CENTRIX EVOLUTION

The flagship system for cable fault location, cable testing, and cable diagnostics

Megger

Centrix Evolution – the most innovative product from Megger

The Centrix Evolution is the world's most advanced and powerful cable test system, able to locate faults in low voltage (LV) and medium voltage (MV) cables quickly, simply, and with minimal stress. It is also able to test cables up to 36 kV and can be used on certain classes of high voltage cables.

The test system is equipped with visionary new software modelled after the operation and ergonomics of smartphones. Navigation is done via multi-touch-screen and gesture recognition. A workflow with an automated sequence and step-by-step instructions guides and pulls the user through the fault location process, making it possible to find faults very quickly, even for inexperienced personnel. Being just one tap away, experienced users have access to a detailed expert mode at any time.

The Centrix Evolution is available in single-phase or three-phase configurations and supports the combination of solutions for cable testing and cable diagnostics in addition to cable fault location.

Its powerful and innovative VLF technology allows for carrying out fully standard-compliant withstand testing, even on long cables, on three phases in parallel, or as PD-monitored withstand test with simultaneous partial discharge measurement at near line frequency.

CENTRIX *Evolution*

11 reasons why the Centrix Evolution is unique

Centrix Evolution sets the standards for user comfort and performance:

01	For all operating modes and system functions, without exception, a centrally-controlled, fully automated, fully integrated test system
02	Easy and convenient operation via the 21.5'' control unit providing a multi-touch industrial-grade panel or, alternatively, via rotary knob (JogDial)
03	For inexperienced users, an automated sequence ("the workflow") with step-by-step instructions guiding through the fault location process
04	Highest safety standards by means of a powerful discharge unit with 32 kJ, as well as by monitoring the station earth (F-U) and the earth connections on the HV return (F-Ohm)
05	Teleflex® RDR – the best cable radar (time domain reflectometry) in the market
06	State-of-the-art resonance burning technology and continuous prelocation method ARM® Live Burning
07	Surge energy (thumping) up to 4000 Joules
08	Monitored withstand testing with near-line-frequency PD measurement (Slope technology), diagnostic PD testing with damped AC (DAC technology)
09	Latest, most innovative implementation of ARM prelocation via Multishot with 32 fault traces, Best Picture algorithm, and inductive ARM filter
10	Linux-based operation system – highest system stability, blackstart capability, and excellent cyber security
11	Connectivity – remote access and remote control of important system functions for the convenient location of cable faults with minimal stress on the cable under test

System control? Super easy!

The Centrix Evolution is operated either via multi-touch display or rotary knob (JogDial).

A 21.5” control unit with a powerful industrial PC, a hard drive which may be scaled as required, and an integrated recovery system ensure safe and stable operation over the entire service life of the test system.

The Linux® operating system is completely maintenance-free. No intrusion of viruses, no defragmentation, and no expensive anti-virus protection software necessary.

System control application, office applications as well as geographic information systems are strictly separated to establish and maintain optimal system stability and cyber security. Office applications, the database software and geomapping software can be displayed on an optionally available additional industrial-grade monitor.

The Centrix Evolution thinks ahead

The system permanently determines the optimal parameters for the currently active operating mode. The next logical step of the workflow is automatically preselected by the software, and all the user has to do is confirm – it's simple and direct!

If necessary, manual fine adjustments can be made at any time.

The reduction of complexity to a minimum provides expert users an optimum of convenience. Even inexperienced users will be able to locate cable faults quickly and very accurately.

