



# The benchmark for compact cable fault location and testing systems

## Centrally controlled, fully integrated

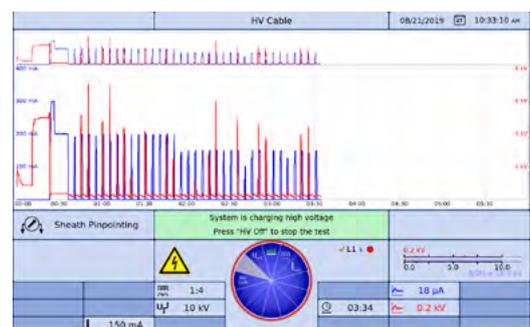
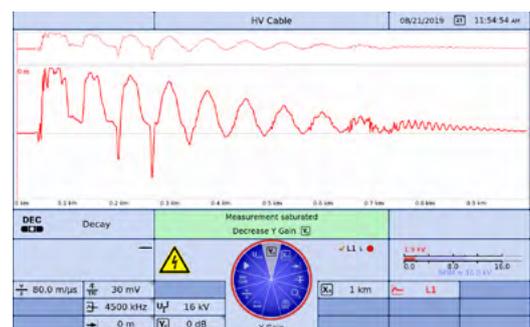
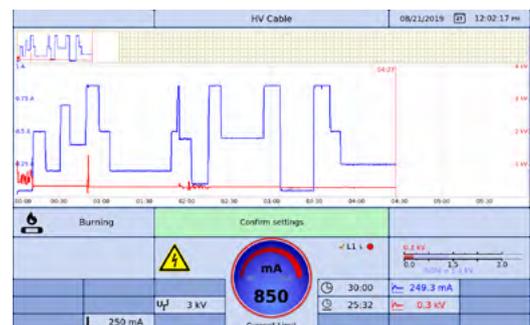
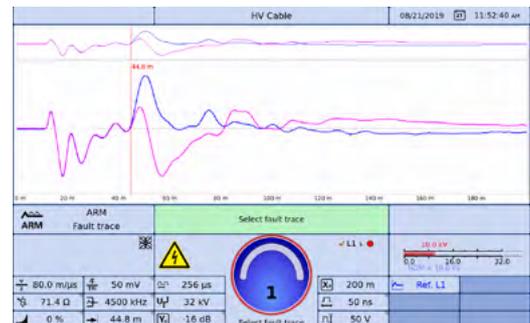
The PRIMEON test van system redefines the state-of-the-art: It is a complete solution for cable fault location and can also be configured with VLF testing and diagnostics options.

PRIMEON comes with an in-built radar of the Teleflex® RDR type for time domain reflectometry, furthermore with an insulation testing unit, a very powerful high voltage DC source, a multi-stage surge wave generator (thumper) for pinpointing with the digiPHONE+2, a high frequency burner for fault conversion, and a set of industry-standard radar-based and transient prelocation methods. Everything is operated from one central single control unit which runs the graphic user interface.

## Primeon is a toolbox

Since low impedance faults, high impedance faults and intermittent faults have different specific characteristics, not every fault location method is applicable to every fault. Each method has its own pros, cons and limitations.

The best approach for being effective in finding faults on underground cables is not to have just one tool only, but a whole toolbox with a multitude of methods that complement one another. Only then technicians will always have the right tool at hand which best fits the actual fault situation in front of them, even on difficult to find faults.



**PRIMEON is a fault locating powerhouse and offers 7 individual technologies for successfully finding faults**

- Insulation resistance testing
- Time Domain Reflectometry (Radar)
- HV DC testing (DC hipot)
- Fault conditioning (Burning)
- TDR-based and transient methods
- Magnetic-acoustic pinpointing via surging/thumping in multiple voltage ranges
- Sheath testing and sheath fault pinpointing

