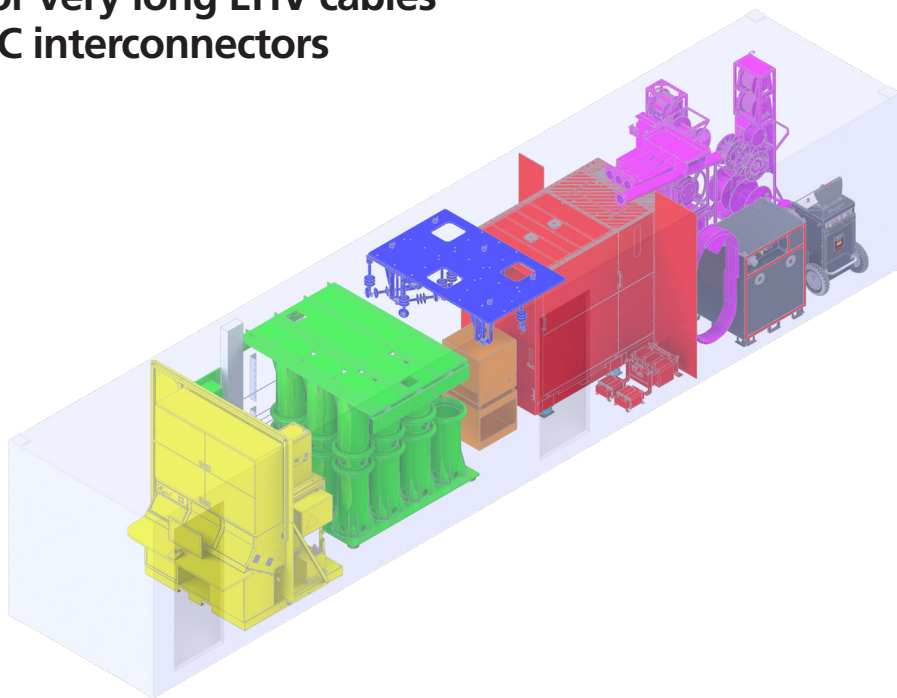


R550

Containerised high-end cable fault location system for very long EHV cables and HVDC interconnectors

Megger[®]



TCFL R550 fault location solution 150 kV

General characterisation	
Topology	Fully centralised and fully automated, digital, software-based cable fault location system
Automation	Automatic switching with motorised HV switches for HV mode selection, HV mode execution and HV range selection in all operating modes of fault location
Controls	Via one single control unit for all operating modes and system functions
Graphical User Interface (GUI)	Piechart (GUI Version 7)
Operation	Turn & Click single rotary knob (jog dial) on control unit
Operating system	Linux
Data management	Measurement history and MeggerBook Lite
Data synchronisation	USB
Control unit	
Display	Industrial grade TFT colour panel with LED backlighting
Antiglare	Yes
Multi-touch	Yes
LCD size	54 cm (21.5 inch)
Aspect ratio	16:9
Resolution	1920 x 1080 Full HD
Luminance	450 cd/m ²
Safety	
Compliance	CE conformance; EN 61010, EN 50191, VDE 0104, VDE 0105, DGUV 203-034 (BGI 891)
Discharge and earthing unit	3,380 kJ, equivalent to the energy stored in a 300 µF capacitance charged to 150 kV DC fast-acting: discharge time constant < 5 sec
System status	Live monitoring and indication
Inherent safety	Yes, immediate earthing in case of power loss
F-U safety interlock	Reference earth to vehicle chassis for monitoring of protective earth incl. voltage-time integral, monitoring of station earth and touch potentials
F-Ohm safety interlock	Connection monitoring for operational earth (HV return)
Safety functions	Front panel: mains on/off, lockout-tagout key switch, emergency stop, residual voltage indicator, HV on, HV off; Control unit: rotary knob (jog dial)
Safety devices	System earthing status indicator lights, mains input protection device NAS60, HV compartment monitoring via door contacts, external safety device
Mains input monitoring	Overvoltage protection, undervoltage protection, residual current device (RCD)
Defined wiring	Yes, distribution panel inside of the system
Isolation transformer	Yes

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Toolbox philosophy for cable fault location

One toolbox, many tools: Maximising versatility, flexibility, and effectiveness of fault locating for field personnel

DC test (DC hipot) with breakdown detection and insulation test for fault identification;
 TDR/Cable radar and HV methods (ARM, ICE, Decay) for fault prelocation;
 Burning for fault conversion;
 Surge generator (thumper) for fault pinpointing;
 DC test and voltage gradient method (step voltage method) for sheath fault testing and sheath fault pinpointing

General configuration and high voltage system output

Voltage class 150 kV
 Exclusively single phase (R550 1-150)

HV DC source, Fault identification

DC test (DC hipot)	0 ... 150 kV, $I_n = 8$ mA continuous at 150 kV, $I_{max} = 250$ mA
Insulation test	IR readout during DC breakdown test: up to 1 GΩ
Breakdown detection	0 ... 150 kV

Cable radar (time domain reflectometry, impulse echometry)

