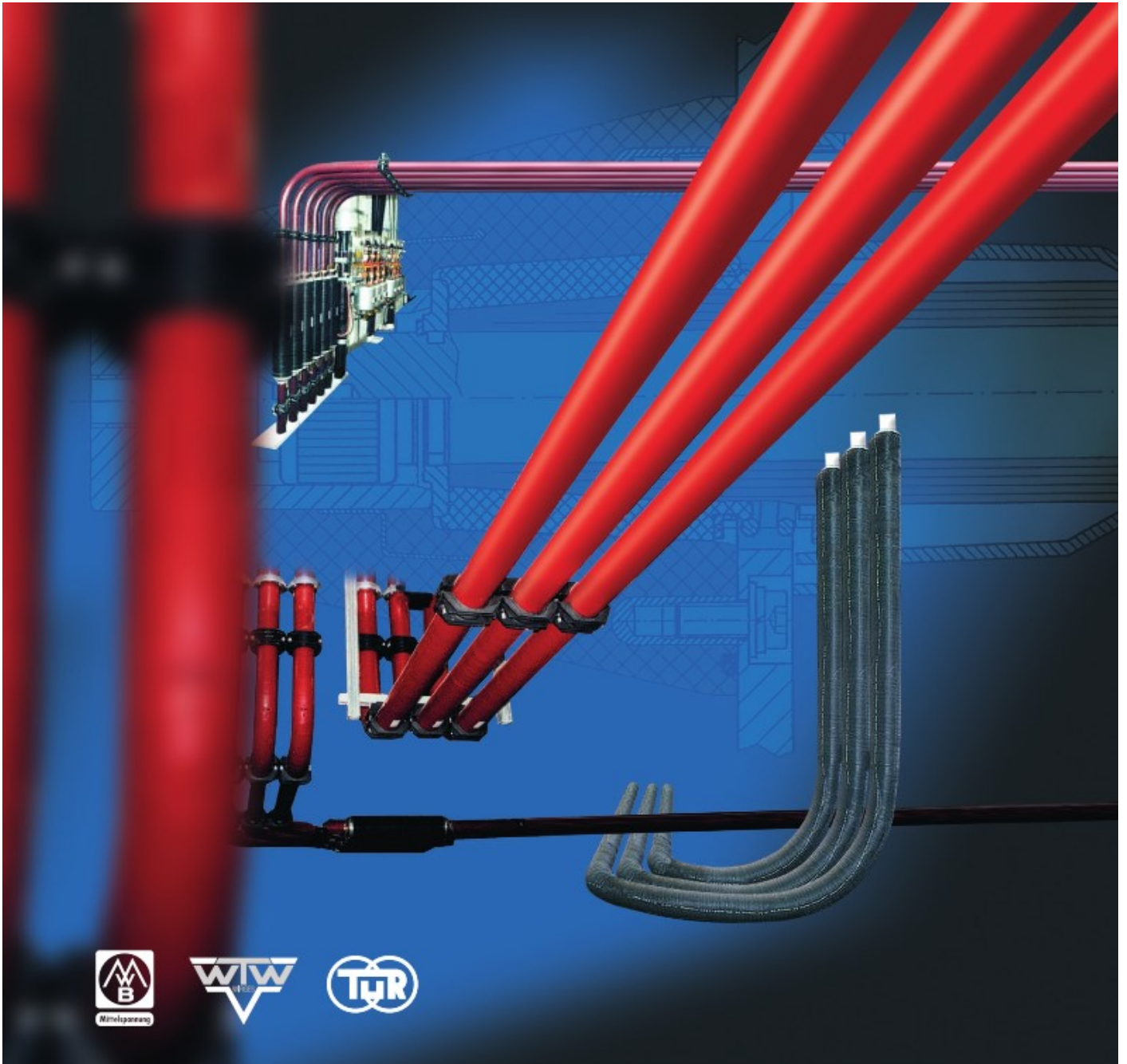




Instrument Transformers

SIS Solid Insulation System



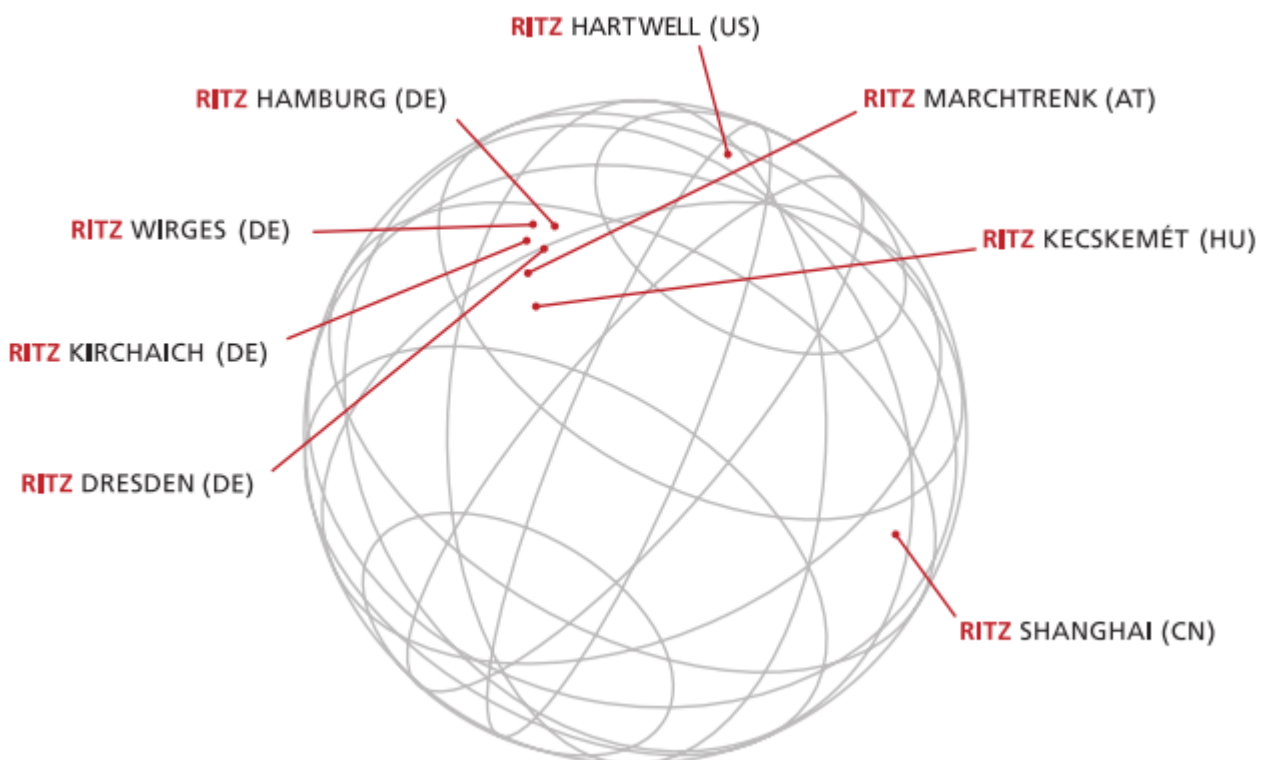
RITZ Instrument Transformers GmbH – Core competency

Under the trading name “RITZ Instrument Transformers GmbH” RITZ has been pooling its activities to gather new strengths since 01/08/2007.

The tradition and knowledge of the parent company “RITZ Messwandler Hamburg” and the subsidiary “RITZ Messwandler Dresden (TuR)” has been united with the companies “Wandlerund Transformatoren-Werk Wirges (WTW)” and “Messwandlerbau Bamberg (MWB)” under this name. This merger unites a total of more than two hundred years of know-how in instrument transformers production.

In addition, RITZ has decided to concentrate on the core business of medium voltage and low voltage transformers in which the high voltage division is sold. The resources gained through this shall now be applied for additional innovations and quality standards in the medium and low voltage products. RITZ is therefore securing its position on the global market.

The overseas corporations of RITZ Instrument Transformers GmbH in Austria (Marchtrenk), Hungary (Kecskemét), China (Shanghai) and USA (Hartwell) strengthen the company’s position on the international market.



General

The RITZ Solid Insulated Bus Bar System especially offers for transmission of higher currents and/or limited space requirements a cost-effective and safe alternative to parallel-connected cable systems, metal-enclosed bus bar or bus duct systems.

The equipment produced plays an important part in power generation and power distribution. Therefore, highest demands are made with respect to industrial safety. By constantly supervising the manufacturing process as well as ongoing modifications to the materials used, the highest degree of safety is guaranteed. The available test equipment allows all of the type and routine tests necessary.

Before delivery each bus bar segment and connecting sleeve gets routine testing.