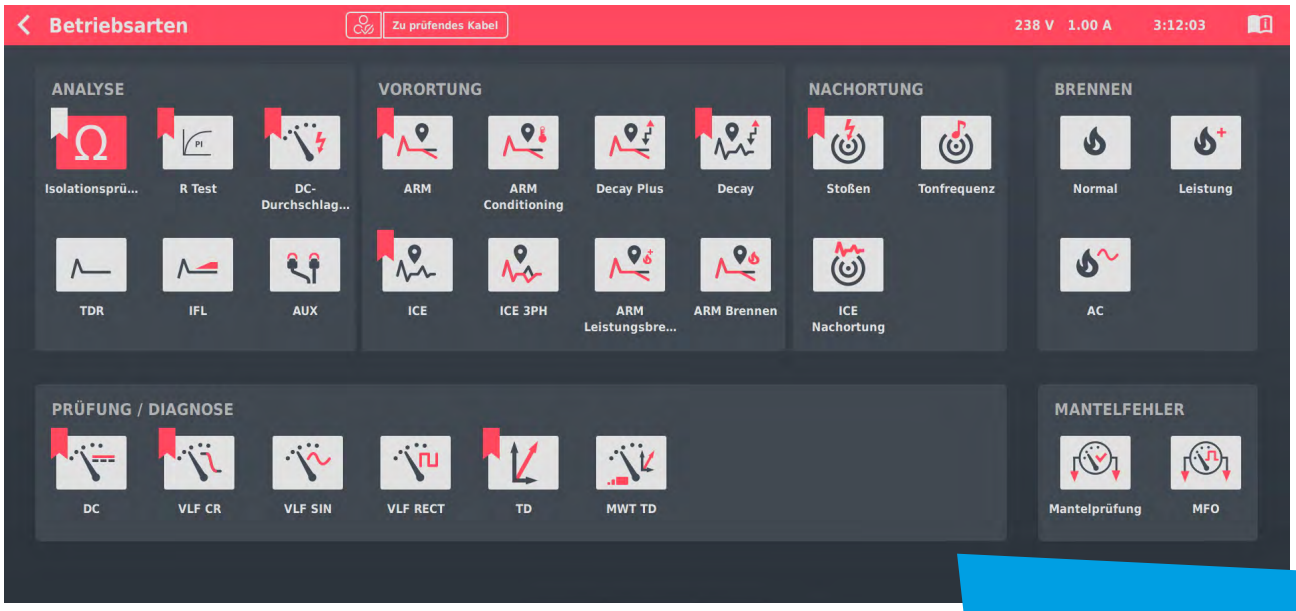
Automatic data logging by the Megger Book

All measurements are automatically recorded and stored as a database entry the moment they are captured. This prevents results from being lost in the event of, for example, a sudden mains failure. All measurement events can be supplemented with comments via an on-screen keyboard.

The input template is freely defineable and can be adapted to the internal documentation templates of the respective distribution system operator.

Results may be printed directly or exported to a USB flash drive as a PDF file. A number of USB ports allow the user to connect additional hardware, for example, a printer, keyboard, or mouse.

Centrix Evolution – unique and inspiring technologies



Expert mode and application screen with quick and easy access to all availabe methods

Please reach out to us for a free demo version!

Prelocation

Teleflex® RDR – the world's most powerful cable radar / TDR

The Centrix Evolution is equipped with the lastest and best-performing TDR technology.
The integrated Teleflex® RDR has been tested and certified by an accredited third-party test lab.
At a glance:

- Bipolar impulse generation of ± 250 V for the injection of high impulse energy into the cable, and as a prerequisite for innovative interference suppression and averaging techniques
- Verification and DakkS certification of the claimed impulse generation parameters by an accredited external test lab
- Smart automatic mode; algorithms automatically determine the necessary parameter adjustments without any user intervention, e.g., setting measurement ranges, gain control, cable end recognition and cursor to fault position
- Extraordinarily high measurement dynamics of 115 dB
- Very high time base accuracy of less than 50 ppm (better than 0.005 %)
- High quality measurement results thanks to fast data rate of 533 MHz
- Distance-dependent dynamic attenuation ProRange
- Multishot with 32 fault traces patterns and Best Picture feature for improved user comfort
- Long range mode *Signature Boost*

ProRange
In order to counteract the exponential cable attenuation, the de-attenuation technology ProRange was developed, by which a distance-dependent adjustment of the signal amplification is achieved. That way, distant faults, joints, and the end of the cable can be detected in a significantly better way. ProRange is indispensable for high attenuation cables such as long onshore and offshore HVAC and HVDC cables, paper cables, wet cables, and crossbonding.

