Operating Instructions

Control for Motorized Festoon Systems

ABB AC500 with ACS880

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Contents

1 General advice

1.1 About this document

This document facilitates safe and efficient handling and use of the equipment.

The document is an integral part of the equipment and must be kept in it´s immediately vicinity to allow access by personnel at any time. Prior to commencing any work, personnel must have carefully read through and understood this document. It is a basic requirement for safe working that all safety and procedural instructions contained in this document are complied with.

Local accident protection regulations and general safety guidelines for the area of use of the device or system also apply.

Illustrations in this documentation are provided for basic understanding and may deviate from the actual implementation of the unit or system.

In addition to these installation and operating instructions, attached instructions (if any) for installed components also apply.

1.2 Limitation of liability

All information and instructions in this document have been compiled with due regard to the standards and regulations in force, best engineering practice, and the findings and experience we have accumulated over many years.

The manufacturer is in no way liable for damages resulting from:

- failure to comply with this document,
- improper use,
- use by untrained personnel,
- unauthorized modifications,
- technical changes,
- use of unauthorized spare parts and accessories.

The actual scope of delivery may differ from the explanations and illustrations described here for special variants, if additional order options are utilized, or due to the latest technical changes.

The obligations agreed upon in the delivery agreement and our General Terms of Business apply, as do the delivery conditions of the manufacturer and all regulations applicable at the time the contract was concluded.

All products are subject to technical modifications in the context of improvement of function and further development.

1.3 Copyright

1.4 Spare parts

WARNING!

Safety risk due to faulty spare parts!

Faulty or defective spare parts might affect the security and cause damage, malfunction or complete failure.

→ Use only original spare parts of the manufacturer!

Order spare parts from your contracted dealer or directly from the manufacturer.
Contact data for spare parts orders: See the last page of this document.

1.5 Warranty

The regulations about material defects are listed in the general terms and conditions of business.

1.6 Technical support

For technical support please contact our staff from the Customer Support Department.
Contact data for technical information: See the last page of these assembly instructions.

Our employees are also always interested in new information and experience from the field that can be valuable for the improvement of our products.

1.7 Applicable documents

These operating instructions are only valid together with the following instructions for festoons:

- Mounting Instructions MAL0300-0004-E Festoons Systems for I-beam – 0365, 0370, 375
- Mounting Instructions MAL0300-0006-E Motorized Festoons Systems – 0380
- Operating instructions of ABB frequency converter (delivered together with the control panel or downloadable at Supplier Website)

The operator must consider the following documents as supplements of the operating instructions (if applicable):

- Project-specific technical documentation
- Circuit diagram for the control of the motorized festoon
- Drawings
- Spare parts lists
- Sketches

2 Safety advice

2.1 Definition of symbols

Safety and hazard information is identified in these assembly instructions by symbols. Safety instructions are introduced by signal words that signal the scale of the hazard. Always observe safety and hazard instructions, and work carefully to avoid accidents, bodily injury and damage to property!

DANGER!

... indicates an immediately hazardous situation, which if not avoided, may result in death or serious injury.

DANGER!

... indicates an immediately hazardous situation due to electricity, which if not avoided, may result in death or serious injury.

WARNING!

... indicates a possibly hazardous situation, which if not avoided, may result in death or serious injury.

WARNING!

... indicates a possibly hazardous situation due to electricity, which if not avoided, may result in death or serious injury.

CAUTION!

... indicates a possibly hazardous situation, which if not avoided, may result in moderate or minor injury.

Tips and recommendations:
...refers to useful tips and recommendations as well as information for efficient and trouble-free operation.

CAUTION!

...indicates measures that help avoid property damage.

2.2 Requirements on the personnel

2.2.1 Qualification

WARNING!

Risk of injury in case of insufficient qualification!

Incorrect handling can cause serious injury to persons and heavy damage to property.

→ All activities must be carried out by qualified staff!