All requirements with respect to the protection of personnel and equipment are met. The following inherent benefits speak for the use of fully insulated bus bars:

Design

System Specific Benefits

- Compact design
- Reduced requirements for the installation space
- Small bending radii
- 3-dimensional geometric shape is possible
- Natural cooling due to effectual conductor design
- High operational reliability due to factory routine test of each bus bar
- Maintenance free

Safety Benefits

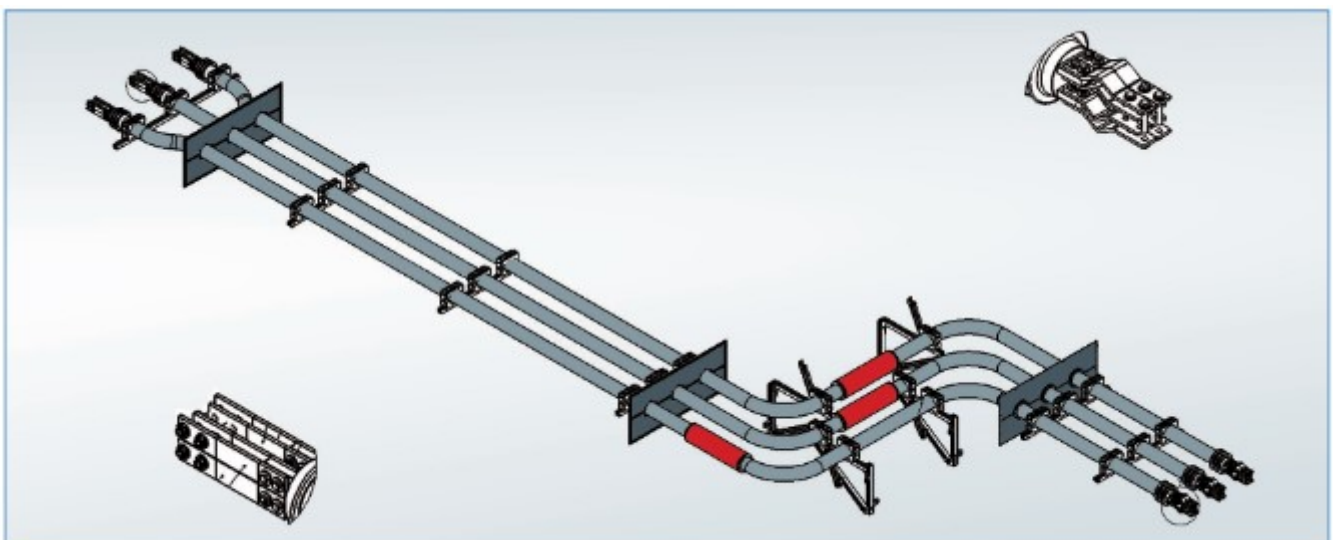
- Touch Safe
- Fully insulated and capacitive graded system
- High thermal and dynamic short circuit current withstand capabilities
- Excluded phase to phase short-circuits
- No toxic fumes in case of fire - self extinguishing
- High operating reliability due to routine tests for each bus bar element

Installation

- Easy installation due to standardized installation and fixing parts

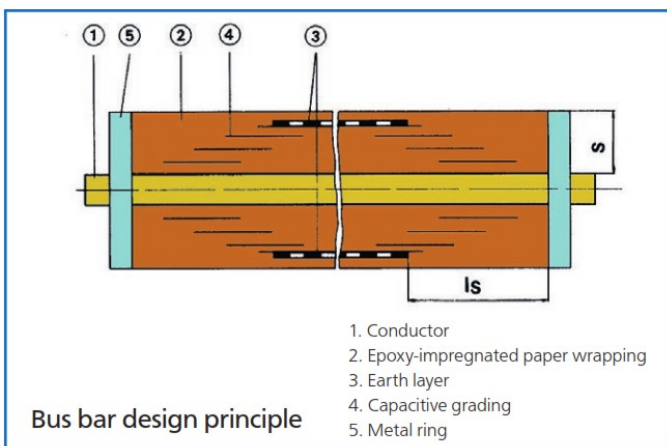
RITZ Service

- Minimized project engineering for YOU as customer due to complete engineering service for bus bar routing including fixation system as 3D CAD model.
- Providing complete Installation documentation
- Supervisor support on request available.
- Installation team on request available.



