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INDIVIDUAL SPAREGAPS (VLD) SUBSTITUTION BY AN EARTHING CONDUCTOR AT RAILWAY STATION

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1. Introduction

The security standard prescribes, that each railway contact line mast or port have to be connected with rail to prevent against electric shock in the case of contact line insulation break-down.

This requirement it is possible to satisfy in two ways, using namely:

A. individual sparegaps (VLD) connected between the mast or port with the rail,

B. bare earthing conductor connecting all masts or all ports at the platform of the railway station, coonected to the rail in one point only.

The solution according **A** is well known and used, but it has a basic disadvantage residing in interference with track circuits requirement (overvoltage, symmetry of rail – earth leak resistance, current maintenace of individual sparegaps).

The solution according **B** seems to have some advantage, but before a wider implementation it is necessary to analyse the concrete conditions in individual railway stations.

Two basic parameters given for this solution are:

- the bare earthing conductor material and its resistance,
- the grounding resistance of the contact line masts or pots.

The former parameter is optional and financial dependent, the later is more notably local and weather dependent.

2. Simulation analysis

The simulation analysis is based on following input data:

- the bare earthing conductor is composed of two wires FeZn with specific resistance 1,43 Ω/km,
- the length of the railway station platforms is 1000 m
- at the platforms there are 20 contact line ports
- the grounding resistance of one port is optional 5 Ω, 9 Ω and 12 Ω
- the grounding resistance of artificial electrode on earthing conductor both ends is 10 Ω
- the model fault current base value is 1000 A .

The circuit analysed includes 20 Π - two-port networks. For the condition of input fault current 1000 A the simulation gives each port potential (touch voltage).

The input fault current 1000 A is injected in the earthing conductor at his end to obtain the greatest value of the port potential. Values of the port potential for particular ports are shown on ***Fig. 1*** in three cases of the ports grounding resistance, namely 5 Ω, 9 Ω and 12 Ω.

The maximal values of the port potential, simulated for the end of the earthing conductor, i.e for the point of injecting the fault current, are included in ***Fig. 2*** in dependence on port grounding resistance.

The ***Fig. 3*** described the situation, when the fault current 1000 A is injected to the middle point of the earthing conductor (i.e. to the port No.10), once again for the three values of the ports grounding resistance 5 Ω, 9 Ω and 12 Ω.

3. Evaluation of the simulated diagrams

The diagrams of port potential are calculated for basic fault current 1000 A. By fact the injected fault current value depends on:

- the distance between the railway station and the feeding railway substation,
- the resistance of contact line from the station up to the substation.

The *Fig. 1* comprises the port potential in relation to port running number. It is usefull to select the curve of estimated ports earthig resistance and to interpolate. Afterwards it is possible to multiply the potential value read for the actual fault current value. The next step is to confront this potential value with the standard EN 50122-1 (2008) requirement.