The operating conditions indicate the following qualifications for the various fields of activity:

- **Instructed personnel/operators**
- have been instructed by the operator about the tasks assigned to them and the possible dangers due to improper behavior.
- **Specialized staff**
- is able to carry out the works assigned to them and realize and avoid any dangers in this regard, based on their training, knowledge, experiences and knowledge of the respective regulations.
- Personnel are considered qualified if they have successfully concluded training, for example, as electricians, master electricians, electrical engineers, or electrical technicians. Personnel are also considered qualified who have been employed correspondingly for several years, have been educated in theory and practice during that time, and whose electrical knowledge and skills have been tested.
- The operator of the electrical facility must document that the corresponding certification or other documentation of qualification are present or have been demonstrated.
- Only those persons are authorized for these works, who are expected to do their work properly. Persons with restricted responsiveness, e.g. due to drugs, alcohol or medication are not permitted.
- For the selection of personnel observe the age-specific and job-related prescriptions effective at the place of installation.

2.2.2 Unauthorized persons

WARNING!

Danger caused by unauthorized personnel!

Unauthorized personnel who do not meet the requirements described in chapter 2.2 do not understand the danger in the working area.

→ Keep unauthorized personnel away from the working area.

→ In case of doubt, address the person and direct them away from the working area.

→ Stop work as long as unauthorized personnel is in the working area.

2.2.3 Instruction

Prior to commissioning the personnel must be instructed by the operator. Report the instructions as follows (example):

Date	Name	Type of instruction	Instructed by	Signature
05.11.2009	John Doe	First safety briefing for the personnel	Robert Miller	

2.3 Personal protective equipment

Always wear: **For all work, always wear:**

Work safety clothing
is close-fitting work clothing that has a low tearing strength with tight arms and no parts that protrude. It is mostly used as protection from getting caught by moving machine parts.
Do not wear any rings, chains or any other jewelry!

Safety shoes
used to protect from falling heavy parts and slipping on slippery floors.

For special tasks, wear: **When carrying out particular tasks, special safety gear is required. The individual sections of these instructions specify this gear in detail. The following particular safety gear is explained below:**

Protective gloves
for the protection of hands from friction, scrapes, stabbing, or deep wounds, as well as from contact with hot surfaces.

Hard hat
for protection from falling and flying parts and materials.

Protective goggles
for eye protection.

2.4 Intended use

The equipment has been exclusively designed and constructed for the intended use described here.
Intended use: Control for motorized festoon system using ABB AC500 and ACS880 components and software adapted to project specific requirements, connecting to crane PLC.

Additional information: Festoon systems are used to operate a power supply for mobile consumer load, such as cranes, overhead cranes, pallet conveyors, etc.

Claims of any kind due to damage from improper use are excluded.

The operator bears sole liability for all damage resulting from unintended use.

WARNING!

Possible injury resulting from improper use!

Any application that deviates from or goes beyond the intended use described here can result in a hazardous situation.

→ The equipment may only be used as intended.

→ Strictly comply with all specifications of these installation and operating instructions.

→ Do not use the equipment for any other purpose than for the operation of the festoon system in the specific project environment described above.

→ Do not use the equipment in any application other than the one it was designed for.

The **following use of the device is forbidden**. Non-intended use particularly includes the following:

- Using the equipment with unapproved accessories or accessories not authorized by the manufacturer.
- Operation of the equipment by untrained personnel.
- Operation of the equipment with supply voltages higher or lower than projected.
- Changing the delivered software modules.
- Changing, bridging and/or deactivation of control circuits or interlocking.
- Bridging and/or deactivating electrical sensors or switches.
- Use of non-approved protective devices.
- Re-adjustment of protective devices.
- Operation under conditions other than the agreed environmental and operating conditions
- Operating the equipment in a location other than the projected physical location.
- Main trolley speed higher than 50 % of nominal speed in case of a fault