Bus Bar Design Principle

The bus bar insulation is built up with Resin Impregnated Paper (RIP). Crepe paper is wound around the conductor (copper or aluminium) and impregnated under vacuum with epoxy resin. This results in cavity free insulation which is free of partial discharge. To avoid partial discharge by delamination of the insulation from the conductor a conducting layer is wrapped around the conductor. Layers of insulating paper are built up on the high voltage layer according to the rated voltage. In these insulation layers the capacitive grading at the ends of the bus bars are included. These are dimensioned to reach an optimised electric field distribution on the surface of the bus bar. Thus a minimised grading length can be reached. Along the whole length of the bus bar, except the grading area, an earth layer is wound on the insulating layers. This earth layer is built up by semi conducting paper, aluminium foil layers and axial copper strips to reach a high short circuit current capability. A connection device is soldered on the copper strips used as earthing point of the bus bar. An additional three millimetres crepe insulation is applied over the earth layer as protection. After drying the insulation, the paper is impregnated with a low viscosity epoxy resin under vacuum conditions. The RITZ manufacturing technology permits to build a bus bar with any geometrical shape.



U_{max}	min. length of grading (l_s)	Insulation wrapping (s)
12 kV	175 mm	10,0 mm
24 kV	215 mm	12,5 mm
36 kV	330 mm	17,5 mm

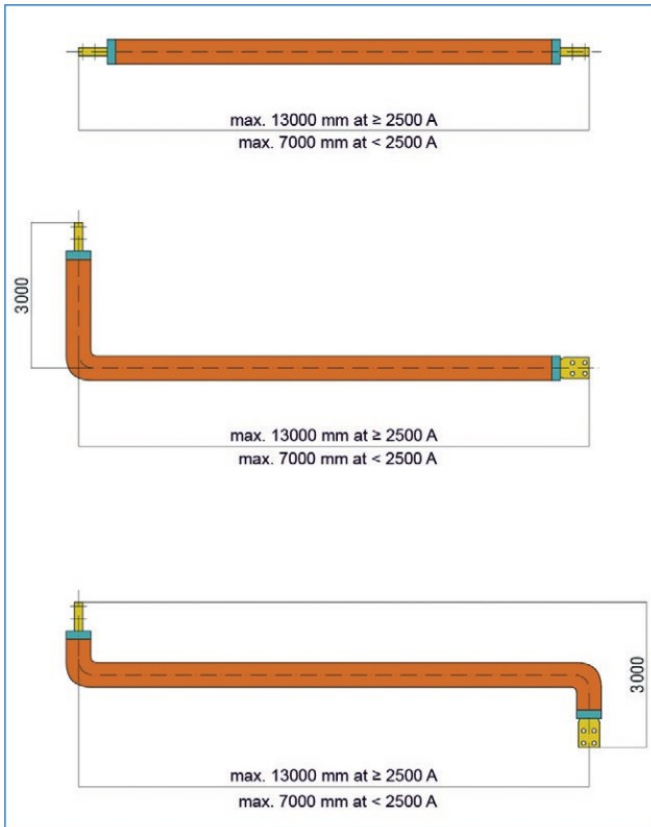
Outdoor Application

For outdoor applications the bus bar will be covered with a weatherproof stainless steel tube. To increase the creepage distance, the capacitive grading of the



Production Length

The length and geometric shape is limited by the size of the equipment (such as the kiln), the means of transportation and the local facilities (building construction). RITZ manufactures different bus bar shapes and lengths as show in the picture below.

