

PFISTERER

Universal Repair Kit



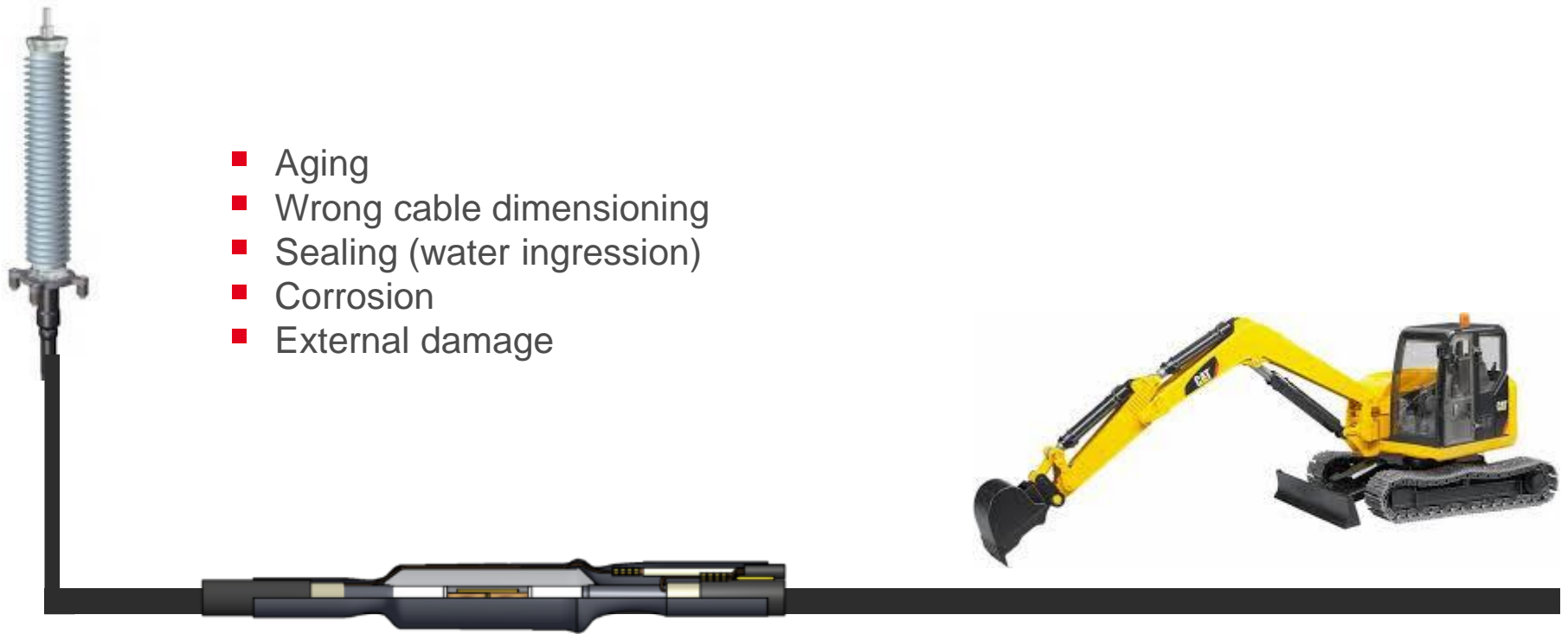
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LAPP
INSULATORS

