MGC Expertise

Product range:

Duresca®

Busbar system

Duresca®

Wall bushings

Tiresca®

Busbar system

Travesca®

Transformer bushings

Gaslink®

Busbar system

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

Richard Unterseh
Sales Manager

one...

...team

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 bushings and busbars technology, **DURESCA®**, based on the RIP (resin insulated paper) technology

1990 New SF_6 insulated busbar system, **GASLINK®**, was developed and produced in co-operation with Siemens

1996 Moser-Glaser developed a new partially insulated busbar system, **TIRESCA®**

2001 Take over by the company **PFIFFNER** Instrument Transformers Ltd., Hirschthal, Switzerland

2004 Birth year of the **TRAVESCA®** Transformer-Bushing product line

2005 New company facility and production plant in Kaiseraugst, Switzerland

2008 Extension of manufacturing plant in Kaiseraugst to total 3350m^2 workshop floor space

Summary

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 builts 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 (Photo 1)

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 in case of an exceptional insulation failure.

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® busbar application in a 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.

The size of the order was important and it consisted of:

- **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 tee-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 and was finished in July 2009. 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.

Our busbars in use at the power plant Gud Linz

7000 A / 24 kV Duresca®: generator link from gas turbine

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 transformer
- Short circuit current 50 kA, 1s.

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

1) Secondary busbar 24kV - 1000A
Direction excitation transformer

2) T-Off sleeve

Duresca® busbar application in a 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.

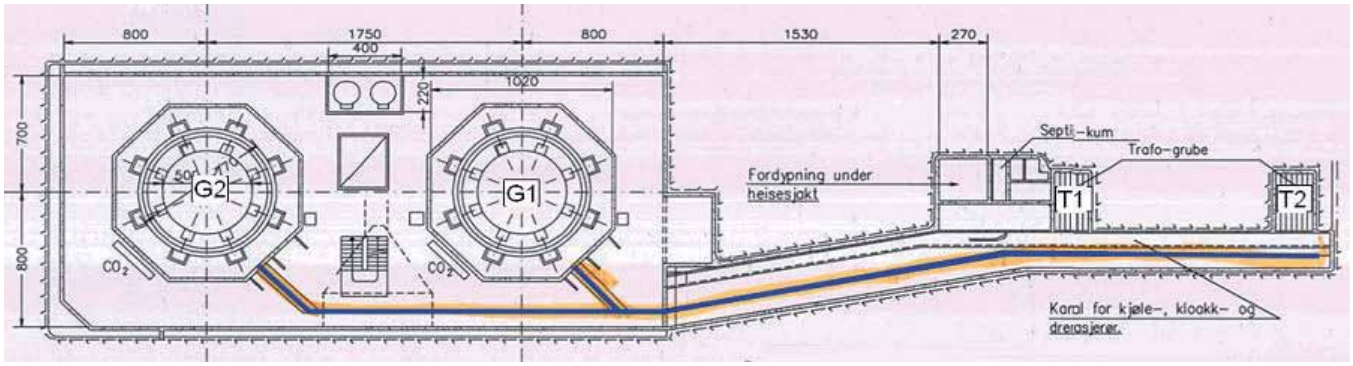
The main electrical data are:

- 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® busbar application in a 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 **Anda**lusia 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 insulation.

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

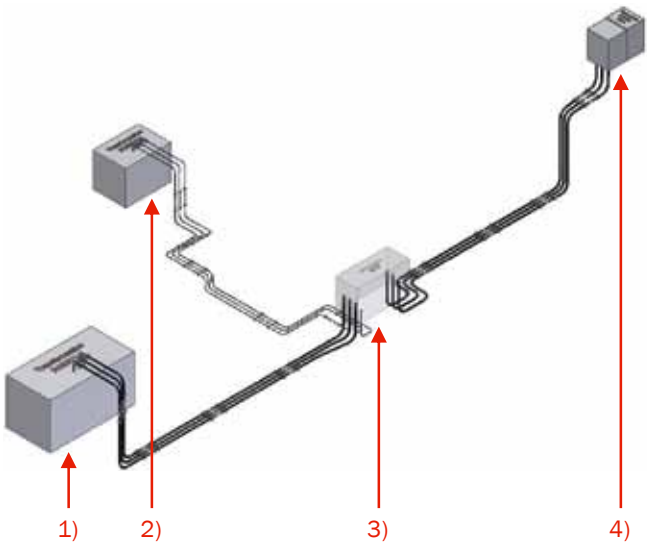
Also the electrical data justify the use of Duresca® busbars:

- 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® busbar application in a Geothermal Power Station

Recent supply of MGC, the Geothermal Hellisheidi Power Station started its opperation 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 opperation. This plant started its opperation 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 kilometers 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 produtcs, 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.

