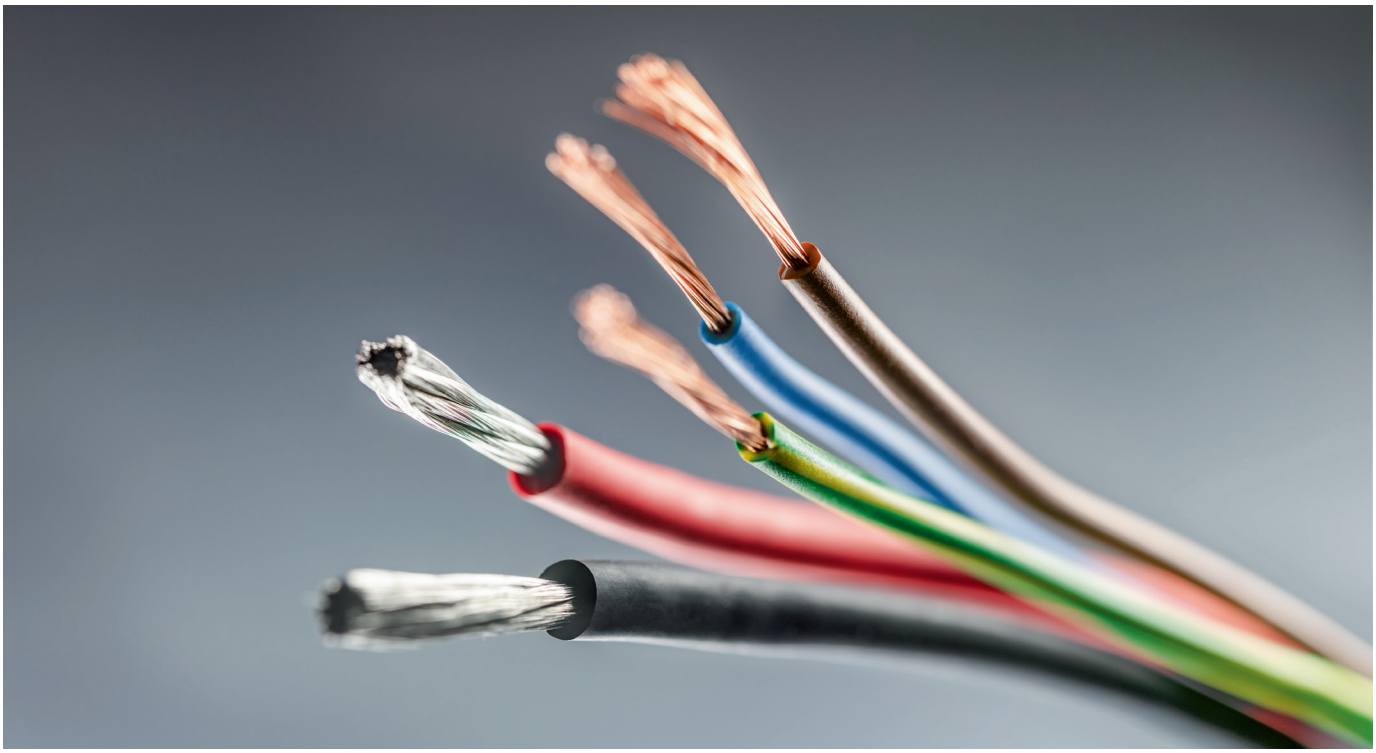
# Compatible in the transition phase

**DC connectors according to IEC TS 62735 are (still) new territory. Tailored for the time being to a very specific clientele and demanding due to the new technology, they pave the way for a future-oriented, efficient power supply with enormous potential for various fields of application.**



In the classic 250 VAC, 10 A power range - in other words with device outputs of up to 2500 W - SCHURTER has successfully positioned itself with its device connectors for decades. This technology is standardized according to IEC 60320 [1], mature and soon to the limit in almost all respects. Here and there are approaches for improvements and additional functions such as switches, fuse holders, cord retention systems or light pipes for status display.

### Lack of energy efficiency

However, with an increasing number of devices that want to be supplied directly with DC voltage, this classic approach must be increasingly questioned. Energy efficiency is moderate [2]. Transformations and conversions waste a not inconsiderable amount of energy without the slightest benefit.

### Shift in energy policy

In the age of the shift in energy policy, in which the majority of politicians and society are calling for a move away from nuclear power and fossil fuels, the focus is increasingly on energy efficiency. A label on every electrical household appliance shows how efficiently this appliance uses energy. Same with automobiles. The list can be extended as required. The days of careless use of energy are over.

### Driving forces

Cool calculators and innovators are the driving forces behind this technology: In the digital age, huge amounts of DC-powered devices are in use. The range extends from consumer electronics to information technology, communications technology and, in the future, electromobility. And these are only consuming loads.

At the other end of the energy supply chain, technologies such as photovoltaics, wind farms or fuel cells are establishing themselves that generate direct current [3].

