Technical Specification ŠKODA AUTO a.s.

Interface of Equipment with Conveyor
Electric Part

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History of Changes

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Content:

1 General

This technical specification for the electrical part is only for the interface with the conveyor. Before submitting the offer, it is necessary to have a technical meeting and an on-site inspection by the supplier. We will not accept additional costs resulting from ignorance of the scope of delivery after the contract is awarded. The technical specification of the interface is a framework work and does not claim completeness.

The language of the complete project is Czech. The equipment supplier must provide eventual interpreting performances.

1.1 Introduction

All HW and SW, which the contractor of the equipment will develop within the project, becomes the exclusive property of Škoda Auto a.s. and the contractor may not further disseminate it.

Škoda Auto a.s. is authorized to use this SW or HW worldwide and distribute it arbitrarily in its projects. During the whole project, the contractor must, upon request by the Electro Planning of Škoda Auto a.s. provide all HW and SW documentation.

1.2 Area of Validity

If there is a discrepancy in the technical specifications, regulations, etc., then the supplier is obliged to report this discrepancy and to request written explanation by operator and planning department. Self-interpretation (without written approval) is not allowed and is fully borne by the supplier.

2 Network Performance Requirements - PROFINET

2.1 Physical Execution

- Use only connectors approved for PROFINET installations (RJ45, M12, SCRJ or special). All connectors must be shielded, i.e. they must have shielding through the connector housing to the device.
- Used metallic and fibre optic cable must be approved by manufacturer for PROFINET installations.
- Min. distance of PROFINET cabling from power cabling> 400V is min. 15 cm.
- Max length of uninterrupted metallic cable <90m.
- The metallic PROFINET cable> 75m long has a shield connected to the ground when entering the cabinet.
- Max length of uninterrupted fibre optic cable is POF <50m, HCF / PCF <100m, Multi-mode <2km.
- If possible, use already completed PROFINET cables with connectors (e.g. patch cables for switchgear in the cabinet). The goal is to eliminate errors when assembling connectors.
- PROFINET devices subject to ambient vibrations must have a PROFINET cable connected so that the weight of the cable does not bend any PROFINET connector in the device socket. Otherwise, the PROFINET cable must be mechanically connected to the device / switchboard, e.g. with a clamp, strap, etc.
- Use the same type of fibre optic cable in one PROFINET network (if possible).

2.2 Network Logical Parameters

- The metallic cables are measured by a PROFINET cable tester and the measurement must be supported by reports. Optimally each cable with FLUKE tester DTX-1200, DTX-1800 and higher.
- Leakage current of the PROFINET cable shield <40 mA, measured by clamp multimeter.

- Common ground conductor impedance of the switchgear <0.3 Ohm.
- PE impedance <protective bonding conductor impedance <PROFINET conductor shield impedance.
- PROFINET wire shielding impedance <0.6 ohm. The measurement takes place between two PROFINET points that are earthed (e.g. stations, earth ground, etc.).
- PROFINET Jitter parameter <50%, measured by a passive analyser.
- Total load of PROFINET cable leading to PLC is max. 20-25%. The ports of a manageable switch also apply.
- Data throughput <4.500 KByte / ms at 100% PN / other telegram ratio.
- Unicast / multicast + broadcast ratio is max 100: 10
- PROFINET communication ratio: other (TCP / IP, etc.)> 100: 1.
- Damaged messages max. 5 damaged messages / 1 trillion telegrams.
- What is the min cycle time of IO device stations? (1, 2, 4, 8, 16 ms…).
- What is the maximum cycle time of the IO device stations? (1, 2, 4, 8, 16 ms…).
- All PROFINET stations in the network have the name, correct IP address and mask set.
- The IO device cycle should be set to the highest speed you want and the slowest possible.

2.3 Switches

- Use only managed CC-B or CC-C (Conformance Class) switches in the network.
- Switches have disabled port mirroring.
- Each manageable switch must have one free port.
- We do not recommend connecting switches of different PROFINET networks with each other.
- The method and reason for connecting PROFINET to the plant's IT network must be consulted in advance with PPF-K / 6.