Application	Description
<b>DC test (DC hipot)</b>	To do proof testing with DC if necessary, and as a technical means to perform fault identification, fault conditioning and charging during capacitor discharge
<b>Fault identification</b>	To tell apart and to identify different types of faults, by means of insulation resistance testing as well as charging the cable with ramped DC in order to measure the breakdown voltage
<b>Prelocation</b>	To get a distance to the fault, and to learn where best to start pinpointing
Radar (TDR)	Time domain reflectometry – runtime-based measurement of impedance changes in the cable using high frequency low voltage pulses;  Distance-dependent de-attenuation ProRange: Essential technology to counteract the exponential attenuation on cables in order to measure far-away reflections at all; beneficial on long cables, cables with many joints, paper-lead cables (PILC)
Inductive ARM Best Picture Multishot	Arc Reflection Method – the standard technology in the industry to find the distance to the fault Multishot: capturing a series of fault traces per single ARM shot Best picture: choosing and displaying the best one out of the Multishot series of fault traces Filter: inductive coil-type arc reflection filter is superior to resistive filters in terms of fault ignition, arc stabilisation and being able to capturing clear fault traces with the radar
ICE (Surge Pulse)	Travelling wave method with current decoupling – beneficial on long cables, paper-lead cables (PILC), bare concentric cables, and on faults which are not chargeable
DECAY	Travelling wave method with voltage decoupling – beneficial for high breakdown faults, long cables, and on high voltage transmission-type cables
<b>Pinpointing</b>	For magnetic-acoustic pinpointing of the exact fault position by applying the coincidence method („thunder and lightning“) using the digiPHONE+2
<b>Fault conversion</b>	When required, changing the characteristics of the fault by burning, which means: continuously applying HV DC to ignite an arc first and subsequently to drive a high current into the fault resulting in a reduction in fault impedance until other methods may be applicable
<b>Sheath integrity</b>	To check the cable’s outer sheath for damage such as cuts, cracks, holes etc.; then pinpointing the exact position of the damaged spots with the help of the step voltage method (voltage gradient method)

# Electrical performance: STX inside!



Feature	Performance
<b>DC test, Hipot</b>	
High voltage output	40 kV DC
<b>Fault identification</b>	
Insulation evaluation	Up to 20 kV, 100 Ω ... 650 MΩ
Ramped DC	Breakdown detection up to 40 kV
<b>Prelocation</b>	
Radar (TDR)	Teleflex® RDR Bipolar pulse generation and amplitude up to ±100 V Distance-dependent de-attenuation ProRange +40 dB Phase comparison and difference measurement No-User-Intervention auto mode Auto-ranging cable end recognition Auto-find cursor to fault position Mode for locating intermittent faults (IFL)
Inductive ARM Best Picture Multishot	Up to 32 kV, inductive ARM-filter for best arc ignition and arc stabilisation properties Multishot: 32 fault traces per arc reflection measurement Best Picture: Intelligent algorithm which analyses all 32 fault traces and automatically displays the best trace
ICE (Surge Pulse)	Up to 32 kV
DECAY	Up to 40 kV
<b>Pinpointing</b>	
Surging/Thumping	8 / 16 / 32 kV with 2000 / 2000 / 2000 J Optionally available: additional 4 kV stage with 1100 J Fast surge cycle of 3 seconds at full voltage of 32 kV
<b>Fault conditioning and fault conversion</b>	
High frequency burner	Up to 40 kV DC Maximum burn-down current up to 850 mA
<b>Sheath integrity</b>	
Sheath testing	Up to 20 kV DC
Sheath fault pinpointing	Up to 20 kV DC with cycle rates of 0.5:1 , 1:3 , 1:4 and 1:6

## A benchmark for safety

Occupational safety and safe working conditions are paramount for us and our customers. Therefore, Megger products are designed to be the safest in the market. Primeon is no exception to that. It meets the strict requirements of EN 50191:2010, VDE 0104:2011 and other standards. Equipped with a ground connection monitoring circuit (F-Ohm) and a touch potential monitoring circuit (F-U or F-Voltage), Primeon is a milestone and the most compact fault location system with the highest safety standards in the market, by far.



**Choose  
the control unit  
whichever fits you best!**



**10 inch**

**Standard mount**  
rotatable, tiltable



**10 inch**

**Tablet-style mobile mount**  
flat back plate, freely moveable



**15 inch**

**Standard mount**  
rotatable, tiltable



**15 inch**

**Comfort mount**  
extendable, rotatable, tiltable,  
vertically adjustable, latching

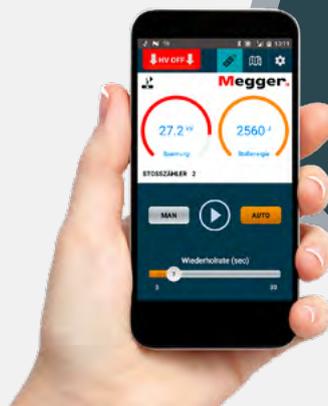
## Radar performance: Teleflex® RDR

- **PRIMEON comes with a best-in-class radar, but you need more?**  
Upgrade your TDR with the performance package Teleflex Unleashed.
- **Teleflex Unleashed!**  
More pulse voltage, more pulse width, advanced denoising technology, averaging and long range signature boost mode! Get the TDR technology which set the world record for the longest ever successful TDR measurement!