2.5 Safety measures by the operator

The equipment is used in the commercial sector. The operator is therefore responsible for occupational safety. Besides the safety advice of these mounting and operating instructions he must observe the safety, accident prevention and environmental protection regulations effective for the range of application of this equipment. Please note in particular:

- The operator must read the valid work safety regulations and determine any additional dangers in a risk assessment, dangers that might arise from special working conditions at the place of installation of the equipment. He then must work out the operating instructions for handling the equipment.
- During the complete operating time the operator must check if his operating instructions are in accordance with the state of technology of rules and standards and adapt them if required.
- The operator must clearly regulate and establish the responsibilities for installation, handling, fault repair and maintenance.
- The operator must ensure that all employees who are handling the equipment, have read and understood these mounting and operating instructions. Moreover he must instruct the personnel at regular intervals and inform them about any dangers.
- The operator must provide the required protective equipment.
- The operator must observe the following standards and regulations when operating a festoon system:

2006/95/EG 2004/108/EG	EC Low Voltage Directive EC EMC Directive
IEC 60204-32	Safety of electrical equipment of hoisting machines
IEC 60038	IEC standard voltages
IEC 60364	Electrical installations of buildings
IEC 60947	Low-voltage switchgear and control gear

Moreover it is in the responsibility of the operator, that the equipment is in perfect technical conditions, this means:

- The operator must ensure that the maintenance intervals described in the mounting and operating instructions are observed.
- The operator must have checked all safety devices regularly for their operational capability and completeness.

2.6 Specific hazards

The following chapter mentions some remaining risks that have been established by risk assessment.

The safety instructions and warning notes listed up in the following chapters of these mounting and operating instructions must be observed, in order to reduce health hazards and avoid dangerous situations.

WARNING!

Danger of death due to suspended loads!

Loads falling or swinging sideways in an uncontrolled manner can lead to severe injuries or death.

→ Never step under suspended loads.

→ Only use the attachment points provided; do not fasten lifting accessories to projecting machine parts or eyes built onto components.

→ Be sure the connection elements are firmly seated.

→ Use only authorized lifting accessories and connection elements with sufficient load capacity.

→ Do not use torn or worn ropes or straps.

→ Do not attach ropes or straps to sharp corners and edges, and do not knot or twist them.

→ Move loads only under supervision.

→ Set down loads before leaving the work area.

WARNING!

Risk of potentially fatal injury from electric shock due to maintenance deficiencies!

When working on motorized festoon system components, there is a risk of death or injury from electric shock, burning, or electric arc if they are not properly inspected and maintained.

→ Disconnect the system from power as described above.

→ Inspect electrical equipment regularly.

→ Replace loose or damaged cables immediately.

→ Burned fuses must always be replaced with a fuse of identical specifications.

→ Use tools that are insulated against voltage.

→ Before each time the device or system is started, test the insulation resistance according to locally applicable technical standards, directives, and law.

WARNING!

Risk of injury due to flexible components!

Careless operation of the motorized festoon system can cause heavy injury and damage of the equipment.

→ Switch off the motorized festoon system before maintenance and repair work.

→ Do not touch moving components during operation, particularly the surface where the festoons roll on the I-beams.

CAUTION!

Risk of crushing!

When the motorized festoon system operates, there is a risk of bruising of the limbs between the buffer and buffer plate, suspension and track beam, and between tooth-belt and pulleys.

→ Do not step into the danger area of the motorized festoon system when it is being operated.

CAUTION!

Risk of stumbling and falling due to projecting components!

When approaching the motorized festoon system, there is the danger of stumbling.

→ When moving inside the working- and danger area of the motorized festoon system, watch out for depressions or bumps in the ground.

→ There must be no loose items are on the ground.

CAUTION!

Risk of getting caught in the festoon system!

When the motorized festoon system operates, there is a risk of getting caught by parts of the festoon system.