2.4 Ring Topology

- In the case of ring topology, route the main ring topology through certified PROFINET switches, not through the IO device itself.
- Route circular topology always through CC-B class managed switches.
- We recommend running the circular topology through optical cables.
- The switches must have correct ring topology settings (MRP manager, MRP client, ports).

2.5 Star Topology

- We recommend connecting large wiring networks with line, tree or star topology so that both PROFINET PLC ports are used.

2.6 IO Device

- Devices of the same type have all the same firmware and HW versions; we recommend the latest FW / HW version available for download. Connect all IRT devices to IRT switches.
- If possible, minimize the number of TCP / IP devices in the PROFINET network to a minimum.
- All devices of the CC-B class must have set the correct name and IP Address.

3 Technical Description

The aim is to supply a fully functional interface with the car body conveyor in the final assembly hall. Before submitting the offer, it is necessary to have a technical meeting and an on-site inspection by the supplier. We will not accept additional costs resulting from ignorance of the scope of delivery after the contract is awarded.

The supplier is obliged to issue a new EC Declaration of Conformity or Supplier's Declaration for all new and modified equipment.

With this interface, the system operator is given the option of decommissioning the equipment with manual emergency strategy for a certain period in the event of an unsuccessful troubleshooting.

After the equipment has been shut down, the conveyer technology is not affected.

3.1 Bridging the Emergency Circuit

The exchange of emergency circuit signals for the safety of persons between the technology and the conveyor shall be capable of being bridged separately by means of an E2 lock. To do this, install a separate E2 lock (at the hall column, filling console, etc.) for each system. The emergency bridging concept needs to be be agreed in advance with planning department of electrical equipment and safety engineer Škoda Auto.

Note: Emergency stop buttons for devices that no longer act on the conveyor after bridging needs to be marked with the message "Emergency stop only affects the safety circuit of the process equipment"! In addition, the person responsible for continuing the operation of the bridged emergency circuit towards the conveyor needs to be mandated.

After bridging of emergency circuit must not be started in the "Automatic" operation state!
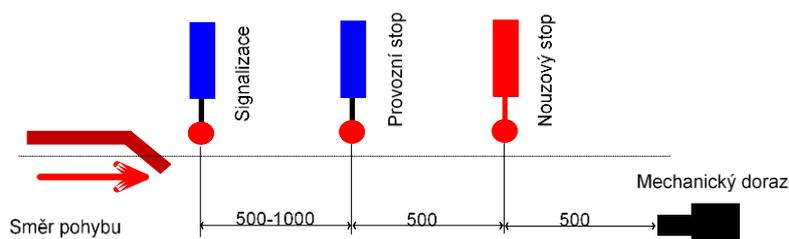
3.2 Interface

3.2.1 Final Assembly M1 Mladá Boleslav

3.2.1.1 Technology without Control System

HW pulley switches controlling the end of the technology travel path in three steps will provide the interface for systems without a control system:

1. Visual and audible warning of approaching end of cycle

2. Conveyor stop3

. Emergency stop of the conveyor

The sensors must be part of the conveyor.

3.2.1.2 Technology with Profinet Control

Interface for the communication with conveyor in the case of technologies with independent control (PLC Siemens), must be realized via PN / PN coupler Siemens 6ES7 158-3AD10-0XA0 with relevant BUS modules (always install BUS module 6ES7 193-6AR00-0AA0 on conveyor side). Place the PN / PN coupler in the technology switchboard and is part of the delivery of the production equipment including the connection to the conveyor (HW and SW). It is necessary to connect the power supply of the coupler from both the technology and conveyor side. It is necessary to check the connection to the Profinet conveyor network or to install a new Siemens Scalance industrial switch. In the final assembly hall is installed the conveyor control system from GE IP. Connection to the conveyor may provide only a company approved by the Škoda Auto a.s. It is necessary to calculate the range of work from this company.

Replace the safety signals by HW signals.

Transmit all alarm and operating states of the production equipment to the Škoda Auto network via a communication card (e.g. Siemens CP 1543-1) and subsequently to the Cimplicity visualization at the as control room of the final assembly maintenance. The communication card also includes a socket for the Škoda Auto data network. Order the socket from an approved Škoda Auto supplier.

