



MOSER GLASER

Current and voltage – our passion



EXPERTISE

Your independent
busbar and bushing supplier



MOSER GLASER

Current and voltage – our passion

Expertise

Swiss quality combined with global experience



Preface

MGC's know-how and expertise are based on the RIP insulation (resin impregnated paper), which was invented by MGC. In this area we have a remarkable experience because we have been using this method since 1958. This type of insulation offers numerous advantages: free choice of positioning, no partial discharges with the voltages used. Therefore this insulation is especially indicated in the area of fully insulated busbars for medium and high voltages and with high current. Hence MGC is the uncontested expert in this field.

Our technology is also boosting in the bushing sector: wall bushings as well as transformer bushings. Based on this experience MGC is a well-known and appreciated player.

Thanks to the size of our company we can offer a high reactivity, and our independence explains our large clientele.

This booklet not only illustrates our know-how, but also the various applications and the different handlings according to the technical environment.

We hope you will find a lot of interesting information in this brochure.

Oliver Härdi
CEO

Peter Schreiner
Sales Manager

MGC - a century of electro-technical tradition

- 1914** March 19, Moser-Glaser & Co. was formed, situated in the city of Basle.
Main business: development, production and marketing of small transformers, up to 4 kVA
- 1921** Birth year and first supply of new developed 8 and 15 kV power transformers
- 1922** First delivery of dry type instrument transformers for indoor application for the Swiss railway company, 15 kV & 66 kV
- 1939** May 2, a joint stock company was formed and renamed Moser-Glaser & Co. Inc.
- 1944** Development of porcelain insulated voltage transformers
- 1946** December 20, factory moved from Basle to the new location in Muttenz
- 1947** Major break through in the field of insulation materials: first delivery of 20 kV epoxy cast resin insulated instrument transformers, SILESCA®, completely developed by MGC. Manufacturing of 500 & 1000 kV test transformers and 380 kV oil isolated voltage transformers
- 1958** Birth year of the insulation material, DURESCA®, based on the RIP (resin insulated paper) technology
- 1990** New SF6 insulated busbar system, GASLINK®, was developed and produced in co-operation with Siemens
- 1996** Moser-Glaser developed a new partially insulated busbar system, TIRESKA®
- 2001** Take over by the company PFIFFNER Instrument Transformers Ltd., Hirschthal, Switzerland
- 2004** Birth year of the TRAVESKA® Transformer-Bushing product line
- 2005** New company facility and production plant in Kaiseraugst, Switzerland
- 2008** Extension of manufacturing plant in Kaiseraugst to total 3350m² workshop floor space
- 2010** Introduction of 245kV feedthroughs.
- 2013** Record year shortly before the 100th anniversary with a turnover of over CHF 29 million.
- 2015** Swiss franc shock stops further expansion.
- 2016** Planning of a new execution factory with 550kV laboratory and parking garage on the existing parking area.
- 2017** Implementation of the new building with additional investments for
2 new laboratories, expansion of test transformer to 850kV, new surge system 2200 kilovolt
Fully automatic feed-through winding machine up to 6.5 meters
Large silicone press
New milling center and new turning center with chuck passage up to 360 mm for the 550 kV feedthroughs
multi-storey car park with 150 parking spaces
Planning of new kilns and procurement

Summary

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Expertise of MGC Duresca® busbars

Vacuum impregnated and dried creep paper with cycloaliphatic resin (called RIP), has been used more than 50 years in the DURESCA® busbars and bushings in applications all over the world. MGC Moser-Glaser invented this technology in 1958 and has the longest experience in the field with this material.

The successful RIP applications of busbars show that we have also to compete with other possible designs. The main difference concerns the protection of the RIP body. The other possible ways consist in a heat shrinking hose instead of an effective protection tube as proposed by MGC. In case of outside applications, the shrinking hose has additionally to be protected with a metal tube, which builds an air gap between the surface of the busbar and the metallic enclosure. The air will condensate and will degrade the insulation properties. This is not the case of the Duresca® busbar system where the RIP body is always protected by a tube.

- Type DE with a corrugated polyamide which represents the major part of our deliveries
- Type DG with Cr-Ni steel which is used mainly for the higher diameters and where the polyamide tube is no more available.
- Both types are produced in the same way. There is absolutely no air gap between the RIP body and the protection which is filled at the end with pure resin.
- This tube has 3 main issues:
 - the best possible barrier against humidity and moisture ingress
 - to be an excellent mechanical protection
 - to offer with the Type DE , an additional creepage distance





1
GuD Linz / Austria 25m long in vertical position
No additional protection is needed for outdoor application.



2
72,5 kV EPCOR / Canada (Photo 2)
Duresca® in a H.V. application and in outdoor installation.



3
110 kV UW Kolin / Czech Republic (Photo 3)
Duresca®, the only fully insulated busbar system which is available in the H.V. level, till to 170 kV.

Type DE with a corrugated PA polyamide tube.

The chemical composition of this polyamide was specially developed for MGC more than 25 years ago. It is very important to grant the best possible behaviour against weather in exposed outdoor situation and this for a long time period. This is supported by a testing in 1993, in an independent laboratory, according to ASTM D2565 standard, for more than 5000 hours, with excellent results.

This protection tube offers highly UV stability.

The material is also self-extinguishing, free of halogen and phosphor and was tested according to IEC 60332-3 and DIN 50266-2.

Relevant are the chemical properties:

- resistance to salt water
- resistance to mineral oil, fat, fuels, weak acids and bases, termites
- none sensitivity to fungus and mould or mildew

Earth layer

Also particular for the DURESCA® busbar system is certainly the earth screen in copper, embedded in the insulation and designed for fault current of 8 kA/1s in case of an exceptional insulation failure.



Preparation of the earth layer in production

Conclusion

The DURESCA® busbar system, with the highest level of quality allows a safe lifetime of more than 30 years. It is a compact design with reduced bending radius, designed for easy and fast installation, without maintenance.