Direct TDR measurement (TDR-LV)
Low resistance faults, shorts, zero-ohm faults, breaks, joints and the electrical length of the cable are determined with a direct LV measurement from the integrated cable radar (Teleflex® RDR).

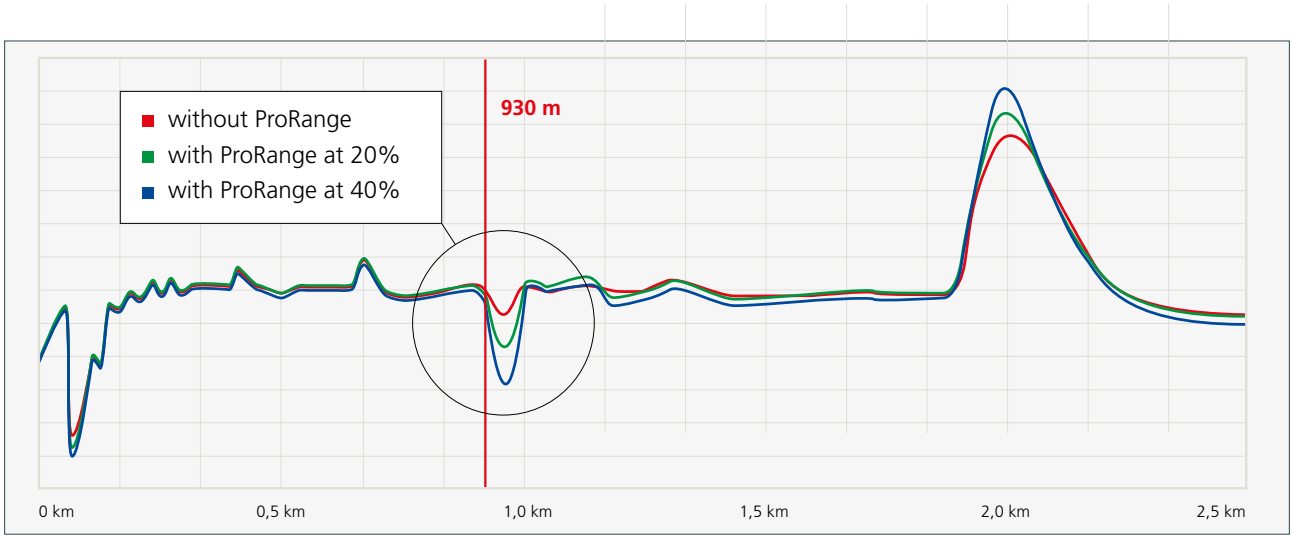
IFL mode
In order to find intermittent, unstable faults, even small, temporary, short-term changes in the impedance are made clearly visible with the help of an envelope curve.

Inductive ARM® Best Picture Multishot
The Arc Reflection Method (ARM) is the standard method for finding high resistance faults and it achieves the highest precision of all methods. ARM is a two-step process during which two different TDR images are captured and directly compared. First the low voltage reference trace, and then the high voltage fault trace after the fault has been ignited by the surge capacitor through an arc reflection filter. The Multishot technology allows to capture 32 fault traces per shot. The Best Picture technology instantly analyses all fault traces and automatically displays the best result to the user. To guarantee optimal ignition and stabilisation of the arc at the fault position, an inductive arc reflection filter is used which is inherently superior to resistive filters.

