

Cable fault location

BAUR
ensuring the flow

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?

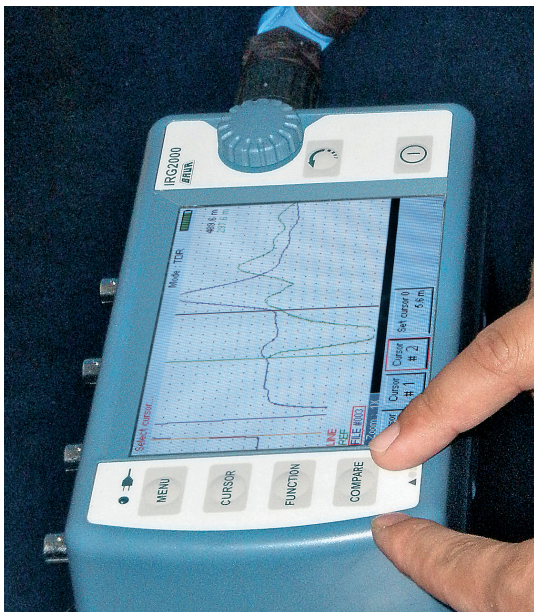
BAUR's top quality cable fault location technology has been setting a global benchmark for decades. With over 70 years of experience in cable fault location, we offer the test engineer application-oriented solutions for all requirements, for all budget ranges and, most notably, all from a single source.

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

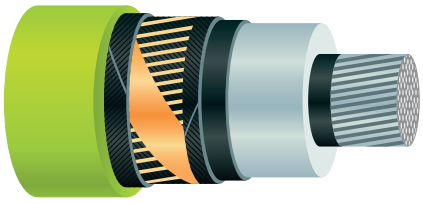
Cable routes are influenced by various ambient parameters. A cable route can consist of multiple diverse cable parts of diverse designs and types.

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.

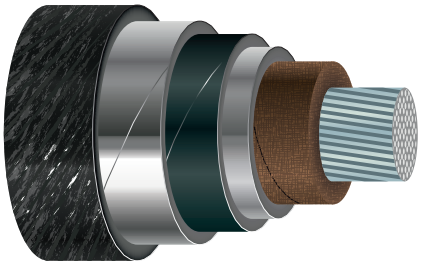
Regardless of the cable type – besides external influence, e.g. damage caused during earth works or earth displacements – the most frequent fault causes include: ageing, service life, overvoltage, thermal overload, corrosion, incorrect cable laying, installation defects and damage from transport and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



Background knowledge: cable fault location user manual

Find out more about the background of cable fault location in BAUR's manual "Cable fault location in LV, MV and HV underground cable networks".

The manual can be found and downloaded via the media centre on our website at www.baur.eu/brochures

If you would prefer a printed copy, this can be ordered via our sales department.

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.

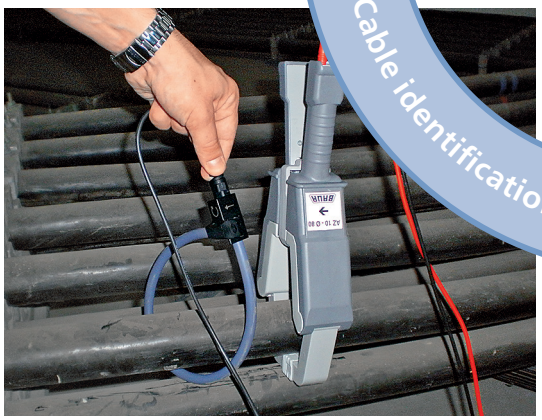
Next comes cable identification, as it is necessary to identify the defective cable in a bundle of multiple cables at the fault location. This is especially important if the fault is not visible from outside.



Fault analysis



Pre-location



Cable identification



Pin-pointing

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.

