

CENTRIX EVOLUTION

Flagship system for state-of-the-art cable fault location, cable testing and cable diagnostics



General system character

Type

Centrally controlled, fully automated, fully integrated, digital, software-based fault location system with options for the functional integration of Very Low Frequency (VLF) testing, Partial Discharge (PD) diagnostics and Tan Delta measurement

Controls

Via one single control unit for all operating modes and system functions

Graphic User Interface	Evolution
Operation	Entirely by Multi-touch with Smartphone-inspired touchscreen gestures Alternatively: Single rotary knob (jog dial) on control pad
Operating system	Linux
Data management	MeggerBook 3
Data synchronisation	USB 3.0; Online Cloud

Control unit

Display	Industrial grade TFT colour panel with LED backlighting
Antiglare	Yes
Multi-touch	Yes
LCD size	54.6 cm / 21.5"
Resolution	1920 x 1080 Full HD

Automation

Fully automatic switching with motorised HV switches for HV mode selection, HV mode execution and HV range selection in all operating modes of fault location, VLF testing, PD diagnostics and Tan Delta measurement

Safety

Compliance	CE conformance; EN 61010, EN 50191, VDE 0104, VDE 0105, DGUV 203-034 (BGI 891)
Discharge unit	SafeDischarge technology, 32 kJ, discharge time constant <1 sec
System status	Live monitoring and indication
Inherent safety	Yes, immediate discharging and 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; Control pad: HV on, HV off, rotary knob (jog dial)
Safety devices	System earthing status indicator lights, mains input protection device NAS16, 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	3.6 kVA

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Cable fault location	
Technologies DC test (DC hipot) with breakdown detection and insulation test for fault identification; Radar and HV methods (ARM, ARM Conditioning, ARM Charging, 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 80 kV Either single phase (Evo 1-80) or three phase (Evo 3-80)	
Fault identification	
DC test (hipot)	0 ... 80 kV, $I_n = 13$ mA continuous at 80 kV, $I_{max} = 550$ mA
Insulation test	0 ... 1 kV in voltage ranges of 6 / 500 / 1000 V Measuring range 1 Ω ... 2 G Ω ; for capacitance 0 ... 19.9 μ F
Breakdown detection	0 ... 80 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 ... 30 μ s
Pulse power	Unrestricted continuous operation and unrestrictedly fast pulse repetition with full power pulse of 30 μ s 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/ μ s
Signal gain Y_G	0 ... 100%
Resolution	0.1 m at VOP = 80 m/ μ s
Accuracy	0.1%
Timebase accuracy	< 50 ppm
Velocity of propagation	10 ... 149.9 m/ μ s, can be expressed in m/ μ s or ft/ μ s or nominal
Output impedance	50 Ω
Compensation	No dedicated internal compensation necessary
HV prelocation	
ARM Best Picture Multishot	
Technology	Arc reflection method as per the original 1965 patent; overlay and direct comparison of two distinct radar traces, one recorded by the Teleflex® RDR as low voltage reference trace, and another one recorded by the Teleflex® RDR as high voltage fault trace after the fault has been ignited by capacitor discharge through an arc reflection filter
Surge voltage	0 ... 32 kV in multiple ranges
Arc reflection filter	Inductive, for superior arc ignition and arc stabilisation purposes
Multishot	Teleflex® RDR captures 32 HV fault traces per ARM surge
Best Picture	Teleflex® RDR analyses all 32 HV Multishot traces, picks the best one and directly displays it to the user
ARM Conditioning	
Technology	Modified version of ARM Best Picture Multishot; after the Teleflex® RDR has recorded the low voltage reference trace, the inductive arc reflection filter is switched off and the fault is conditioned by surging (thumping) the cable a certain number of times. Immediately thereafter, the inductive arc reflection filter will be activated again, so that the Teleflex® RDR can capture the 32 HV fault traces (Multishot).
Surge voltage	0 ... 32 kV in multiple ranges
Conditioning shots	Adjustable 5 ... 10
ARM features	See above ARM Best Picture Multishot