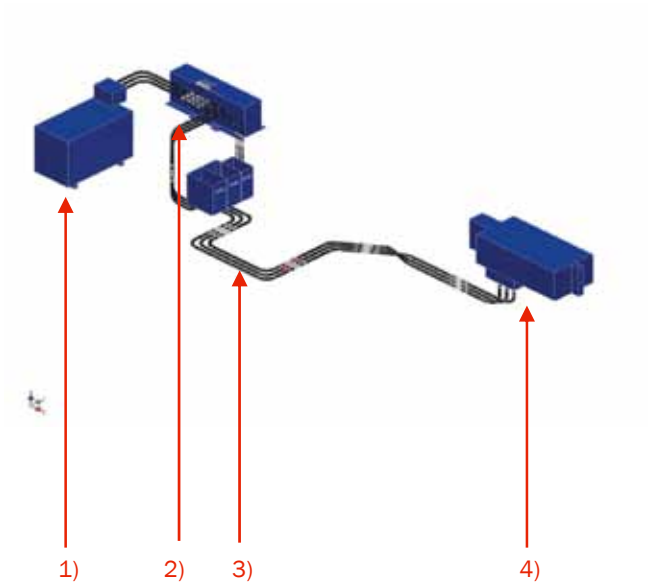
The scope of this supply:

- 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® busbar application 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.

123 kV H.V. Duresca® busbar application 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.

Duresca® busbar application in a gas turbine power plant

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

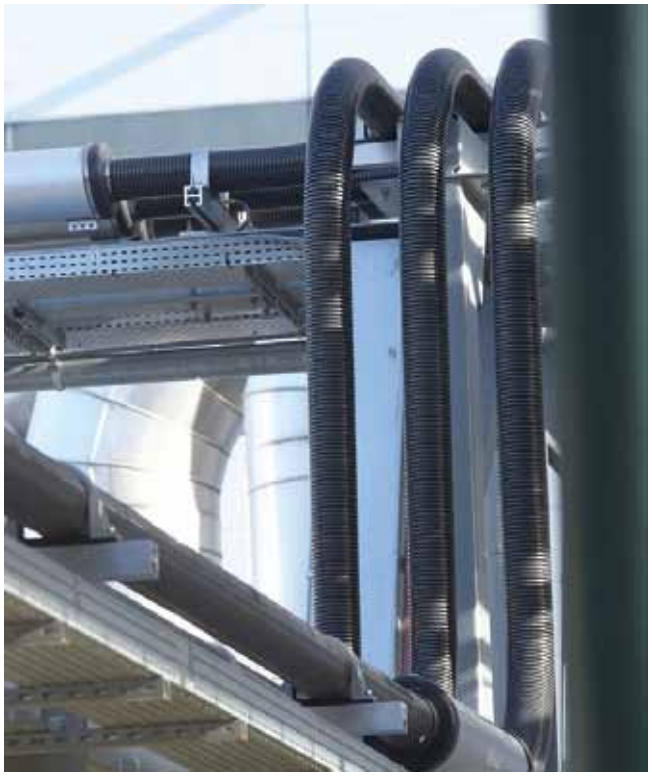
A large part of this run is located in an outside situation. Therefore and thanks to its standard protection tube which covers also the exposed outside application, the choice of Duresca® busbars is particularly appropriate.

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.



Application of Duresca® busbars and bushings under severe climatic conditions

Given the extreme climatic conditions in certain countries the application requirements can be very demanding. Therefore MGC carried out climatic tests in order to prove the excellent behaviour of its busbars and bushings.