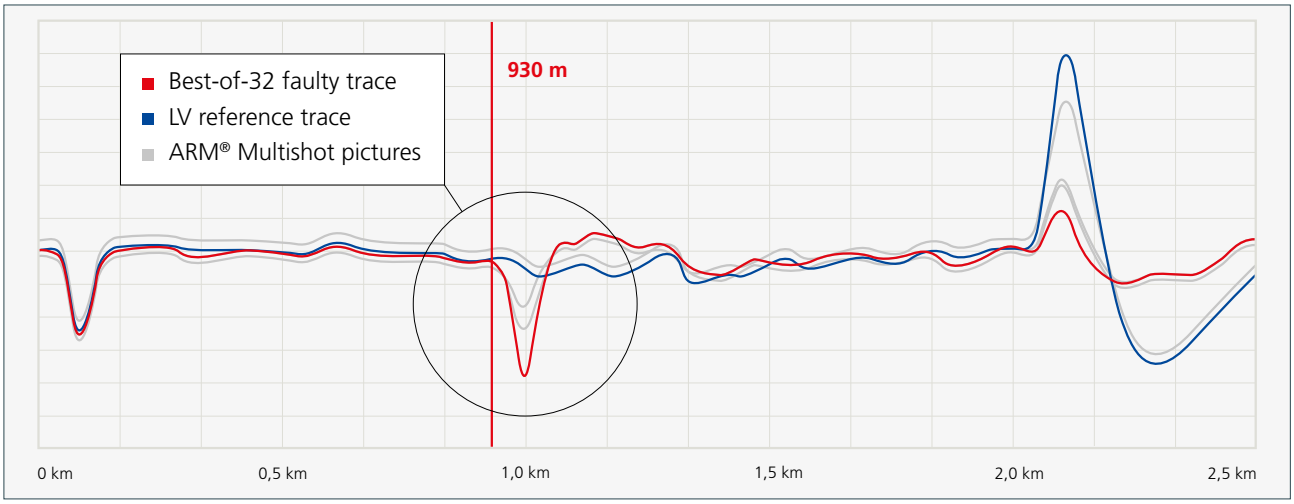
ARM® Live Burning
ARM® Live Burning was developed as a continuous prelocation method that allows to observe any impedance changes live during the burn-down process. As soon as a stable low-resistance state is reached, the burner stops automatically. The comparison of the fault trace with the reference trace is done immediately, and the user may quickly proceed with pinpointing. ARM® Live Burning is a very powerful method to find faults which are particularly difficult to ignite and to stabilise, e.g., oil-filled joints, paper cables, wet faults, long cables. Due to the controlled burn-down process, even XLPE cables can be handled relatively gently.

ARM® Conditioning
Modification of ARM® for conditioning difficult-to-ignite faults with using the surge capacitor (thumper) when there is no burner available. After having captured the reference trace, the fault is first subjected to cap discharge several times with as much energy as possible, and then, with the shortest possible time delay, the fault trace is recorded. ARM(R) Conditioning is particularly helpful on paper cables, wet faults, and faults in oil-filled joints.

ICE and Decay
The well-established transient methods of current decoupling (ICE) and voltage decoupling (Decay) also determine the fault position automatically. The Centrix Evolution is now the first cable fault location system to take both a) the length of the HV test lead and b) the 5-10 % transient overestimation into account when determining the distance to the fault.



ProRange – distance-dependent dynamic de-attentuation



ARM® Best Picture Multishot

A wide range of functionality for precise fault location

Testing for sheath integrity

Sheath testing
To check the outer sheath (outer jacket) for any damage, sheath fault testing can be performed up to 20 kV DC.

Sheath fault prelocation
To find the distance to identified sheath faults, they have to be prelocated. For this purpose a bridge measurement is best suited, utilising the so-called voltage drop method. With output voltages of up to 10 kV, highly sensitive electronics, and a fully automatic test sequence, even very high resistance sheath faults can be easily prelocated. The technology is also suitable for the prelocation of main insulation faults on offshore cables.

Special features:

- High voltage bride using the voltage drop method
- Bipolar testing eliminates thermoelectric offsets and galvanic influences (e.g., wet joints)
- Testing is not impacted by resistance changes in the measurement loop: connection clamps, shields, cross sectional area of conductors, auxiliary wires and, far-end jumpers, etc.
- Integrated automatic discharge unit

Sheath fault pinpointing
After having prelocated any sheath faults, their exact position has to be pinpointed before commencing with the repair. For this purpose a measurement with pulsed DC voltage is best suited, utilising the so-called voltage gradient method or step voltage method. The Centrix Evolution is capable of generating a non-hazardous voltage distribution around the actual fault position in several ranges between 5 kV and 20 kV, which can be very precisely located with a set of earth spikes and the ESG earth fault locator. The technology is also applicable to direct buried secondary LV cables.