Particularly adapted in very corrosive atmosphere like in offshore applications



KW Löbbia / Switzerland

Duresca® busbars and bushings under severe climatic conditions



- 60 °C



+ 50 °C

Temperature changes and their impact on busbar performances

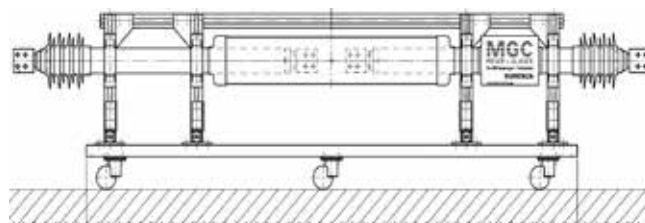
MGC carried out climatic tests in order to prove the excellent behaviour of its busbars in extreme climatic conditions. One test was performed by Hydro Quebec, Canada in the Laboratoire mécanique et thermomécanique on 2 insulated Duresca® busbars samples 17,5 kV and 2650 A.

Each of these 2 models consists of a set of 2 busbars, each with a silicone insulator at the extremity and connected by a sleeve.

These tests involved thermal cycling between +40 °C and -50 °C with a period of stabilization at each of these 2 temperatures.

At the end of each temperature stabilization period a current of 2650 A was circulated for a period of 2 hours. At the beginning of each temperature decrease the test objects were exposed to a spray of tap water.

During the tests 5 thermal cycles were carried out. These tests consisted of measurement of the dielectric withstand, capacity, dielectric dissipation factor ($\tan \delta$) and partial discharge intensity. Check of the bolt tightness (torque) of the flexible joint after completion of all other test. The busbars passed all of the tests successfully.



Low Temperature Test at -60 °C :

Wall bushing	72.5kV–1600A outdoor - outdoor
Transformer bushing	145kV–1250A
Busbar	24kV–1250A

This test was performed by the Institute of Electric Energy Systems and HV Technology – University of Karlsruhe (Germany). The equipments were placed in the climate chamber. Starting from ambient temperature (20 °C), the temperature was lowered to -60 °C for 68 h. This time is long enough to get thermal equilibrium in all parts of the test objects. The dielectric measurements were performed before and after the climatic tests. The equipments passed all tests successfully.

Duresca® busbars in Hydroelectric power plant



ABB AS, Power Technologies Division, Norway placed an order for two three-phase links between generator and power transformer for the power station in Hunderfossen. It is located in the middle of the tourist areas Hunderfossen and Hafjell, north of the town of Lillehammer. Hunderfossen power station is one of the most famous power stations in Norway. The power station is characterized by a dam of 280 m long above the Gudbrandsdalslagen river.

The 16 m high dam has ten spill gates with a flood diversion capacity of 3000 m³/s. The power station has an absorption capacity of 320 m³/s.

The power station is set up inside the mountain, west of the river. The water is discharged into the river about 2 km downstream. The power station has 2 Kaplan turbines with a total effect of 116 MW. In the period 2000-2002, both blade wheels were changed with the result of a notable increase in production.





Old Installation



After renovation

The scope of supply of MGC consists in the delivery of these 2 links between Generator 1 to Transformer 1 and Generator 2 to Transformer 2. Both are located inside the building.

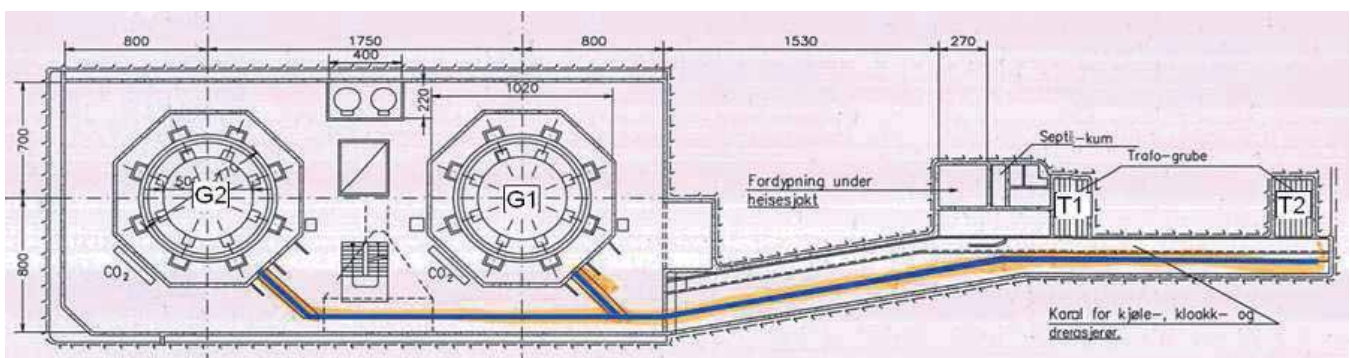
The main electrical data are:

- rated voltage : 12 kV
- rated current : 4000 A
- short time capability: 31,5 kA / 3 s

The total length of these 2 systems represents 315 m busbars, 36 bends and 30 connecting sleeves.

The fully insulated Duresca® busbars will replace an existing air insulated blank system. One of the reason is the increase of power and certainly also with the advantages of a fully insulated system.

As usual MGC will deliver the complete fixation and earthing hardware and all accessories like flanges and wall plates.



Duresca® busbars in Oil refinery



Naftna Industrija Srbije's (NIS) Pancevo refinery is situated in South Vojvodina, Serbia. The refinery, which began operations in December 1968 produces petrol, diesel, jet fuel and fuel oil.

Gazprom Neft hold 51% interest in NIS. Following the acquisition, Gazprom has planned to invest € 500m in upgrading NIS' processing facilities.

Siemens received a contract as part of Oil Industry of Serbia's strategy for modernizing the Pančevo oil refinery. That included:

- modernization of the jetty facility for loading/unloading the barges carrying petroleum products
- truck loading/unloading facility modernization mild hydrocracking complex and hydrofinishing (MHC/DHT) project
- 220/6kV high-voltage (HV) substation project including the busbars delivery.