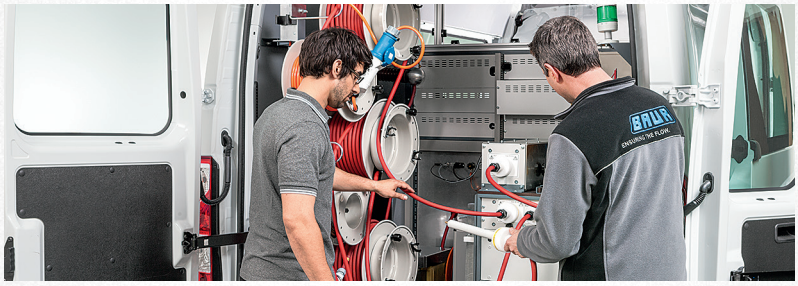
Our devices have a wide spectrum of measurement methods and thus provide you with maximum support in locating the fault. The following double-page spread will explain which method is used for which process step.

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

Professional consultation and service worldwide

We offer reliable support through skilled 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



For further information or competent advice, please contact us at: www.baur.eu/services

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 shirla



↗ Phase detector paula

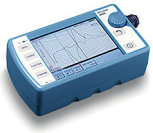


↗ Cable identifier KSG 200

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

Technical information and data sheets for each of our products are available at www.baur.eu/cablefaultlocation

Product function matrix

	Products	Application / measurement methods: Pre-location: 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	Testing: Insulation measurement	Voltage withstand test for breakdown detection	Cable sheath testing	Pin-pointing: Audio frequency methods	Acoustic pin-pointing	Step voltage or voltage drop method	Tracing	Iden-tifica-tion: Cable identification	Phase identification	Application: Medium voltage	Low voltage	High voltage	Telecom and control cables
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

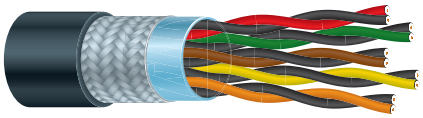
Try our product advisor on our website at:
www.baur.eu/productadvisor

