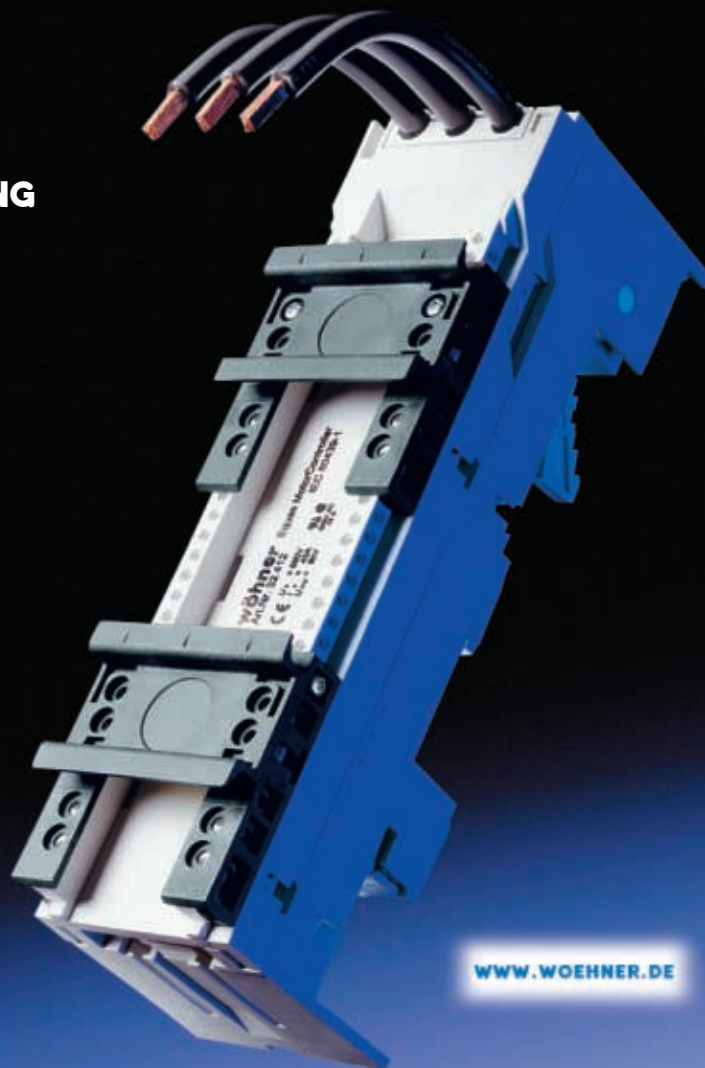


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Special

**Adapters for complete
motor circuits**

Hubert Lenker

Adapters for complete motor circuits

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Adapting switching devices and consumer circuits on busbars allows rationalization in switchgear and distributor construction. It also increases operating safety and availability of the systems for the operator.

Wöhner, a company located in Rödental, has pursued the system concept since the beginning of the 80s. They have consistently used busbars to establish direct connections between switchgear, device combinations and fuse outgoing terminals. The compact, clear layout of the units, ease of replacing entire circuits and the optimization of terminals are major advantages.

The range of components in the busbar/system technology area has been expanded considerably in recent years. Distributors carrying up to 2500 A can be constructed using triple T sections in the 60 mm busbar system. The power sources for this reach up to 75 kA short circuit current. This makes high demands of all components. DIN VDE 0100 part 430 [1] states the requirements under which the protecting device for overloading and short circuits can be repositioned in the circuit when the cross section is changed.

Overload protection is guaranteed by generously sized cross sections and high temperature resistance of the insulation for busbar adapters.

Voltage tap from the busbar without fuses

However, this does not answer the question whether voltage tap by the busbar system without direct protection is permitted for short circuit protection.

Section 7.5.5.1.2 of DIN EN 60439-1 [1] states that the connections between the main busbars and the incoming terminal



