

# Cable fault location expertise for land and submarine cables

Reliable fault location for  
maximum cost effectiveness

BAUR Solutions



# Indispensable and robust, but sadly not indestructible: Long land and submarine cables for global power supply

Due to the growing demand for power and increasing dependence on renewable energy – more and more of which is being generated offshore – submarine power cables are becoming indispensable for a reliable energy supply. Amongst experts, submarine cables are classified as critical infrastructure. Why critical? Firstly due to the harsh environment in which they are installed. Secondly – and this is also the most common cause of faults – submarine cables are exposed to mechanical stress, such as currents, fishing or heavy ship's anchors, at irregular intervals and at all water depths, which can result in significant damage.

## The impact of cable faults enters a new dimension

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 on day!

Many cable operators therefore invest in a suitable fault location system even before the cable is put into operation. Immediate availability when a fault occurs means that the fault can be located straight away, thus reducing cable downtime in the long term. Due to the enormous

time saving, the investment pays for itself after just one cable fault.

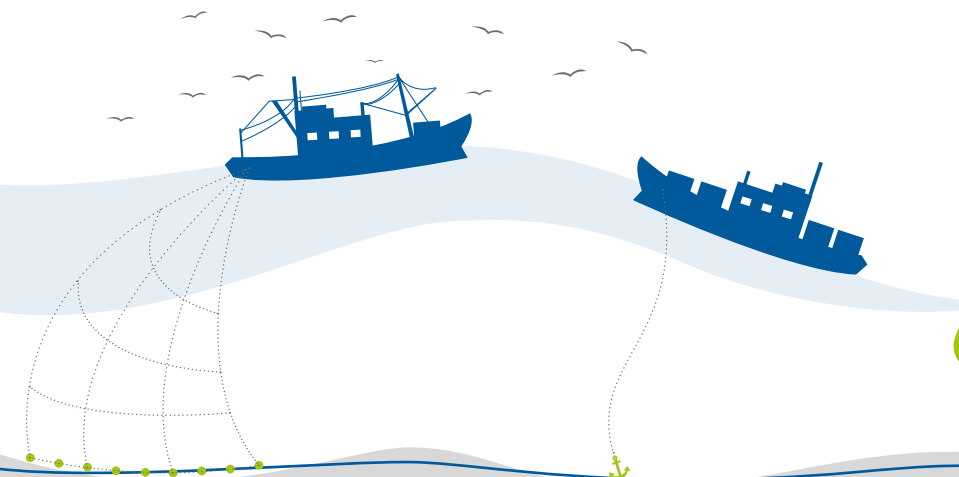
## More stringent safety requirements cannot be met with traditional cable fault location

Depending on the fault type and breakdown voltage, high voltage may be used for cable testing and cable fault location. Long cables store a lot of energy during this process. Most devices and measurement systems are unable to cope with the discharge of such a high level of energy. Moreover, standard devices are also not protected against the very high-energy transient waves. This inevitably leads

to the devices being damaged and presents a high risk for operating personnel. You should rely on proven BAUR solutions from the outset that are specifically designed for long land and submarine cables.

## Save millions in downtime costs!

No matter what the application, BAUR has the technology to allow you to locate cable damage rapidly and accurately. Suitable measurement methods provide a measuring accuracy of less than 1%. For very long cables, stationary measurement systems at both cable ends significantly improve measuring accuracy. Imagine the time and cost savings!



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

# Cable fault location by BAUR

## Proven system for fast and efficient cable fault location

Since 2010, BAUR has been developing individual product solutions for fast and efficient fault location on long land and submarine cables. With the powerful systems and extensive expertise of BAUR specialists, critical cable faults on submarine cables have been located rapidly, efficiently, and precisely in recent years. You, too, can rely on BAUR expertise and the high-performance technologies that have been tried and tested worldwide.

### 5 questions for the specialists Manfred Bawart, BAUR GmbH

#### 1. Do long submarine cables often sustain damage during their life time?

Submarine cables for power transmission are designed to be very robust and have a service life of over 50 years. Nevertheless, cable system failures do occur during this long service life, mostly caused by external forces such as heavy ships' anchors, fishing operations, the erection of wind turbines, and natural forces.

#### 2. What is the best way of preparing for cable damage?

Precise preparation is crucial for fast and successful cable fault location. Compile a comprehensive contingency plan together with your experts early on. Follow this in the event of any damage, and be guided by the experts. CIGRE Technical Brochure TB 773 contains suitable approaches. In particular, you should bear in mind that working on long cables requires specific safety procedures. Standard fault location systems are not suitable for use on long power cables. Special discharge systems are required for the safe discharge of energy. Invest in suitable cable fault location technology and the safety of your personnel before commissioning the cable.

#### 3. What is the best way to obtain a cable fault location as quickly as possible?

Fast and successful cable fault location depends upon the prompt on-site availability of suitable fault location systems and trained personnel, or expert support on a case-by-case basis. In particular, you should bear in mind that the measurement methods commonly used for land cables are not usually appropriate for long cable systems. Special measurement methods and optimised measurement technology are used. Recording accurate distance measurements on very long cables usually requires a measurement to be taken at both ends. If suitable cable fault location systems are available at both ends, this will save valuable time and the fault can usually be pre-located within a few hours. Taking a precise pre-location measurement at both ends is the starting point for fast pin-pointing and saves having to conduct expensive investigations on the seabed, which can often take days and weeks to complete. Particularly in deep-sea areas, this method eliminates expensive section losses due to the cable being cut in the wrong place.