Radar type	Teleflex® RDR Unleashed, physically and functionally fully integrated
Pulse generation	Bipolar
Pulse magnitude	± 250 V adjustable
Pulse width	20 ns ... 90 μs
Pulse power	Unrestricted continuous operation and unrestrictedly fast pulse repetition with full power pulse of 90 μs at ± 250 V into any cable impedance
Third-party certification	Yes, pulse generation has been tested and DAkkS-certified
Noise suppression	Yes, innovative technology <i>Advanced Noise Suppression</i>
Averaging	Yes, innovative technology <i>Next-gen Averaging</i> with 3 modes
Long range measurement	Yes, innovative technology <i>Signature Boost</i>
Dynamic range	115 dB
ProRange	Yes, +40 dB exponential distance-dependent de-attenuation
Data rate	533 MHz
Measuring range X_R	20 m ... 1280 km at VOP = 80 m/μs
Signal gain Y_G	0 ... 100%
Resolution	0.1 m at VOP = 80 m/μs
Accuracy	0.1%
Timebase accuracy	< 50 ppm
Velocity of propagation	10 ... 149.9 m/μs, can be expressed in m/μs or ft/μs or nominal
Output impedance	50 Ω
Compensation	No dedicated internal compensation necessary

HV prelocation

ARM — implemented as inductive-active double surge ARM Multishot

Technology	The Arc Reflection Method in the R550 utilises a double discharge mechanism alongside a unique arc reflection filter. The technique is executed in a sequential two-step process comprising of the acquisition, superposition, and direct assessment of two distinct Time Domain Reflectometry (TDR) traces. The first, recorded by the Teleflex® RDR, is the low voltage reference. The second, is the high voltage fault trace obtained subsequent to fault ignition. This ignition is achieved by the main capacitor discharge through an active arc reflection filter which ensures optimal ignition and best stabilisation of the arc at the fault position when a secondary, high-energy discharge from an auxiliary capacitor is released. The effectiveness of the double surge surpasses the sum of the individual energies stored in the capacitors, leading to the best possible prelocation results of any ARM version.
Surge voltage of main capacitor	0 ... 50 kV 2500 J
Double surge auxiliary capacitor	12 kV 2000 J
Total prelocation effectiveness	Better than 4500 J (> 2500 J + 2000 J)
Arc reflection filter	Active, for the best technically achievable arc ignition and arc stabilisation
Multishot	TDR captures a sequence of 32 HV fault traces per single ARM shot
BestPicture® (Best-of-32)	TDR automatically analyses all 32 multishot traces, picking and displaying the best one to the operator

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ICE	
Technology	Impulse current decoupling; Teleflex® RDR captures the impulse current component of the travelling wave which is initiated after the fault has been ignited by capacitor discharge
Surge voltage	0 ... 25 / 0 ... 50 kV / 0 ... 100 kV
Decay	
Technology	Voltage decoupling; Teleflex® RDR captures the voltage component of the travelling wave which is initiated after the fault has been ignited by DC charging
Voltage	0 ... 150 kV
Fault pinpointing	
Coincidence method (magnetic-acoustic pinpointing of main insulation faults)	
Surge generator (Thumper)	R550
Voltage ranges	Standard version: 3 stages 0 ... 25 kV 6250 J 0 ... 50 kV 2500 J 0 ... 100 kV 4000 J
Surge rate (Thump rate)	Adjustable; 3 ... 10 sec, single surge (single thump)
Fault conversion	
High performance unit, automated high power burner	
Technology	Specially wound 3-ph 50 Hz transformer-rectifier, continuously variable output, smooth uninterrupted burn-down process, $P_{cont} = 20 \text{ kW}$ ($S = 80 \text{ kVA}$)
System integration	Functionally fully integrated, operation via centrally control unit,
Voltage and current	0 ... 40 kV DC; $I_{max} = 5 \text{ A}$ continuous at 4 kV DC, $I_n = 500 \text{ mA}$ continuous at 40 kV DC
Prelocation	ARM Live Burning (Burn Arc Reflection); 0 ... 40 kV DC
Cable sheath testing	
Sheath fault testing	0 ... 20 kV DC in voltage ranges of 5 / 10 / 20 kV
Sheath fault pinpointing	Voltage gradient method (step voltage method)
Pulsed DC voltage	0 ... 5 kV; 0 ... 10 kV; 0 ... 20 kV; $I_{max} 250 \text{ mA}$
Pulse sequences	0.5:1, 1:3, 1:4
Weight	
Standard version	Single phase configuration starting at 5500 kg
Environmental	
Operating temperatures	-5 °C ... +35 °C (+23°F ... +95°F) 0 °C ... +35°C (+32°F ... +95°F) Suitable for ambient temperature range -20°C ... +55°C due to multiple air conditioner/dehumidifier/heater units built-in. Climatisation/air conditioning shall be running for a minimum of 1 hour before turning on HV.
Storage temperatures	-20°C ... +60°C (-4°F ... +140°F)
Mains input	
Input voltage	High voltage unit only: 230 V $\pm 10\%$ / 50 Hz, 16 A, single-phase, $S = 5 \text{ kVA}$ High voltage unit and high performance unit: 400 V $\pm 10\%$ / 50 Hz, 200 A, three-phase, $S = 80 \text{ kVA}$
Connections and test leads	
HV system output for 150 kV single-phase configuration	
Professional 1x1	1x single-phase T4 HV cable drum, 200 m, motor-driven
LV auxiliary functions	
Professional	1x mains input cable drum, 200 m, motor-driven, Schuko with NAS60 1x protective earth cable drum, 200 m, motor-driven 1x 15 m reference earth lead for F-U safety interlock
TDR/Cable radar output (dedicated TDR-LV connection)	
Professional	1x three-phase coaxial measurement cable, 50 m, motor-driven
External safety device EN 50191	
Economy	1x ESE signalling cable, 15 m, with external socket and storage compartment

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