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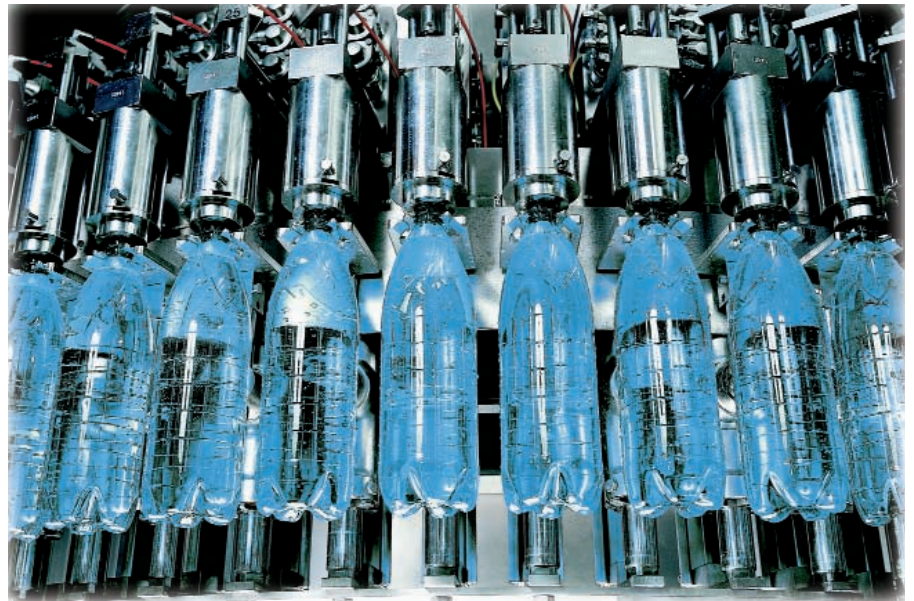


Image 1. Filling unit, run using Eques® technology

side of functional units within a field may be measured for short circuit stress on the outgoing terminal side of the functional unit if no short circuit is to be expected within the connection under operating conditions in compliance with the instructions. Where busbar adapters are used, the requirements are fulfilled. The conductors of the busbar adapter are fitted with increased insulation which is long-term heat resistant to a temperature of 105 °C in compliance with IEC 60227-3: 1997-11. The danger of mechanical damage can be excluded as the conductor spacing of the conductors chosen to match the switchgear is sufficiently large. There are no sharp edges and external pressure. Internal connections are welded, all tests are passed.

According to table 5 of EN60439-1, the conductors selected and the laying conditions are such that short circuits are not to be expected.

Adapters and switchgear must be considered as a unit. The condition for their use is that the switchgear selected may be connected to the power supply (rated li-

mit short circuit strength I_{CU} and rated operating strength I_{CS} at the respective voltage used). If a series fuse or a circuit breaker with a limiter function is required for connecting the circuit breaker, it also applies to use with an adapter.

The values of the busbar adapters match

the conducting values of the switchgear of all leading providers. The class "1" or "2" assignment in accordance with DIN EN 60947-4-1 [3] is not affected by the adapter.

The limitation of the conducting values (surge current and I_{dt} value) is used by the switchgear in both the adapter system and the conventional structure:

Surge current: If a fault occurs, the current outside the motor circuit breaker may not be interrupted. The resulting arc could easily pass to the busbar system.

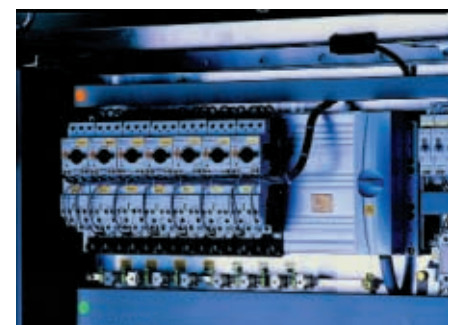


Image 2. Outgoing motor terminals from the busbar

Lifting forces at the contact points must be dominated

Lifting forces are generated at the contact points by the opposite parallel current direction, which is in the micro range. The contact force must be greater than the lifting force generated by the surge current at all points in the current circuit. When calculating the contact force, the way in which the insertion forces interact with it must be incorporated. In order to increase the resistance against short circuits, the contact geometry on the new Wöhner adapters was selected so that an additional magnetic force is generated to increase the contact force.

İdt value: The system could also be irreparably damaged if the conductors are heated above the maximum insulation temperature.

The cross sections of the internal busbars, the conductor cross sections and the heat resistance of the insulation are sufficiently rated at 105 °C, which guarantees that the conducted energy of the switchgear is handled safely.

Wöhner GmbH has introduced three innovatively designed series of adapters, which draw on years of experience in the adapter technology field.

- The **Eques® EasyPorter** acts as the basic carrier for group construction of switchgear which form a functional unit.
- The **Eques® EasyConnector** is a standard adapter for mechanical attachment and safe contacting of switchgear groups on the busbar system.
- The **Eques® MotorController** is a convenient adapter for systems which cannot be cleared. The plug-in unit allows the busbars to remain covered to prevent contact when the switchgear platform is removed.