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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 ... 32 kV in multiple ranges
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 ... 80 kV
Fault pinpointing	
Coincidence method (magnetic-acoustic pinpointing of main insulation faults)	
Surge generator (Thumper)	CENTRIX Evolution
Voltage ranges	Standard version: 3 stages 0 ... 8 kV 2,000 J 0 ... 16 kV 2,000 J 0 ... 32 kV 2,000 J
Surge rate (Thump rate)	Adjustable: 3 ... 10 sec, single surge (single thump)
Recommended receiver	digiPHONE*2
Fault conversion	
Burning	
Technology	High frequency cascade burner
Burn-down current	0 ... 8 kV, 550 mA; 0 ... 80 kV, 170 mA
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} 550 mA
Pulse sequences	0.5:1, 1:3, 1:4, 1:6, 1:12
Weight	
Standard version	Single phase configuration starting at 300 kg, three phase configuration starting at 370 kg
Environmental	
Operating temperatures	HV unit: -25°C ... +55°C (-13°F ... +131°F) Operator room: 0° ... +55°C (32°F ... 131°F)
Storage temperatures	-25°C ... +70°C (-13°F ... +156°F)
Mains input	
Input voltage	230 V ± 10%, 50 Hz (also available 120 V, 60 Hz)
Power consumption	< 3.5 kVA
System connections and test leads	
HV system output – for single phase configurations	
Economy 1x1	1x single-phase T4 HV cable drum, 50 m or 80 m, manual
Professional 1x1	1x single-phase T4 HV cable drum, 50 m or 80 m, motor-driven
HV system output – for three phase configurations	
Economy 3x1	3x single-phase T4 HV cable drum, stacked, 50 m or 80 m, manual
Professional 3x1	3x single-phase T4 HV cable drum, stacked, 50 m or 80 m, motor-driven
Professional 1x3	1x three-phase T4 HV cable drum, 50 m or 80 m, motor-driven
LV auxiliary functions	
Economy	1x mains input cable drum, 50 m, manual, Schuko with NAS16 1x protective earth cable drum, 50 m, manual 1x 15 m reference earth lead for F-U safety interlock
Comfort	1x mains input cable drum, 50 m, belt pull, Schuko with NAS16 1x protective earth cable drum, 50 m, belt pull 1x 15 m reference earth lead for F-U safety interlock
Professional	1x mains input cable drum, 50 m, motor-driven, Schuko with NAS16 1x protective earth cable drum, 50 m, motor-driven 1x 15 m reference earth lead for F-U safety interlock

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Radar output (dedicated TDR-LV connection)	
Economy	1x three-phase coaxial measurement cable, 50 m, manual
Comfort	1x three-phase coaxial measurement cable, 50 m, belt pull
Professional	1x three-phase coaxial measurement cable, 50 m, motor-driven
External safety device	
Standard	1x ESE signalling cable, 15 m, with external socket and storage compartment
Economy	1x ESE signalling cable, with external socket and cable reel, 50 m, manual

System expansions – Optional packages for cable fault location

Surge generator	
Versatility upgrade for Surging (Thumping) – LV extension	
Voltage ranges	Additional 2 ranges for LV applications
0 ... 2 kV	2,000 J
0 ... 4 kV	2,000 J
alternatively just 0 ... 4 kV	4,000 J
Performance upgrade for Surging (Thumping) – High energy	
Voltage ranges	Same 3 as base module
0 ... 8 kV	4,000 J
0 ... 16 kV	4,000 J
0 ... 32 kV	4,000 J
Prelocation	
Decay Plus	
Technology	Double surge method; Teleflex® RDR captures and overlays two traces, one is recorded as low voltage reference trace, and another one is recorded as high voltage fault trace after the fault has been ignited by DC charging while the arc is stabilized by an additional high energy discharge of an auxiliary capacitor.
Voltage	0 ... 80 kV
Auxiliary capacitor	4 kV
Utility Location	
Audio frequency generator	
Technology	Class D amplifier for maximum active power
System integration	Functionally fully integrated, operation via CENTRIX control unit
Power output	250 W
Number of Frequencies	5
Recommended receiver	digiPHONE*2 NTRX set; alternatively: Ferrolux RX or CARLOC
Fault conversion	
VPK-1 burn-down unit with radar-based prelocation	
Technology	VPK-1 resonance burner; optimally regulated and continuously variable output over its full range (no fixed voltage-current ranges, no tap positions, no manual switching)
System integration	Physically and functionally fully integrated, operation via CENTRIX control unit
Voltage and current	0 ... 20 kV DC; I_{max} 25 A
Prelocation	ARM Live Burning (Burn Arc Reflection); 0 ... 20 kV DC
Sheath integrity	
MFM10 sheath fault location unit	
Technology	High voltage bridge applying voltage drop method; suitable for sheath testing, sheath fault prelocation and sheath fault pinpointing
Voltage	± 10 kV
Current	750 mA, 0.4 kV; 200 mA, 1.5 kV; 60 mA, 5 kV; 30 mA, 10 kV
Discharge capability	10 µF

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System expansions – Optional packages for cable testing and cable diagnostics