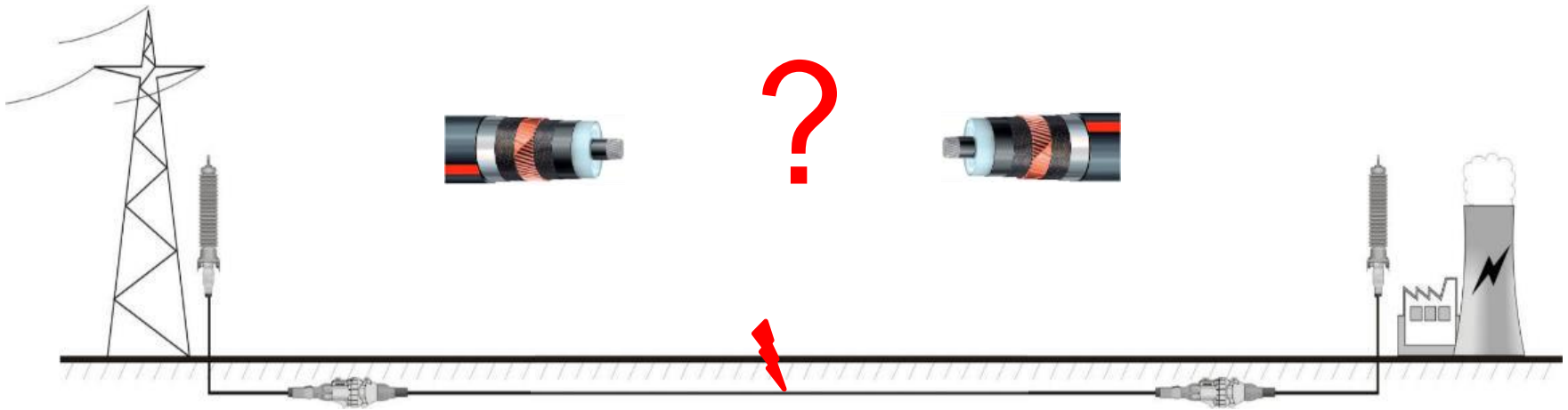
the power connection

Cable system failure reasons

- Aging
- Wrong cable dimensioning
- Sealing (water ingress)
- Corrosion
- External damage



Malfunction – Time until Recovery is crucial



- Cable to be replaced
- Ideally the original cable is to be used
- But what to do if the original cable is not available on short term and cannot be manufactured at the required length?

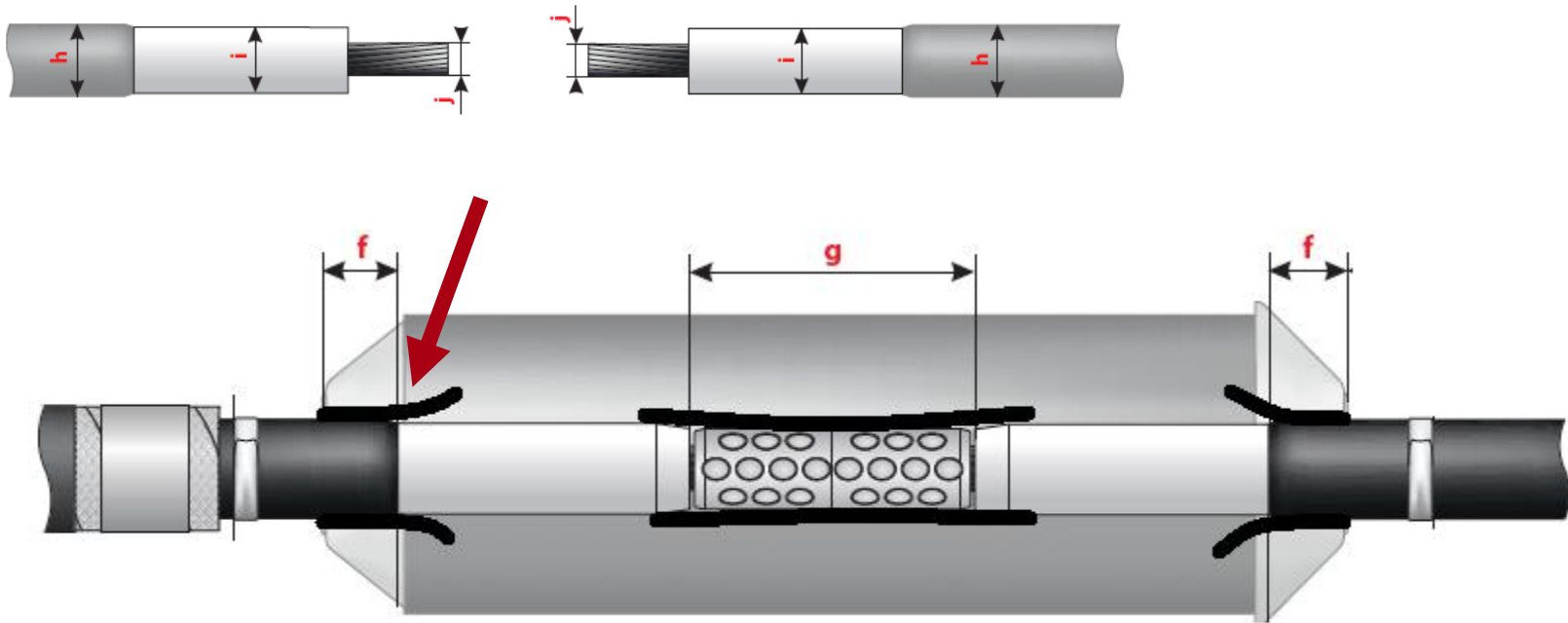
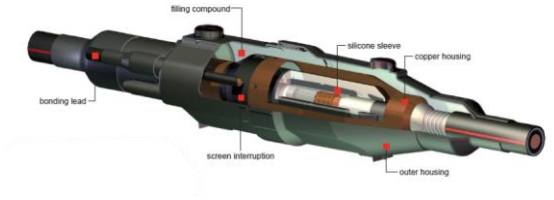


