

Operating Manual

Low voltage fault location system Surgeflex 8-1000

Mess- und Ortungstechnik Measuring and Locating Technologies

Elektrizitätsnetze
Power Networks



Kommunikationsnetze
Communication Networks



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Abwassernetze
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Leitungsortung
Line Locating





Consultation with Megger

The present system manual has been designed as an operating guide and for reference. It is meant to answer your questions and solve your problems in as fast and easy a way as possible. Please start with referring to this manual should any trouble occur.

In doing so, make use of the table of contents and read the relevant paragraph with great attention. Furthermore, check all terminals and connections of the instruments involved.

Should any question remain unanswered or should you need the help of an authorized service station, please contact:

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Megger warrant that at the time of delivery Megger products are free from manufacturing or material defects which might considerably reduce their value or usability. This warranty does not apply to faults in the software supplied. During the period of warranty, Megger agree to repair faulty parts or replace them with new parts or parts as new (with the same usability and life as new parts) according to their choice.

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Each measure to remedy a claim under warranty shall exclusively be carried out by Megger or an authorized service station.

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Since some states do not allow the exclusion or limitation of an implied warranty or of consequential damage, the limitations of liability described above perhaps may not apply to you.

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1. Intended Application

The low voltage fault location system **Surgeflex 8-1000** is a modular component system for the handling of different tasks in the cable measuring technologies specially for the low voltage network.

Surgeflex 8-1000 consists of a powerful base system, which can be extended by additional units to an universal test system.

The base system consists of the Surge Unit 2/4/8 kV, the Arc Reflection Adapter ARM Unit 8 kV and a powerful reflectometer (Teleflex SX or Teleflex T3060). All units are mounted in a solid chassis and easily movable. By simple changing of the connection cables, the unit is prepared for the different tasks. According to the requirements, the units can be removed from the chassis and used separately. The basic system permits the following operational modes:

- DC-testing up to 8 kV
- Prelocating
 - Reflection measurement
 - ARM measurement (Arc Reflection Method)
 - Impulse Current Method 2 / 4 / 8 kV
- Burning (Fault conditioning)
- Pinpointing
 - Distance and acoustic measurement
 - Sheat fault locating

By the installation of the following additional components, the **Surgeflex 8-1000** system can be extended:

- Pinpointing receiver **Digiphone**
- Audio frequency cable tracer and faultlocater **Ferrolux** family
- Earth fault locating receiver **ESG**

2. Technical Description

2.1 Technical Data

Dimensions (W x H x D)	660 mm x 1050 mm x 700 mm
Weight	appr. 100 kg
Supply	230 V \pm 10 %, 50/60 Hz (110 V optional)
Power consumption	appr. 2 kVA
Operating temperature	-15°C ... +45°C
Storage temperature	-20 °C ... 70°C
Protection class	I
Protection rating	IP21
Circuit breaker (isolating transformer) (optional)	9 A

The detailed technical data are available from the operating manual of the surge generator Surge Unit 2/4/8 kV and the reflectometer.

2.2 Scope of delivery

Surgeflex 8-1000 consists of the following components:

Amount	Description
1	Surge Unit 2/4/8 kV
1	ARM Unit 8 kV
1	Teleflex SX or Teleflex T3060
1	Rolling Frame
1	Isolating transformer (optional)
1	Safety device (optional)
1	User Manual
1	Cable set

3. Safety precautions

3.1 General safety measures

Five safety rules

The five safety rules must always be followed when working with HV (High Voltage):

1. De-energise
2. Protect against re-energising
3. Confirm absence of voltage
4. Ground and short-circuit
5. Cover up or bar-off neighbouring energised parts



Wear Ear Protection

Surge operation can cause high and sudden noise levels. It is strongly recommended to wear hearing protection during surge operation. Keep in mind that this will limit the operators awareness for ambient dangers.

- Ensure that there are no unsecured components with live voltage in the close vicinity of the **Surgeflex 8-1000**, which could come into contact with you or the system. Secure any possible component by the correct covering procedure. If this is impossible due to technical reasons, disconnect them from any voltage or cause the according responsible manager or technician to arrange this before continuing. Observe the correct execution of this task.
- Perform a control measurement with appropriate test equipment. Ensure the correct functionality of this tester with a test or a measurement on a known reference voltage.
- Select a location for the **Surgeflex 8-1000** which suits the weight and dimension of the system and which provides a safe stand.
- Ensure also that the pace selected for the **Surgeflex 8-1000** does not affect the function of any other components or systems. If the use of the **Surgeflex 8-1000** requires modifications to other systems or system components, it must be ensured that these modifications are removed after the work is completed. Observe the special requirements of this system. Obtain the correct permission from the authorised personnel to do so before conducting any work.

This applies especially to any interference with safety appliances and safety regulations.

