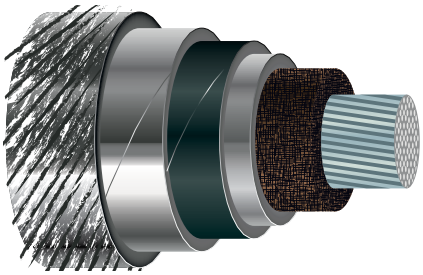
Regardless of the cable type – besides external influence, e.g. damage caused during earth works or earth displacements – the most frequent fault causes include: ageing, service life, overvoltage, thermal overload, corrosion, incorrect cable laying, installation defects and damage from transport and storage.

It is beneficial for daily use if the equipment for cable fault location is designed for medium- and high-voltage ranges but it can be applied just as well for low voltage.

All from a single source
The BAUR device portfolio meets this requirement and reflects all the needs related to cable fault location, testing and diagnostics, as well as devices for phase selection of power cables.



↗ Cables with plastic insulation



↗ Cables with paper-oil insulation

Fault types

Short-circuit
Damaged insulation leads to a low-resistance connection of two or more conductors at the fault location.

Earth fault / short-circuit to earth
Faults can occur due to an earth fault (low-resistive connection to the earth potential) in a defunct network or in an isolated operational network, as well as due to a short-circuit to earth in an earthed network. The double earth fault is another type of fault; this fault shows two earth faults on different phases with separated bases.

Cable breaks
Mechanical damage and ground movements can lead to breakage of individual or multiple conductors.

Intermittent faults
Frequently, faults do not occur constantly, but rather occasionally depending on the load on the cable. One reason for this can be the drying out of oil-isolated cables with a low load. Another reason is the partial discharge through ageing or “electrical trees” in plastic-insulated cables.

Cable sheath faults
Damage to the outer cable sheath does not always lead directly to faults but can cause long-term cable faults, among other things, as a result of moisture penetration and insulation damage.

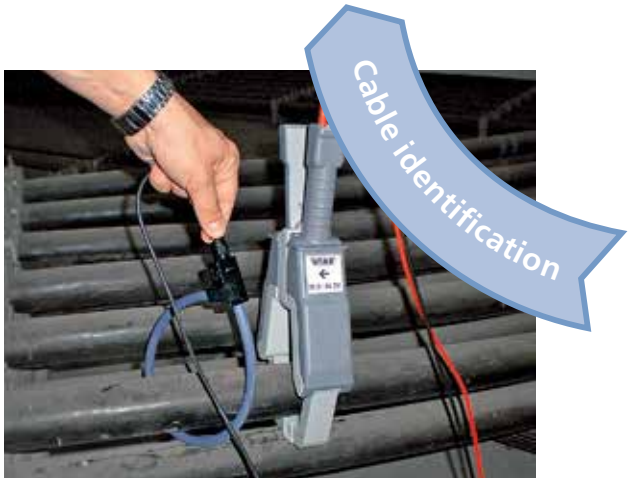
↗ Cable faults on paper-insulated mass-impregnated cable

↗ Joint faults

Process steps and methods of cable fault location

Fault location is carried out methodically following a logical procedure and in four steps. Fault analysis makes it possible to determine the characteristics of the fault and the further procedure. During pre-location, the fault is determined precisely to the meter. The objective of the subsequent pin-pointing is to precisely determine the fault point to limit the ground excavation and, in turn, to minimise the repair time.

Next comes cable identification, as it is necessary to identify the defective cable in a bundle of multiple cables at the fault location. This is especially important if the fault is not visible from outside.



As quick and precise as possible: the right measurement method counts

The objective of the fault location is to localise a cable fault as quickly and precisely as possible so as to create an ideal foundation for the subsequent repair and reconnection.

Our devices have a wide spectrum of measurement methods and thus provide you with maximum support in locating the fault. The following double-page spread will explain which method is used for which process step.

On page 11 you will find our product function matrix which will help you relate to the devices and measurement methods at a glance.

Fault analysis

The objective of the analysis is to ascertain the fault characteristics and to determine the further procedure in the fault location, the selection of methods and also the voltages.

Insulation resistance measurement is used to determine the faulty phase and the type of fault

Voltage withstand testing and breakdown detection is used for testing the electric strength of the cable insulation.