Challenges



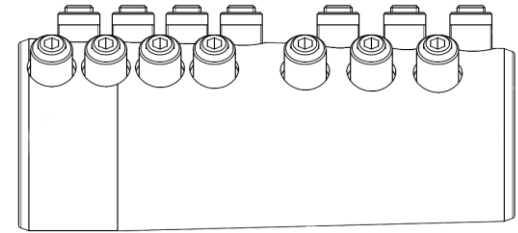
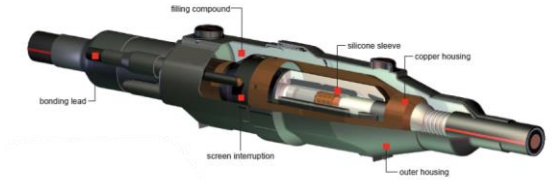
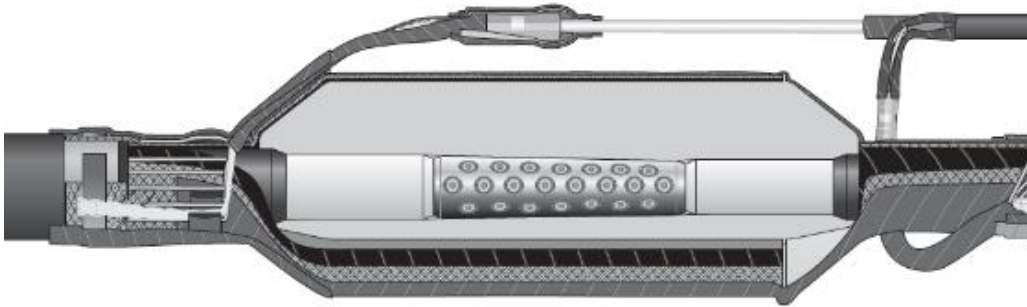
- **Installed cable system are historically based on multiple cable accesories supplier**
- **Different cable cross sections, different cable types**
- **Complexity to handle material and support / Large storage place**
- **Grid expansion – Extension/Reduction of Substations**

Limitation of a conventional joint



- Smooth triple point (XLPE, Insulating silicone, semiconductive silicone) is necessary, no air gaps
- Pressure on cable is critical but without deformation of semiconductive silicone
- High pressure can deform the XLPE cable over time due to load changes (plastic deformation)

Limitation of a conventional joint



- Cable joint with a conical connector
- Usability and range of compensation needs to be ensured
- Mechanical simulation
- Electrical simulation required
- Test values as reference