The new products are based on the module system. This results in the same advantages for all three product families which allow simple planning, assembly, mounting and maintenance:

- Consistent modularity, clear technology, logical structure
- Graded widths and lengths
- Same user interfaces for all products
- High degree of variability, wide range of combination options within each family
- Vertical and horizontal alignment – lateral movement protection
- Plug-in option for all connections
- Combination with bus modules (currently LON, AS-i)
- For multi-component switching, three devices can easily be aligned side-by-side and three on top of one another

- Operating elements accessible at top or at top and bottom
- Stable surface makes prewiring on workbench easier
- Adjustable mounting rails, can be attached using screws at intervals of 1.25 mm at the front and side
- Large wiring space for control cables
- Standardized accessories

Market penetration in Europe has enabled Wöhner to rationalize manufacturing of high quantities.

The adapter ranges have the following special features:

Basic carrier for DIN rails

Eques® EasyPorter (EEP) basic carrier can be locked to 235-mm DIN rails at a distance of 125 mm or on 75-mm DIN rails in accordance with DIN EN 60715: 2001-09. They can be unlocked from above and below. The EEP can also be screwed to the mounting plate.

Standard adapters in the 60 mm busbar system

The **Eques® EasyConnector (EEC)** standard adapters form a complete series in the 60 mm busbar system for switchgear by all manufacturers. They are produced in the following widths; 45 mm, 54 mm, 63 mm, 72 mm and 81 mm. The adapters are either 200 mm or 260 mm long.

The conductors were adapted for the adapter surface and it was possible to keep them within the adapter surfaces. Conductor cross sections from 0.75 mm² – 6 mm² or 1.5 mm² – 16 mm² can be connected to the versions with terminals. This allows a high degree of variability in conductor cross sections and conductor length. One, two and three-pin adaptation is possible. All adapters can be used on the 60-mm busbar systems produced by a wide range of manufacturers. The new combination bases allow switching from 5 mm to 10 mm busbars and back. The contact forces are transferred via extremely strong and heat-resistant materials. Torsion and tension are only transferred via metal components. Patented elastic external suspension with pretensioned steel springs facilitates easy sliding of the busbar adapters and allows great contact force. The robust locks are aligned such that unintentional opening is prevented if the holding mechanism comes under strain. There is a locking position to facilitate dismantling.

Complete motor circuit removable from the busbar

The convenient **Eques® MotorController (EMC)** adapter family offers the advantages of the EEC series and creates

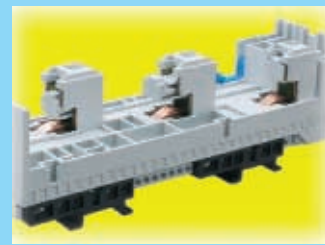


Image 3. Externally sprung base contacts for current tap



Image 4. Direct starter with bus module



Image 5. Platform for the construction of a complete motor circuit



Image 6. 2 lengths, 5 widths and 5 connection versions are available.



Image 7. The busbars remain covered on the EMC

convenient solutions similar to a motor control center. The complete motor circuit can be removed from the busbar system, leaving the busbars protected. For this purpose, these adapters can be divided into two levels. If necessary, the two parts which are connected by plugs, can be separated. The platform with the busbar contact remains on the busbar and covers them to protect them from contact.

The unit with the switchgear can be replaced or fully tested in the test position. The auxiliary switches remain in the same position as for normal operation. However, the load is disconnected from the power supply. In order to prevent unintentional disconnection when under load, the load can be released manually via a microswitch. The air gap and creep distance are guaranteed during the entire plugging process.

Same accessories as side and bus mo-

dule, mechanical connecting elements and plug-in connectors correspond to the family and system concept.

The entire type test in accordance with DIN EN 60439-1 was passed successfully. It was proved that a high degree of safety exceeding the conducting values of the switchgear is present.

The provisions of the UL508 regulations must be observed for international use. It is therefore important for the operator that the new Wöhner adapters with the delivery insert are UL approved.

The desire to reduce costs, and make products convenient and safe has brought rapid growth to the adapter technology field in recent years.

Today, busbar adapters have been successfully introduced in Germany, are generally well known in Europe and unstoppable world-wide. The new Eques, family has played a major role in this success.

Busbar technology as a system solution since the 70s
Practical use of busbar adapters since 1985

Wöhner 1 vendor
2 models
Several hundred units

Today over 20 renowned providers
Hundreds of versions
Millions of units throughout Europe, increasing globally

Literature

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