Cable sheath testing is used to determine external cable damage (sheath faults)

Pre-location

The objective of the pre-location is to determine the fault position as precisely as possible to keep the subsequent pin-pointing activities as brief and efficient as possible.

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 analysed.

DC-SIM/MIM: Secondary/multiple impulse method in DC mode for pin-pointing intermittent faults. The cable is charged with voltage; in doing so, the cable capacitance is included in the testing.

Conditioning-SIM/MIM: Faults that are difficult to locate or are wet are first conditioned with surge voltage, then 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.

ICM: Impulse current method for locating high-resistive 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 flashover faults for which the cable capacitance is used in connection with a surge voltage generator.

Measurement mode with envelope curve display for intermittent faults; for the use of TDR and SIM/MIM methods even small changes to impedance are made visible by means of an envelope curve and are automatically saved.

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 corrected by precise pin-pointing.

Tracing: for precise determination of the cable route. Precise cable tracing is essential, particularly with unknown or imprecise cable routes, and saves both time and money.

Acoustic pin-pin-pointing: is the most common method used to precisely locate high-resistive and flashover faults. High voltage pulses create electromagnetic pulses on the way to the fault and generate a flashover with an acoustically noticeable bang.

Step voltage method: used for 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.

Twist method or minimum distortion method: applied when pin-pointing short circuits depending on the cable type. In this process, the interruption caused by the fault in the – under normal circumstances – homogeneous magnetic field, is measured and precisely located.

Cable identification: Usually, multiple cables are laid in a bundle. After the exact position of the fault is found and uncovered, the defective cable must be identified reliably.

Phase identification: Definition of the individual leads prior to the installation of a new joint.

Product overview

Our products reflect our over 70 years of experience. The BAUR device portfolio for cable fault location helps locate faults quickly and safely, and covers the entire process in an optimum manner. Modular systems and devices are perfectly customised to your individual requirements. Convincing flexibility!

Portable devices
Our portable devices convince with their highest level of precision, easy handling and unlimited mobility.

↗ Cable sheath testing and fault location system

↗ Phase detector paula

↗ Cable identifier KSG 200

High performance modules
BAUR offers a diverse portfolio of modules from which you can put together an individual package for cable fault location. This makes fault location child's play.

↗ Surge and test generators STG

↗ Time domain reflectometer IRG

↗ Surge voltage generators SSG

System solutions
With the Syscompact series, BAUR offers compact, robust, small systems that are adapted to fault location tasks.

↗ Cable fault location systems Syscompact 2000 portable

↗ Cable fault location systems Syscompact 2000 M pro

↗ Cable fault location systems Syscompact 4000

Cable test vans
Our cable test vans are equipped according to your requirements and make it possible to combine the complete product range for cable fault location, testing and diagnostics in one single system. There are fully-automatic and semi-automatic systems, each with either 1 or 3 phases.

↗ Cable test van titron

↗ Cable test van transcable

Product function matrix

		Application / measurement methods																						
		Pre-location											Testing			Pin-pointing				Iden-tifica-tion		Application			
		Time domain reflectometry (TDR)	TDR with envelope curve display	SIM/MIM Secondary/Multiple Impulse Method	Conditioning-SIM/MIM	ICM impulse current method	DC-SIM/MIM	Decay method	DC-ICM	3-phase current coupling methods	Fault conversion/burn	Sheath fault pre-location	Insulation measurement	Voltage withstand test for breakdown detection	Cable sheath testing	Audio frequency methods	Acoustic pin-pointing	Step voltage or voltage drop method	Tracing	Cable identification	Phase identification	Medium voltage	Low voltage	High voltage	Telecom and control cables
	Products																								
Systems	Cable test vans titron	■	■	■	■	■	■	■	■	■	□		□	■	■	□	□	□	□			■	■	■	■
	Transcable cable test van	■		■		■	■	■	■	■	□		□	■	■	□	□	□	□			■	■	■	■
	Syscompact 4000	■		■		■	■		■				□	■	■	□	□	□	□			■	■	■	■
	Syscompact 2000 M pro	■		■		■	■									□	□	□	□			■	■	■	■
	Surge and test generator STG with IRG	■														□	□	□	□				■		■
Devices	Surge voltage generator SSG																■					■	■		
	Time domain reflectometer IRG 4000	■											□									■	■	■	■
	IRG 2000 time domain reflectometer	■																				■	■	■	■
	Burn down transformers ATG										■											■	■		
	Sheath testing and fault location system shirla/KMF1											■			■			■				■	■	■	■
	Pin-pointing system protrac																■	■	■			■	■	■	
	Pin-pointing equipment Locator Set (UL 30 + SP 30 + TG)															■	■	■	■	■		■	■	■	■
	Cable identifier KSG 200																			■		■	■	■	■
	Phase detector paula																				■	■	■	■	
	Cable locator CL 20															■			■			■	■	■	■
	Time domain reflectometer TDR 500 and 510	■																				■	■	■	■

