titron

BAUR automatic cable test van

Image of the cable test van - incl. options

State of the art in cable fault location

- New intuitive operational concept
- Central, automatic system control
- Top reliability and quality standard
- Flexible in terms of technology and equipment

The **BAUR titron** is a new automatic cable test van designed for cable fault location and cable testing. The new generation of the high-performance cable test van is based on state-of-the-art technology and provides efficient, safe and reliable cable fault location and cable testing.

Thanks to the novel operational concept and the high-performance technology, the **titron** system is able to carry out measurements more rapidly, more easily and with higher precision. The test van's functions are centrally controlled via the BAUR titron software. The intuitive user interface that is perfectly adapted to the work process of a test engineer supports the user throughout the entire fault location process without taking decisions out of his hands. The system generates recommendations for further lines of action, that are based on a multitude of factors which are linked in an intelligent manner to an algorithm specifically designed for this purpose. Nevertheless, the user is still, at any time, able to override the given specifications of the system and to carry out the measurement process based on his own experience and knowledge.

The well-proven and continuously enhanced Time Domain Reflectometry method TDR, Secondary Impulse methods SIM/MIM, DC-SIM/MIM, and Impulse Current and Decay method are available for the cable fault location as well as the newly developed Conditioning-SIM/MIM combined method which makes it even more effective and quick to locate wet cable faults that are difficult to detect.

Automatic cable test van with 3-phase connection

- DC voltage up to 40 kV (up to 80 kV*)
- VLF-truesinus® up to 57 kV_{rms}*
- Surge voltage up to 32 kV
- Functions:
  - Cable testing
  - Cable fault pre-location
  - Cable route tracing
  - Cable fault pinpointing
  - Cable sheath testing

Higher efficiency through innovative technology

- The new SSG 40 high-performance surge voltage generator
- Surge energy up to 3000 J, complete surge energy on all voltage levels
- Quickest surge sequence with maximum power surge for efficient and rapid fault pinpointing
- Further developed and new pre-location methods:
  - SIM/MIM – the most effective method for cable fault location
  - DC-SIM/MIM – for flashover faults and intermittent faults
  - Conditioning-SIM/MIM – helpful in locating wet faults that are difficult to detect
  - DC-ICM – for flashover faults
  - Envelope curve display for intermittent faults – even small changes to impedance are made visible and saved.

Robust technology with intelligent protection functions

- Automatic monitoring of the supply voltage incl. overvoltage and undervoltage protection
- Redundant design of all safety-relevant functions according to EN 13849-1
- High reliability by monitoring and recording all system events

*** Option**

BAUR GmbH · Raiffeisenstraße 8, 6832 Sulz, Austria · T +43 (0)5522 4941-0 · F +43 (0)5522 4941-3 · headoffice@baur.at · www.baur.eu

titron

State of the art in cable fault location

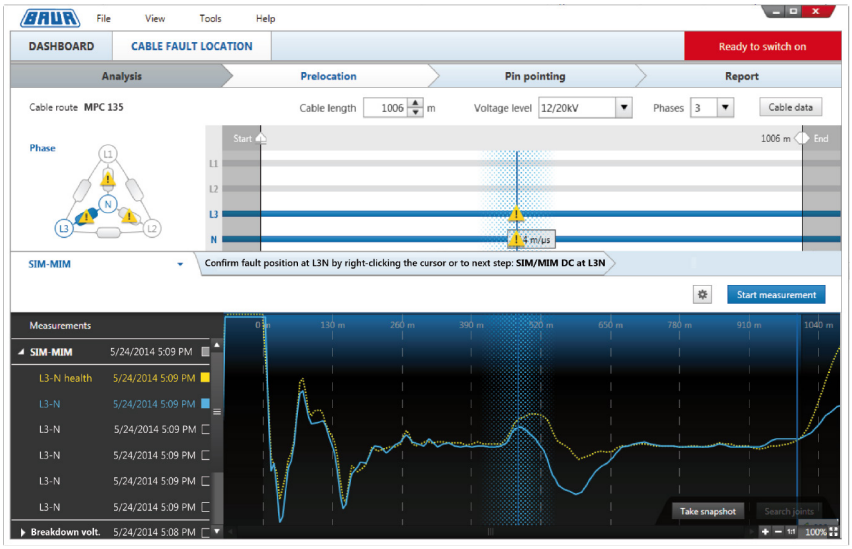
Image of the cable test van - incl. options