Pinpointing and line tracing

Datasheet digiPHONE+2 sets

Pinpointing of main insulation faults

Coincidence method / magnetic-acoustic method
High resistance faults and intermittent faults can be accurately pinpointed by using the Digiphone surge wave receiver in conjunction with a surge generator, applying the so-called coincidence method or magnetic-acoustic method. With adjustable voltage levels of 8, 16, and 32 kV, all of the typical requirements in medium voltage distribution systems will be taken care of. As an option, an additional surge extension for prelocation and pinpointing on low voltage cables is available upon request. This includes the voltage levels 2 kV and 4 kV. The Centrix Evolution comes with a surge energy of 2000 J as standard. Optionally, 4000 J are available upon request.

Utility location
The system's centrally controlled and functionally integrated tone generator provides the signals for perfoming line location of cable routes as well as pinpointing low resistance cable faults. The powerful audio frequency generator with up to 250 W active transmitting power supports five very common audio frequencies and the SignalSelect® feature. It is also possible to simultaneously transmit up to three frequencies at the same time.

How to master the condition assessment of your cables

Cable testing and diagnostics

Insulation testing
Automatic measurement of insulation resistance and capacitance is possible with voltages up to 1000 V DC and for capacitances of up to 20 µF.

DC testing
DC tests and DC breakdown detection are possible up to voltages of 80 kV.

VLF testing according to international standards: VDE, CENELEC, IEC, and IEEE
The available VLF attachment in cosine-rectangular technology (VLV CR) is second to none in terms of power and enables fully standard-compliant withstand testing of particularly large loads. This makes it possible to test all three phases simultaneously, even on long cables, without any deviation from the prescribed test frequency of 0.1 Hz. Because of that, users can save two hours of downtime without compromising on standardised test parameters.

Three-phase breakdown detection
When testing all three phases simultaneously, the breakdown detection is capable of indicating in which phase a breakdown has occurred. This saves time and puts less stress on the cables.

Optimum partial discharge diagnostics
The Slope technology has been introduced for monitored withstand testing on medium voltage cables and allows for accompanying PD diagnostics during an otherwise fully standard-compliant VLF withstand test which is part of an underground installation's commissioning test. The measurement of any partial discharges is done during the polarity reversal of the test voltage, and the its rapid rate of change of voltage which is in the range of milliseconds causes PD activity that is very similar to the typical behaviour at 50/60 Hz.

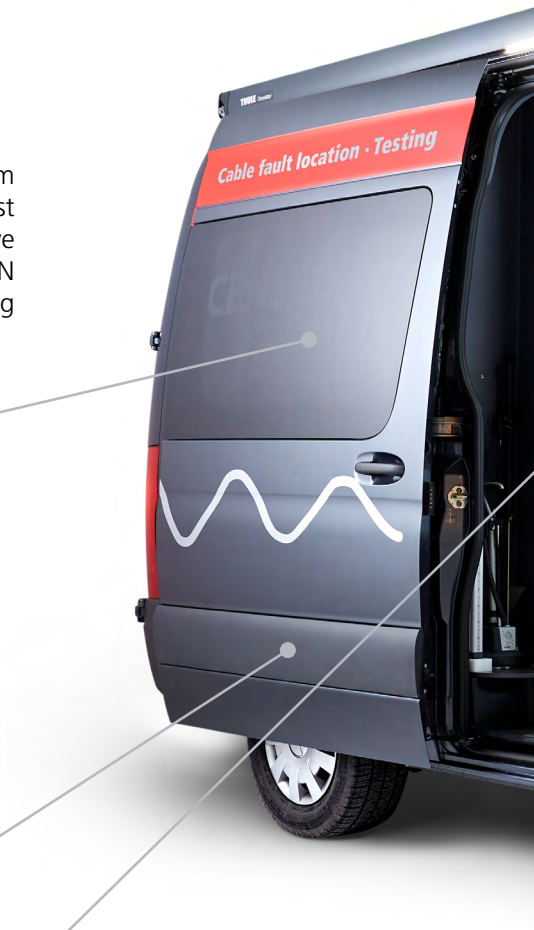
Due to this near-line-frequency stress on defects and weak spots, all measurement results such as PD inception voltage, PD count, and PD level, are comparable to results obtained with 50/60 Hz or with the well-established damped oscillating voltage DAC.