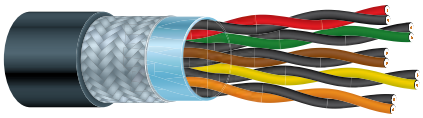
■ ... Basic configuration □ ... Option

Customised solution packages

BAUR has multiple devices for the mentioned fault location methods. In the following, we propose possible solution packages depending on the type of cable and use. However, our sales and service employees will gladly recommend an individual, customised package especially for you.

Solutions for control cables

Here, the focus is on various control cables, e.g. in switchgear, telephone cables, traffic light pre-emption, etc.



↗ Control cable

The right method

Pre-location

- TDR
- Bridge measurement

Pin-pointing

- Tracing
- Step voltage method
- Twist method
- Minimum distortion method

A precise description of the methods can be found from page 8 onwards.

The right product package

↗ Cable sheath testing and fault location system shirla

↗ Time domain reflectometer TDR 510

↗ Pin-pointing equipment Locator Set

↗ Pin-pointing system protrac

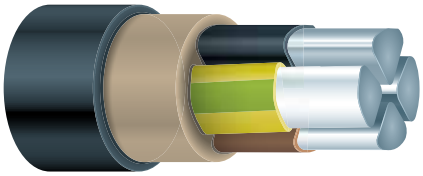
↗ Cable locator CL 20

↗ Cable identifier KSG 200

↗ Phase detector paula

Solutions for low-voltage cables

Low-voltage cables transport voltage up to 1 kV.



↗ Low voltage cable

The right method

Fault analysis

- Insulation resistance measurement
- Voltage withstand test up to 5 kV

Pre-location

- TDR
- SIM/MIM
- Bridge measurement

Pin-pointing

- Tracing
- Step voltage method
- Twist method
- Acoustic pin-pointing

Cable identification also on cables under voltage (online)

A precise description of the methods can be found from page 8 onwards.

The right product package

↗ Cable fault location system Syscompact 2000/8 kV portable

↗ Surge voltage generator STG with time domain reflectometer IRG 2000 (low voltage locating system)

↗ Cable sheath testing and fault location system shirla

↗ Cable locator CL 20

↗ Pin-pointing equipment Locator Set

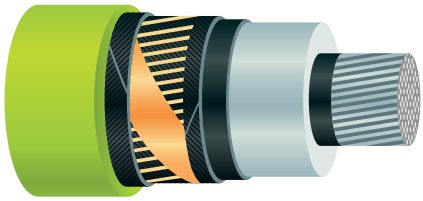
↗ Pin-pointing system protrac

↗ Cable identifier KSG 200

↗ Phase detector paula

Solutions for medium-voltage cables

Medium-voltage cables transport voltage from 1 kV to 36 kV (country specific).



↗ Medium voltage cable

The right method

Fault analysis

- Insulation resistance measurement
- Breakdown voltage detection

Pre-location

- TDR
- SIM/MIM
- DC SIM/MIM
- Conditioning-SIM/MIM
- ICM and DC-ICM
- Decay
- Bridge measurement

Pin-pointing

- Tracing
- Step voltage method
- Twist method (for lead belted cables only)
- Acoustic pin-pointing
- Cable or phase identification

A precise description of the methods can be found from page 8 onwards.

The right product package

↗ Cable sheath testing and fault location system shirla

↗ Cable fault location system Syscompact 4000

↗ Cable fault location system Syscompact 2000/32 kV portable

↗ Cable test van titron

↗ Cable test van transcable

↗ Cable locator CL 20

↗ Pin-pointing equipment Locator Set

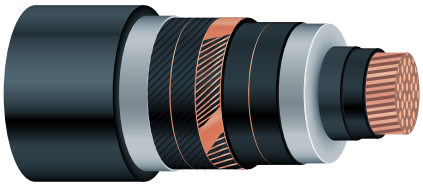
↗ Pin-pointing system protrac

↗ Cable identifier KSG 200

↗ Phase detector paula

Solutions for high-voltage cables

High-voltage cables transport voltage from 36 kV (country specific)



↗ High voltage connection cable

The right method

Fault analysis

- Insulation resistance measurement
- Breakdown voltage detection
- Sheath testing

Pre-location

- TDR
- SIM/MIM
- ICM differential method
- Decay differential method
- Bridge measurement

Pin-pointing

- Tracing
- Acoustic pin-pointing
- Step voltage method for sheath faults

A precise description of the methods can be found from page 8 onwards.

