

Pipelines running parallel to high voltage overhead lines are interfered by their operating- and short circuit currents.

Because of the inductive coupling, AC voltages between pipeline and surrounding soil are unavoidable.

Maximum permissible safety voltage up to which personnel and equipment may be exposed under various conditions are defined in international safety codes and standards.

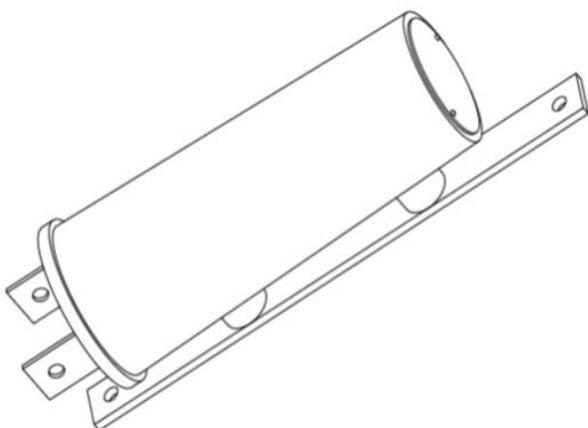
In case of higher interfered voltages, it is necessary to give due consideration to earthing measures to keep the magnitude of AC voltages within acceptable limits.

Effect on protection range and the measurement of OFF-Potential of an impressed current system

The average current density [J_{SM}] for a PE-isolated pipeline with directly connected earthing system resulted in a large reduction of the protection range of an impressed current system.

At direct connection of the earthing system with the pipeline emerges when switching off the impressed current system a potential difference (U_{RF}) between the pipeline and the zinc earthing system of about 80...230 mV. The real OFF-Potential (IR-free potential) is not measurable because of the appearing transient currents.

In addition, the location of pipeline insulation holidays in a potential gradient area of a direct connected earthing system is impossible.



AC-Voltage limiter VL-14-401

AC-Voltage limiter VL-14-401 is designed to protect operating personnel and pipeline equipment against electrical shocks and damages caused by AC-fault currents.

Limiter VL-14-401 effectively blocks the protective DC-current required for cathodic protection while providing a low ohmic connection for induced AC-currents caused by operating or short circuit currents of high voltage overhead line systems.

Limiter VL-14-401 is available in common models with the following technical data:

V_{RSM}	500 V - 2300 V	V_{RRM}	400 V - 2200 V
I_{FRMS}	10 A	i^2t	100 A ² s

(V_{RSM}) non-repetitive peak reverse voltage

(V_{RRM}) max. allowable peak value of repetitive transient off-state and reverse voltage

(I_{FRMS}) max. current for continuous operation

(i^2t) rating which should not be exceeded due to short circuits

Dimensions:

Length: 270 mm, Diameter: 65 mm, Weight: 1.2 kg

The dimensions of VL-14-401 allows installation inside test stations

PIPELINE ACCESSORIES

Kirk Polarization Cells

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Sheet: 1 of 1

Protection Against Dangerous Voltage

Induced alternating current, lightning strikes, and grounding fault current on buried pipelines not only pose serious safety threats to pipeline operators and contractors, they can also cause major damage to buried pipelines.

Kirk grounding cells control these hazardous voltages while permitting lower level cathodic protection voltage to flow. The cells do not possess an internal voltage. Instead they act as an electrochemical switch to shunt dangerous voltage to ground. They consist of multiple pairs of stainless steel plates, which are immersed in a 30 percent potassium hydroxide solution. An oil seal is also added to prevent evaporation and limit foaming of the electrolyte solution under high current flow.

When low levels of DC current flow through the grounding cell, a film of hydrogen gas forms on the negative plates of the Kirk cell. At the same time a film of oxygen gas forms on the positive plates. This polarisation allows the low level DC voltage associated with cathodic protection to develop. As the applied voltage across the cell increases from either AC or higher DC current, the polarisation film on the plates breaks down and the Kirk cell conducts current.

Kirk grounding cells can be installed above or below grade. For exterior installations, a series of galvanized steel enclosures are offered which are in conformity with the EN-Standards or NEMA and 3R. The cells are shipped with a dry package of potassium hydroxide and can be stored indefinitely in clean, dry locations.

Typical Applications

Kirk grounding cells control the flow of potentially dangerous AC and DC current on buried metallic structures. They are often used on buried oil, gas, and water pipelines that share the same right-of-way as high voltage power lines. Because the cells produce various gases that can be explosive, they should be installed with proper venting.

They should also be routinely inspected to ensure adequate electrolyte levels are present.

The cells can be operated in temperatures ranging from -40°F to 140°F (-40°C to 60°C).



K-50 KIRK CELL PERFORMANCE TABLE

Delta E Across Cell Terminals	Resultant Current Flow	Apparent Internal Impedance (Ω)
DIRECT CURRENT DATA		
0.15 V	100 μ A	1500
0.42 V	2 mA	210
0.46 V	4 mA	115
0.50 V	6 mA	83
0.53 V	8 mA	66
0.59 V	10 mA	59
0.86 V	20 mA	43
1.00 V	30 mA	33
1.20 V	50 mA	24
1.30 V	100 mA	13
1.72 V	500 mA	3.4
1.76 V	1 A	1.8
1.82 V	5 A	0.36
1.85 V	10 A	0.19
2.15 V	100 A	0.022
2.65 V	500 A	0.053
3.15 V	1 kA	0.0032
ALTERNATING CURRENT DATA		
0.01 V	500 mA	0.02
0.02 V	1 A	0.02
0.04 V	5 A	0.01
0.20 V	10 A	0.02
0.58 V	50 A	0.012
0.62 V	100 A	0.0062
1.30 V	500 A	0.0026
10.6 V	14 kA	0.00076
12.5 V	38.5 kA	0.00032
14.0 V	44.0 kA	0.00032
15.0 V	52.5 kA	0.00029
17.0 V	58.0 kA	0.00029
19.9 V	64.0 kA	0.00031

Further Kirk cells available:

Type K-5A and K-25

To order the right cell for your application, indicate your requirements and specify the technical basis data.

We will build special enclosures or other items in connection with cells to customer specifications.