Central automatic control with complete system monitoring

- Central system control combined with a high-performance industrial PC
- Control of all safety functions as well as phase and device selection via the new BAUR titron software
- Highest level of efficiency and measurement precision through the optimally adjusted measurement path, combined with modern digital signal processing
- Quick start: ready for operation in just a few seconds

The new intuitive operational concept

- Intuitive modern user interface – no long introduction or familiarisation period is required
- Automated processes for quick and reliable cable fault location
- BAUR GeoBase Map*: Unique combination of road maps, including the cable route, and the BAUR cable database
  - Display of the current location, the cable route and faults via GPS
  - Map extension optional*
- Cable Mapping Technology CMT: displays 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, all measured values, etc. are automatically saved and can be accessed at any time.
- Quick and easy compilation of clear and precise measurement reports – with freely selectable company logo, comments and figures of the measured traces.

Easy and convenient to operate

- Standard, convenient operation by means of a mouse and keyboard
- Proven Windows 7 operating system
- Installation of office software, e.g. MS Office programs, company-internal ERP systems, GIS and web applications, is possible. The second monitor* makes the task convenient and productive.
- Printers, laptops and data carriers can be optionally connected via USB ports and network connections.

Cable test vans online

- Automatic synchronisation of data via a network or the Internet with other cable test vans or stationary computers*
- Online support via the Internet
  - With your permission, BAUR's customer service department can access the computer of your cable test van, identify your problem and quickly find a solution.
  - During the fault location, your engineers can share the desktop with the test engineer on site and support him in the analysis of the measurement results (where applicable, a licence for a desktop-sharing program may be required).

*** Option**

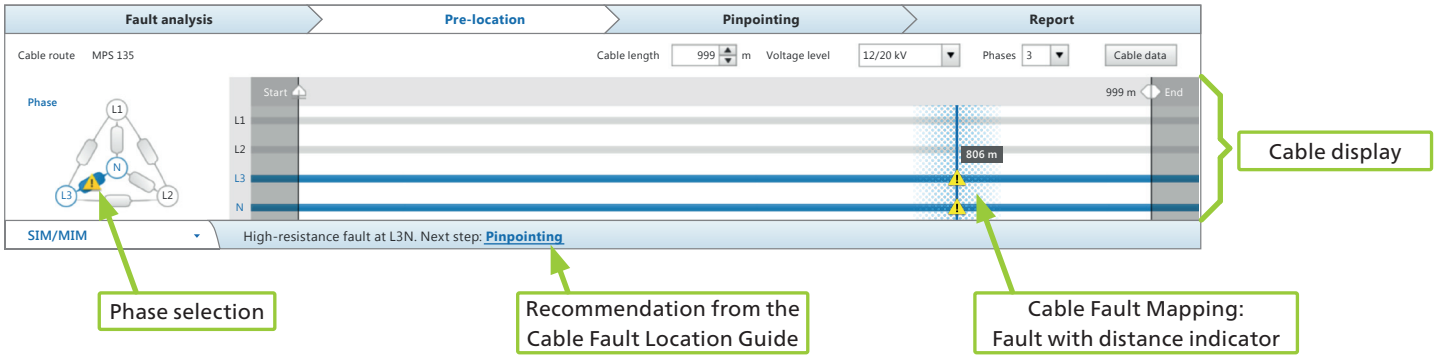
titron

Find your cable fault with just a few clicks!

Smart Cable Fault Location Guide

- The intelligent Smart Cable Fault Location Guide leads the user step-by-step – quickly and efficiently – to the cable fault.
- The special algorithm continuously analyses the current measurement results which it uses to generate optimum recommendations for the user regarding the further procedure required to reliably locate the cable fault.
- Automatic fault analysis with clear graphical presentation giving a better overview.
- Test voltage wizard:
  - The system recommends voltage values according to the cable data and the fault type.
  - The test voltages can be defined according to the user.
- Automatic cursor positioning at the cable end and at the fault.
- Automatic adjustment of method-related parameters for quick and efficient fault location.
- Clear graphical presentation of the measurement results with helpful functions for the analysis.

All this **with full flexibility for experienced users!** The experienced test engineer can use his know-how directly at any point during the measurement process and select a user-specific procedure.



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)
- Separation in the operating and HV area, red and green signal lamps
- Emergency stop button in the operating area and optional external emergency stop feature in accordance with EN 50191
- Key switch against unauthorised commissioning
- All operation-related error messages are displayed clearly on the screen and are immediately visible to the user.