The right product package

↗ Cable fault location system Syscompact 4000 incl. high-voltage source

↗ High-voltage test device PGK 80

↗ Cable sheath testing and fault location system shirla

↗ Cable test van titron

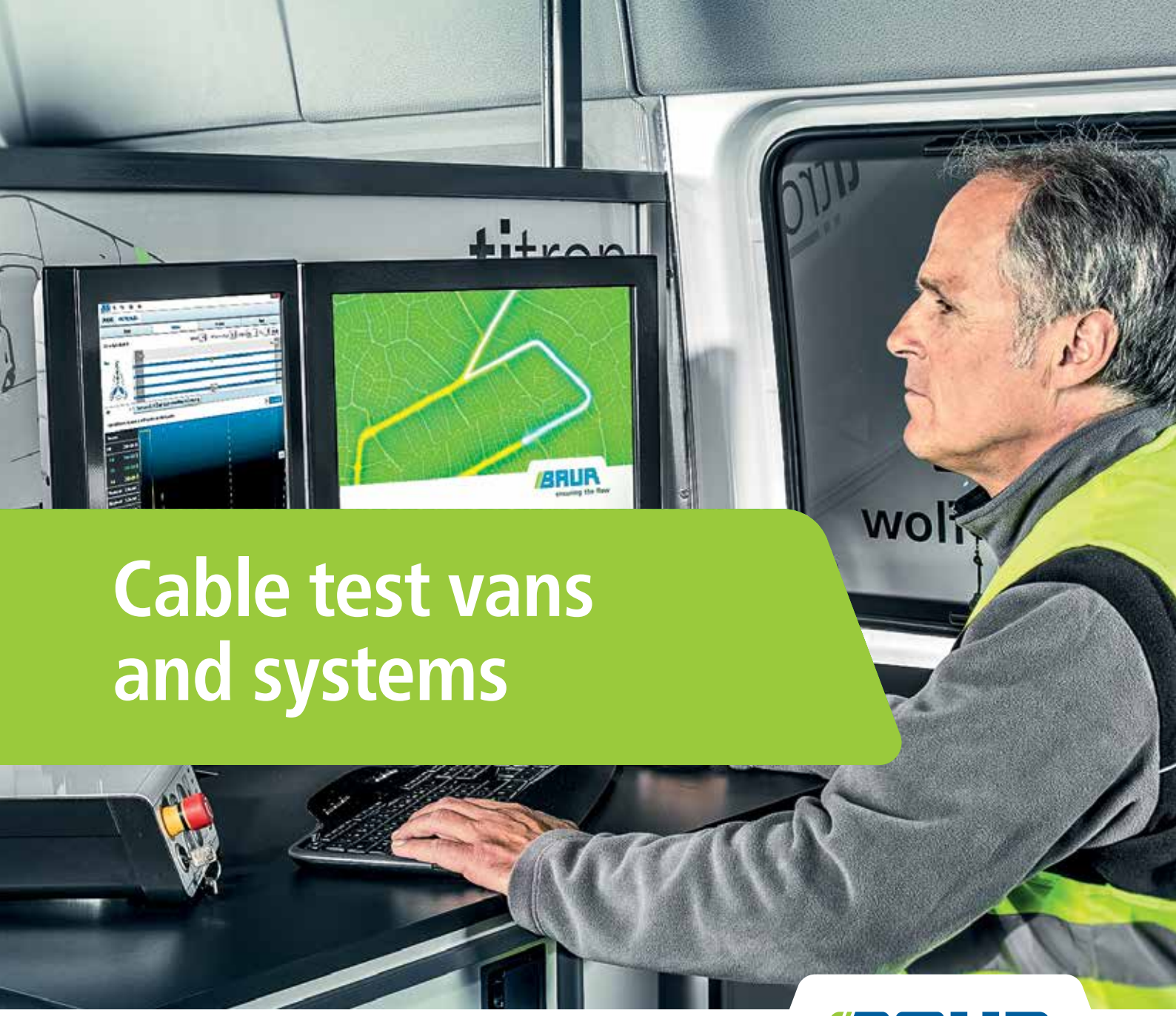
↗ Cable test van transcable

↗ Pin-pointing equipment Locator Set

↗ Pin-pointing system protrac

↗ Cable identifier KSG 200

↗ Phase detector paula



Cable test vans and systems

BAUR
ensuring the flow

Prepared for anything

BAUR's cable fault location and diagnostics systems

Would you like to test and assess new installations and existing cable locations efficiently? To rectify issues in the network as quickly as possible? Or offer your clients the maximum security of supply every day through a reliable and stable network?

Then BAUR's modern cable fault location and diagnostics systems are the ideal solution for you. Save your and especially your clients' time and money with modern and efficient technology.

BAUR offers three types of system solutions for one- and three-phase cables: the cable test vans titron and transcable, as well as the Syscompact series.

↗ The titron system

↗ The transcable system

A system with additional value