On 2 insulated busbar samples 17,5 kV and 2650 A

This test was performed by Hydro Québec, Canada in the *Laboratoire mécanique et thermomécanique.* 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 temperatures of +40 °C and -50 °C with a period of temperature stabilization at each of these two 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 measurements of the dielectric withstand, capacity, dielectric dissipation factor (tan δ) and partial discharge intensity. The dielectric measurements were made before and after the climatic tests. Check of the bolt tightness (torque) of the flexible joint after completion of all other tests. The busbars passed all of the tests successfully.

- 50 °C

+ 50 °C

On a wall bushing 100 kV, 630 A for an outdoor - outdoor service

This test was performed by the Institute of Electric Energy Systems and HV Technology – University of Karlsruhe (Germany). The bushing was placed in the climate chamber. Starting from ambient temperature (20 °C), the temperature was lowered to -50 °C for 38 h. Then the temperature was raised to +50 °C, kept constant again for 38 h, thereafter lowered to -50 °C and so on. This bushing was subjected to 3 such cycles. The dielectric measurements were performed before and after the climatic tests. The bushing passed all tests successfully.

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

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

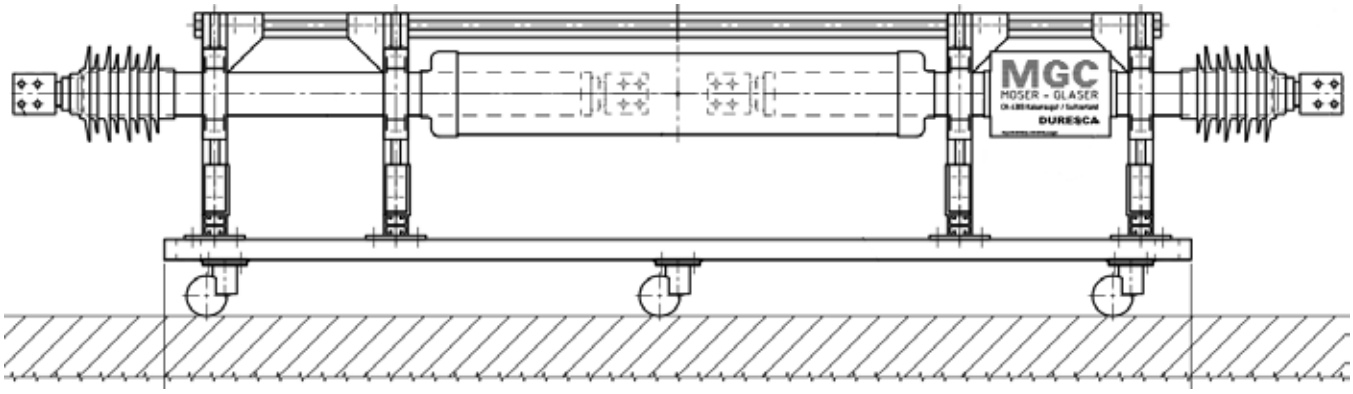
The severe conditions bound with the saline environment need an adapted solution regarding the choice of the exposed materials. Fixation hardware is in a particular quality of stainless steel, special fastening clamps are not in aluminium as usual and what is to be noted, is the excellent behaviour of 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.

Vibrations and the effect on the busbar installation

The Duresca® of MGC have been successfully vibration tested according to the requirements of Det Norske Veritas (DNV) and find application in ships.

Temperature changes and their impact on busbarperformances

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 δ) 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.



Experience

MGC delivered Duresca® busbars and assumed the supervision for 2 majors projects in the UK.

Offshore wind farm Greater Gabbard

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 switchgear and transformers. The order consisted of 36 kV, 2000 A and a total length of 710 m busbars.

Offshore wind farm Thanet

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

Duresca® busbar in a new application field: Offshore Wind Farm

In 2008, Siemens Power Transmission UK placed 2 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.

The use of fully insulated Duresca® busbars makes sense in offshore applications. The reduced bend radius allows, in comparison to cables, an optimization of the run. Furthermore it would be more difficult to install such connections with cables in view of the reduced space. Obviously the individual cost of the busbars may be higher than a cable solution, however the global pricing of an offshore installation should be positively influenced by a Duresca® installation.

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.

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.