The benefits of innovative cable testing and diagnostics solutions and technical basis for the best possible preventive and predictive condition assessment, decision-making, and asset management

All voltage waveshapes in one device with the **Ultimate** diagnostics package, suitable for 36 kV class medium voltage cable (IEC: U_m = 36 kV)

■ VLF CR	For standard-compliant withstand testing in accordance with IEEE, VDE, CENELEC, and IEC at $U_T = 3x\ U_0$ with the fixed standard frequency f = 0,1 Hz; offers very high test capacity without compromising any VLF test paramters and is therefore highly beneficial on long cables and when connecting all three phases simultaneously
■ Slope	For performing an acceptance test/commissioning test on new cables with accompanying PD diagnostics at near line frequencies and with very high test capacity like VLF CR
■ DAC	For non-destructive, minimally stressing PD diagnostics on service-aged cables with damped AC voltage at near line frequencies
■ VLF Sine	For tan delta measurement

Other features



Safety
A key component of the Centrix Evolution is the comprehensive safety system which monitors all safety-relevant parameters very strictly according to the latest safety standards. The purpose is to support the general technical rules and the five safety rules. The Centrix Evolution has got CE conformance and complies with EN 61010, EN 50191, VDE 0104, VDE 0105, DGUV 203-034, DGUV 203-048 among other standards.

The following criteria are continuously checked and indicated to the user by the system status live monitoring:

- F-Ohm safety interlock for earthing connections:
  Loop resistance between operational earth (HV return) and station earth
- F-U safety interlock for step voltages and touch potentials:
  Reference earth to station earth and earth to vehicle frame
- Voltage-time integral to catch rapid rises of hazardous voltages (fast transients)
- Access to the separated HV compartment via door contacts
- Lockout-tagout key switch
- Internal and external emergency stop
- Using an isolation transformer and keeping operational earth and protective earth separated enures safe earthing and isolation conditions

Inherent safety and protection from stored energies
The Centrix Evolution is equipped with Safe-Discharge technology, a very powerful discharge, and earthing unit. This device enables the fast, safe, and repeatable discharge of 32 kJ. The energy of 32 kJ corresponds to a cable capacitance of 10 µF charged to 80 kV DC. In addition, SafeDischarge is operated in such a way that in case of pressing the emergency stop or in the event of a mains failure, a forced discharge and forced earthing of all system components takes place immediately. Any energy stored in the system is not discharged into the cable. The Centrix Evolution's capabilities in terms of handling internal and external energies are best-in-class, surpassed only by the R30.

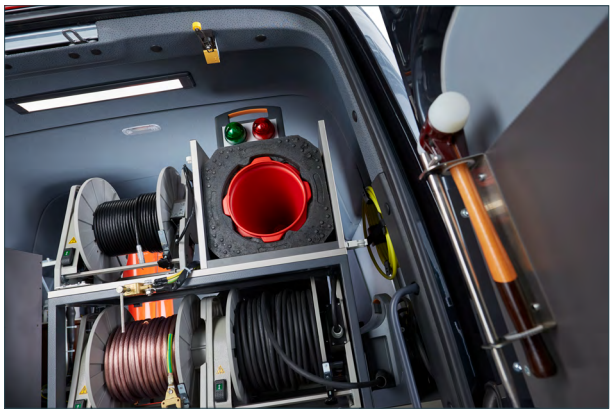
Connectivity
The Centrix Evolution can be equipped with a connectivity package that enables remote access and remote control of most functions via TeamViewer. For best user convenience during fault pinpointing, a smartphone app with digital geographic map data is available for Android and iOS. This allows fault location to be as gentle on the cable as possible because the stress from surge pulses is reduced to the necessary minimum.