- The **Surgeflex 8-1000** generates during its operational procedure dangerous voltages up to 8 kV. These voltages are fed via the HV cable into the test object. The high voltage connector must not be touched or disconnected during HV operation.
- The test object must be protected against contact by applying protective devices as covers, safety chains etc. which ensure the danger zone cannot be reached.
- By according earthing and disconnection it must be guaranteed that the dangerous voltages cannot access any unprotected location or technical installation.
- During the operation of the **Surgeflex 8-1000** a second person must be present in sight and calling distance. This person must be able to recognise eventual dangerous situations and to operate the emergency off procedures.
- The **Surgeflex 8-1000** must not be operated unattended.
- To prevent dangerous charges, all metallic objects in the vicinity of the **Surgeflex 8-1000** must be constantly earthed.
- All unused phases and cables must be shorted and earthed.

3.2 Connection rules

- Protective and operational earth must be connected in such a way, that no dangerous step voltage or potential can build up between Protective earth (PE) and Neutral (N).
- Protective earth connection in TN-Networks:
Connect the earth cable of the **Surgeflex 8-1000** at the earth connection point of the neutral (N). If this is impossible it must be connected to a protective earth terminal which has the shortest connection to this point.
- Protective earth connection in TT-Networks:
The operational conditions in these nets different and therefore not applicable to a general rule. The operator of the system must avoid dangerous and critical conditions by appropriate measures adapted to the local rules.
- The operational earth of the **Surgeflex 8-1000** (screen of the HV connection cable) must be always connected to the earthed screen of the test object, of this is not possible at the connection lead to the station earth.
- Unused lines of the test object must be connected directly to the operational earth.
- If test object and supply net are connected to different no with each other connected earthing systems, it must be ensured that during the operation of the **Surgeflex 8-1000** the potential equalisation is maintained with a connection cable of at least 16 mm² Cu diameter.
- The operation of the **Surgeflex 8-1000** is only permitted with a correct connected earth cable, since only this guarantees the correct protection from high voltage when operation and contacting the system.

Connection sequence:

1. Connect the yellow/green earthing wire to an appropriate foundation earth electrode (station earth).
2. Connect to the object under test (see connection examples in section 4.1.).
3. Make sure to attach the dummy plug to the HV output of the ARM Unit 8 kV which is not in use (**ARM out** or **HV out**)!



The connection cables of the Surgeflex 8-1000 are only to be connected or disconnected from the test object, if this is visibly shorted and earthed at the connection point with an approved device in accordance with DIN VDE 0105.

4. Mark off test area according to EN 50191.
5. Connect the system to mains power.

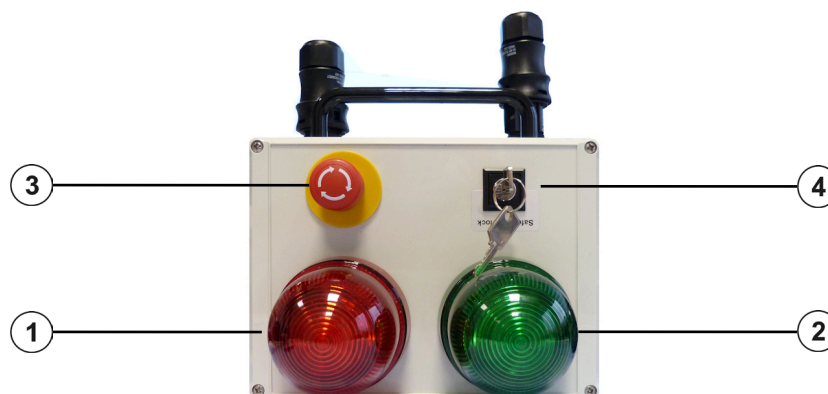
ATTENTION





The wiring between the individual components of the **Surgeflex 8-1000** is equally appropriate for all operating modes and should not be changed at any time!

3.3 Safety Device (optional)

Using the safety device, the power supply to the Surge Unit 2/4/8 kV can be disrupted or blocked with the EMERGENCY OFF switch and the key switch. Furthermore, the status of the system is made clearly visible with the help of two signal lights.



Part	Description
①	<p>Red signal light Lights up when the system is supplied with mains voltage. Voltage may be present at the HV output! The connected object under test is to be regarded as live!</p>
②	<p>Green signal light Lights up if the mains supply has been disrupted by the EMERGENCY OFF switch or the key switch. No voltage is present at the HV output!</p>
③	<p>"HV-Interlock" key switch</p> <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;">  </div> <div> <p>High voltage generation possible</p> </div> </div> <div style="display: flex; align-items: flex-start; margin-top: 10px;"> <div style="margin-right: 10px;">  </div> <div> <p>High voltage generation locked. Pulse reflection measurements with the reflectometer can be carried out.</p> </div> </div> <p>In the locked state, the key can be removed and the system can thus be protected against unauthorised high-voltage operation.</p>
④	<p>EMERGENCY OFF switch</p>

3.4 Danger during the surging

In the classic lead sheath cables with steel armour, the sheath and armour are also used as earth. By this large surface earthing and the involved shifting of the earth potential directly to the fault location, dangerous voltage potential may build up.