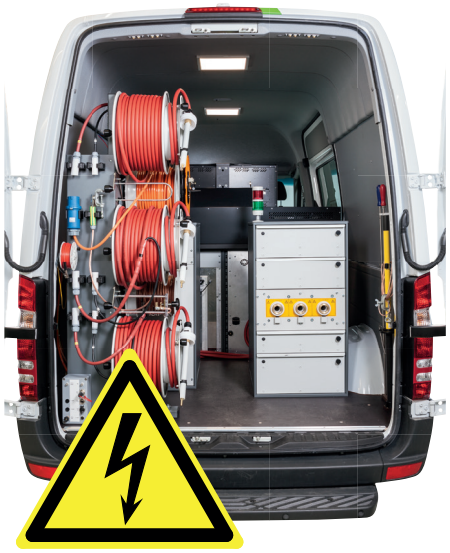
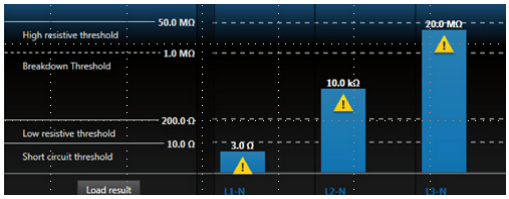


Image of the cable test van - incl. options

titron

The most efficient fault location methods

Fault analysis



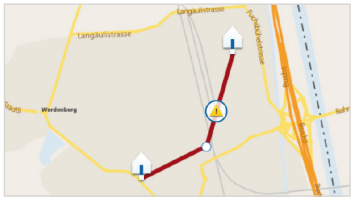
- **Resistance measurement** is used to determine the faulty phase and the type of fault.
- **Voltage testing** is used to test the electric strength of the cable insulation. The following voltage shapes are available depending on the system configuration: DC, VLF sine and VLF square wave voltage.
- **Cable sheath testing** is used to determine external cable damage (sheath faults).

Cable fault pre-location

- **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 SIM/MIM 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** » The Secondary/Multiple Impulse Method is used in DC mode to locate intermittent faults. Voltage is applied to the cable; at the breakdown an SIM/MIM measurement is automatically and simultaneously carried out.
- **Conditioning-SIM/MIM** » Fault conditioning with SIM/MIM measurement was specially developed 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** » The voltage coupled decay method is used to locate 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.

NEW: 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.

Cable fault pinpointing



- **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 located by means of earth spikes and a universal receiver (UL 30).
- **Twist method:** used to pinpoint conductor-conductor short-circuits.
- **Cable route tracing:** used to precisely determine the cable route.

Technical data

Standard			Options
Resistance measurement			
Insulation resistance measurement: measurement range 1 Ohm – 3 GOhm			
Connection socket for an external resistance measurement device			
Automatic phase selection and voltage release via the BAUR central control system			
DC voltage testing / cable sheath testing			
Output voltage	0 – 40 kV		↗ DC ±1 – 70 kV I_{max}: 10 mA @ 70 kV; 90 mA @ 20 kV
			↗ DC ±1 – 80 kV I_{max}: 1.8 mA @ 80 kV; 90 mA @ 20 kV
VLF voltage test			
			↗ VLF-truesinus® 1 – 38 kV_{rms}; 0.01 – 1 Hz Max. capacitive load: up to 20 µF; 3 µF @ 0.1 Hz at 38 kV_{rms}
			↗ VLF-truesinus® 1 – 57 kV_{rms}; 0.01 – 1 Hz Max. capacitive load: up to 20 µF; 1.2 µF @ 0.1 Hz at 57 kV_{rms}; 3 µF @ 0.1 Hz at 38 kV_{rms}
Cable fault location – Pre-location methods			
Time Domain Reflectometry TDR (3-phase measurement), Secondary/Multiple Impulse Method (SIM/MIM), DC-SIM/MIM, Conditioning-SIM/MIM, Impulse Current Method ICM, DC-ICM, Decay Method, breakdown voltage determination			↗ TDR and resistance measurement via TDR low voltage connection with 50 m TDR connection cable, inverse voltage protected up to 400 V
Pulse reflectometry			
Test modes	Differential measurement, mean value calculation, continuous measurement, stop after recording the change, envelope curve display		
Automatic calculation of the cable length and fault distance			
View range	10 m – 1000 km	Resolution 0.1 m (at v/2 = 80 m/µs)	
Propagation time factor v/2	20 – 150 m/µs	Sampling rate 200 MHz	
Accuracy	0.1% relating to the measurement result		
Output impedance	12 – 2000 Ohm		
Pulse width	20 ns – 1.3 ms		
Measuring pulse	20 – 160 V		
Electric strength	AC 400 V, 50/60 Hz		
HV pre-location methods			
Surge voltage			
Voltage levels	0 – 8 kV, 0 – 16 kV, 0 – 32 kV		↗ 0 – 4 kV: 1460 J / 1580 J / 1820 J @ 4 kV
Surge energy	1500 J or 2100 J or 3000 J @ 8, 16 and 32 kV		↗ 0 – 4 kV: 2530 J / 2660 J / 2890 J @ 4 kV
Surge sequence	5 – 20 surges/min, single surge		
Capacitor charge time	Max. surge voltage 32 kV in 3 s		
SIM/MIM and Conditioning-SIM/MIM			
Surge voltage	0 – 8 kV, 0 – 16 kV, 0 – 32 kV		
DC-SIM/MIM and DC-ICM			
DC voltage	0 – 8 kV, 0 – 16 kV, 0 – 32 kV		
Decay method			↗ DC ±1 – 70 kV
DC voltage	0 – 40 kV		↗ DC ±1 – 80 kV
Impulse Current method ICM			
Surge voltage	0 – 8 kV, 0 – 16 kV, 0 – 32 kV		
Fault conditioning through burning			
			↗ Voltage 0 – 10 kV, up to 32 A; 2.3 kVA
			↗ Voltage 0 – 15 kV, up to 90 A; 6 kVA