VLF Cable testing, in accordance with VDE 0276, CENELEC HD 620/621, IEC 60060, IEC 60502, IEEE 400.2		
Testing BASIC		
Technology	0.1 Hz VLF Sine	
System integration	Functionally fully integrated, operation via CENTRIX control unit	
Voltage	0 ... 62 kV _{peak} (0 ... 44 kV _{RMS})	
Test load	1 µF at standard-compliant frequency of 0.1 Hz and full output of 62 kV _{peak} Up to 10 µF at lower voltage or frequency	
Testing PROFESSIONAL	54	62
Technology	0.1 Hz VLF Cosine-Rectangular	
System integration	Functionally fully integrated, operation via CENTRIX control unit	
Voltage	0 ... 54 kV _{RMS}	0 ... 62 kV _{RMS}
Test load	5 µF at 54 kV _{RMS} and 0.1 Hz	3.2 µF at 62 kV _{RMS} and 0.1 Hz
Testing AMBITION M		
Technology	0.1 Hz VLF Cosine-Rectangular	
System integration	Functionally fully integrated, operation from CENTRIX control unit	
Voltage	0 ... 40 kV _{RMS}	
Test load	5 µF at standard-compliant frequency of 0.1 Hz and full output of 40 kV _{RMS}	
Testing AMBITION L		
Technology	0.1 Hz VLF Cosine-Rectangular	
System integration	Functionally fully integrated, operation from CENTRIX control unit	
Voltage	0 ... 60 kV _{RMS}	
Test load	4.4 µF at standard-compliant frequency of 0.1 Hz and full output of 60 kV _{RMS}	
Cable diagnostics, in accordance with IEC 60270 and IEEE 400		
Diagnostics BASIC		
Technology	0,1 Hz VLF Sine, with built-in dielectric loss factor measurement Tan Delta for service-aged cables	
System integration	Functionally fully integrated, operation via CENTRIX control unit	
Voltage	0 ... 62 kV _{peak} (0 ... 44 kV _{RMS})	
Test load	1 µF at 44 kV _{RMS} and 0.1 Hz Up to 10 µF at reduced test voltages and/or test frequencies	
Type of Tan Delta device	Internal; suitable for dielectric loss measurement up to 2x U ₀ on MV cables rated up to 36 kV	
Tan Delta range	10 ⁻⁴ ... 10 ⁰	
Tan Delta accuracy	10 ⁻⁴	
Tan Delta resolution	10 ⁻⁵	
Automatic evaluation	Yes, built-in evaluation of results as per IEEE 400.2	
Diagnostics ADVANCED		
Technology	0,1 Hz VLF Sine, with built-in dielectric loss factor measurement Tan Delta for service-aged cables, and sinewave-PD diagnostics	
System integration	Functionally fully integrated, operation via CENTRIX control unit or alternatively via external laptop	
Voltage	0 ... 62 kV _{peak} (0 ... 44 kV _{RMS})	
Test load	1 µF at 44 kV _{RMS} and 0.1 Hz Up to 10 µF at reduced test voltages and/or test frequencies	
Type of PD coupling device	PDS 62 Sine; IEC 60270-compliant external partial discharge detector with HV coupling capacitor, filters, quadrupole and calibrator; suitable for VLF Sine	
Type of Tan Delta device	Internal; suitable for dielectric loss measurement up to 2x U ₀ on MV cables rated up to 36 kV	
Tan Delta range	10 ⁻⁴ ... 10 ⁰	
Tan Delta accuracy	10 ⁻⁴	
Tan Delta resolution	10 ⁻⁵	
Automatic evaluation	Yes, built-in evaluation of results as per IEEE 400.2	

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System expansions – Optional packages for cable testing and cable diagnostics