A refinery is also characterized by an aggressive environment. The design proposed by MGC is particularly well adapted to such applications:

- DE type with its corrugated polyamide protection tube which offers highly UV stability and weather effect resistance. This material is also self-extinguishing, with excellent chemical properties, resistance to mineral oil, fat, fuels, weak acids and bases.
- DG type with its Cr-Ni steel or aluminium, both painted which given their characteristics, propose an excellent behaviour.





Busbars through the wall



Busbars through the wall



Transformer connection



Fully Insulated Connecting Sleeves

MGC delivered DG and DE types of busbars for this refinery both can be installed in indoor as well as outdoor location.

- DG type, 12kV and 4000A, and about 300m
- DE type, 12kV and 3150A and about 250m

The installed links consist in a connection between two transformers and the related switchgear



DG Type 12kV / 4000A and DE type 12kV / 3150A

Duresca® busbars in gas and steam turbine power plant



On behalf of KAM (Kraftanlagen München), Elpro GmbH Berlin placed an order with MGC for producing and fitting busbars for the power plant GuD-Linz in Austria.

Scope of supply:

- 1 link from the steam turbine to the power transformer:
12 kV - 3750 A and a total length of 380 m busbars
- 1 link from the steam turbine to the switchgear:
12 kV - 3750 A and a total length of 80 m busbars
- 1 link from the gas turbine to the power transformer:
12 kV - 4500 A and a total length of 310 m busbars
- 1 T-off link to the auxiliary power transformer:
12 kV - 630 A and a total length of 15 m busbars

The fitting took three months in total. The altitude in which the assembling took place was remarkable: the fitters had to be free from vertigo since they had to work in 25 m altitude! Moreover our on-site collaborators were in charge of material supply and also logistics.

The project's success was mainly based on the smooth cooperation of our various departments, such as design, production and assembling team.



MGC disposes of the necessary capacity, experience and expertise to carry out successfully such large projects.



Duresca® busbars in use at the power plant Gud Linz

Duresca® busbars in gas turbine power plant



PPC Bratislava / Slovakia, in line with an upgrading of a gas turbine power plant, are using a Duresca® fully insulated busbar system for the connection between generator and switchgear, and switchgear to the power transformer.

A large part of this run is located in an outside situation. Therefore and thanks to its standard protection tube which covers also the exposed outside application, the choice of Duresca® busbars is particularly appropriate.

The nominal generator power of 68.24 MVA leads to a design current of 4000 A under a voltage rating of 17.5 kV. The corresponding short circuit capability is 63 kA during 1 s.

The scope of supply incorporates

- 63 individual busbars for a total length of 485 m
- about 100 bends
- 57 sleeves
- and what is a tradition by MGC, all the necessary hardware for the fixation, earthing and relevant accessories

MGC disposes of the necessary expertise to handle successfully such large projects.



Duresca® busbars in a pumped storage hydro power station



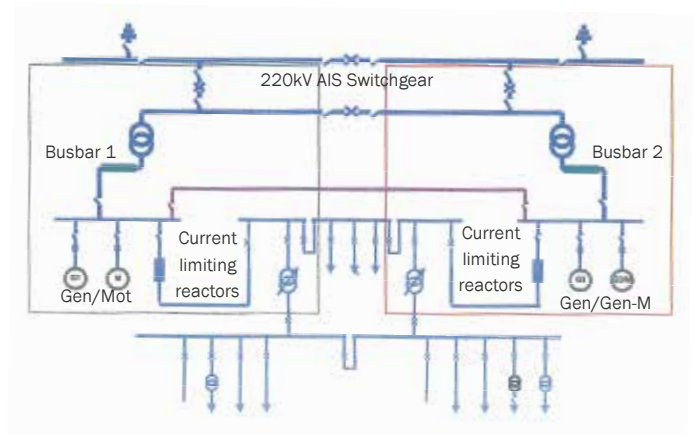
The increased demand for renewable electricity leads utilities to exploit more and more the existing hydraulic resources. Some countries like Switzerland are, with all the beautiful mountains, favoured. A good example concerns EWZ (Elektrizität Werke Zürich) who decided to renew an important pumped storage plant, KW Löbbia.

To ensure a better reliability of the electricity production a second power transformer 220kV was installed and as consequence the electrical substation was completely redesigned. This ensures the redundancy of the power station.

MGC was awarded with the complete busbar supply, between 3 generators, switchgears main transformers and auxiliary transformers.



Outside view of Löbbia substation



The main electrical data are:

Rated voltage: 17.5kV

Rated current:

between Generator to Switchgear: 2650A

between Switchgear and Transformer: 2900/4100A

between Switchgear and current limiting Reactors: 1050A

between Switchgear and Pump: 1750A

Short time capability: 50kA / 3s

Installation altitude: 1500m

Design temperature: -40....+40 °C

The complete scope of supply represents 1350m busbars. As common practice, all the fixations and earthing hardware are included. Also part of this supply, 33 VT's and 48 CT's manufactured by Pfiffner.



Current Transformer

Voltage Transformer



Connection to the switchgears



Current and voltage – our passion



Connection to the current limiting reactors



1350m of busbars have been installed

Duresca® busbars in renewable energy: Solar power station



The Solar Millennium, one of the largest solar thermal power plants in the world, has begun the development on the 50 MW Andasol 3 plant in southern Spain for completion in 2011. Situated on the Plateau of Guadix in the province of Granada, Andasol 3 is the third of the Andasol projects using parabolic trough technology and also the first in Europe. The Name of Andasol is a combination of Andalusia and Sol (sun in Spanish).

Andasol 1 is grid connected, having been officially inaugurated, while Andasol 2 is in the test phase. Each of the 3 plants will feature a collector surface of 51 hectares and will reach an output of approximately 170 GWh per annum. Each plant has a gross electricity output of 50 megawatts. Because of the high altitude (1100 m) and the semi -arid climate, the site has exceptionally high annual direct insolation.