MGC boosting its wall bushing product line

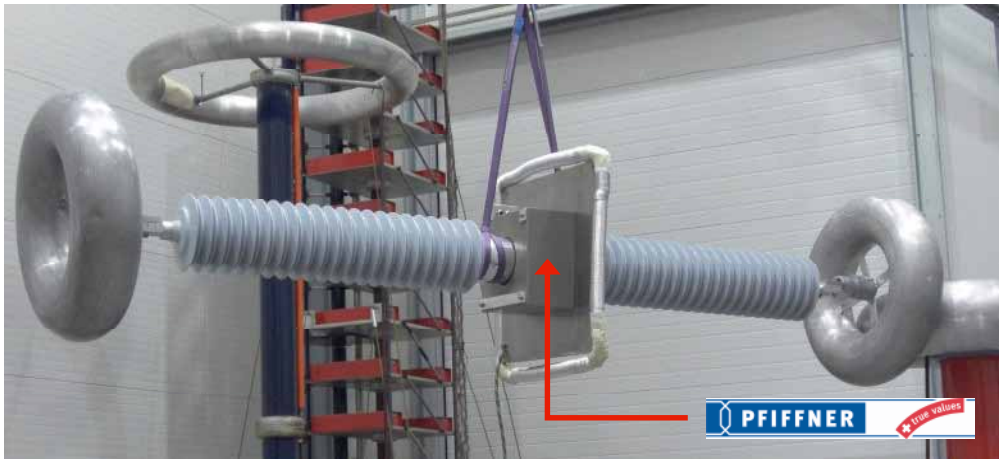
During the last two years MGC has been boosting its wall bushings product line. Between 2007 and 2009 the production was tripled.

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. Therefore MGC has invested in a new injection press. In order to cover all needs MGC proposes just one creepage distance, which is 31 mm/kV and corresponds to a very heavy pollution.

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.

Silicon insulator injection press



Outdoor - Outdoor bushing 123 kV with PFIFFNER current transformer

Your independent bushing supplier

TRAVESCA® 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 Travesca® **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.

Travesca® have in standard a creepage distance of 31 mm/kV which corresponds to a very heavy pollution (level IV) and withstand for ambient temperatures between -40 to +40°C.

Key references

ABB Oy Vaasa,
Finland

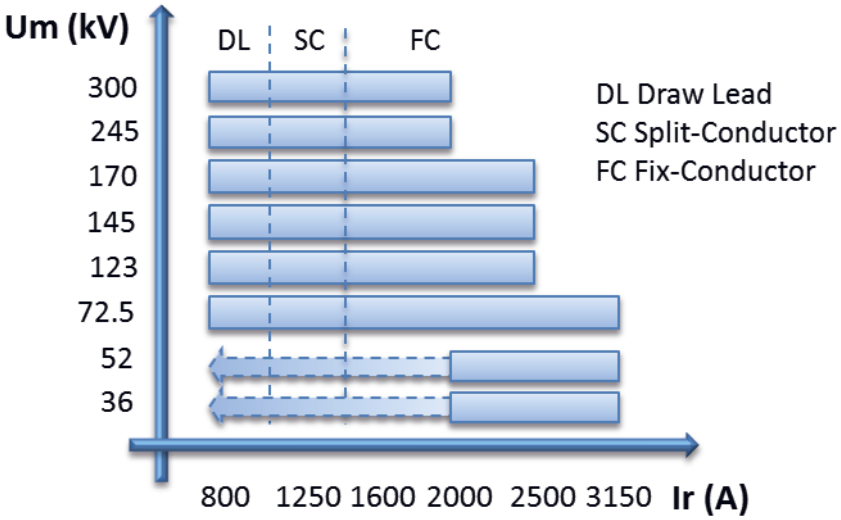
Starkstromgerätebau, Regensburg,
Germany

Eskom, Contipower,
South Africa

EnBW AG ,
Siemens Dresden, Germany

RWE AG, Alstom Grid Mönchengladbach,
Germany

Travesca® transformer bushings cover your needs for Um 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

Acknowledgements

Enrica Mahieu
for her assistence and linguistic talent

Denise Stalder
for her efficient organisation

Michael Wening
for his constant support and incomparable talent as illustrator

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 _____
SF_6 _____
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:

MGC
MOSER-GLASER

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ISO 9001
ISO 14001
OHSAS 18001
BUREAU VERITAS
Certification