Technical data

Standard		Options
Cable fault pinpointing		
Acoustic pinpointing		
Voltage levels	0 – 8 kV, 0 – 16 kV, 0 – 32 kV	↗ 0 – 4 kV: additionally 1460 J/1580 J/1820 J @ 4 kV
Surge energy	1500 J or 2100 J or 3000 J @ 8, 16 and 32 kV	↗ 0 – 4 kV: additionally 2530 J/2660 J/2890 J @ 4 kV
Surge sequence	5 – 20 surges/min, single surge	
Capacitor charge time	Max. surge voltage 32 kV in 3 s	↗ Universal receiver UL 30, ground microphone, headphones
	Highly efficient due to the very quick recharging of the capacitors	
Step voltage method (cable sheath fault location)		
Output voltage	0 – 8 kV, 0 – 16 kV, 0 – 32 kV	
Surge sequence	5 – 20 surges/min	↗ Universal receiver UL 30 / KFM 1, cable sheath fault location set
	Highly efficient due to pulsed current	
Twist method, tracing		
Control of audio frequency transmitter: automatic phase selection and voltage release via the BAUR central control system		↗ Audio frequency transmitter TG 600, 600 VA
		↗ Audio frequency transmitter TG 20/50, 20 VA/50 VA
		↗ Universal receiver UL 30, audio frequency transmitter TG 600 or TG 20/50, search coil SP 30
Safety and protective features		
Functional safety	Category 3 according to EN 13849-1	↗ Voltage interruption: Isolation transformer
Electrical safety	Overvoltage category IV/300	
Earthing monitoring	Protective, operational and auxiliary earthing, potential monitoring	
Monitoring	HV connections, rear doors, emergency stop button	
Monitoring of the supply voltage with overvoltage protection, undervoltage protection		
Connection of the measurement system		
HV connection	HV connection cable 3 x 1-phase cable, 80 kV, 50 m or 80 m	
	Cable drum system KTG M6	↗ Cable drum system with motor drive, 5 drums
LV connection	LV connection panel to connect external measuring devices	↗ TDR connection cable, 50 m, on hand drum
		↗ External emergency stop unit with signal lamps, incl. connection cable on drum
Operating system, software und display		
Operating system	Windows 7 Ultimate 32-bit (or higher)	
Memory data	2 GB RAM, graphics card 1024 MB memory	
Hard disk	SSD industrial standard	
Display	TFT monitor 19", screen resolution: 1280 x 1024	
Data export format	PDF, Excel	
Software available in	22 languages	
BAUR GeoBase Map	90 days test licence	↗ BAUR GeoBase Map: Roadmap display via GPS combined with BAUR cable database
Data synchronisation	USB	↗ Synchronisation of data via network or the Internet (with other cable test vans, office computer)
Systems supply and operating conditions		
Input voltage	198 – 264 V, 47/63 Hz (220 – 240 V, 50/60 Hz)	↗ Synchronous generator 7 kVA, 230 V
Power consumption	2 kVA	↗ Travel Power generator with power box 5 kVA, 230 V
UPS	500 VA for industrial PC	↗ Electric heating 230 V, 2000 W
Ambient temperature (operation) HV room: –20°C to +50°C, operating room: 0°C to +50°C		↗ Electric cooling system 230 V
Storage temperature	–20°C to +60°C	
Weight		
Standard version	From 800 kg	