Andasol has a thermal storage system which absorbs part of the heat produced in the solar field during the day. Each heat reservoir consists of 2 tanks measuring 14 m in height and 36 m in diameter and containing molten salt. This allows the plant to generate electricity for almost twice the amount of hours as a solar plant without the storage system.

UTE Andasol placed an order with MGC for the Duresca® fully insulated busbars and the corresponding fitting. MGC has the experience and expertise to carry out successfully such important projects.





The use of the Duresca® in this solar power plant corresponds to a typical application of fully insulated busbars system:

- to connect the generator to a power transformer and that via a switchgear
- to feed the auxiliary transformer from the switchgear

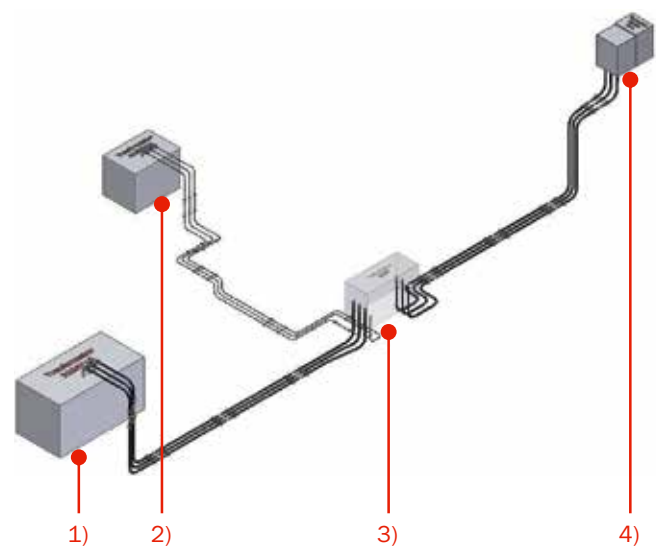
Also the electrical data justify the use of Duresca® busbars:

- main link from generator to the power transformer: 17,5 kV, a rated current of 3500 A and a short circuit capability of 63 kA 1 sec.
- link to the auxiliary transformer: 17,5 kV, a rated current of 800 A and the same short circuit capability of 63 kA 1 sec.

The scope of this order incorporates:

- approx. 300 m busbars system length for the main link of 3500 A rating
- 100 m for the connection of the auxiliary transformer
- as usual all the fixation hardware, fire wall plates, earthing cables
- and the complete assembling

A distinctive advantage of the Duresca® busbar system is certainly the fact that no additional protection is needed in case of an outdoor installation and for this project the major part of the busbars are installed outside.



- 1) Generator connection
- 2) Auxiliary transformer
- 3) Circuit breaker
- 4) Power transformer

Duresca® busbars in renewable energy: Geothermal Power Station



Recent supply of MGC, the Geothermal Hellisheidi Power Station started its operation in 2006 and is actually the second largest geothermal power plant in the world, 213 MW in electrical energy, biggest in Iceland. This plant is situated in the city of Hengill, an active volcanic ridge in Iceland, South West of the country.

Orkuveita Reykjavíkur is its owner. Once completed the full capacity of this plant, the Geothermal Hellisheidi Power Station will be the largest of the world with 300 MW in electricity and 400 MW in thermal energy.

The installed capacity includes 4 turbines with 45 MW and 1 turbine with 30 MW, all in operation. This plant started its operation with just 1 turbine with 40 MW and 1 with 45 MW; in 2007 received 1 more turbine with 30 MW and, in 2008 added 1 turbine with 40 MW and 1 with 45 MW. In 2010 this disposition was reviewed to get the current capacity.

This plant is combined with heat and power plant. The purpose is to meet the increasing demand for electricity and hot water for space heating in the industrial and domestic sectors.

The region covers 112 square kilometres and is one of the most extensive geothermal areas in Iceland.

The Orkuveita Reykjavíkur supply heating, water and electricity for more than 50% of Iceland population, and due to this reason needs a safe partner to supply them quality equipment. MGC is the best partner for these applications, because we have top quality products, a specialized technical team to give support on design and after sales services, and may deliver its systems in a short time.





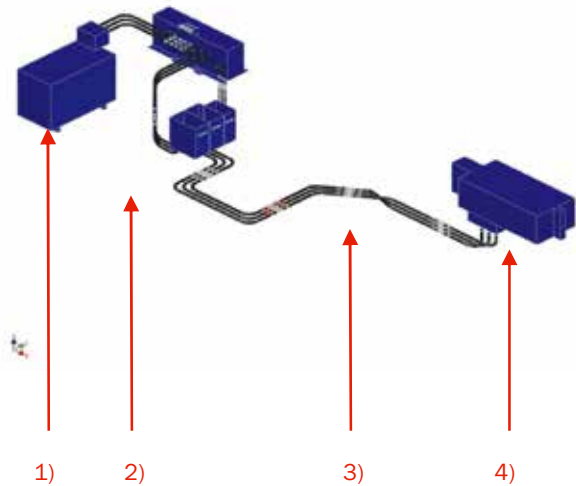
Electrical data and Duresca® Busbar use:

- main circuit connecting power transformer—generator—switchgear: 17.5 kV, rated current 3150 A, short-circuit capacity 40 kA 1 sec.

- auxiliary circuit: 17.5 kV, rated current 1250 A and the same short-circuit capability 40 kA 1 sec.

The scope of this supply:

- 270 m of DURESCA Busbar in 17,5 kV 3150 A
- 90 m of DURESCA Busbar in 17,5 kV 1250 A
- as usual, complete set of supports, earthing systems and bends
- assembly supervision service



1) Power transformer connection

2) Auxiliary transformer

3) Switchgear

4) Generator



Duresca® busbars for a link between gas turbine and generator



ABB Energi & Industri A/S, Denmark, placed an order for two threephase generator links for the Power Plant Mongstad CHP of the DONG Generation Norge AS, Norway. Each of them connects a gas turbine generator with a power transformer. In addition to that the power supply of the excitation transformer is connected by a T-off sleeve.