The production equipment must be able to completely shut down the conveyor functions by selecting with the E2 key on the technology - that is, the safety and operating conditions on the conveyor are bypassed when the key is activated. Furthermore, the conveyor continues autonomously without any influence; failure or complete shutdown of the technology. Visualize the shutdown of the technology from the conveyor on the HMI technology, the conveyor and the central maintenance visualization.

The equipment must be able to completely shut down the conveyor functions by selecting with the E2 key on the system – when the key is active, the safety and operating conditions on the conveyor are bypassed. Furthermore, the conveyor continues autonomously without any influence; failure or complete shutdown of the system. Visualize the shutdown of the system from the conveyor on the HMI screen of the system and conveyor and the central maintenance visualization.

For all system equipment, the supplier is obliged to ensure connection to the central visualization to the maintenance dispatching. Creation of visualization (addition or creation of new screens) at the control room in Cimplicity environment (version will be specified during technical meetings) is part of this delivery. The access to the visualization and integration of screens may provide only a company approved by the Škoda Auto a. s. It is necessary to calculate the performance volume of this company in the quotation.

3.2.2 Final Assembly M13 Mladá Boleslav

3.2.2.1 System without Control

HW pulley switches scanning the end of the system way in three steps will provide the interface for systems without a control:

1. Visual and audible warning of approaching end of cycle
2. Operational conveyor stop
3. Emergency stop of the conveyor
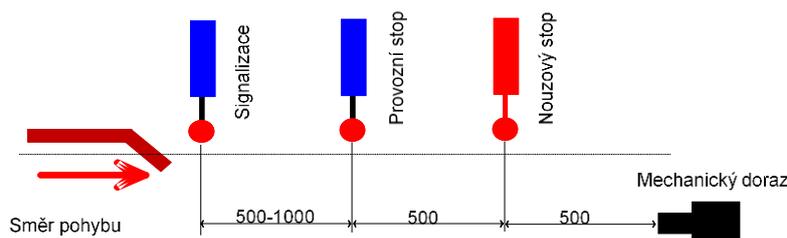
The sensors must be part of the conveyor.

3.2.2.2 System with Profinet Control

The interface for communication with conveyor technology in case of systems with independent control (PLC Siemens), must be realized via PN / PN coupler Siemens 6ES7 158-3AD10-0XA0 with relevant BUS modules (always install BUS module 6ES7 193-6AR00-0AA0 on conveyor side) . Place the PN / PN coupler in the system switchboard and is part of the delivery of the production equipment including the connection to the conveyor (HW and SW). It is necessary to connect the power supply of the coupler from both on the system side and on the conveyor side. It is necessary to check the connection to the Profinet conveyor network or to install a new Siemens Scalance industrial switch. In the assembly hall is installed the conveyor control system from GE IP. The Connection to the conveyor may provid only by a company approved by the Škoda Auto a.s. It is necessary to calculate the performance volume of this company in the quotation.

Replace the safety signals by HW signals.

Transmit all alarm and operating states of the technology to the Škoda Auto network via a communication card (e.g. Siemens CP 1543-1) and subsequently to the Cimplicity visualization at the control room of final assembly maintenance. The communication card also includes a socket for the Škoda Auto data network. Order the socket from an approved Škoda Auto supplier.

The production equipment must be able to fully shut down the conveyor functions by selecting with the E2 key on the system - when the key is activated, the safety and operating conditions on the conveyor are bypassed. Furthermore, the conveyor continues autonomously without any influence; failure or complete shutdown of the technology. Visualize the shutdown of the technology from the conveyor on the HMI technology, the conveyor and the central maintenance visualization.

For all system equipment, the supplier is obliged to ensure connection to the central visualization to the maintenance dispatching. Creation of visualization (addition or creation of new screens) at the control room in Cimplicity environment (version will be specified during technical meetings) is part of this delivery. Access to the visualization and integration of screens should may provide only by a company approved by the Škoda Auto a.s. It is necessary to calculate the performance volume of this company.