Options for an onboard power supply

- Synchronous generator in the 7 kVA range attached as underfloor generator, suitable for vehicles with power take-off (PTO) like the Mercedes-Benz Sprinter. **Note**: When using the PTO, all-wheel drive is not possible
- Voltstar electronic generator in the 5 kVA range attached as belt-driven generator in the engine compartment
- Battery inverter solutions based on lithium-ion technology, incl. charger and maintainer electronics and display unit
- External petrol and diesel generators

CENTRIX Evolution

Test system customisation
When it comes to storage space, storage options, furnishing and, if necessary, vehicle inner linings, Megger Germany endeavors to meet your needs right from the start. The Centrix Evolution allows for an enormous amount of interior customisability. As standard, it come with high quality furniture made from durable, climate-tested materials. So, reach out to our sales and project team and tell us about your specific needs!



Cleverly stowed …

… and quickly accessible

Universal base module

The new universal base module of the Centrix Evolution is a predefined and fully functional fault location system. It's like a large toolbox: It's a well-rounded concept providing numerous technologies and beneficial features that enable users to deal with all eventualities and challenges during their typical day-to-day work.

The base module is a minimum configuration which cannot be reduced in features. None of the functions can be omitted, but it is always possible to add on optional functions in the form of predefined packages.

The standard scope of delivery is shown in the following table:

	Single phase (Evo 1-80)	Three phase (Evo 3-80)
HV DC source (DC hi-pot)	0 … 80 kV	0 … 80 kV
Automation via motorised switches HV mode selection, HV mode execution, dialling voltage ranges	Fully automatic switching for all operating modes	Fully automatic switching for all operating modes
Safety system and live status monitoring i.a. F-U, U-t-integral, F-Ohm, key switch, emergency stop, RCD, 32 kJ discharge and earthing unit with time constant <1 sec, etc.	☑	☑
Three-phase breakdown detection	☒	☑
Integrated radar Teleflex® RDR DakkS-certified bipolar impulse generation ± 250 V ProRange de-attenuation +40 dB	☑	☑
Integrated HV prelocation 32 kV Arc Reflection Method (ARM) 32 kV ARM® Conditioning and ARM® Charging 32 kV Current decoupling (ICE) 80 kV Voltage decoupling (Decay) Mode for locating intermittent faults (IFL)	☑	☑
Inductive ARM® filter	☑	☑
ARM® function «Best Picture Multishot» Multishot: Capturing 32 HV fault traces per ARM® shot Best Picture: Instant display of the best out of 32 Multishot traces	☑	☑
Integrated surge generator (Thumper) 8 / 16 / 32 kV with 2000 Joule in each stage	☑	☑
Integrated insulation and capacitance test	1-phase measurement via HV output	3-phase measurement via HV output
External connectors for devices up to 1 kV / 1 A	☑	☑
Control unit Industrial grade 21.5" Multi-touch Full HD anti-glare colour display	☑	☑
Graphic user interface (GUI) Operation entirely by Multi-touch via Smartphone-inspired touchscreen gestures; Dark mode and light mode; Alternatively: Operation via rotary knob (JogDial) on control pad still possible	☑	☑
Automatic workflow and user guidance Pull-through sequence prompts the user step by step; the user need not select but just acknowledge the next step suggested by the software	☑	☑
Data management MeggerBook 3 database and reporting software	☑	☑

Packages for
Fault location

Do you need more power for certain applications?
Expand your capabilities by adding more fault location packages to the base module of your Centrix Evolution.

FL1

Utility location

Tone generator

Functionally integrated, automated, and centrally controlled

250 W transmitting power
SignalSelect® function
multi-transmission mode
(sending multiple signals at different frequencies simultaneously)

Five audio frequencies:
491 Hz, 982 Hz, 8.44 kHz,
480 Hz, 9.82 kHz

FL2

Fault conversion

Resonance burner and ARM® Live Burning

Functionally integrated, automated, and centrally controlled

Fault ignition up to 20 kV DC
burn-down current up to 25 A

Prelocation with ARM® Live Burning

Uninterrupted burn-down process with optimal regulation (continously variable output, no tap positions, no manual switching, no burn range takeover)

FL3

Sheath integrity

Sheath fault tester

Testing up to 10 kV DC

Prelocation with
voltage drop bridge

Pinpointing with voltage gradient method (step voltage method)