Technical data of the busbars

- 24 kV and a max. current of 7000 A for the main busbar
- 24 kV and 1000 A for the derivation to the excitation



A part of the installation is an outdoor service (transformer). The delivery also comprised a metal framework of 7 m. MGC delivered the required protection boxes for the generator side as well as for the transformer side and a fire wall plate was also supplied.

This is where the fully insulated Duresca® busbars offer an ideal solution for a high voltage application for indoor and outdoor service.

Advantages of this solution

- Little space is required
- Smallest possible arc radius
- High short-circuit strength
- Fully insulated busbar system
- Natural cooling

Transformer Side

Generator Side



Connection to the auxiliary transformer

Expertise in offshore applications: Why the fully insulated Duresca® busbars are particularly indicated

The application of Duresca® busbars makes sense on offshore platforms, because they meet the requirements of a rough environment and limited space. Furthermore they allow to decrease the cost of platforms and to facilitate the assembling.

Structural saving

The reduced bend radius allows, in comparison to cables, an optimization of the run. This reduced space requirement leads to a possible reduction of the structure dimensions and as a consequence to substantial economy.



Installation process

The use of connecting sleeves authorizes an optimized split in the run and therefore simplifies, in comparison with cables, the assembling of the busbars run. A simplified assembling saves money and time.



Corrosion aspects from saline offshore environment

The severe conditions bound with the saline environment need an adapted solution regarding the choice of the exposed materials. Fixation hardware is in a particular quality of stainless steel, special fastening clamps are not in aluminium as usual and what is to be noted, is the excellent behaviour of the protection tube in polyamide which represents also a strong barrier against moisture ingress as well as a mechanical protection of the busbars. These are decisive pre-conditions regarding corrosion given in the harsh sea environment.

Duresca® and Tiresca® busbars for Marine application

The Duresca® and Tiresca® of MGC have been successfully certified by the Marine division from Bureau Veritas and find application in ships.



Jewel of Sea is equipped with Duresca® busbars

Duresca® busbars in renewable energy: Offshore Wind Farm



Siemens Power Transmission UK placed 3 orders with MGC for a delivery of Duresca® Busbars and for the corresponding supervision during the assembly work.



Offshore wind farm Greater Gabbard, which is one of the world's largest offshore wind farm projects. The delivery contained 9 typical three phase MV sets, connections between switchgears and transformers. The order consisted of 36 kV, 2000 A and a total length of 710 m busbars.

Offshore wind farm Thanet with the same application, connections between switchgears and transformers. The delivery consisted of 36 kV, 2000 A and a total length of 206 m busbars.

Offshore wind farm Gwynt y More, this project consisted of 36kV, 3150A and a total length of 260m



MGC is also in the position to provide adapted solutions in the particular sea environment. Fixation hardware in stainless steel - special fastening clamps not in aluminium as usual - and an excellent behaviour of the polyamide protection tube are decisive pre-conditions regarding corrosion given the harsh sea environment.



Offshore wind farm Greater Gabbard



Duresca® busbar in the industry



LG Display, a worldwide reputed manufacturer of flat TV monitors, is producing the panels in South Korea. Up to now the MV Energy supply from the main power transformer to the switchgear was realized with air insulated busduct systems. To upgrade and ensure the power supply for the production line of the panels they took the decision to use a fully insulated Duresca® busbar system:

- Duresca® can be installed outdoor as well as indoor
- Thanks to the protection tube there is no risk of humidity and moisture ingress, which guarantees a long lifespan of the system
- No condensation, no heater is needed
- Maintenance free
- Natural cooling
- Single solid insulated phases
- Phase crossings are possible
- Plug in solutions for switchgear connections
- Vibration resistant

This order consists in the delivery of:

- one three phase set of 24 kV and 3150A busbars.
The system length consists of 325 meters
- the delivery was effective in February 2010

MGC disposes of the necessary capacity, experience and expertise to carry out successfully such projects. And this project's success has led to a new order from LG Display for a new extension on the same substation.



Phases crossing

High Voltage application for Duresca® busbars in Canada



EPCOR Transmission Inc., our end customer has selected MGC Duresca® busbars for the renewal and expansion of the Victoria terminal substation.

This substation is used for energy supply of Edmonton, Alberta. The entire project represent CAN \$ 54 million.

MGC Duresca® busbars are intended for coupling the two separation systems.

MGC has provided 285 m, 72.5kV and 3150A Duresca® busbars.

The use of these rails will be used under severe climatic conditions, from -50 ° C to + 40 ° C.



Replacement of GIS equipment by Duresca® Busbar 145 kV and 1250 A Ecological and Maintenance Free!



The PEPCO (Potomac Electric Power Co.), an utility company in USA, reviewed its old substation located at downtown Washington's Chinatown last year. This substation was 40 years in operation and this period is the common life time of a normal substation equipment. The main equipment, a regulating transformer, a special kind of transformer, is responsible to regulates the flow of electricity in the District of Columbia and parts of Montgomery County, Md. The replacement transformer needed two years to be delivered at the site. This new equipment makes the same job as the old one, but the new one has several devices to make the supervision in the transformer operation.



To follow these technological improvements and to keep this substation full time in operation without fails, PEPCO installed DURESCA® bus bars in this substation.

DURESCA® is the perfect solution for saving space, connecting GIS equipment, keeping the complete system in operation with free maintenance and getting a long life time. DURESCA® may be installed in outdoor or indoor areas without additional protection, because itself is already protected by a polyamide tube which prevents the action of UV rays, humidity and pollution.

This specific installation is for 145 kV fully insulated and touch safe. The insulation for this high voltage level is guaranteed by the RIP (Resin Impregnated Paper) technology applied at DURESCA® bus bars. The DURESCA® bus bar system is a compact design and guarantees a safe area for the employees of the substation.

DURESCA® bus bars are factory tested individually to ensure the perfect operation of the complete system. There are many details in DURESCA® bus bars to guarantee just one thing: keep your system in operation.



