Application Note DK9322-1109-0011

TwinCAT Supplement ‚RFID Reader Communication'

Keywords
RFID
TwinCAT
Supplement
Reader
Middleware
Serial interface
PLC

TwinCAT RFID Library

The 'TwinCAT PLC RFID Reader Communication' supplement is a middleware for connecting RFID readers by different manufacturers to TwinCAT PLC via an abstract interface. Communication between the reader and TwinCAT PLC takes place via the serial interfaces EL60xx (Beckhoff EtherCAT Terminal system) and KL60x1 (Beckhoff Bus Terminal system) or also via the COM port of the PC, so that automated detection of the presence of tags can be used extending as far as write accesses to the production controller and other applications.

Basic principles and advantages of RFID

RFID (radio frequency identification) is a contactless identification system for objects that is used in the manufacturing or logistics controller in order to initiate further sequences and steps via presence detection. An RFID system consists of several transponders (tags), a reader and software that evaluates the data from the tags. A tag contains an ID, which does not change over the entire lifetime, and a memory in which data can be stored. In addition to presence detection, the memory can be used to read or write further data. The size and writability of the memory (Write-once-Read-Only/Read-Write) of the tags are manufacturer-specific.

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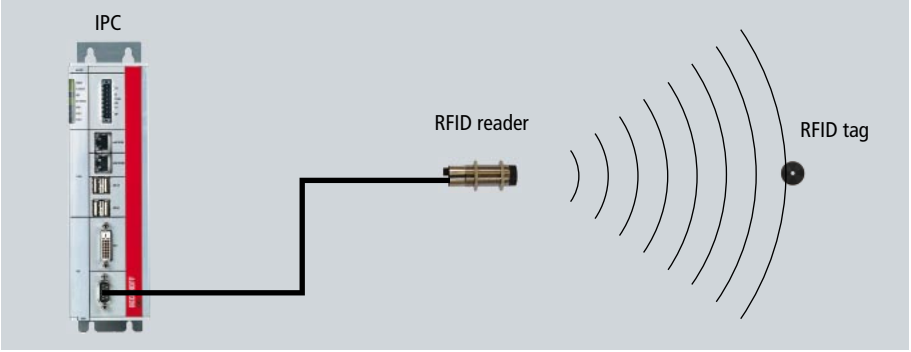

Fig. 1 Structure of an RFID connection

The object to be detected is fitted with a tag that transmits its data as soon as the object is within range of the reader. A specific alignment of the tag and the readers, such as is required with a barcode, is not necessary, since the data is received contactlessly within the range cone of the reader. As opposed to barcodes, tag detection is also assured in poor lighting conditions and in the case of dirty surfaces. Since RFID has short detection times and many tags can be detected simultaneously (bulk reading ability), the individual goods on an entire pallet of different goods, for example in a goods reception area, can be identified individually without having to take the container apart. Thus, all goods can be identified within a very short space of time and their data made available for further processing. RFID offers many advantages over other identification systems and is now used as an industrial standard in almost all industries.

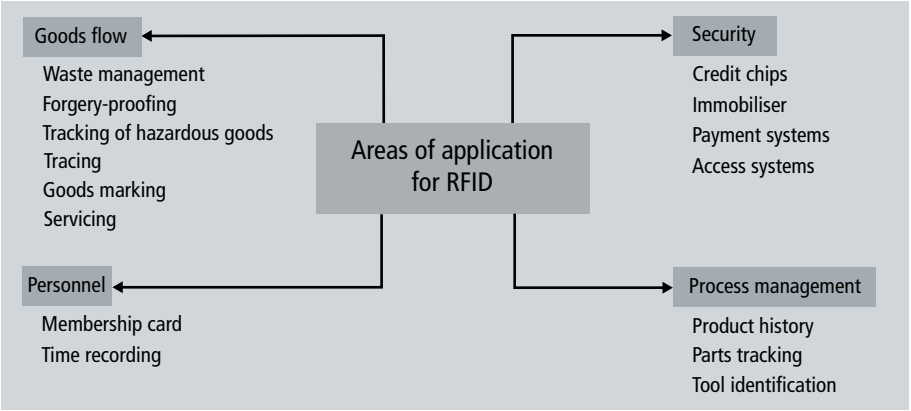

Fig. 2 Areas of application of RFID

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	Barcode	RFID
Wear and tear	high	variable
Procurement costs	low	depends on the technique
Data density	low	high
Influence of dirt/moistrue	high	no or little influence
Influence of optical coverage	failure	no or little influence
Manufacture by customer	possible	not possible
Complexity of the application	high	very easy
Bulk reading capability	not possible	possible
Unauthorised copying	easy	difficult or impossible

Fig. 3 Differences between barcode and RFID

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In order to connect RFID readers to the controller, up to now the appropriate protocols had to be implemented for the various readers on the basis of the serial interfaces. With the 'TwinCAT PLC RFID Reader Communication' TwinCAT library, a general, abstract interface has been developed that can be used for any supported reader. The user sees only one block in the user interface. The corresponding protocols have already been implemented internally for different readers; special adaptations to a reader can be carried out simply via the configuration setting. The TwinCAT library is based on the IEC 61131-3 standard, with which the data from the tags can be directly accessed or changed. This way, alongside the mere presence detection, the writing of the RFID tags is also integrated into the PLC automation.