FL4

HV surging

Performance upgrade: Energy increase

4000 Joule at 8 kV
4000 Joule at 16 kV
4000 Joule at 32 kV

FL5

LV surging

Versatility upgrade: Range extension

Either

2000 Joule at 2 kV
2000 Joule at 4 kV

or

4000 Joule at 4 kV

FL6

Advanced prelocation

Decay plus

Double surge method:
DC charging and fault ignition up to 80 kV DC, followed by timed dischage of 4 kV auxiliary capacitor to stabilise arc; measurement trace looks similar to regular ARM®

Packages for
Testing

Did you know?
VLF testing is a well-proven and well-established technology for on-site cable testing for more than 35 years now. The original VLF was invented and introduced to the market by HDW Elektronik in 1986!

BASIC

- ☑ **Sinusoidal**
- ☐ Cosine-rectangular
- ☐ Suitable for long cables
- ☐ Testing all 3 phases simultaneously

Moderate test capacitance of 1 µF at full output and 0.1 Hz.

44 kV_{RMS} (62 kV_{peak})

PROFESSIONAL

- ☐ Sinusoidal
- ☑ **Cosine-rectangular**
- ☑ **Suitable for long cables**
- ☑ **Testing all 3 phases simultaneously**

Very high test capacitance of 5 µF (54) or 3.2 µF (62) at full output and 0.1 Hz.

54 kV_{RMS} or 62 kV_{RMS}

54
30 kV cable

62
35 kV cable

AMBITION

- ☐ Sinusoidal
- ☑ **Cosine-rectangular**
- ☑ **Suitable for long cables**
- ☑ **Testing all 3 phases simultaneously**

Very high test capacitance of 5 µF (M) or 4.4 µF (L) at full output and 0.1 Hz.

40 kV_{RMS} or 60 kV_{RMS}

M
25 kV cable

L
35 kV cable

Packages for

Testing and Diagnostics

Can't find the right product for your daily needs? Reach out to us!
Our project team will be happy to help you with special adaptions and customisation!

BASIC

- ☑ **VLF testing**
- ☐ PD testing
- ☑ **Tan delta**
- ☑ **Sinusoidal**
- ☐ Cosine-rectangular
- ☐ Slope
- ☐ DAC (damped AC)

Entry-level solution.
Cable testing and limited diagnostics using 0.1 Hz VLF Sine.

44 kV_{RMS} (62 kV_{peak})

ADVANCED

- ☑ **VLF testing**
- ☑ **PD testing**
- ☑ **Tan delta**
- ☑ **Sinusoidal**
- ☐ Cosine-rectangular
- ☐ Slope
- ☐ DAC (damped AC)

Entry-level solution.
Cable testing and limited diagnostics using 0.1 Hz VLF Sine, including sinusoidal PD testing.

44 kV_{RMS} (62 kV_{peak})

COMFORT

Add on option for testing and diagnostics packages: internal PD detector permanently installed in the vehicle for PD testing with the highest possible degree of safety and the highest ever comfort and convenience.

- ☑ **DYNAMIC M**
- ☑ **ULTIMATE M**
- ? **DYNAMIC L**
- ? **ULTIMATE L**

DYNAMIC

- ☑ **VLF testing**
- ☑ **PD testing**
- ☐ Tan delta
- ☐ Sinusoidal
- ☑ **Cosine-rectangular**
- ☑ **Slope**
- ☑ **DAC (damped AC)**

Professional solution.
Powerful cable testing and diagnostics with near line frequency technologies
Slope and DAC for PD testing.

M
25 kV cable

L
35 kV cable

ULTIMATE

- ☑ **VLF testing**
- ☑ **PD testing**
- ☑ **Tan delta**
- ☑ **Sinusoidal**
- ☑ **Cosine-rectangular**
- ☑ **Slope**
- ☑ **DAC (damped AC)**

The ultimate testing and diagnostics machine.
All technologies and waveshapes included.
Maximum benefits for the user.

M
25 kV cable

L
35 kV cable

www.cabletestvan.com

Please take advantage of our nice configurator and send quotation requests to van.projects@megger.com

Please submit just one PDF file per configuration!

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