Substation with existing old GIS equipment:



This old solution presented a lot of problems in the PEPCO substation, including leakage of the insulating gas. A quick view at the pictures above may show potential leakage points in the installation.

To ensure the reliability of the reviewed substation, now with the new regulating transformer, PEPCO decided to install the DURESCA® bus bars instead of gas insulated system. This system is composed of "eco" dielectric materials, such as compressed papers and naturally occurring resins, which are viewed as more environmentally friendly. The combination of increase reliability, resources maximization and reduced environmental impact is good news for long-term goals of constantly improving reliability. In this way, DURESCA® solution is beyond as alternative bus bar system in the market because it may keep the advantages of GIS solution as compact dimensions and correct regular problems of GIS bus bars as leakage and high cost for maintenance.

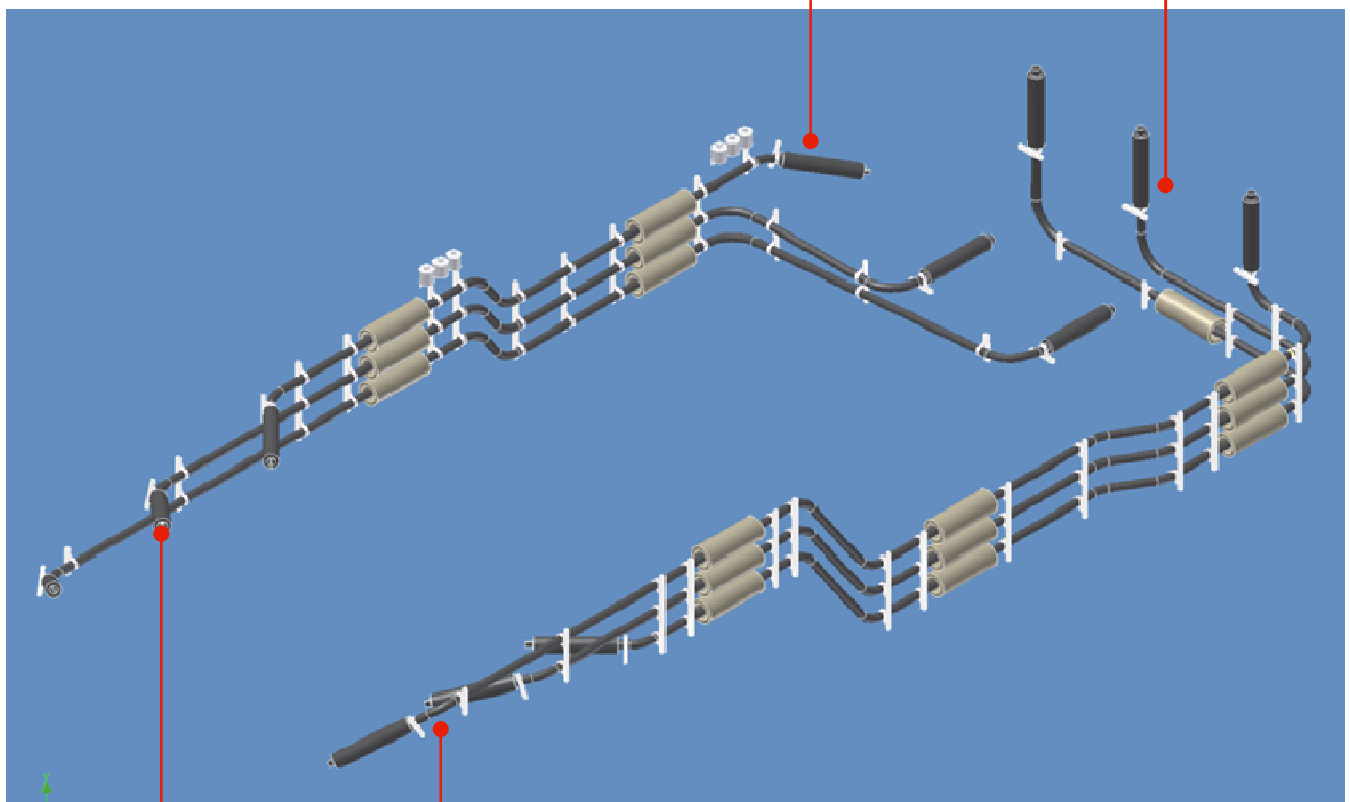
Scope of MGC Moser-Glaser equipments (1st step of Project):

- 168 meters of bus bars
- 16 pieces of sleeves
- 12 pieces of flexible connectors
- Support material
- Earthing material of the system
- Complete set of accessories to assembly the system
- Installation works
- All documents and drawings for assembly



Outgoing line disconnector termination

Incoming line cable termination



Connection to the regulating transformer

123 kV H.V. Duresca® busbar in a test laboratory



Duresca® is the only fully insulated busbar system which is available in the H.V. level, up to 170 kV.

A typical high voltage application

- The supply of a test laboratory for power transformers

Siemens and KONCAR produce in Zagreb, in Joint Venture, power transformers above 100 MVA and for voltages up to 420 kV. A new test facility is now in service. The infeed of the energy was realized with Duresca® busbars. Thanks to reduced bending radius, the choice of fully insulated busbars was particularly indicated given the limited space and the compact configuration of the installation.

The connection is a typical outside/inside application. With the exception of the protection of the external arcing distance with silicone insulators, no particular precautions have to be taken with Duresca® busbars.



The electrical data of this link are a max. voltage level of 123 kV, a rated current of 2000 A and a short circuit capability of 40 kA / 4s.

The scope of this order incorporates

- approx. 260 m busbars
- 36 bends
- 33 sleeves
- and as common practice all the fixation and earthing hardware and usual accessories

Such an application demonstrates the know-how and expertise of MGC in the field of high voltage with fully insulated busbar system.



A classic Tiresca® application: protection against damages caused by small animals



In April MGC was informed that a marten had caused severe damage in KW Neurath - RWE (a power plant in Germany).