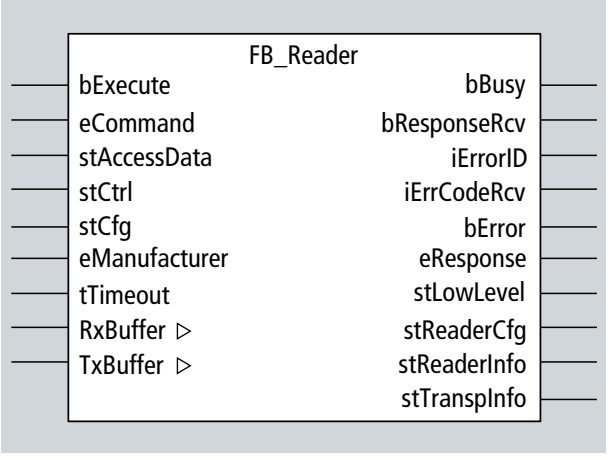

Fig. 4 TwinCAT function block for reader implementation

The system hardware, consisting of transponders and readers, can be chosen by the user according to his application and

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procured externally. The RFID reader is connected to the industrial PC either via a serial interface (KL60x1 Bus Terminal | EL60xx EtherCAT Terminal) or via the COM port. If the range is not sufficient for serial transmission, the connection point of the RFID reader can be distributed anywhere in the I/O field using the corresponding coupler. The selected system can be integrated into the automation environment via TwinCAT and the RFID reader supplement.

Advantages

In conjunction with the serial interfaces in terminal form, the RFID reader can be used in any fieldbus. Several readers can also be integrated in the simplest way in the TwinCAT-encompassing automation world; all that is required for integrating several readers is to create multiple instances of a function block. This way, even extensive applications that use different functions of the RFID reader can easily be implemented. The implementation expenditure is very low, because the manufacturer-specific interface protocol does not need to be researched in detail and implemented.

The handling and the interface of the PLC library are the same for all the supported RFID reader models. The frame structure, the composition of the telegrams, the command name and other protocol specifications are performed automatically by the library. This saves the user valuable development and implementation time and he can concentrate fully on his application. Access to the RFID reader with tools from the Windows environment is similarly not a problem with the 'Virtual Serial COM Driver' supplement for virtual interfaces.

If networking takes place at process control level, then detection of the RFID tags can take place at each station in order to implement the traceability of components within the production process.

Practical application: detection of the presence of components

RFID is used to detect the presence of individual components within a production line for wooden products. The RFID tag is attached to each component and is read by readers at different stations.

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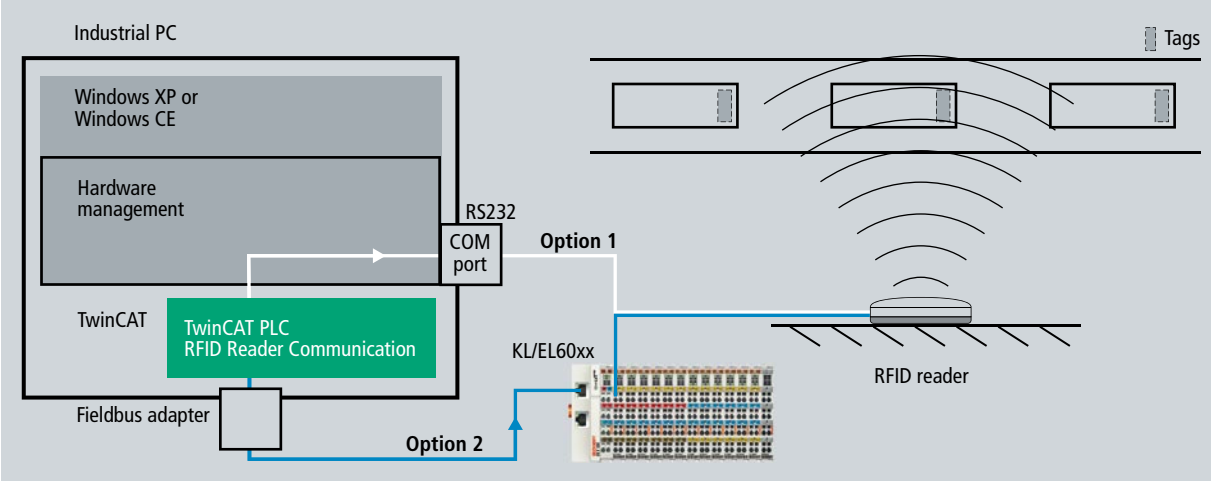

Fig. 5 Two options for connecting the reader to the PLC

Various components are created from the blanks in order to minimise cutting waste. For this reason, the boards are fitted with a tag after being cut to size and the ID is assigned to an order or an assembly within a database. Once the tags have been written, the components are transported by conveyor belts and parts trolleys to the individual machining centres. Due to the fully automated manufacturing, the boards reach speeds of 60 metres per minute on the conveyor belts. Since RFID, as opposed to barcodes, allows detection without stopping and speed reduction, the selection of the branching points can be executed in real-time. If the component passes a reader attached to the conveyor belt, the tag is read, the destination is recognised and the points are set accordingly.

– TwinCAT PLC RFID Reader Communication **www.beckhoff.com/TwinCAT-RFID-Reader**
– Optional TwinCAT software packages **www.beckhoff.com/supplements**
– EtherCAT Terminal, RS232 interface **www.beckhoff.com/EL6001**
– EtherCAT Terminal, RS422/485 interface **www.beckhoff.com/EL6021**
– EtherCAT Terminal, 2-channel RS232 interface **www.beckhoff.com/EL6002**
– EtherCAT Terminal, 2-channel RS422/485 interface **www.beckhoff.com/EL6022**
– Busterminal, RS232 interface **www.beckhoff.com/KL6001**
– Busterminal, RS422/485 interface **www.beckhoff.com/KL6021**
– Busterminals **www.beckhoff.com/Busterminal**
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