3.2.3 Final Assembly ML1 Kvasiny

3.2.3.1 System without Control

A HW pulley switch monitoring the collision with the conveyor profile during movement will provide the interface for systems without a control system. In the event of technology interference in a moving conveyor, stop safely the conveyor immediately and a failure reported. Simultaneously display the machine to complete the conveyor movement and stop it in the tact position - for example, with a two-colour traffic light. Made the HW pulley sensor

connection from a decentralized peripheral of the conveyor. The connection of the "traffic light" will be potential-free by means of a coupling relay that switches the conveyor from the decentralized periphery. Realize powering the traffic light separately within the system.

The shutdown of the technology and the non-checking of the collision with the conveyor profile will be carried out via the conveyor control panel in the respective area by means of a SW bridging.

3.2.3.2 System with Profinet Control

The interface for communication with conveyor technology in case of systems with independent control (PLC Siemens), incl. emergency stops, must be realized via PN / PN coupler Siemens 6ES7 158-3AD10-0XA0 with relevant BUS modules (always install BUS module 6ES7 193-6AR00-0AA0 on conveyor side). Place the PN / PN coupler in the system switchboard and is part of the delivery of the production equipment including the connection to the conveyor (HW and SW). It is necessary to connect the power supply of the coupler from both on the system side and on the conveyor side. It is necessary to check the connection to the Profinet conveyor network or to install a new Siemens Scalance industrial switch. In the assembly hall is installed the conveyor control system from GE IP. The connection to the conveyor may provid only by a company approved by the Škoda Auto a.s. It is necessary to calculate the performance volume of this company.

Transmit all alarm and operating states of the technology to the Škoda Auto network via a communication card (e.g. Siemens CP 1543-1) and subsequently to the WinCC visualization at the control room of final assembly maintenance. The communication card also includes a socket for the Škoda Auto data network. Order the socket from an approved Škoda Auto supplier.

The production equipment must be able to complately shut down the conveyor functions by switching with the E2 key on the system - when the key is active, the safety and operating conditions on the conveyor are bypassed. Furthermore, the conveyor continues autonomously without any influence; failure or complete shutdown of the technology. Visualize the shutdown of the technology from the conveyor on the HMI of the system and conveyor and the central maintenance visualization.

For all system equipment, the supplier is obliged to ensure connection to the central visualization to the maintenance dispatching. Creation of visualization (completion or creation of new screens) on the control room in WinCC environment (version will be specified at technical meeting) is included in this delivery. Only a company approved by the Škoda Auto a.s may provide access to the visualization and integration of screens. It is necessary to calculate the performance volume of this company.

3.2.3.3 System with Profibus Control

Realize the connection of the system with the control to the SKD conveyor via DP / DP coupler. Place the DP / DP coupler in the system switchboard and is part of the system delivery including the connection to the conveyor (HW and SW). It is necessary to connect the power supply of the coupler from both on the system side and on the conveyor side. The connection to the conveyor may provide only a company approved by the Škoda Auto a.s. It is necessary to calculate the performance volume of this company.

Carry out the safety signals by HW signals.

Transmit all alarm and operating states of the technology to the Škoda Auto network via a communication card (e.g. Siemens CP 1543-1) and subsequently to the WinCC visualization at the control room of final assembly maintenance. The communication card also includes a socket for the Škoda Auto data network. Order the socket only from an approved Škoda Auto supplier.

The production equipment must be able to fully shut down the conveyor functions by switching with the E2 key on the system - when the key is activated, the safety and operating conditions on the conveyor are bypassed. Furthermore, the conveyor continues autonomously without any influence; failure or complete shutdown of the technology. Visualize the shutdown of the technology from the conveyor on the HMI of the system and conveyor and the central maintenance visualization.

For all system equipment, the supplier is obliged to ensure connection to the central visualization to the maintenance dispatching. Creation of visualization (completion or creation of new screens) on the control room in WinCC environment (version will be specified at technical meeting) is included in this delivery. Access to the visualization and integration of screens may provide only a company approved by the Škoda Auto a.s. It is necessary to calculate the performance volume of this company.

3.2.4 Final Assembly ML2 Kvasiny

3.2.4.1 System without Control

A HW pulley switch monitoring the collision with the conveyor profile during movement will provide the interface for systems without a control system. In the event of technology interference in a moving conveyor, stop safely the conveyor immediately and a failure reported. Simultaneously display the machine visually to complete the conveyor movement and stop it in the tact position - for example, with a two-colour traffic light. Make the HW pulley sensor connection from a decentralized peripheral of the conveyor. The connection of the "traffic light" will be potential-free by means of a coupling relay that switches the conveyor from the decentralized periphery. Realize powering the traffic light separately within the system.