Plastic insulated cables have no insulated screen. The screen consists of a semiconducting layer and a relatively wide meshed copper screen. The earthing is done at the earth terminals at both ends of the cable in the station. With a cable fault it is common to have also a damage of the outer screen, resulting in a return of the surge current via the earth to the station earthing point. At the fault location as well as at the station earthing points hazardous potentials are possible.

Since the **Surgeflex 8-1000** is directly connected to the station earth, it is possible to have dangerous contact voltages, if the earth transit resistance of the station earth exceeds more than 2Ω .

With the transit resistance being lower than 2Ω , a danger to the operator by a too high voltage over time ratio becomes relatively unlikely.

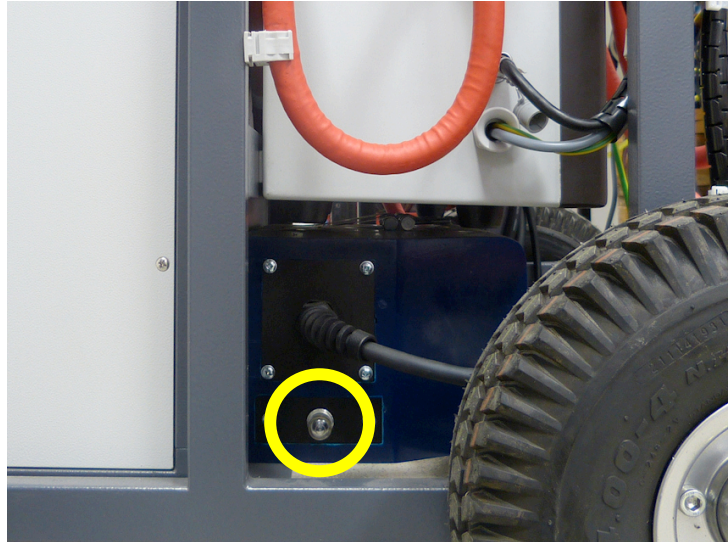
Is the location of the directly on top of the fault, the danger increases excessively due to high and dangerous voltage potentials.

Safety measures:

- 1. Surgeflex 8-1000 may only be connected to earth points whose resistance is lower than 2Ω .**
- 2. Surgeflex 8-1000 shall not be placed on the trace of the faulty cable.**

3.5 Circuit breaker (optional)

The mains circuit of the **Surgeflex 8-1000** is secured against overcurrent by a circuit breaker (optional). If the system suddenly switches off or cannot be switched on despite an existing mains connection, it should be checked whether the breaker has been tripped.



The system can be restarted after the the breaker switch has been pushed in again.

If the circuit breaker cannot be switched on again or continues to trip, please get in touch with the Megger service department in order to have the fault resolved.

4. Processing of the measurements

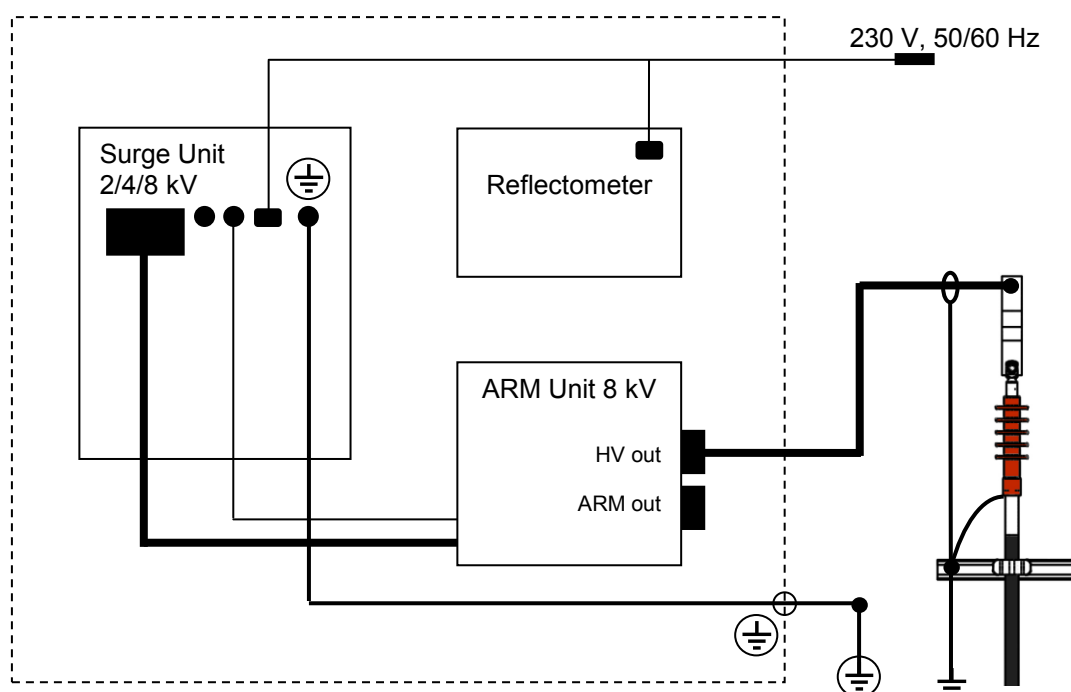
The setup of the test set must be done in accordance with the regulations described in topic 3.

