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CONSISTENT COMMUNICATION

Safety controller with OPC UA interface simplifies predictive maintenance

Collecting and evaluating data in Production 4.0 forms the basis for process improvements and predictive maintenance. This is made easier thanks to a safety controller with built-in OPC UA server which enables a consistent flow of data from the sensor systems to the central IT systems.

Consistent communication from the shop floor level, i.e. the individual sensor and/or drive to the central IT systems such as PPS, MES and ERP, is one of the basic tenets of Industry 4.0 There are clear benefits for production planning, for example. But the uninterrupted flow of signals and data also has advantages in terms of operational engineering and maintenance, for example for troubleshooting and predictive maintenance and in terms of optimising machine operations.

The question as to the “right” communications standard

One of the things that production companies who want to convert this finding into reality need to do is make a basic decision on a suitable, and most importantly, future-oriented communications standard There is plenty of evidence that the OPC UA protocol described in IEC 62541 will establish itself in the medium term. One reason is the fact that the architecture of this protocol not only sends, forwards and receives machine data (measured values, parameters, documents, etc.) but also describes it in machine-readable form. This allows a higher-level data exchange between products from different manufacturers. This is an important prerequisite for predictive maintenance on machines and systems, among other things. And that applies not only to “traditional” machine data, but also to data generated by the safety switchgear systems.

Collecting data for predictive maintenance

For example: Based on the number of switching cycles of safety sensors and actuators, it is possible to derive when these devices are reaching the end of their service life and need replacing. For electro-mechanical switchgear which is prone to wear, this number can be worked out from the $MTTF_d$ value (mean time to dangerous failure), which, according to be EN 13849-1, must be calculated based on the B_{10d} value (nominal service life to dangerous failure). This is based on a value of T_{10d} which defines the time for the preventative replacement, which is at 10 % of the $MTTF_d$ value. Here too, the service life can also be determined very accurately if the switching cycles are counted at the same time. In practice, the safety switchgear can then normally be used for longer and does not need to be replaced on a pre-emptive basis after a calculated service life.

New: Safety controller with built-in OPC UA server

The Schmersal Group is now making this an option with the latest communications interface of the modular Protect PSC1 safety controller. Previously, an interface was offered for this controller which created connections to standard fieldbus systems such as Profibus, Profinet, EtherCat, Ethernet/IP and CANopen. It now has an integrated OPC UA server which enables it to include comprehensive information about the safety switchgear from the Schmersal range used for cross-company data exchange. For machine and system maintenance, predictive or otherwise, this means that users can access comprehensive data records for all safety sensors in the Schmersal range via the M2M communication protocol of the interface. This includes, for example, the status data of safety outputs, safety keywords, information on sensor lifecycle, order information, datasheets or CAD data and images. This makes the status of the machine more transparent and users have access to various maintenance-related data without having to collect this data using separate measuring or recording devices.

An integrated OPC UA connection is now available for the PROTECT PSC1 safety controller.

If the signals from the safety switchgear are comprehensively evaluated, there are real benefits, including for maintenance. 02 The connection via an OPC UA server provides the prerequisite.

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Precision calculation of switchgear end of life

But this is in no way an end to the benefits. The OPC UA connection allows the users to define a target value for service life, i.e. a maximum number of switching cycles for every single switchgear device, for example a solenoid interlock which enables access to a robot workstation, using the SafePLC2 programming software on the Protect PSC1. The controller then records the number of actual switching cycles and notifies the user when this number is reached. This means the end of life can be calculated very accurately and the switchgear device replaced at the designated time. This is the basic principle of predictive maintenance.

Machine-to-machine communication

Safety sensors which have a connection to the SD bus developed by Schmersal for the transfer of non-safety-related data can transfer other information, such as various error messages (e.g. cross-circuit, excess temperature, internal device error, communication error, output Y1/Y2, etc.). The integration of OPC UA into the communications interface of Protect PSC1 also provides the prerequisite for the latest data from Schmersal safety switch systems (and therefore their “digital twins”) being available for manufacturer-neutral exchange, for example, from one machine to another or for communication between factories. Again, this is a basic prerequisite for production structured according to the principles of Industry 4.0.

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The data collected from safety switchgear by the safety controller can be forwarded to higher-level control room via OPC UA and utilised for predictive maintenance.

A future-oriented communications standard

OPC UA is currently not that widespread. But large production companies are pressing for a binding, manufacturer-neutral introduction of this standard. Fifteen specialist groups in the VDMA are currently working on application-specific “OPC Companion Specifications”, i.e. standardised data and interfaces for individual applications such as robotics and industrial image processing. The OPC Foundation also recently set up its own working group on “Functional Safety”. So a great deal is pointing towards OPC UA becoming established as the communications standard for digitalised production.