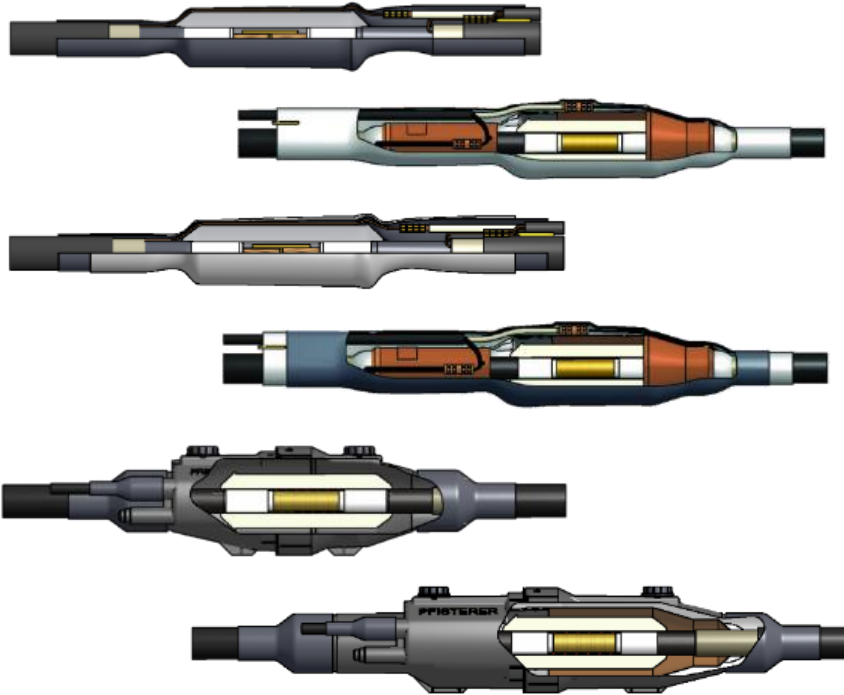


Rule of thumb

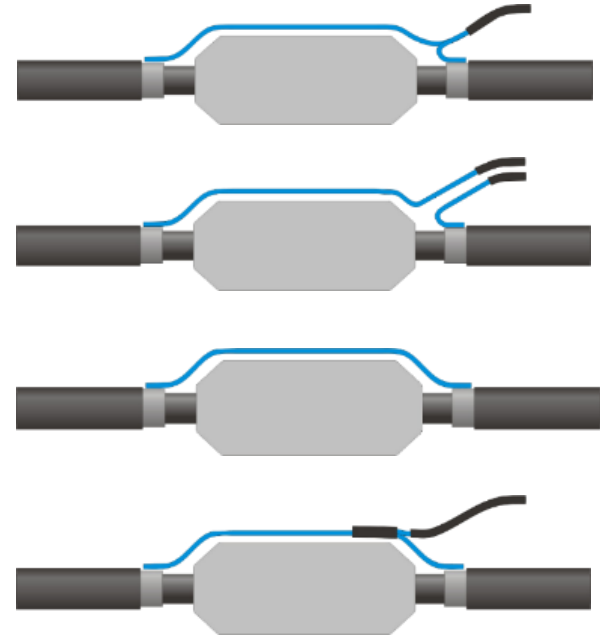
10mm or 0.4in difference in
cable insulating diameter

Limitation of a conventional joint

Housing variants

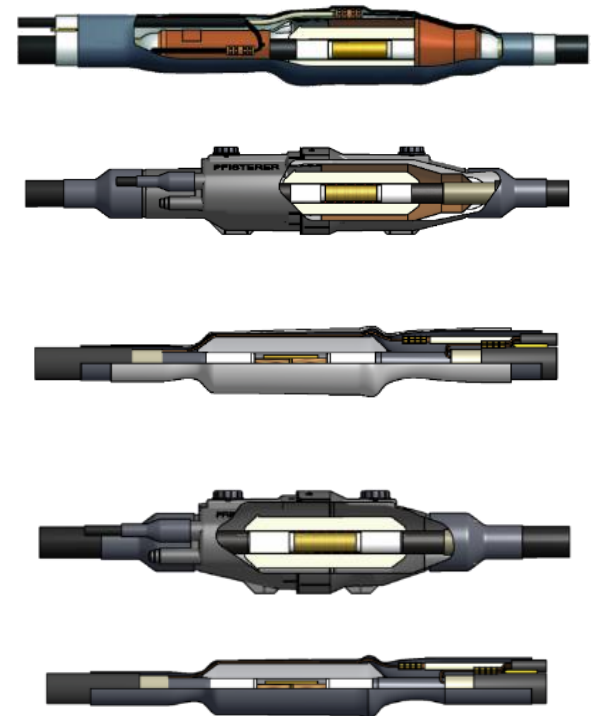


Screen handling



Universal Repair Kit : Requirements

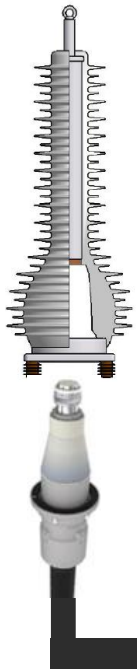
- Pre-engineered solution
- For any type of dry type cable
- To replace any type of joint
- Pre-tested components
- Modular System (reduce stock)
- Fast deploy



Universal Repair Kit

Fix it easy

- Pluggable system for repairing any type of high voltage cable up to 170kV
- Pretested components
- Permanent or temporary use
- Underground application (IEC 60840 - ANNEX G)



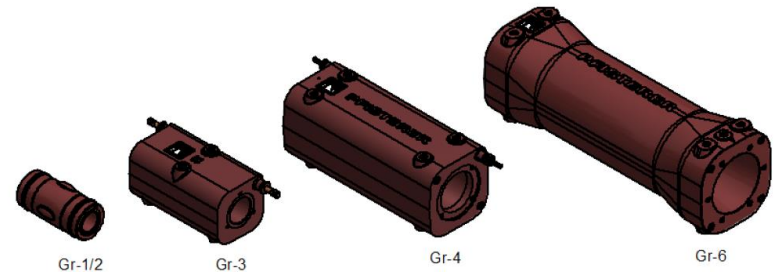
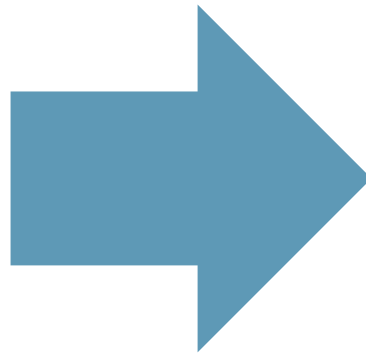
Universal Repair Kit