4.1 Measurements with the base system Surgeflex 8-1000

4.1.1 Testing and Burning

With the Surge Unit you are able to test and burn for 2 min.
For the testing and burning the reflectometer is not required.

Test Setup:

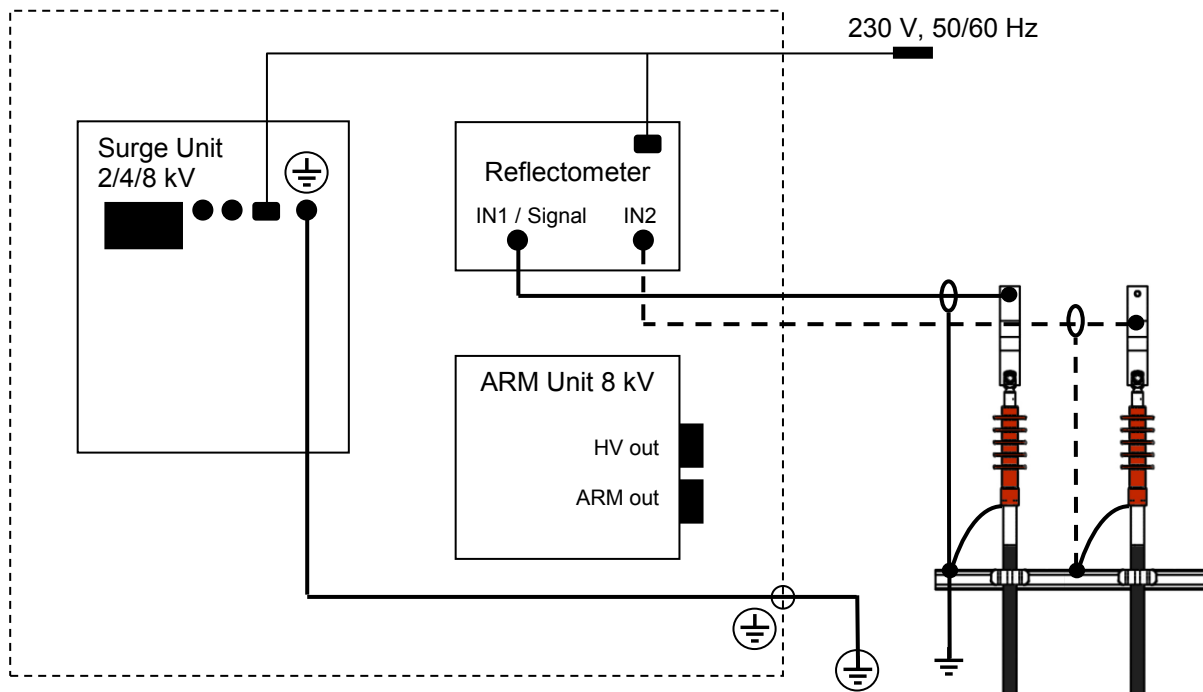


The Surge Unit 2/4/8 kV should be set-up in accordance with the associated operating manual and a test or a burning process should be initiated.

4.1.2 Pulse reflection measurement

You need only the reflectometer for the reflection measurement.

Test Setup:

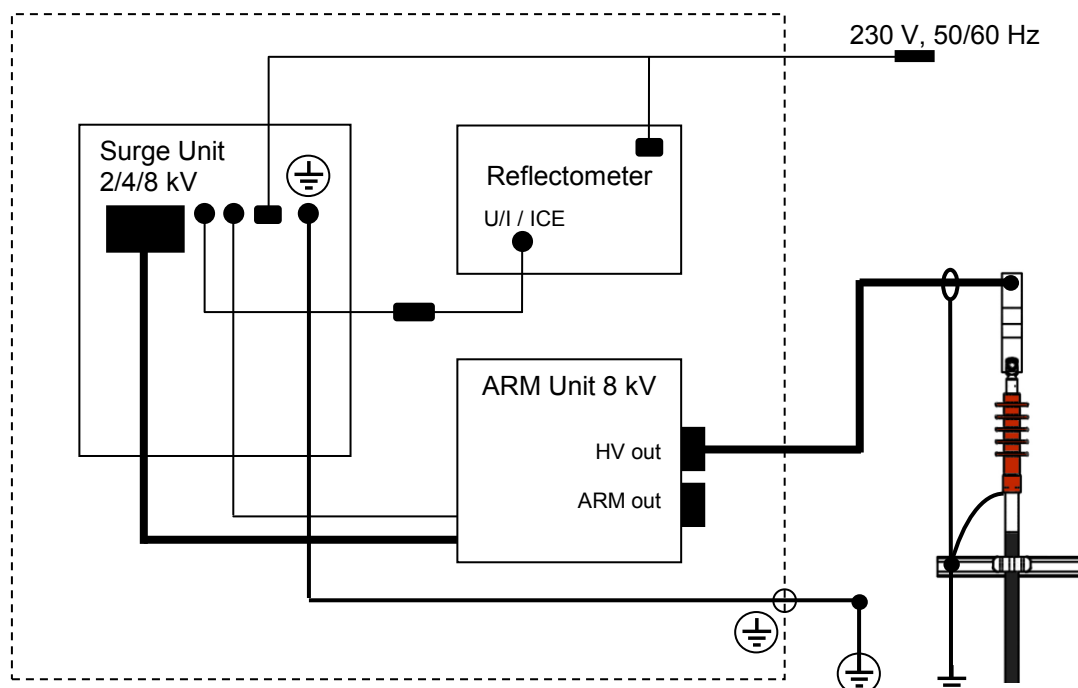


Operational steps:

- Start up the reflectometer according to the instructions of the associated operating manual and carry out a pulse reflection measurement.

4.1.3. Surge Prelocation (ICE)

Test Setup:



Operational steps:

- Start up the reflectometer according to the instructions of the associated operating manual and prepare for recording the current curve in operating mode ICE.
- Start up the Surge Unit 2/4/8 kV according to the instructions of the associated operating manual and trigger a single shot.
- Determine the fault distance on the reflectometer.

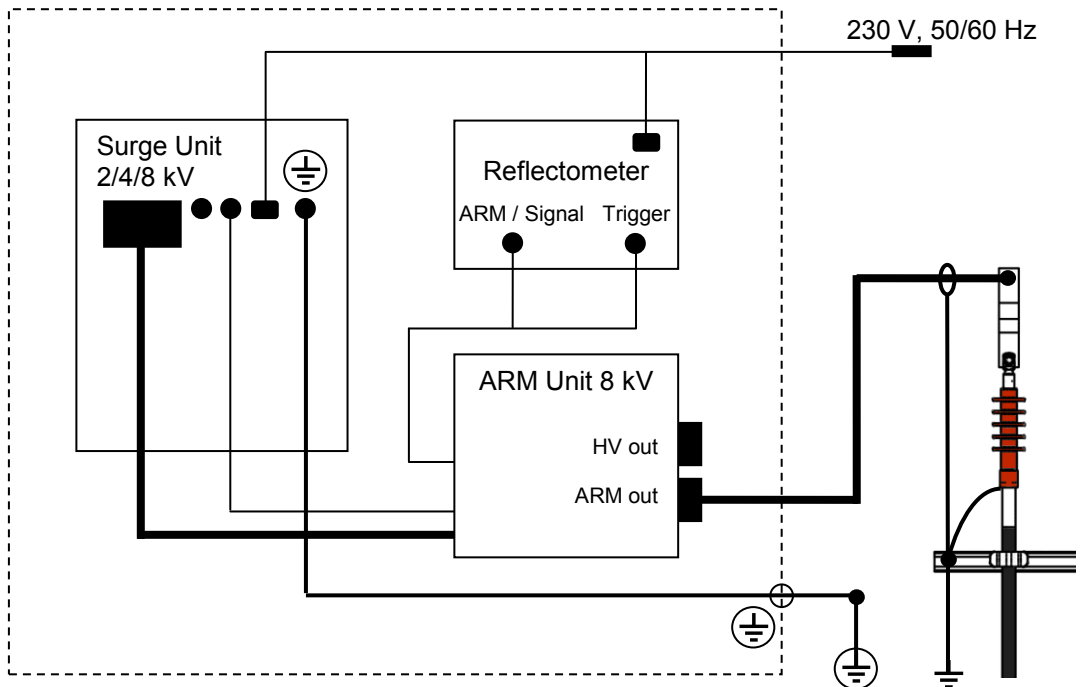
ATTENTION



For the Surge Prelocation (ICE) you have to use only the „HV out“ output. It is forbidden to use the „ARM out“ output.

4.1.4 Arc Reflection Prelocation ARM

Test Setup:



Operational steps:

- Start up the reflectometer according to the instructions of the associated operating manual and prepare for recording the fault trace in operating mode ARM.
- Start up the Surge Unit 2/4/8 kV according to the instructions of the associated operating manual and trigger a single shot.
- Determine the fault distance on the reflectometer.