This damage provoked a short circuit on the MV busbars behind the power transformer between the phases, and led to an electrical arc and a fire. The whole system failed. This incident shows that a steel grid is not always sufficient to provide protection against small animals.



This is where Tiresca offers an ideal solution and makes a protection against small animals needless. The cable connection taps as well as the fitting of the current transformer are easy to carry out.

EDF (Electricité de France) has been successfully using Tiresca-systems for many years now. RWE (Germany) do also belong to our customers.

Tiresca contains the same protection tube as fully insulated Duresca busbars and can be used as well as for indoor as for outdoor services.

The problem of animals and branches penetrating in substations is globally known. That is where MGC provides the right solution with its Tiresca program.

DURESCA® Resin Impregnated Paper Transformer Bushing Oil to Air from 36 to 300kV

A better connections maker, Moser Glaser Company researched a way to increase the dielectric characteristics of the High Voltage equipments.

As a result we [MGC invented in 1958 the Resin Impregnated Paper technology](#).

With more than 50 years of experience in development of the RIP technology, MGC offers transformer bushings **DURESCA® from 36 to 300kV**

Take the best combination such as [RIP](#) with [silicone insulator](#)

- A dry type insulation suitable to be installed in position 0 to 90° from the vertical and no specific requirement during transport.
- [Maintenance free](#); No oil inside subject to leakage, or to be regularly checked.
- A [higher thermal stability](#) up to 120°C which increases the reliability during overload periods.
- The silicone insulator thanks to its hydrophobic characteristic has [excellent behaviour against pollution](#) and is particularly suitable for salty or cement environment.
- Weight reduced as well as flexible sheds, increase its tolerance to vandalism, or earthquakes. No risk of porcelain break during shipping or handling; [No collateral damage](#).



Specific to the MGC exclusive design:

- [Excellent mechanical properties, our complete range comply](#) with the class Heavy Load (level II) according to the IEC 60137-2008.
- Additional moisture barrier, MGC performs special long duration tests to prove the [excellent behaviour under wet condition](#) of its bushings.

DURESCA® have in standard a creepage distance of **31 mm/kV SCD** or **53.7mm/kV USCD** which corresponds to the very heavy level and withstand for ambient temperatures between **-40 to +40°C**.

MGC is your independent bushing supplier.

Key references



ABB Oy Vaasa, Finland



Starkstromgeräteebau,
Regensburg, Germany



Eskom, Contipower,
South Africa

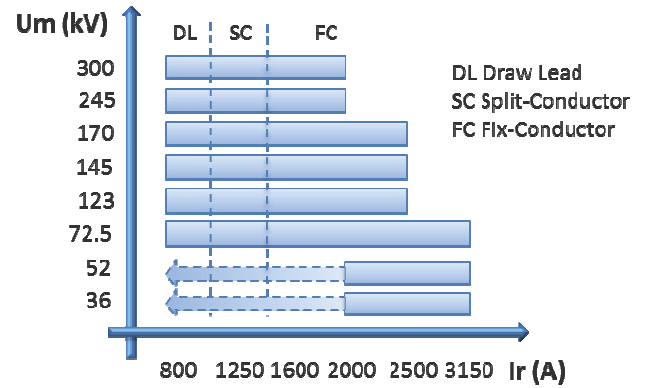


EnBW AG , Siemens Dresden,
Germany



RWE AG, Alstom Grid
Mönchengladbach, Germany

DURESCA® transformer bushings cover your needs for U_m from 36 to 300kV



The supply chain is simplified as the direct moulding operation is done in-house no need to supply an external component, Moser Glaser can offer [short lead-times](#) for its standard range of product.

In addition to our standard range, our design combined with our production process allow a wide flexibility and adaptability in order to provide [tailor-made solution](#).



Our factory comply with:

SN ISO 9001 : 2008

SN ISO 14001 : 2004

BS OHSAS 18001 : 2007

MGC boosts its Duresca® wall bushing product line



During the last two years MGC has been boosting its wall bushings product line.

This development was definitely favoured by the standardization of this product. As you have certainly noticed offers and drawings are made much quicker now. Our Duresca® Wall bushings catalogue shows the complete product range of 24 to 245 kV bushings.

MGC is also in the position to offer short delivery times since the whole manufacturing process is under total control including the production of silicone insulators.



Silicone insulator injection press



In order to cover all needs MGC provide one creepage distance, 31mm/kV SCD or 53.7mm/kV USCD which corresponds to the very heavy level.



Outdoor-Outdoor application



Indoor-Outdoor application



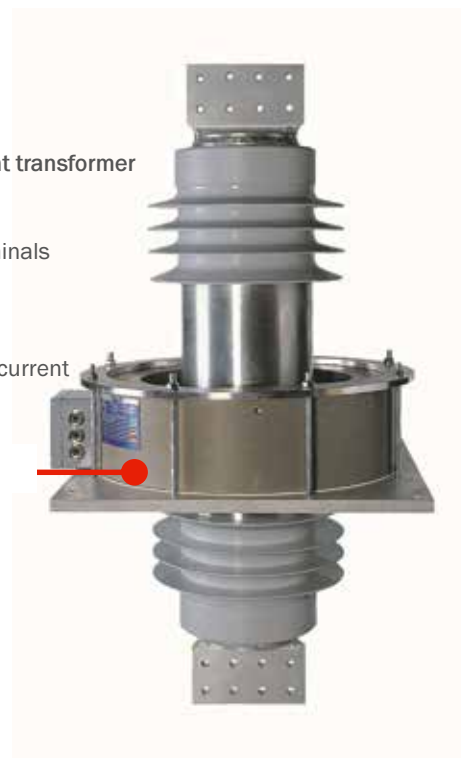
A large number of the bushings have also a current transformer.

The fact that MGC is part of Pfiffner Holding makes all this far easier. Our customers do not have to buy the transformers somewhere else, since MGC offers the whole device with an adapted flange.