Whilst fewer employees carry out more and more work, this doesn't have to impact the quality of the work: BAUR systems counterbalance this evolution through intelligent software. The operator no longer deals with operating the technology but instead provides the system with the tasks. The system carries out the work in an efficient and reliable manner without limiting the operator's work or even imposing on him. Flexibility is our highest priority; this means each step suggested by the system can be selected freely.

↗ Syscompact 2000

titron

State of the art

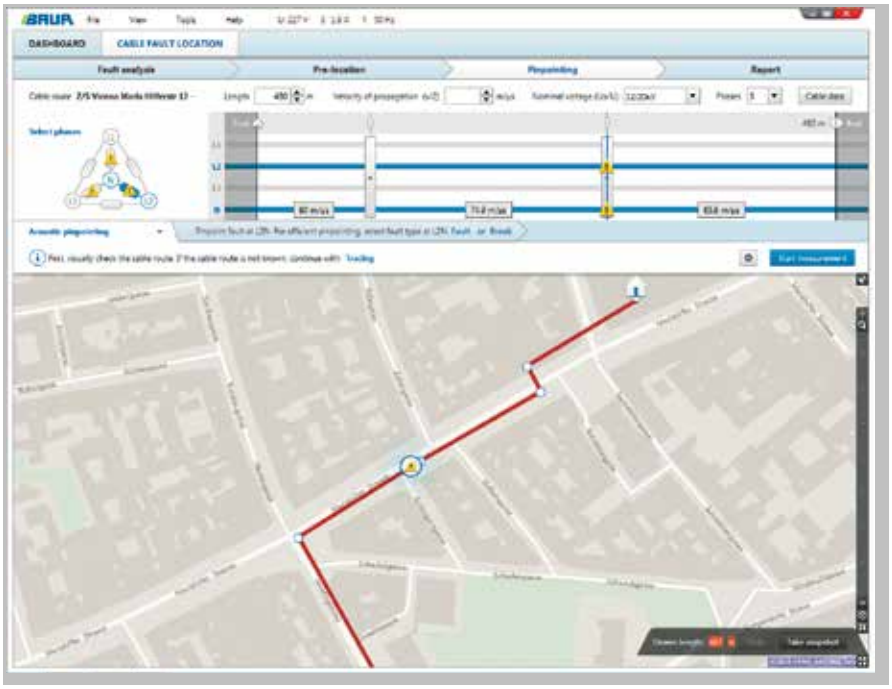
The titron automatic cable fault location system is characterised by efficient technology and intuitive operation. The new generation high-performance system is based on state-of-the-art technology and provides efficient, safe and reliable cable fault location, cable testing and cable diagnostics with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

A system with exclusive features

The completely new titron concept makes your work easier. With an intuitive user interface and automated sequences, titron ensures reliable and quick cable fault location. A package full of features that saves time and money.

New intuitive operational concept

BAUR GeoBase Map: The unique GPS-supported combination of road maps with the cable route and the BAUR cable database shows the current location, the cable route and the fault locations. The selection of maps can be extended at any time.