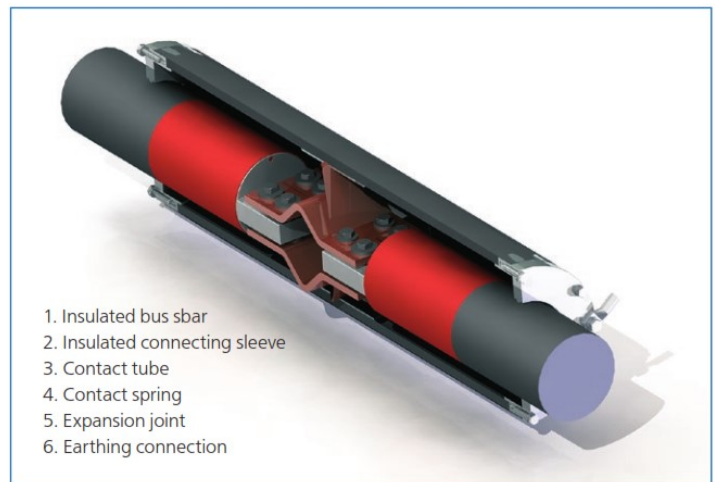


Multiple Bus Bar Connections

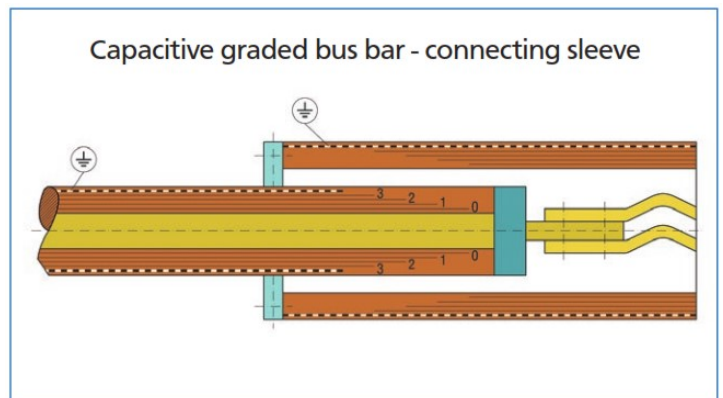
The length of the individual bus bars is limited by the manufacturing process, transportation and installation conditions. For complex installations the bus bars have to be connected. The connection is performed with flexible connectors between the bus bars to allow thermal expansion and to compensate for tolerances during installation.

These joints are fully insulated by connection sleeves, which cover the capacitive grading at the bus bar ends.

These connecting sleeves are also fully insulated and guarantee absolute safety upon contact throughout the whole length of the bus bar installation. For voltages above 12 kV the sleeves are also capacitive graded. The high voltage connection to the sleeve is realised by a contact spring installed on the flat connector of the bus bar. The connecting sleeve has an ingress protection class1 IP 54. Higher protection classes are available upon request. Outdoor connecting sleeves are manufactured with an aluminium or stainless steel protection tube. The sealing between bus bar and connecting sleeve is made by a rubber bellow and achieves the ingress protection class² IP 65.



The drawing shows the insulated conductor and the insulated tube. The capacitive layer of the bus bar and connecting sleeve are laid in the opposite direction which guarantees a homogenous electrical field inside the connecting sleeve.



1. Ingress protection rating against dust and water according to IEC 60529 corresponding to NEMA 3/3s.
2. Ingress protection rating against dust and water according to IEC 60529. A corresponding NEMA rating does not exist.

Certificate

Independent, accredited testing station - Member Laboratory of IFL and LONAC

TEST REPORT

NO. 122821313940845

Client: Ritz Instrument Transformers GmbH
Wandsbeker Zollstraße 92-98
22041 Hamburg
GERMANY

Manufacturer: Ritz Instrument Transformers GmbH

Test Object: Fully insulated busbar 55 36 - 1250A

Type: Busbar 55 36

Serial No.: 13/202171948/51/74 (L1)
13/202171948/52/75 (L2)
13/202171950/53/76 (L3)

Parameter	Value	Rated Characteristics Given by the Client
Rated voltage	U _i 36 kV	
Rated normal current	I _n 1250 A	
Rated frequency	f 50 Hz	
Rated short-circuit power-frequency withstand voltage	U _s 80 kV	
Rated lightning impulse withstand voltage	U _i 190 kV	
Rated dynamic current	I _d 54 kA	
Rated thermal short-time current	I _t 25 kA, 3 s	

According to client instructions and on the basis of IEC 60137: 2008-07

Normative Document: IEC 60137: 2008-07

Range of Tests Performed:

- Dielectric routine tests before all other tests
- Dry lightning impulse voltage withstand test (BU)
- Temperature-rise test
- Measurement of impedance
- Verification of thermal short-time current withstand
- Dielectric routine tests after all other tests

Date of Test: 03 January to 30 January 2014

See Sub-clause 10

Test Result: **OK**

IPH Berlin logo and signatures of Rüdiger Borchert and Jörn-Robert Wittmer.

Test Report by IPH Berlin

KEMA Page 3 of 3

TEST REPORT 2017198-01-QUAIND

Applicant: SIS GmbH
Schiedweg 4
B-2850 Boorn

Application date: 2004-02-09

Order Number: 2017198-QUAIND

Subject: LCV-voltage and medium voltage busbar trunking system

Trademark: Debnair

Types: LA, LB, LC, DH, PH and MH (ports and lengths only)

Amhem, March 31, 2004

Manufacturer Production site: Elscom B.V., Schiedweg 4, B-2850 Boorn, Belgium

Test Requirements: IEC 60529:2001 Ed. 2.1

Conclusion: The products comply with the specified requirements.

Tested by: H.L. Schenck

Checked by: H.H.M. Barrens

Enclosure: 2 Pages general and description of test results
3 pages with drawings

HLB/oo 0373-04

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Type Test Certificate by KEMA

Success Story

NO	Project Name	Customer	Market Application
1	PLTP Lahendong Unit 5 & 6	PT. ReKayasa Industri	Power Plant
2	Lombok GECC Power Plant (Peaker) 130-150MW	PT. PP (Persero) Tbk	Utility