### User convenience is key:

#### Centralised control and fully automated operation

- Very convenient system control from one central touchscreen control unit
- Software-driven user interface via one single turn, tilt & click rotary knob
- Hardwired functions conveniently integrated on control unit:  
No additional box necessary for Mains on/off, HV on, HV off and emergency stop
- Fully automated centralised system operation of fault location and diagnostics via motorized HV switches, including HV mode selection and HV mode execution automated via software-controlled motor switch
- Integrated safety master for complete safety interlock monitoring of all system parts with direct message display
- Most sophisticated safety system in the market incl. ground connection monitoring F-Ohm and touch potential monitoring F-U
- Single-phase HV system output
- Dedicated three-phase connection for radar measurements available
- Remote access and remote control via cyber secure internet connection, TeamViewer support and smartphone app
- Fully integrated database software MeggerBook V2



Central operation  
and monitoring  
of the test system

Remote control of  
the test system via  
Smartphone-App



Lots of space available for shelving or for a test and diagnostics system



## HV output concepts

### ■ Standard

The standard output solution requires a plugboard to take in the short end (pigtail) of the HV cable. It cannot be considered touchproof thus interlocked HV compartment monitoring and door contacts are necessary. Any combined system with fault location and diagnostics will need the standard output.

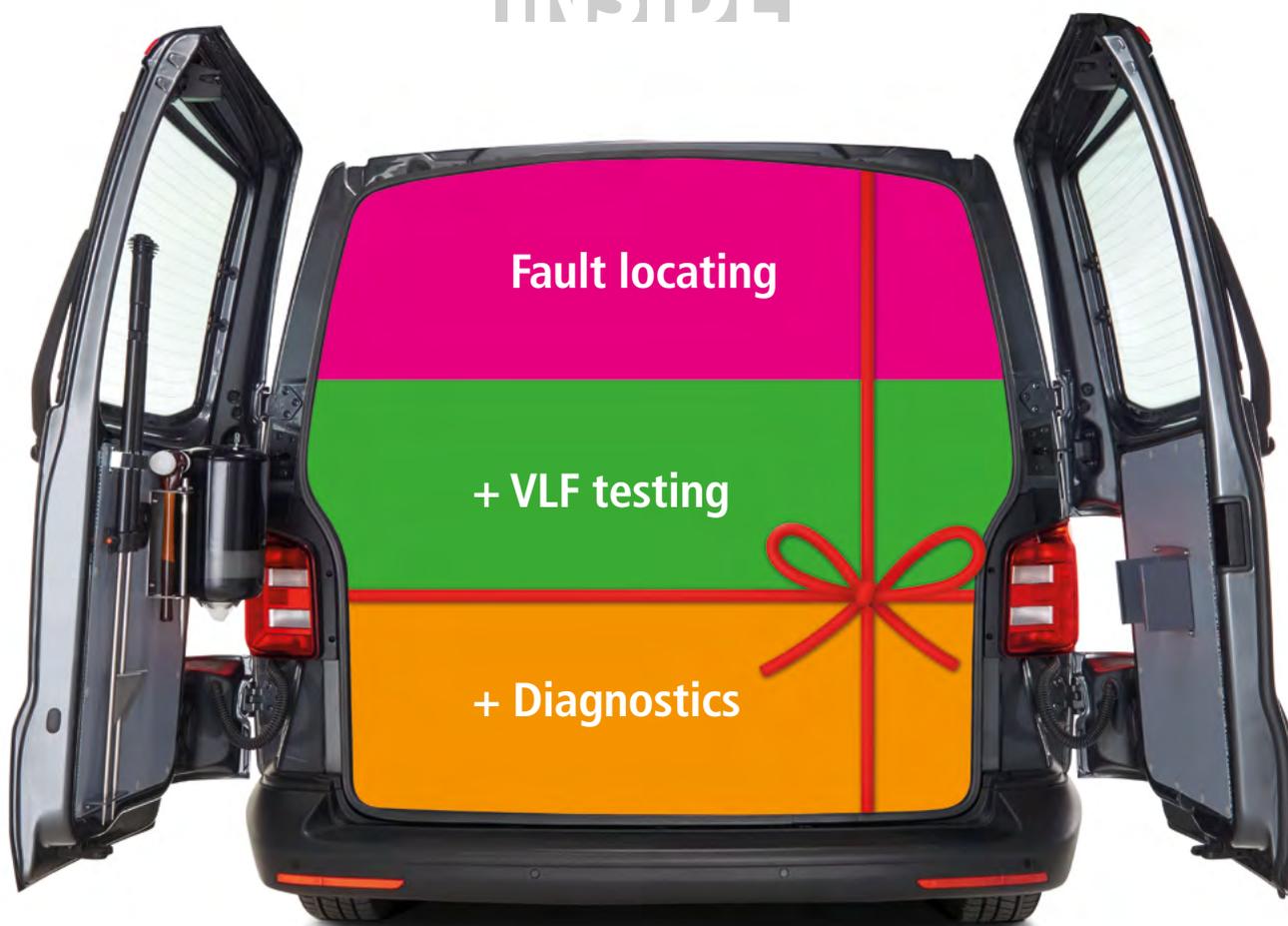
### ■ Coaxial

The coaxial output solution does not require a plugboard and is touchproof because the concentric HV cable is directly plugged into the STX. The coaxial solution is best suited for fault location systems only, with very restricted space and weight requirements.



Various setups possible to accommodate your preferences

Choose a setup which perfectly fits  
your daily requirements



**Tie up your  
package!**



## Packages for **Fault locating**

### **Need more performance for certain applications?**

Add up to 3 fault locating packages to your Primeon base system and expand your capabilities!