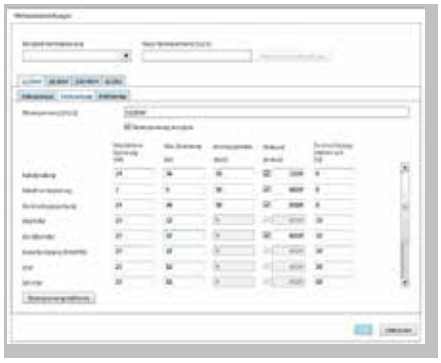
The Cable Mapping Technology (CMT) provides an overview of the cable accessories and faults proportional to the cable length. All data on the cable route such as geographic position, voltage level, joints, measured values, etc. are automatically saved and can be accessed at any time. Clearly arranged and precise measurement logs can be quickly and easily compiled with individual comments and figures of the traces.

Smart Cable Fault Location Guide

Our intelligent Smart Cable Fault Location Guide software leads you to the cable fault step-by-step. In this process, special, experience-based algorithms continuously analyse the current measurement results which are used to generate optimum recommendations regarding the further procedure required to quickly and efficiently locate the cable fault.

The voltage wizard recommends voltage values that comply with the standards according to the present cable data, the type of fault and the application. A user-specific adjustment can be carried out at any time.

With the cable mapping tool and its clear graphic display, the automatic fault analysis provides you with a better overview and a direct, detailed comparison of the trace of the cable. The system automatically adjusts the required measurement parameters and marks the cable end and the fault position.



↗ Voltage assistant

Remote control of the cable test van with the BAUR Remote Control app

The app gives you the option of remotely controlling the functions of the titron. In this process, the priority is to only activate the high voltage after reaching the pre-located fault and to switch off the system after successfully locating the fault so as to minimise the load and wear and tear for the cable and system. This ensures that the system and the cable route remain in good condition for a significantly longer period.

In conjunction with the BAUR GeoBase Map, the titron system transmits the existing map data to the app and creates a map view from which you can read your position, that of the cable test van and of the cable route with the approximate position of the fault. If there is no exact cable route, the measurement system visualises the area in which the fault could be located.

In addition, when in operating mode, the cable test van's SSG surge voltage generator can be switched on and off and the HV release can be cancelled. Important values, e.g. the charge and performance of the surge generator, are displayed and the surge sequence can be varied right down to a single surge.

Central automatic control
with complete system monitoring
The titron system software with a high performance industrial PC controls the phases and choice of device and simultaneously monitors all safety-relevant functions and parameters. The optimally adjusted measurement procedure and the modern digital signal processing achieve the highest level of efficiency and measurement precision. In this process, the system is ready for operation in just a few seconds.

Cable test vans online
BAUR online support is available for you via the Internet. With your permission, our customer service department can access the computer of your cable test van, identify your problem and quickly find a solution. Or, during the fault location, our engineers can share the desktop with the test engineer on site and support him in the analysis of the measurement results.

Easy and convenient to operate
You can work as usual with the mouse and keyboard of a reliable Windows 7 operating system. Office programs such as MS Office, in-house ERP systems, GIS and web applications can be installed that support you e.g. in logging and reporting. Printers, laptops and data carriers can be optionally connected via USB ports and network connections.

Comprehensive safety concept
in accordance with the latest standards

- Safety concept in accordance with EN 61010-1 and EN 50191
- Monitoring of all safety-relevant parameters (protective and auxiliary earthing, rear door and HV connection sockets)
- Partition between work and HV area, red and green signal lamp
- Emergency stop button in the operating area and optional external emergency stop feature in accordance with EN 50191
- Key switch against unauthorised operation
- All operation-related error messages are displayed clearly on the screen and are immediately visible to the user.

The right measurement method counts

Our system software has a wide spectrum of measurement methods and provides you with the maximum support in locating the fault. The Smart Cable Fault Location Guide offers an automatic pre-selection of the method best suitable.

Fault analysis

The analysis serves to ascertain the fault characteristics and determines the further procedure in the fault location, the selection of methods and also the voltages.

Insulation resistance measurement is used to determine the faulty phase and the type of fault.

Voltage withstand testing and breakdown detection is used for testing the electric strength of the cable insulation.

Cable sheath testing is used to determine external cable damage (sheath faults).

Pre-location

The objective of the pre-location is to determine the fault position as precisely as possible to keep the subsequent pinpointing activities as brief and efficient as possible.

TDR: Time Domain Reflectometry is used to locate low-resistive faults and cable interruptions and to determine the cable length.