Even when it comes to power transmission, DC brings a weighty argument to the fore: high-voltage direct current (HVDC) transmission. It enables low-loss transmission of high power over long distances.

If energy is generated, transmitted and consumed in the form of direct current, it would not only be unecological but also uneconomical to dissipate part of this energy through transformation.

### Pioneer Data Center

Information and communication technology with its data centers plays a pioneering role in the consistent use of direct current [1] [4].

The approach of supplying a data center with efficient DC voltage is therefore obvious. If the computers at the end of the chain are already working with DC, it would only be reasonable to process it in this way throughout. From the grid to the chip.

The DC architecture contains significantly fewer components than its AC version. It is therefore less susceptible to faults. According to calculations and studies (ABB, Stulz, etc.), the elimination of various

transformations and conversions already results in an increase in efficiency of 10 % from the feed-in to the server. A reduction of 15 % is assumed for pure investments in the electrical infrastructure.

**It's about energy**

However, the key word for the efficient and economical use of direct current should not be data centers. It must be energy! In addition to data centers, there is a wide range of applications that cannot yet be fully assessed. An obvious solution would be the complete building technology. Or smart and microgrids. The latter in particular are dependent on their own power generators or storage facilities, which accumulate in DC, due to the possibility of autonomous operation. Examples of microgrids include critical infrastructures, hospitals and public emergency control centers. But microgrids will also play a central role in developing countries. Especially in regions that are difficult to access. They form real energy islands that have to supply themselves. With renewable energy.

**The new DC-Standard: IEC TS 62735**

SCHURTER has been involved in the development of the new IEC standard TS 62735 for years. Since August 2015, the IEC TS 62735-1 standard for plug-in systems up to 2.6 kW has existed on the power distribution side. For higher power ratings up to 5.2 kW, which may no longer be disconnected under load (arc), the IEC TS 62735-2 standard was adopted in December 2016. Standardization is also in full swing on the equipment side. This means that a solution on the network side will have one on the side of the devices.
Jonas Bachmann, Head Engineering Inlets & Connectors at SCHURTER and member of the IEC standards committee TC23 WG8: "400 VDC connectors can play an important role in a wide range of applications. In the transition phase from AC to DC supply, we want to increase acceptance and promote distribution by mechanically coding an AC/DC-compatible inlet".

**Compatibility**

When equipping IT infrastructure, e.g. in a data center, all devices must be able to be operated safely. Accordingly, when changing from AC to DC, it is important that the hardware used can be operated at both 230 VAC and 400 VDC. To ensure that the power supply in the device is tapped off correctly, new mechanically coded connector systems are prepared, which reliably guarantee the two supply

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systems AC and DC and prevent polarity reversal in any case.

**Pull-out safety device**

In the higher power ranges up to 5.2 kW, disconnection under load must be prevented. IEC 62735-2 describes components with automatic or mechanical interlocking [6]. This means: either the circuit is automatically interrupted early by a switch or similar when disconnected under load, or a mechanical switch provides for locking/unlocking and simultaneous circuit closing or disconnection.
The common pull-out safety devices known from AC products according to IEC 60320 (V-Lock, SecureLock, locking clip, etc.) have little in common with this [6].

**Distribution of load**

In a data center, a large number of devices must be connected to the power supply. For this reason, the load distributions and PDUs must also be dimensioned correctly with regard to the connected loads so that both the electrical and thermal load of the components are within the safety limits. By means of activity Displays [6] and the knowledge from the thermal conditions, experience can be transferred to the new AC/DC connector systems.

**Equipment side**

SCHURTER concentrates on the worldwide standardized plug connection on the device side. As a result, one can assume that the new DC power plug GP21 will not have to lead a shadowy existence. The engineers are already developing concepts and solutions for device sockets, (inlet combination elements) power entry modules, filters and take into account the safety-relevant protection units for 400 VDC against overcurrent and overvoltage.

**Summary**

The many years of experience in the AC field combined with the wide product range of IEC 60320 plug-in systems offer ideal conditions for the transition of the device supply of up to 5.2 kW from AC to DC. The leading role of Jonas Bachmann as a member of the IEC standards committee TS 62375 confirms SCHURTER's confidence in becoming an important partner who actively promotes the energy transition with solutions for AC, AC/DC and DC for now and in the future.

[1] White Paper Mating Connectors
[2] White Paper Data Center
[3] Services & Solutions for Renewable Energies
[4] Landing Page 400 VDC
[5] Application Note Light Pipe
[6] White Paper Cord Retention

**About SCHURTER**

SCHURTER continues to be a progressive innovator and manufacturer of electronic and electrical components worldwide. Our products ensure safe and clean supply of power, while making equipment easy to use. We offer a broad range of standard products including circuit protection, connectors, EMC products, switches and input systems, as well as electronic manufacturing services. Moreover, SCHURTER is ready to work with our customers to meet their application specific requirements, not covered in our standard range. You can rely on SCHURTER's global network of companies and partners to guarantee a high level of local service and product delivery.

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