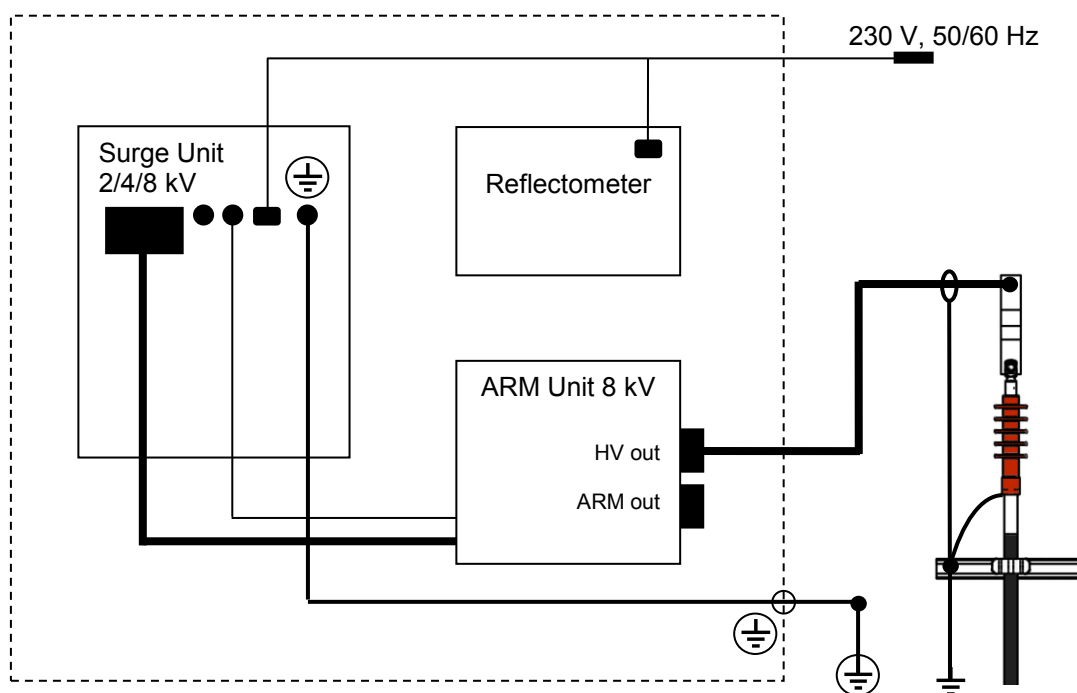
ATTENTION



To avoid thermal overloads of the ARM Unit 8 kV, you only can make between 10 to 20 single shots. Later a rest is necessary.

4.2 Surge Pinpointing

Test Setup:



Operational steps:

- Start up the Surge Unit 2/4/8 kV according to the instructions of the associated operating manual and initiate surge mode with an appropriate pulse sequence.
- Using the Digiphone according to the instructions of the associated operating manual, pinpoint the fault location.

5. Maintenance

General Information

It is not necessary to open the housing of the device to commission and operate the system. Opening the housing causes the immediate termination of all warranty claims!

The connections and connection leads of the system must be regularly tested to ensure that they are free of defects and intact, in accordance with the applicable national and company-specific arrangements.

Additionally, Megger recommends a yearly safety check of the system by a Megger service centre.

Notes on the fuses

For systems without the optional Isolating transformer, protection of the reflectometer's power input is provided by two fuses instead.



If the reflectometer cannot be switched on, even though it is connected to the mains power supply, both fuses must be checked. The fuse holder must be pulled out to do so. If the fuses are defective, they must be replaced with suitable microfuses (5 x 20 mm) of the type T1,0A.

You can find instructions on the fuses of the surge generator Surge Unit 2/4/8 kV from the associated operating manual.

6. Storage and Transport

If the system is not used for a lengthy period, it should be stored in a dust-free and dry environment. Continuous moisture (humidity) especially when combined with dust can reduce critical insulating clearances that are essential for safe high-voltage operation.

ATTENTION	Due to its weight, the Surgeflex 8-1000 cannot be carried by hand. If for example the system must be loaded into a vehicle, it may only be lifted by holding the frame. The handles on the top side of the Surge Unit 2/4/8 kV cannot support the forces occurring on lifting and could break as a result.
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Tento symbol indikuje, že výrobek nesoucí takovéto označení nelze likvidovat společně s běžným domovním odpadem. Jelikož se jedná o produkt obchodovaný mezi podnikatelskými subjekty (B2B), nelze jej likvidovat ani ve veřejných sběrných dvorech. Pokud se potřebujete tohoto výrobku zbavit, obraťte se na organizaci specializující se na likvidaci starých elektrických spotřebičů v blízkosti svého působíště.



Dit symbool duidt aan dat het product met dit symbool niet verwijderd mag worden als gewoon huishoudelijk afval. Dit is een product voor industrieel gebruik, wat betekent dat het ook niet afgeleverd mag worden aan afvalcentra voor huishoudelijk afval. Als u dit product wilt verwijderen, gelieve dit op de juiste manier te doen en het naar een nabij gelegen organisatie te brengen gespecialiseerd in de verwijdering van oud elektrisch materiaal.