Wall bushing equipped with a current transformer

- Several ratios possible
- Easily accessible secondary terminals
- Compact size
- Up to 4 cores
- Suitable for very high short-time current



Indoor - Outdoor bushing with PFIFFNER current transformer



DM2K Ur: 72.5kV Ir: 1250A,
Special bushings for rotating Disconnector



Tailor made solution with a special flange for a full interchangeable solution

Checklist for Duresca® busbars

Electrical data

Standard: IEC _____
 Rated voltage _____ kV
 Rated frequency _____ Hz
 Rated current _____ A
 Thermal short time current / Duration _____ / _____ kA / s
 Dynamic short time current _____ kA

Design: Busbar type

The electrical data and environmental conditions are determinant for the busbar design. Conductor with high electrical conductivity could be in aluminium or copper. According to IEC rules the surface temperature of the busbar cannot exceed 70 °C and is based on a max ambient temperature of 40 °C. Therefore if the design ambient temperature exceeds 40 °C, it is important to note it. The rated voltage, according to the IEC voltage coordination, leads to the dimension of the insulation thickness.

Site installation

Outdoor / Indoor / Outdoor & Indoor _____

The Duresca® busbars, thanks to its protection tube, which represents the best possible barrier against humidity and moisture ingress as well as mechanical protection, can be installed outside or inside without problems, only in case of AIS connection, the arcing distance has to be protected by silicone insulators or an adequate termination box.

Connections

Transformer

Location of the transformer _____

Generator

Location of the generator _____

Switchgear

Manufacturer _____

Type AIS _____

SF₆ _____

Oil _____

Layout

Total system length (Single phase x 3) _____ m

Total bends per system (Three phase) _____

Optional

Protection box Transformer _____

Generator _____

Switchgear _____

Wallplate (quantity) _____

Fire wallplate (quantity) _____

Fire wallplate (class) _____

Environmental Conditions

Max. ambient temperature _____ °C

Min. ambient temperature _____ °C

Altitude if higher than 1000 m _____ m



1) Humidity barrier: pure resin layer

2) Mechanical protection: PA tube

3) Conductor with high electrical conductivity:
Aluminium or Copper

4) RIP Isolation: fine graded capacitive layers



Transformer & box

Special requirements:

Checklist for DURESCA® transformer bushings

Electrical data

Standard: IEC IEEE FSK Other _____

Rated voltage _____ kV

Bushing Insulation Level

Lightning impulse withstand voltage 1.2/50µs (BIL) _____ kV

Dry power frequency voltage withstand (AC) _____ kV

Switching Impulse (SIL) _____ kV

Rated frequency _____ Hz

Rated current _____ A

Connections

Altitude < 1000m Other _____ m

Ambient temperature -40 / +40 °C Other _____ °C

Oil temperature 90 °C Other _____ °C

Creepage distance 31 mm/kV SCD or 53.7 mm/kV USCD

Cantilever test load Acc to the IEC 60137 class II

Seismic conditions

Angle of mounting 0-90° Other _____ °

Horizontal acceleration _____ m/s²

Vertical acceleration _____ m/s²

Design

Top terminal material



- Aluminium
- Copper
- Silver Plated Copper
- Tin Plated Copper

CT extension E



- 0mm
- 300mm
- 500mm
- _____ mm

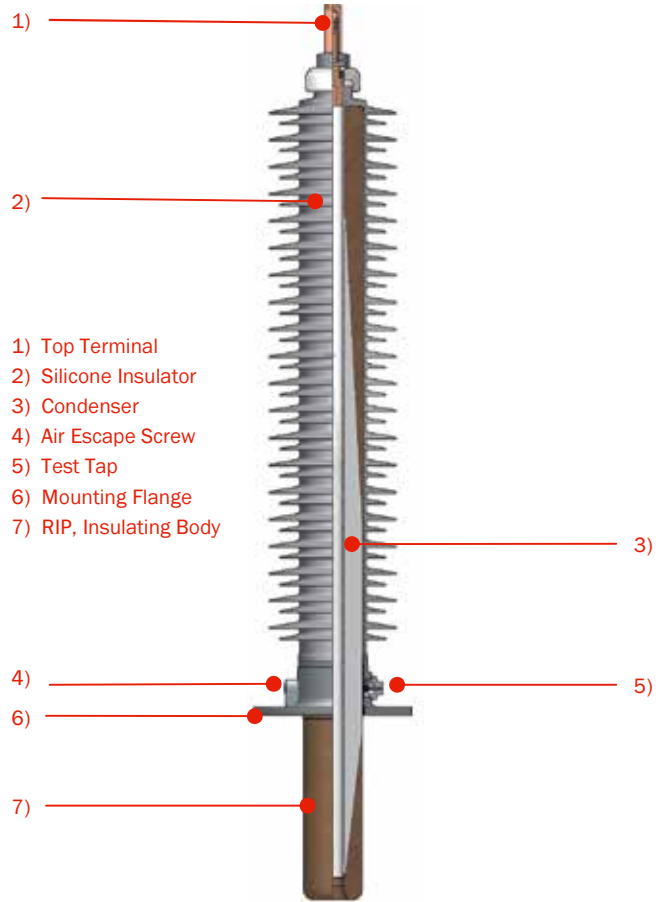
Arcing horns

- Yes No

Oil side shield



- Yes No



- 1) Top Terminal
- 2) Silicone Insulator
- 3) Condenser
- 4) Air Escape Screw
- 5) Test Tap
- 6) Mounting Flange
- 7) RIP, Insulating Body



Power Transformer equipped with MGC Bushings

Commercial

Company name: _____

Contact: _____

Phone number: _____

email: _____

Quantity: _____ pieces

Delivery Term :

EXW FOB DDU Other _____ Destination: _____





DURESCA®
Busbar systems



TIRESCA®
Busbar systems



GASLINK®
SF₆ insulatet busbar system



DURESCA®
Wall bushings



DURESCA®
Transformer bushings



MOSER GLASER

Current and voltage – our passion

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