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



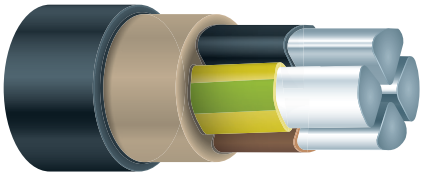
↗ Cable identifier KSG 200



↗ 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



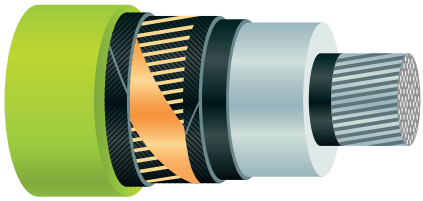
↗ Cable identifier KSG 200



↗ 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



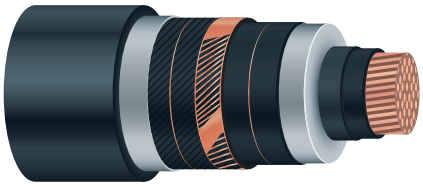
↗ Cable identifier KSG 200



↗ 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



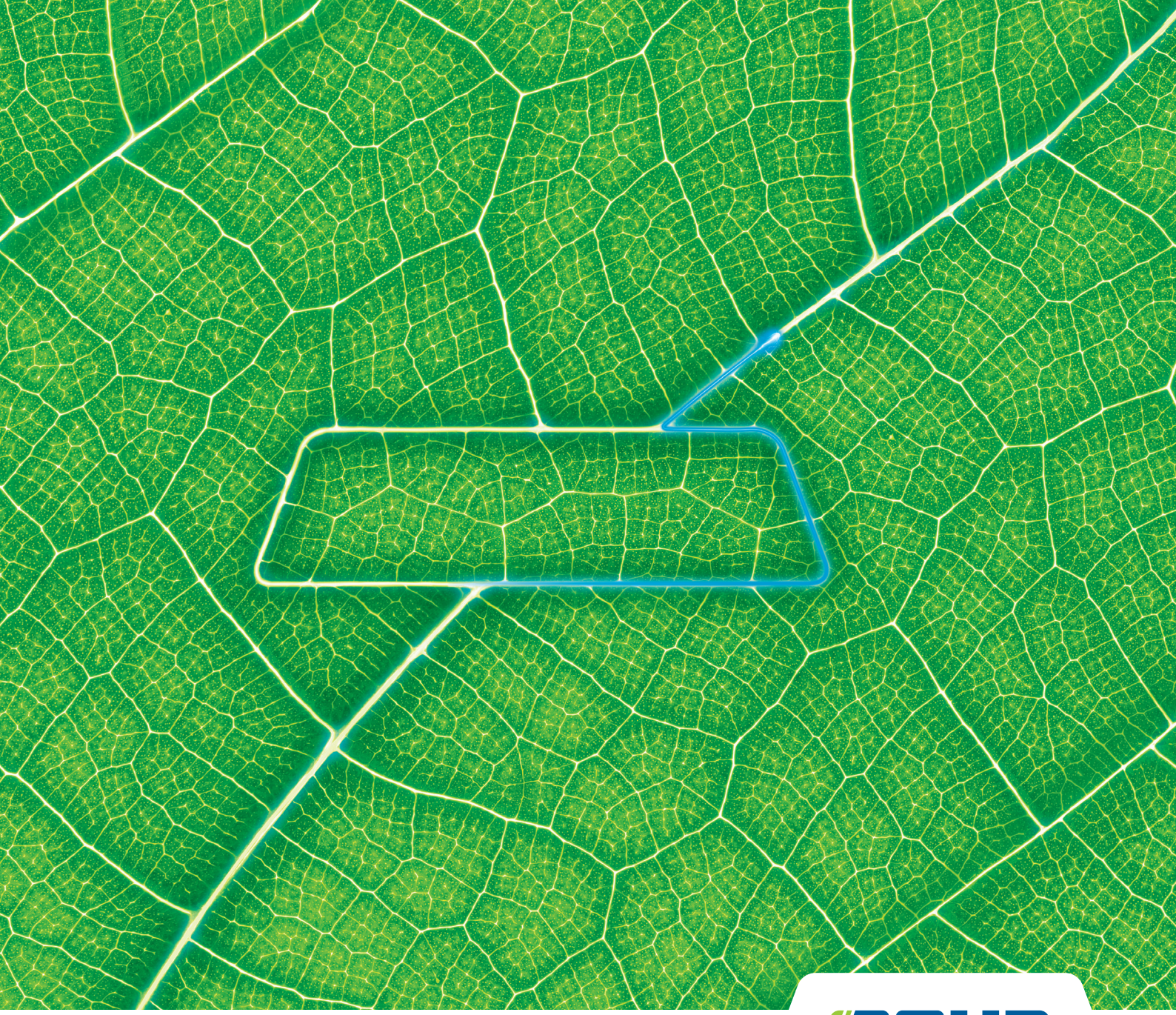
↗ Pin-pointing system protrac



↗ Cable identifier KSG 200

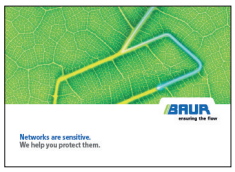


↗ Phase detector paula



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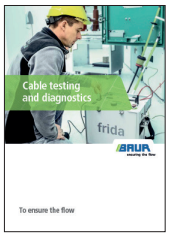
Other BAUR Brochures



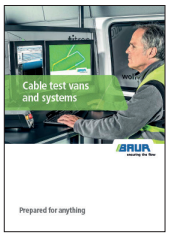
BAUR company brochure



BAUR product overview



Cable testing and diagnostics



Cable test vans and systems



Insulating oil testing

Our brochures and manuals are also available online at: www.baur.eu/brochures

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