This symbol indicates that the product which is marked in this way should not be disposed of as normal household waste. As it is a B2B product, it may also not be disposed of at civic disposal centres. If you wish to dispose of this product, please do so properly by taking it to an organisation specialising in the disposal of old electrical equipment near you.



Този знак означава, че продуктът, обозначен по този начин, не трябва да се извърля като битов отпадък. Тъй като е B2B продукт, не бива да се извърля и в градски пунктове за отпадъци. Ако желаете да извърлите продукта, го занесете в пункт, специализиран в извърлянето на старо електрическо оборудване.



Dette symbol viser, at det produkt, der er markeret på denne måde, ikke må kasseres som almindeligt husholdningsaffald. Eftersom det er et B2B produkt, må det heller ikke bortskaffes på offentlige genbrugsstationer. Skal dette produkt kasseres, skal det gøres ordentligt ved at bringe det til en nærliggende organisation, der er specialiseret i at bortskaffe gammelt el-udstyr.



Selleli sümbliliga tähistatud toodet ei tohi käidelda tavalise olmejäätmena. Kuna tegemist on B2B-klassi kuuluva tootega, siis ei tohi seda viia kohalikku jäätmeäitluspunkti. Kui soovite selle toote ära visata, siis viige see lähimasse vanade elektriseadmete käitlemisele spetsialiseerunud ettevõttesse.



Tällä merkinnällä ilmoitetaan, että kyseisellä merkinnällä varustettua tuotetta ei saa hävittää tavallisen kotitalousjätteen seassa. Koska kyseessä on yritysten välisen kaupan tuote, sitä ei saa myöskään viedä kuluttajien käyttöön tarkoitettuihin keräyspisteisiin. Jos haluatte hävittää tämän tuotteen, ottakaa yhteys lähimpään vanhojen sähkölaitteiden hävittämiseen erikoistuneeseen organisaatioon.



Ce symbole indique que le produit sur lequel il figure ne peut pas être éliminé comme un déchet ménager ordinaire. Comme il s'agit d'un produit B2B, il ne peut pas non plus être déposé dans une déchetterie municipale. Pour éliminer ce produit, amenez-le à l'organisation spécialisée dans l'élimination d'anciens équipements électriques la plus proche de chez vous.



Cuireann an siombail seo in iúl nár cheart an táirgeadh atá marcáilte sa tsíl seo a dhiúscairt sa chóras fuíoll teaghlaigh. Os rud é gur táirgeadh ghnó le gnó (B2B) é, ní féidir é a dhiúscairt ach oiread in ionaid dhiúscairthe phobail. Más mian leat an táirgeadh seo a dhiúscairt, déan é a thógáil ag eagraíocht gar duit a sainfheidhmiú i ndiúscairt sean-thearais leictirigh.



Dieses Symbol zeigt an, dass das damit gekennzeichnete Produkt nicht als normaler Haushaltsabfall entsorgt werden soll. Da es sich um ein B2B-Gerät handelt, darf es auch nicht bei kommunalen Wertstoffhöfen abgegeben werden. Wenn Sie dieses Gerät entsorgen möchten, bringen Sie es bitte sachgemäß zu einem Entsorger für Elektroaltgeräte in Ihrer Nähe.



Αυτό το σύμβολο υποδεικνύει ότι το προϊόν που φέρει τη σήμανση αυτή δεν πρέπει να απορρίπτεται μαζί με τα οικιακά απορρίματα. Καθώς πρόκειται για προϊόν B2B, δεν πρέπει να απορρίπτεται σε δημοτικά σημεία απόρριψης. Εάν θέλετε να απορρίψετε το προϊόν αυτό, παρακαλούμε όπως να το παραδώσετε σε μία υπηρεσία συλλογής ηλεκτρικού εξοπλισμού της περιοχής σας.



Ez a jelzés azt jelenti, hogy az ilyen jelzéssel ellátott terméket tilos a háztartási hulladékokkal együtt kidobni. Mivel ez vállalati felhasználású termék, tilos a lakosság számára fenntartott hulladékgyűjtőbe dobni. Ha a terméket ki szeretné dobni, akkor vigye azt el a lakóhelyéhez közel működő, elhasznált elektromos berendezések begyűjtésével foglalkozó hulladékkezelő központhoz.



Questo simbolo indica che il prodotto non deve essere smaltito come un normale rifiuto domestico. In quanto prodotto B2B, può anche non essere smaltito in centri di smaltimento cittadino. Se si desidera smaltire il prodotto, consegnarlo a un organismo specializzato in smaltimento di apparecchiature elettriche vecchie.