#### **Utility location package (PACK 1)**

Add a centrally controlled audio frequency generator which is able to provide powerful signal outputs at various frequencies for performing tasks such as line location, cable route tracing and pinpointing of low resistance faults. Don't forget to order a utility locator like the Ferrolux or the NTRX line location set of the digiPHONE+2.

#### **Fault conversion package (PACK 2)**

Add a resonance burner which is able to condition, convert, and prelocate faults at significant power levels. Unlike old-fashioned burn-down units based on 50 Hz transformers, a resonance burner has a continuously variable output and delivers more active power into the fault while at the same time its reactive power demand is greatly reduced.

By using the unique ARM Live Burning technology, it is possible to prelocate challenging faults which are hard to ignite and difficult to stabilise.

#### **Sheath Integrity package (Pack 3)**

Add a sheath tester which is able to identify, prelocate and pinpoint sheath faults. Damage to the cable's outer sheath is identified by DC testing and prelocated by voltage drop bridge measurement. For sheath fault pinpointing the voltage gradient method (step voltage method) is used.

### **PACK 1**

#### **Utility location**

##### **Tone generator**

Optimised for high active power  
250 W output

Multiple audio frequencies

### **PACK 2**

#### **Fault conversion**

##### **Resonance burner ARM Burning**

Fault ignition up to 15 kV DC

Burn-down current up to 25 A

Prelocation with  
ARM Live Burning

Continuously variable  
output (no tap positions,  
no range-takeover)

### **PACK 3**

#### **Sheath integrity**

##### **Sheath fault tester**

Testing up to 10 kV DC

Prelocation with  
voltage drop bridge

Pinpointing with voltage gradient  
method (step voltage method)



## Packages for VLF testing

### Did you know?

VLF testing has been a well-established well-proven technology for onsite cable testing for over 35 years now. The original VLF was invented and introduced by HDW Elektronik Kiel in 1986!

### Testing in accordance with international standards

VLF testing is supported by many international standards, namely VDE 0276, CENELEC HD 620, IEC 60060, IEC 60502 and IEEE 400.2.