SIM/MIM: The Secondary / Multiple Impulse Method is the best and most precise cable fault pre-location method with the highest level of efficiency. High-resistive and intermittent faults are triggered by one single HV pulse, then the fault distance is measured accurately multiple times with the TDR technology and automatically analysed.

DC-SIM/MIM: Secondary/multiple impulse method in DC mode for pinpointing intermittent faults; voltage is applied to the cable; at the breakdown a SIM/MIM measurement is automatically and simultaneously carried out.

Conditioning-SIM/MIM: The fault conditioning with SIM/MIM measurement has been developed specifically for wet faults that are difficult to locate. First, the fault is conditioned with surge voltage, then a SIM/MIM measurement is carried out.

Decay: Voltage-coupled decay method for pinpointing intermittent cable faults; the oscillating reflected waves are automatically analysed to determine the fault distance.

ICM: The Impulse Current Method is used to locate high-resistive and intermittent cable faults. The fault distance is determined by analysing the impulse current diagrams.

DC-ICM: The Impulse Current Method is used in DC mode to locate flashover faults.

Measurement mode with envelope curve display for intermittent faults; reflection measurements are carried out continuously. In this process, even small changes to impedance are made visible by means of an envelope curve and are automatically saved.

Pinpointing

As precise as pre-location is, it is not able to detect or recognise the existing deviations in the ground. These can only be corrected by precise pinpointing.

Cable route tracing: used to precisely determine the cable route; precise positioning is essential, particularly with unknown or imprecise cable routes, and saves both time and money.

Acoustic pinpointing: the most common method used to pinpoint the location of high-resistive and intermittent flashover faults; the high-voltage flashovers at the fault generate acoustic and electromagnetic signals that are used for locating the fault position.

Step voltage method: used to pinpoint the location of cable sheath faults; a voltage drop is generated at the fault which can be pinpointed using an earth rod and a universal locator (UL 30).

Twist method or minimum turbidity method: applied when pinpointing 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 precisely located.

Testing and diagnostics

Testing and diagnostics make it possible to determine the quality of the cable. They also help in a preventive manner by using suitable measures to maintain the highest quality of the cable installation.

Testing: DC, VLF sine and square wave voltage are available depending on the system configuration.

A partial discharge diagnosis is used to determine possible fault locations in cables and fixtures before they lead to failure. This makes it possible to rectify the problem in a timely manner and prevent any subsequent damage resulting from uncontrolled failure.

The tan delta dissipation factor measurement is used to determine the ageing condition of a cable. Possible exchange activities can be controlled in a targeted manner in the framework of professional asset management.


frida

transcable

Proven quality

The transcable is an automatic or semi-automatic, one- or three-phase cable fault location system. Through the modular design, the individually functional modules work independently from one another. This makes it possible to modify or expand the transcable system without any problems at any time.

The functional scope of the transcable is very versatile. In addition to the required testing technology for cable fault location and cable testing, meaningful software-supported cable condition assessments with dissipation factor and partial discharge measurements are possible due to the VLF truesinus® based smart testing technology.

Universal application

Due to its modular design, the transcable system enables the integration of multiple options: e.g. the integration of a PHG VLF testing system but also surge generators up to 60/100 kV or DC voltage testing up to 110 kV. Therefore, the system is universally applicable, even on HV cables and offshore.

transcable system, 1-phase

Extended Syscompact 3000 system

Semi-automatic transcable system, 3-phase, 110 kV

Cable test van equipment

Options that leave nothing to be desired

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

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

Our experts will gladly help you plan and equip your personal fault location system.

↗ Example of options in the high voltage area: motor-operated cable drum rack, external emergency stop unit and TDR connection cable

↗ Example of options in the operating area: two industrial screens and transparent partition

↗ Example of optional seat console with storage space

↗ Example of optional drawer with matching inlay

↗ Example of an air conditioner

↗ Example of a synchronous generator, underfloor

↗ Example of an electronic generator

↗ Light signalling system

↗ Warning light

↗ Cable test vans of all sizes are equipped by BAUR.

Syscompact

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 the large systems. These systems comprise different cable fault location methods making them quick and reliable. 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 foundation for smaller budgets without compromising on performance.

BAUR
ensuring the flow

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Вологда (8172)26-41-59
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Липецк (4742)52-20-81
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Мурманск (8152)59-64-93
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Орел (4862)44-53-42
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