Ští zíme noráda, ka izstrádajumu, uz kura tā atrodas, nedrīkst izmest kopā ar parastiem mājsaimniecības atkritumiem. Tā kā tas ir izstrādājums, ko citi citam pārdod un lieto tikai uzņēmumi, tad to nedrīkst arī izmest atkritumos tādās izgāztuvēs un atkritumu savāktuvēs, kas paredzētas vietējiem iedzīvotājiem. Ja būs vajadzīgs šo izstrādājumu izmest atkritumos, tad rīkojieties pēc noteikumiem un nogādājiet to tuvākajā vietā, kur īpaši nodarbojas ar vecu elektrisku ierīču savākšanu.



Šis simbols rodo, kad juo paženklinto gaminio negalima išmesti kaip paprastų buitinių atliekų. Kadangi tai B2B (verslas verslui) produktas, jo negalima atiduoti ir buitinių atliekų tvarkymo įmonėms. Jei norite išmesti šį gaminį, atlikite tai tinkamai, atiduodami jį arti jūsų esančiai specializuotai senos elektrinės įrangos utilizavimo organizacijai.



Dan is-simbolu jindika li l-prodott li huwa mmarkat b'dan il-mod m'ghandux jintrema b'hal skart normali tad-djar. Minhabba li huwa prodott B2B , ma jistax jintrema wkoll f'centri civici g'har-rimi ta' l-iskart. Jekk tkun tixtieq tarmi dan il-prodott, jekk jogh'g'bok g'hamel dan kif suppost billi tiehdu g'hand organizzazzjoni fil-qrib li tispeccjalizza fir-rimi ta' taghmir qadim ta' l-eletriku.



Dette symbolet indikerer at produktet som er merket på denne måten ikke skal kastes som vanlig husholdningsavfall. Siden dette er et bedriftsprodukt, kan det heller ikke kastes ved en vanlig miljøstasjon. Hvis du ønsker å kaste dette produktet, er den riktige måten å gi det til en organisasjon i nærheten som spesialiserer seg på kassering av gammelt elektrisk utstyr.



Ten symbol oznacza, że produktu nim opatrzonego nie należy usuwać z typowymi odpadami z gospodarstwa domowego. Jest to produkt typu B2B, nie należy go więc przekazywać na komunalne składowiska odpadów. Aby we właściwy sposób usunąć ten produkt, należy przekazać go do najbliższej placówki specjalizującej się w usuwaniu starych urządzeń elektrycznych.



Este símbolo indica que o produto com esta marcação não deve ser deixado fora juntamente com o lixo doméstico normal. Como se trata de um produto B2B, também não pode ser deixado fora em centros cívicos de recolha de lixo. Se quiser desfazer-se deste produto, faça-o correctamente entregando-o a uma organização especializada na eliminação de equipamento eléctrico antigo, próxima de si.



Acest simbol indică faptul că produsul marcat în acest fel nu trebuie aruncat ca și un gunoi menajer obișnuit. Deoarece acesta este un produs B2B, el nu trebuie aruncat nici la centrele de colectare urbane. Dacă vreți să aruncați acest produs, vă rugăm s-o faceți într-un mod adecvat, ducând-ul la cea mai apropiată firmă specializată în colectarea echipamentelor electrice uzate.



Tento symbol znamená, že takto označený výrobek sa nesmie likvidovať ako bežný komunálny odpad. Keďže sa jedná o výrobok triedy B2B, nesmie sa likvidovať ani na mestských skládkach odpadu. Ak chcete tento výrobok likvidovať, odneste ho do najbližšej organizácie, ktorá sa špecializuje na likvidáciu starých elektrických zariadení.



Ta simbol pomeni, da izdelka, ki je z njim označen, ne smete zavreči kot običajne gospodinjinske odpadke. Ker je to izdelek, namenjen za druge proizvajalce, ga ni dovoljeno odlagati v centrih za civilno odlaganje odpadkov. Če želite izdelek zavreči, prosimo, da to storite v skladu s predpisi, tako da ga odpeljete v bližnjo organizacijo, ki je specializirana za odlaganje stare električne opreme.



Este símbolo indica que el producto así señalizado no debe desecharse como los residuos domésticos normales. Dado que es un producto de consumo profesional, tampoco debe llevarse a centros de recogida selectiva municipales. Si desea desechar este producto, hágalo debidamente acudiendo a una organización de su zona que esté especializada en el tratamiento de residuos de aparatos eléctricos usados.



Den här symbolen indikerar att produkten inte får blandas med normalt hushållsavfall då den är förbrukad. Eftersom produkten är en så kallad B2B-produkt är den inte avsedd för privata konsumenter, den får således inte avfallshanteras på allmänna miljö- eller återvinningsstationer då den är förbrukad. Om ni vill avfallshandera den här produkten på rätt sätt, ska ni lämna den till myndighet eller företag, specialiserad på avfallshandling av förbrukad elektrisk utrustning i ert närområde.