Easy to program, flexible to use

Controllers for DC charging stations

Setting up a DC charging station is a rather complex project – but it can be effortlessly mastered using an intelligent and easily programmable charging controller. The EV Charge Control Professional DC charging controller encompasses all the interfaces of a sophisticated fast charging station in a single device (figure 1).

Communication with electric vehicles is based on DIN SPEC 70121, a protocol that was developed for this purpose only. In the future, the standard will become a fixed component of DC charging in ISO 15118. Phoenix Contact designed the EV Charge Control Professional DC charging controller to contain all of the specific function blocks that precisely map this communication. After all, the most time-consuming, complex task before commissioning a DC charging station is programming the communication.

Figure 1 Surprisingly simple: Equipping and operating a charging station with the EV Charge Control Professional DC controller is much easier

The function blocks already available will relieve charging station operators or installers of a good deal of work. For example, the digital communication between a fast charging station and the electric vehicle necessary for controlling the DC charging process in accordance with IEC 61851-24 can be set up quickly. The overall program sequence is stored in the controller as a function block. If the programmer who is tailoring the application for operation does not want to or is unable to do the work, Phoenix Contact provides a block as part of a specific library for EV Charge Control Professional controllers.

Communication is everything

The Modbus/RTU protocol has become established for communication with energy measuring devices, which is normally implemented via the RS485 interface. The EV Charge Control Professional DC controller has two of these interfaces. This enables an RFID card reader to be connected for authenticating the user. Alternatively, users can use two RS232 interfaces that are available for connecting card-reading devices and electronic energy measuring devices.

Phoenix contact provides a series of standard libraries for easily using the protocols mentioned above. The exchange of data between the charging controller and power electronics can be implemented via the onboard CAN bus interface or, as an alternative, via Ethernet using Modbus/TCP.

A total of 16 digital outputs are available for actuating the DC contactors and for actuating additional LEDs, for example in order to display the current charging status. The 16 digital inputs can record whether or not a CCS (Combined Charging System) charging connector has been inserted into the proper charging station holder, whether the charging station door is locked, or whether an insulation meter has triggered.

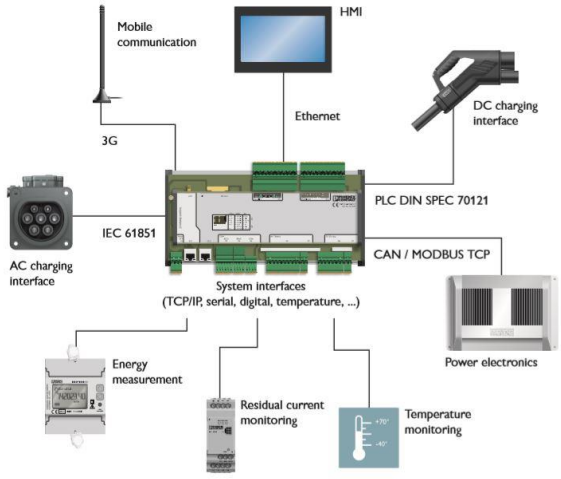

Figure 2 Universal use: The many interfaces of EV Charge Control Professional can be used to conveniently install the required hardware components

To acquire the contact temperature of the DC contacts of the CCS charging connector during charging, two PT1000 inputs have been implemented on the controller. The values can be acquired via the CAN bus interface and processed. The CAN bus interface also enables HPC (High Power Charging) technology to be used. This interface can also be used for acquiring and processing additional parameters that go far beyond simple contact temperature detection (figure 2).

DC charging stations in accordance with the standards

The hardware layout of a DC charging station for electric vehicles is defined in the core body of the IEC 61851-23 standard for conductive charging systems. In addition, the standard

specifies insulation measurement and the charging sequence: when and how the DC contactors should switch and the point in time at which current and voltage must be provided.

During charging, electric vehicles permanently request the target current and target voltage. Accordingly, these values must be transmitted as set points to the charging station's power electronics. The power electronics then set the requested values and also transfer them to the actual inverter communication protocol.

Alternatively, the set point can be acquired by separate measuring devices and transferred to the vehicle as present current and present voltage values in the communication protocol. In accordance with the standard, the values may only deviate to a minimum degree. If they are not precise enough, the charging process will be interrupted immediately. This means that the DC charging controller must convert analog signals into the values required by digital communication with high precision. At the same time, the correct signal transmission ensures that the charging stations is stable and failsafe.

An overview at all times

The values acquired by the measuring devices can be transmitted to an accounting system so that charging can be billed. The values are also useful for energy management systems – depending on how much power is currently available for charging, the charging station's maximum current can be adjusted at any time during the active charging process. All values generated during charging are available to the controller and can be used for the user interface, visualization, and energy management.

The available standard libraries can even transfer and convert the values to other systems and protocols seamlessly. Charging station programmers do not have to spend time with the

A wide range of possible applications:

The EV Charge Control Professional charging controller at a glance

- Flexible use, thanks to free choice of programming in accordance with IEC 61131
- Little programming work, thanks to pre-assembled function blocks for vehicle communication in accordance with DIN SPEC 70121
- Easy system integration, thanks to comprehensive interfaces
- Convenient remote access via integrated mobile network modem
- Only one controller is required for two independent charging points - AC and DC

protocol. Instead, they can concentrate on optimizing the values. Many small aids significantly reduce user time and the costs involved in the higher-level goal – achieving a high-performance charging station (figure 3).

Figure 3 Compact and flexible: Numerous free programming options extend the applications of the EV Charge Control Professional controller

Summary: The core of a DC charging station

The freely programmable EV Charge Control Professional DC charging controller from Phoenix Contact was launched as a powerful control solution for the sophisticated fast charging station. Equipped with a wide range of interfaces, it features numerous options for integrating all internal and external components and enabling them to communicate with each other. The DC charging controller is also harmonized to the CCS type 2 charging solution and the HPC charging cable. It is fully compatible with the EEM 357 and EEM 377 energy measuring devices from Phoenix Contact. Furthermore, Phoenix Contact also provides a wide range of components for building DC charging stations – from operating panels and voltage supply units to IT network components, surge protection devices, and terminal blocks.

If you are interested in publishing this article, please contact Becky Smith: marketing@phoenixcontact.co.uk or telephone 0845 881 2222.