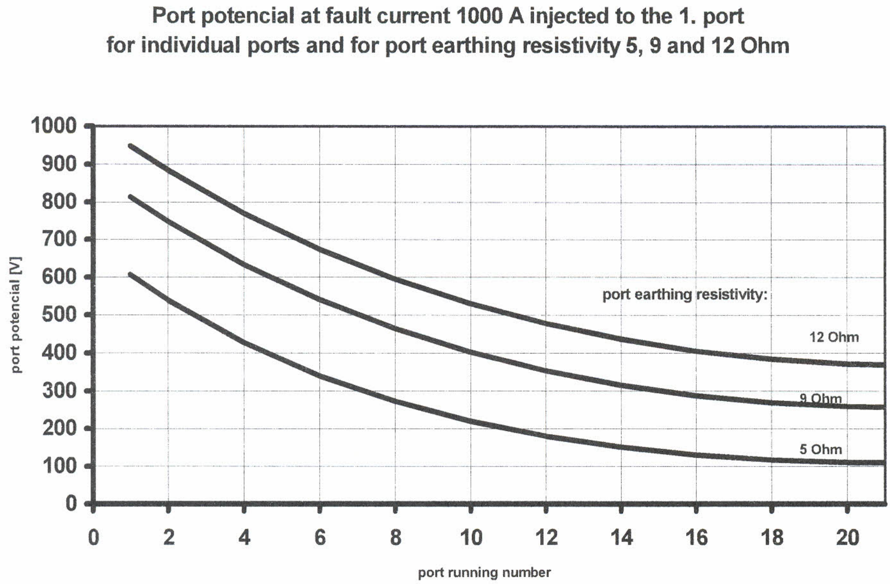

Fig. 1

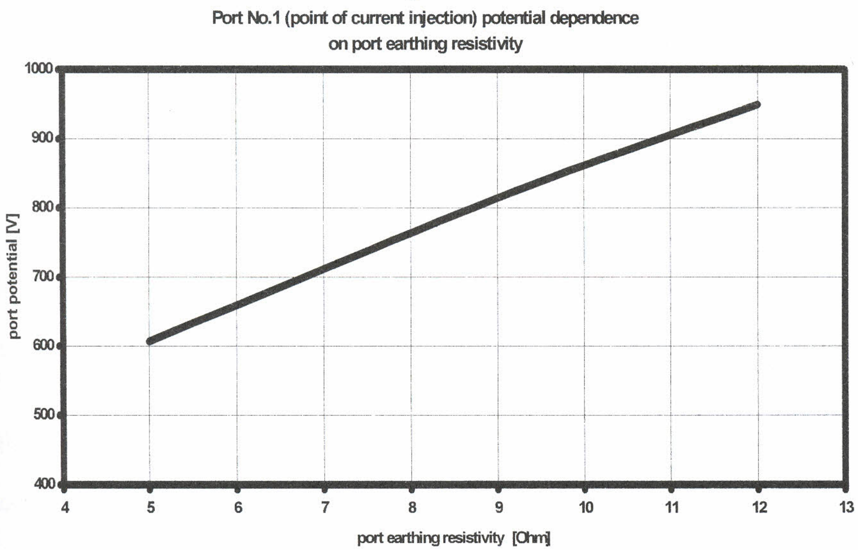

Fig. 2

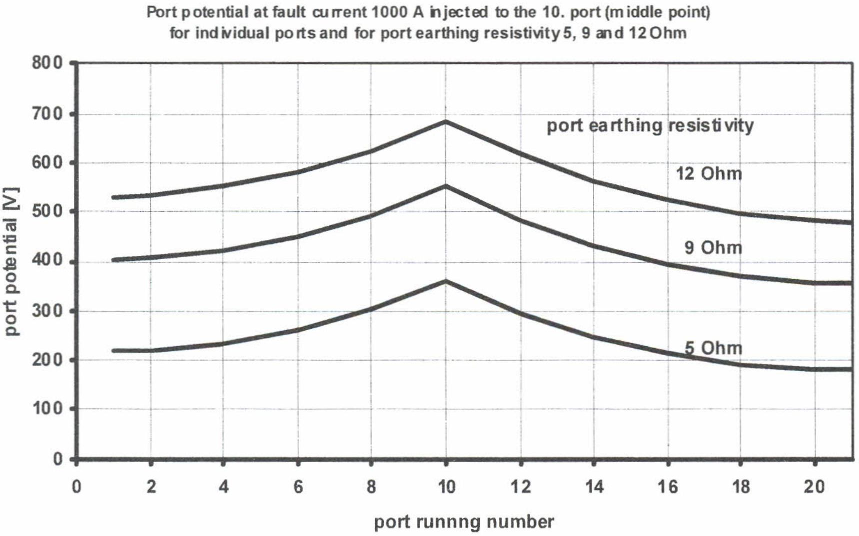

Fig. 3

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Resumé

NÁHRADA INDIVIDUÁLNÍCH PRŮRAZEK V ŽELEZNIČNÍ STANICI UKOLEJŇOVACÍM LANEM

Karel HLAVA, Michal SATORI, Tomáš KRČMA

Článek vyšetřuje napěťové poměry na ukolejňovacím lanu propojujícím brány trolejového vedení v železničních stanicích. Použitím těchto lan by bylo možno vyloučit nutnosti použití individuálních průrazek připojených mezi bránu a kolejnici. Simulační výsledky jsou shrnuty ve formě diagramů platných pro zvolené vstupní hodnoty obvodu a vztažnou hodnotu 1000 A poruchového proudu. Závěrem je připojen postup využití těchto diagramů pro jinou hodnotu poruchového proudu.

Summary

INDIVIDUAL SPAREGAPS (VLD) SUBSTITUTION BY AN EARTHING CONDUCTOR AT RAILWAY STATION

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The paper deals with the analyses of voltageses on the bare earthing conductor connecting the masts and ports of the overhead contact line at the railway station. Introduction of this earthing contactor can exclude the individual spargaps connecting the mast or port with the rail. The simulation results are recapitulated in diagrams useful for chosen input circuit values and for chosen faulty current 1000 A. The method of the diagrams utilisation is described in the final part of the paper.

Zusammenfassung

ERSATZ DER INDIVIDUELLEN FUNKENSTRECKEN ZWISCHEN MAST UND SCHIENE DURCH ERDUNGSSEIL IN EISENBAHNSTATION

Karel HLAVA, Michal SATORI, Tomáš KRČMA

Der Artikel analysiert die Spannung am Erdungsseil, das die Masten oder Pforten der Fahrleitung in Eisenbahnstation verbindet. Die Anwendung dieses Erdungsseiles kann die individuellen Funkenstrecken zwischen Mast und Schiene ausscheiden. Die Simmulationsergebnisse sind in Diagrammen zusammengefasst, die fűr gegebene Eintrittskenndaten und gegebenen Störungstrom 1000 A gűltig sind. Am Ende des Artikles ist die Auswertungsmethodik dieser Diagrammen beschrieben.