#### 4. How exactly can you home in on the fault position?

Submarine cables are buried in the seabed over wide areas or laid with a protective cover. This consider-



**Manfred Bawart**  
Cable fault location expert and author of specialist publications (published in CIGRE, JICABLE, IEEE-PES-ICC, IEEE Electrical Insulation Magazine, CIRED, etc.)

ably reduces the chance of visually pin-pointing the fault. High-precision measurement results from pre-location are therefore extremely important. Certain pre-location methods, taking measurements at both ends and comparing several measurement methods, provide greater certainty when determining where to cut the cable. Measuring accuracy with deviations ranging from 0.05% to 1% of the cable length can be achieved. Reference measuring points of known cable joints permit further fine-tuning of the measurement results.

#### 5. What is special about the BAUR technology?

BAUR offers custom fault location systems for long land and submarine cables, HVDC cables (monopolar or bipolar), as well as for particularly long AC cable systems with cross bonding earth treatment. The cable fault location systems are optimised for safety and, even in the case of very long submarine cables, allow safe discharge of the stored energy.

# BAUR solutions for XL cable fault location

## Suitable for all cable types:

- HVDC submarine cable links (monopole, bipole)
- HVDC land cable links
- AC submarine cable systems
- Combined AC land and AC submarine cable systems

Device type	Area of application	Advantages	BAUR solution	Additional info
Portable devices	<ul style="list-style-type: none"> <li>■ For cable fault location at multiple locations of use</li> <li>■ For cable systems with high relevance – high costs in the event of cable failure, high risk for security of supply</li> </ul> <p><b>FEATURES:</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Long cables</li> <li><input type="checkbox"/> All measurement methods</li> </ul>	<ul style="list-style-type: none"> <li>■ Small and convenient</li> <li>■ Fast transportation to place of use</li> <li>■ Great flexibility of use</li> <li>■ TDR fingerprint in accordance with CIGRE TB 773, CIGRE TB 610, CIGRE TB 680, CIGRE TB 490, CIGRE TB 496</li> <li>■ IEEE 1234-2019</li> </ul>	 <p><b>shirla</b>      <b>IRG 4000 portable</b></p>	<p>Modified systems for use on long cables.</p>
Mobile systems	<ul style="list-style-type: none"> <li>■ For cable fault location at multiple locations of use</li> <li>■ For cable systems with very high relevance – very high costs in the event of a cable failure, very high risk for security of supply</li> <li>■ Fastest possible availability and operational readiness</li> </ul> <p><b>FEATURES:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Long cables</li> <li><input checked="" type="checkbox"/> All measurement methods</li> </ul>	<ul style="list-style-type: none"> <li>■ Compact: all cable fault location methods integrated into a single system</li> <li>■ Fast transportation to place of use</li> <li>■ Immediate use</li> <li>■ Great flexibility of use</li> <li>■ Very high degree of efficiency</li> <li>■ Proven system solution</li> </ul>	<p><b>Systems on wheels for use within the station</b></p>  <p><b>Cable test van</b></p> 	
Stationary XL-CFL systems for long cable systems, can be used at both ends	<ul style="list-style-type: none"> <li>■ For cable systems with extremely high relevance – extremely high costs in the event of cable failure, extremely high risk for security of supply</li> <li>■ Tailored cable fault location system integrated in a container with immediate availability when stored in the cable hall</li> </ul> <p><b>FEATURES:</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Long cables</li> <li><input checked="" type="checkbox"/> All measurement methods</li> </ul>	<p><b>Time savings</b></p> <ul style="list-style-type: none"> <li>■ No loss of time due to transportation</li> <li>■ Immediate deployment in the event of a cable system failure</li> <li>■ Cable fault location within the shortest possible time / on the first day</li> <li>■ Suitable for very long cables</li> </ul> <p><b>Precision</b></p> <ul style="list-style-type: none"> <li>■ Improved positional accuracy thanks to deployment at both ends of the cable</li> </ul> <p><b>Cost savings</b></p> <ul style="list-style-type: none"> <li>■ Reduction of downtime and holding time costs – these can amount to several €100,000 per day</li> <li>■ Investment pays for itself after just one fault</li> </ul>	<p><b>Cable fault location systems in measurement containers</b></p>   	





## Immediate availability guaranteed

thanks to the high security of supply  
and operational readiness of cable  
fault location systems

## Minimised downtime

thanks to a customised contingency  
plan, trained personnel, and the  
immediate availability of the  
fault location system



## Maximum safety

Comprehensive safety features and  
high-performance discharge unit

## Precise measurement results

thanks to tried and tested  
measuring techniques and the  
professional location system





## Other BAUR Brochures



Cable fault location



Cable test vans and systems



Further product information is available at:  
[baur.eu/brochures](https://baur.eu/brochures)

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