IXOSIL MSA Joints



CONNEX GIS-Joint

CONNEX EPOXY JOINT



Universal Repair Kit

Pluggable Joint Specifications

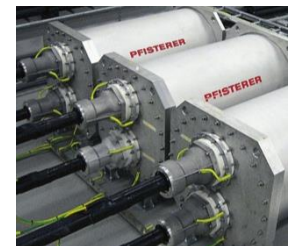
- Type Test according IEC60840
- Dielectrical test, tan d, Step-Test ($U_{bil}=1175kV$, $U_{AC}=218kV/30min$, $240kV/15min$ $U_{TE}=190kV$ $<2pC$)
- Computer Tomograph Analysis
- Climate Chamber Test (3 cycles= $3*9h=27h$ $T=-40^{\circ}C/+80^{\circ}C$)
- Salt Fog Test (DIN EN 60068-2-52)
- GL Certified (GL-IV-2)



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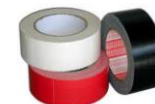
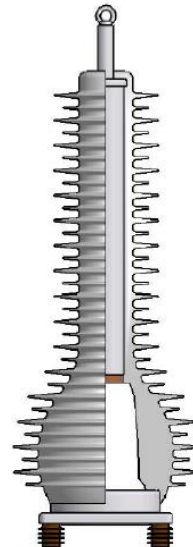
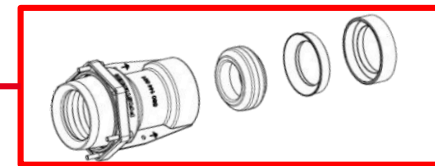
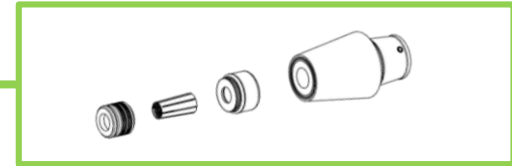
Example (pre-engineering)

Name	Insulating material	Conductor (kcmil)	Material	Screen	
Cable 1	EPR	800	Cu	corrugated	
Cable 2	XLPE	1600	Al	wire	
Cable 3	EPR	2000	Al	lead	
Cable 4	XLPE	3000	Cu	wire	Spare!



Universal Repair Kit

Cable 1 specific	BOX A
Cable 2 specific	BOX B
Cable 3 specific	BOX C
Cable 4 specific	BOX D
Cable general part	BOX E
Pluggable Joints	BOX I
Cross Bonding	BOX F
Installation Tools	BOX G
Consumables	BOX H



Universal Repair Kit



- Material will be packed into durable aluminum crates
- Cable specific components will be placed in separated crates and labeled for easy reference
- In case of failure, repair system can be easily setup due to modular system

Universal Repair Kit

Example: Repairing Cable 1 with Cable 4 (spare)

Cable 1 specific	BOX A
Cable 2 specific	BOX B
Cable 3 specific	BOX C
Cable 4 specific	BOX D
Cable general part	BOX E
Pluggable Joints	BOX I
Cross Bonding	BOX F
Installation Tools	BOX G
Consumables	BOX H



Amount	Description	BOX
2	Cable 1 specific	BOX A
2	Cable 4 spec	BOX D
4	Cable general part	BOX E
2	Pluggable Joints	BOX I
1	Installation Tools	BOX G
1	Consumables	BOX H

Cable 1



Cable 4



Cable 1

Universal Repair Kit



- Transportable (Truck, Boat)
- Durable (>15 Years)
- Dry type system
- Defined Storage Conditions
- Ready to deploy

- This is an expandable solution!!



Universal Repair Kit

Components

Elbow Joint
up to 245 kV



Connection Joint
up to 550 kV



Joint
up to 170 kV



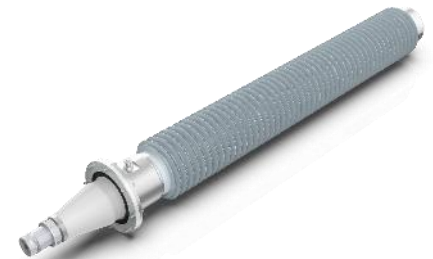
Pneumatic Cable Reel



Flexible Cable Dry Termination



Bushing
up to 362 kV



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Thank you



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the power connection