### Test parameters: Voltage, frequency, duration

VLF test voltages are always expressed and prescribed as RMS values because the essential point is the energy. Typically, VLF tests are carried out at a voltage level of  $3x U_0$  and a fixed frequency of 0,1 Hz for up to 60 minutes. Backed up by scientific research and large-scale VLF field testing campaigns IEC, CENELEC and VDE do not recognise any frequency reduction, and a test carried out at less than 0,1 Hz is non-compliant with those standards. VLF test durations range between 15-30 minutes for newly laid cables and 60 minutes for service-aged cables. The latest trend in the industry is to simultaneously observe partial discharge activity during the VLF withstand test. This accompanying trend indicator can reveal local defects in joints and terminations and thus greatly improve the informative value of the conventional pass/fail VLF withstand test.

### VLF CR: Benefits of choosing Cosine-Rectangular for withstand testing

The Cosine-Rectangular waveshape offers unique benefits as an excitation voltage for VLF testing: Very high test capacitance, greatly reduced power consumption and considerably less heat losses, three very important factors for cable test vans which have to work anywhere and in any climate, while having limited input power supply and limited operating temperatures. VLF CR makes it possible to test all three phases in parallel as well as to test long onshore and offshore MV and HV cables. Furthermore, research studies have shown that VLF CR testing at  $3x U_0$  RMS is the most effective waveshape to break down weak spots, even more effective than 50 Hz testing.

## BASIC

- Sine wave
- Cosine-Rectangular
- Suitable for long cables
- Suitable to test all 3 phases in parallel

44 kV<sub>RMS</sub> (62 kV<sub>peak</sub>)

Moderate test capacitance of 1  $\mu$ F at full output and 0,1 Hz

## PRO

- Sine wave
- Cosine-Rectangular
- Suitable for long cables
- Suitable to test all 3 phases in parallel

40 kV<sub>RMS</sub> or 60 kV<sub>RMS</sub>

High test capacitance of 2+  $\mu$ F at full output and 0,1 Hz

Coming  
Soon

M  
25 kV cable

L  
35 kV cable

# Packages for Diagnostics

## BASIC

- VLF Testing
- PD Testing
- TanDelta
- Sine wave
- Cosine-Rectangular
- DAC (Damped AC)

Entry-level solution for cable testing and limited diagnostics with dielectric loss factor

44 kV<sub>RMS</sub> (62 kV<sub>peak</sub>)

## ADVANCED

- VLF Testing
- PD Testing
- TanDelta
- Sine wave
- Cosine-Rectangular
- DAC (Damped AC)

Entry-level solution for cable testing and limited diagnostics with dielectric loss factor and PD testing using 0,1 Hz sine

44 kV<sub>RMS</sub> (62 kV<sub>peak</sub>)

*Coming  
Soon*

## PRO

- VLF Testing
- PD Testing
- TanDelta
- Sine wave
- Cosine-Rectangular
- DAC (Damped AC)

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

**M**  
25 kV cable

**L**  
35 kV cable

*Coming  
Soon*

## ULTIMATE

- VLF Testing
- PD Testing
- TanDelta
- Sine wave
- Cosine-Rectangular
- DAC (Damped AC)

The ultimate diagnostics machine. All technologies and waveshapes included

**M**  
25 kV cable

**L**  
35 kV cable

What else can we offer you  
for your daily demands?



## DIGIPHONE+2

Pinpointing with magnetic-acoustic surge wave receiver

## DIGIPHONE+2 NT SET

Additionally sheath fault location using voltage gradient method

## DIGIPHONE+2 NTRX SET

Additionally cable tracing with detection of current direction



Datasheet  
digiPHONE+2 Series



PINPOINTING with  
optional SHEATH  
FAULT LOCATION  
and CABLE TRACING

## CI/LCI

Reliable cable identification of energised and de-energised cables



CI/LCI  
Datasheet



CABLE  
IDENTIFICATION

## MFM10

Battery operated sheath fault location system



MFM10  
Datasheet



SHEATH  
FAULT LOCATION

## Training & Support

A tremendous benefit to purchasing any test instrument from Megger is that we won't disappear after your purchase! We do have broad and in-depth technical expertise, application knowledge and experience in the field which we can all share with you.

We have invested heavily in creating a local support network of engineers to provide a rapid response by people who understand your challenges and needs.

Product and application training can also be offered at your premises or in specialist training facilities around the world. More information on course availability and other technical resources can be found on our website [www.megger.com](http://www.megger.com).



# Trainings with high practical value!





**Megger. We are building the best cable test vans  
in the world. For over 50 years now.  
[www.megger-cable.com](http://www.megger-cable.com)**

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