The shutdown of the technology and the non-checking of the collision with the conveyor profile will be carried out via the conveyor control panel in the respective area by means of a SW bridging.

3.2.4.2 System with Profinet Control

The interface for communication with conveyor technology in case of systems with independent control (PLC Siemens), incl. emergency stops, must be realized via PN / PN coupler Siemens 6ES7 158-3AD10-0XA0 with relevant BUS modules (always install BUS module 6ES7 193-6AR00-0AA0 on conveyor side). Place the PN / PN coupler in the system switchboard and is part of the delivery of the production equipment including the connection to the conveyor (HW and SW). It is necessary to connect the power supply of the coupler from both on the system side and on the conveyor side. It is necessary to check the connection to the Profinet conveyor network or to install a new Siemens Scalance industrial switch. in the assembly hall is installed the conveyor control system from GE IP. The connection to the conveyor should may provide only a company approved by the Škoda Auto a.s. It is necessary to calculate the performance volume of this company.

Transmit all alarm and operating states of the technology to the Škoda Auto network via a communication card (e.g. Siemens CP 1543-1) and subsequently to the WinCC visualization at the control room of the assembly maintenance. The communication card also includes a socket for the Škoda Auto data network. Order the socket only from an approved Škoda Auto supplier.

The production equipment must be able to fully shut down the conveyor functions by switching with the E2 key on the system - when the key is active, the safety and operating conditions on the conveyor are bypassed. Furthermore, the conveyor continues autonomously without any influence; failure or complete shutdown of the technology. Visualize the shutdown of the technology from the conveyor on the HMI of the system and conveyor and the central maintenance visualization.

For all system equipment, the supplier is obliged to ensure connection to the central visualization to the maintenance dispatching. Creation of visualization (completion or creation of new screens) on the control room in WinCC environment (version will be specified at technical meeting) is included in this delivery. Access to the visualization and integration of screens may provide only a company approved by the Škoda Auto a.s. It is necessary to calculate the performance volume of this company.

3.3 Model Situations

Dopravník v chodu

Dopravník PROVOZNÍ STOP

1) Provozní stop na dopravníku

4) Přejezdový snímač ext. zařízení - provozní stop

8) Provozní stop ext. zařízení - natažené hadice

Dopravník NOUZOVÝ STOP

2) Nouzový stop na dopravníku

5) Přejezdový snímač ext. zařízení - NOUZOVÝ STOP

6) Přejezdový snímač ext. zařízení - NOUZOVÝ STOP - odstranění

7) Nouzový stop ext. zařízení - tlačítko

9) Nouzový stop ext. zařízení - bezpečnostní závora

Externí zařízení v chodu

Externí zařízení PROVOZNÍ STOP

4) Přejezdový snímač ext. zařízení - provozní stop

6) Přejezdový snímač ext. zařízení - NOUZOVÝ STOP - odstranění

8) Provozní stop ext. zařízení - natažené hadice

Externí zařízení NOUZOVÝ STOP k dopravníku

1) Provozní stop na dopravníku

2) Nouzový stop na dopravníku

5) Přejezdový snímač ext. zařízení - NOUZOVÝ STOP

7) Nouzový stop ext. zařízení - tlačítko

9) Nouzový stop ext. zařízení - bezpečnostní závora

Externí zařízení Přejezdový spínač - pípák

3) Přejezdový snímač ext. zvukové upozornění

Externí zařízení Provozní stop - přejezdový snímač; natažené hadice

4) Přejezdový snímač ext. zařízení -

8) Provozní stop ext. zařízení - natažené hadice

Externí zařízení NOUZOVÝ STOP - Přejezdový snímač, tlačítko NS, bezpečnostní závora

5) Přejezdový snímač ext. zařízení - NOUZOVÝ STOP

7) Nouzový stop ext. zařízení - tlačítko

9) Nouzový stop ext. zařízení - bezpečnostní