Cable diagnostics, in accordance with IEC 60270 and IEEE 400	
Diagnostics DYNAMIC M	
Technologies	0.1 Hz VLF Cosine-Rectangular for general cable testing Slope for PD-monitored withstand testing during commissioning of new cables DAC for non-destructive PD testing on service-aged cables
System integration	Functionally fully integrated, operation via CENTRIX control unit or alternatively via external laptop
Voltages	VLF CR, Slope DAC 0 ... 40 kV _{RMS} 0 ... 40 kV _{peak} ; suitable for PD diagnostics up to 1.7x U ₀ on MV cables rated up to 25 kV
Test loads	VLF CR, Slope DAC 5 µF at 40 kV _{RMS} and 0.1 Hz 5 µF at 40 kV _{peak}
Type of PD coupling device	PDS 60; IEC 60270-compliant external partial discharge detector with HV coupling capacitor, filters, quadrupole and calibrator; suitable for all waveforms VLF CR, Slope, DAC, VLF Sine
Diagnostics DYNAMIC L	
Technologies	0.1 Hz VLF Cosine-Rectangular for general cable testing Slope for PD-monitored withstand testing during commissioning of new cables DAC for non-destructive PD testing on service-aged cables
System integration	Functionally fully integrated, operation via CENTRIX control unit or alternatively via external laptop
Voltages	VLF CR, Slope DAC 0 ... 60 kV _{RMS} 0 ... 60 kV _{peak} ; suitable for PD diagnostics up to 2x U ₀ on MV cables rated up to 36 kV
Test loads	VLF CR, Slope DAC 4.4 µF at 60 kV _{RMS} and 0.1 Hz 4.6 µF at 60 kV _{peak}
Type of PD coupling device	PDS 60; IEC 60270-compliant external partial discharge detector with HV coupling capacitor, filters, quadrupole and calibrator; suitable for all waveforms VLF CR, Slope, DAC, VLF Sine
Diagnostics ULTIMATE M	
Technologies	0.1 Hz VLF Cosine-Rectangular for general cable testing Slope for PD-monitored withstand testing during commissioning of new cables DAC for non-destructive PD testing on service-aged cables 0.1 Hz VLF Sine with built-in dielectric loss factor measurement for service-aged cables
System integration	Functionally fully integrated, operation via CENTRIX control unit or alternatively via external laptop
Voltages	VLF CR, Slope DAC VLF Sine 0 ... 40 kV _{RMS} 0 ... 40 kV _{peak} ; suitable for PD diagnostics up to 1.7x U ₀ on MV cables rated up to 25 kV 0 ... 45 kV _{peak} (0 ... 32 kV _{RMS})
Test loads	VLF CR, Slope DAC VLF Sine 5 µF at 40 kV _{RMS} and 0.1 Hz 5 µF at 40 kV _{peak} 0.6 µF at 45 kV _{peak} (32 kV _{RMS}) and 0.1 Hz
Type of PD coupling device	PDS 60; IEC 60270-compliant external partial discharge detector with HV coupling capacitor, filters, quadrupole and calibrator; suitable for all waveforms VLF CR, Slope, DAC, VLF Sine
Type of Tan Delta device	Internal; suitable for dielectric loss measurement up to 2x U ₀ on MV cables rated up to 25 kV or 1.5x U ₀ on MV cables rated up to 36 kV
Tan Delta range	10 ⁻³ ... 10 ⁰
Tan Delta accuracy	10 ⁻³
Tan Delta resolution	10 ⁻⁴
Automatic evaluation	Yes, built-in evaluation of results as per IEEE 400.2

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System expansions – Optional packages for cable testing and cable diagnostics

Cable diagnostics, in accordance with IEC 60270 and IEEE 400		
Diagnostics ULTIMATE L		
Technologies	0.1 Hz VLF Cosine-Rectangular for general cable testing Slope for PD-monitored withstand testing during commissioning of new cables DAC for non-destructive PD testing on service-aged cables 0.1 Hz VLF Sine with built-in dielectric loss factor measurement for service-aged cables	
System integration	Functionally fully integrated, operation via CENTRIX control unit or alternatively via external laptop	
Voltages	VLF CR, Slope DAC VLF Sine	0 ... 60 kV _{RMS} 0 ... 60 kV _{peak} ; suitable for PD diagnostics up to 2x U ₀ on MV cables rated up to 36 kV 0 ... 62 kV _{peak} (0 ... 44 kV _{RMS})
Test loads	VLF CR, Slope DAC VLF Sine	4.4 µF at 60 kV _{RMS} and 0.1 Hz 4.6 µF at 60 kV _{peak} 1 µF at 62 kV _{peak} (44 kV _{RMS}) and 0.1 Hz
Type of PD coupling device	PDS 60; IEC 60270-compliant external partial discharge detector with HV coupling capacitor, filters, quadrupole, and calibrator; suitable for all waveforms VLF CR, Slope, DAC, VLF Sine	
Type of Tan Delta device	Internal; suitable for dielectric loss measurement up to 2x U ₀ on MV cables rated up to 36 kV	
Tan Delta range	10 ⁻⁴ ... 10 ⁰	
Tan Delta accuracy	10 ⁻⁴	
Tan Delta resolution	10 ⁻⁵	
Automatic evaluation	Yes, built-in evaluation of results as per IEEE 400.2	
PD coupling device (always included in the associated options above)		
Type of PD coupling device	PDS 60 V2	PDS 62 Sine
Suitable for waveforms	VLF CR, Slope, DAC, VLF Sine	VLF Sine (0.1 ... 0.01 Hz)
Weight	30 kg	14.5 kg
HV coupling capacitor	25 nF	
Sensitivity	2 pC ... >100 nC	
Inherent PD level (self-noise)	< 2 pC	
PD impulse repetition rate	100 kHz	
PD localisation	Technology Measurement range Velocity of propagation (VOP, V/2) Sampling rate Bandwidth Accuracy Resolution	
	Single-ended travelling wave and runtime analysis 0 ... 16 km (VOP = 80 m/µs) 50 ... 120 m/µs 125 MHz 25 MHz 1% of the cable length ± 1 pC / ± 1 m	
PD calibrator	Fully compliant with IEC 60270, calibration ranges 100 pC ... 100 nC	
PD pinpointing	Yes, with external handheld device PD Loc	

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