→ Do not step into the danger area of the motorized festoon system when it is being operated.

2.7 Safety devices

DANGER!

Danger of death from malfunctioning safety systems!

Safety can only be guaranteed when the safety systems are intact.

→ Before starting work, check if the safety systems are functional, check if all covers properly mounted.

→ Never disable safety systems.

2.8 Behavior in case of accidents and disturbances

Measures in case of accident

- Secure the location of the accident.
- Evacuate personnel from of the danger area.
- Notify rescue services.
- Take first aid measures.
- Inform those responsible for the place of use.
- Free the access path for rescue vehicles.

Measures in case of faults

- Involve qualified personnel for fault analysis.
- Fix the fault before restarting the system or continuing work
- Check for correct function after fault fixing.

3 Technical data

3.1 General

Motorized festoon systems serve as an energy supply for mobile consumers, such as cranes, warehouse cranes, pallet conveyors, etc. The precise specification of the motorized festoon systems are given in the order confirmation. The dimensions of each motorized festoon systems can be found in the dimension sheet.

3.2 Interfaces

Interfaces between the crane control system and control cabinet of the motorized festoon systems are provided in the control panel terminal block or the terminals of the supplied field devices.

The control cabinet is mounted in accordance with the customer in an enclosed electrical equipment room.

CAUTION!

Keep designed power supply voltages!

Operation of the control beyond the power supply voltage tolerances might cause a breakdown of the control or damage to electrical components.
Power supply voltages lower as the nominal motor voltage might cause too high motor current, over-temperature and drive disturbances because of too less motor torque!
That applies for the power supply voltage even during drive acceleration.

CAUTION!

Exemplary voltage and frequency range in this operating instructions!

Voltage and frequency ranges in this operating instruction reflect exemplary system design. Specified voltage and frequency ranges that match project-related requirements are written down in separate, project-related documents (Technical data sheet electrical or circuit diagram).

Description and numbering of interface terminals are usually order specific and may therefore differ from the description and numbering in this document. See also Technical data sheet electrical or circuit diagram for the values relating to your project.

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For the control of the motorized festoons, the customer provides the following power supply:

Designation	wires	Voltage/frequency
Primary current	L1, L2, L3, PE	380 - 480 V, 50/60 Hz
Control voltage AC	L; N; PE	110/230 V, 50/60 Hz
Control voltage DC	L+, M (earthed)	24 VDC
Power supply for anti-condensation heaters	L, N; PE	110/230 V, 50/60 Hz

Permitted tolerances at input terminals of the panel according to IEC 60204-32:
Voltages ± 10%
Frequency ± 1%

Other voltages and frequencies are possible, inquiry is required.

The current required for each supply voltage are dependent on the interpretation and indicated in the circuit diagram of the control cabinet.

CAUTION!

Main switch:

Main switch for the power supply of the control has to be installed in customer's distribution cabinet!

The main power supply of the festoon system has to be switched off by the customer, when the crane operator leaves the crane and in case of emergency stop (e.g. by the crane main switch). Leading switching-off (> 100 ms) of the release signal for ON/OFF of the festoon control is requested.

CAUTION!

Line filter for category 2:

Line filter for limits according to category 2 of EN61800-3 are available for TN systems!

Conducted electromagnetic disturbances are limited according to the requirements of category 3 of EN61800-3. Limits according to category 2 of EN61800-3 are possible by using of an optional line filter (only for TN system available).

3.3 Operating conditions

CAUTION!

Damage due to wrong operating conditions!

Operation conditions **beyond the specified range** cause damage due to short circuit and early aging and failure of electrical components!

Stress factors are

- Dust and deposits
- Humidity
- Condensation
- High temperatures

Environment:

Designation	Value	Hints
Environmental temperature	+5 up to +40°C	
Humidity (relative), max.	≤ 85%, without condensation	
Altitude	Below 1000m	

4 Description of control and operation

4.1 Overview

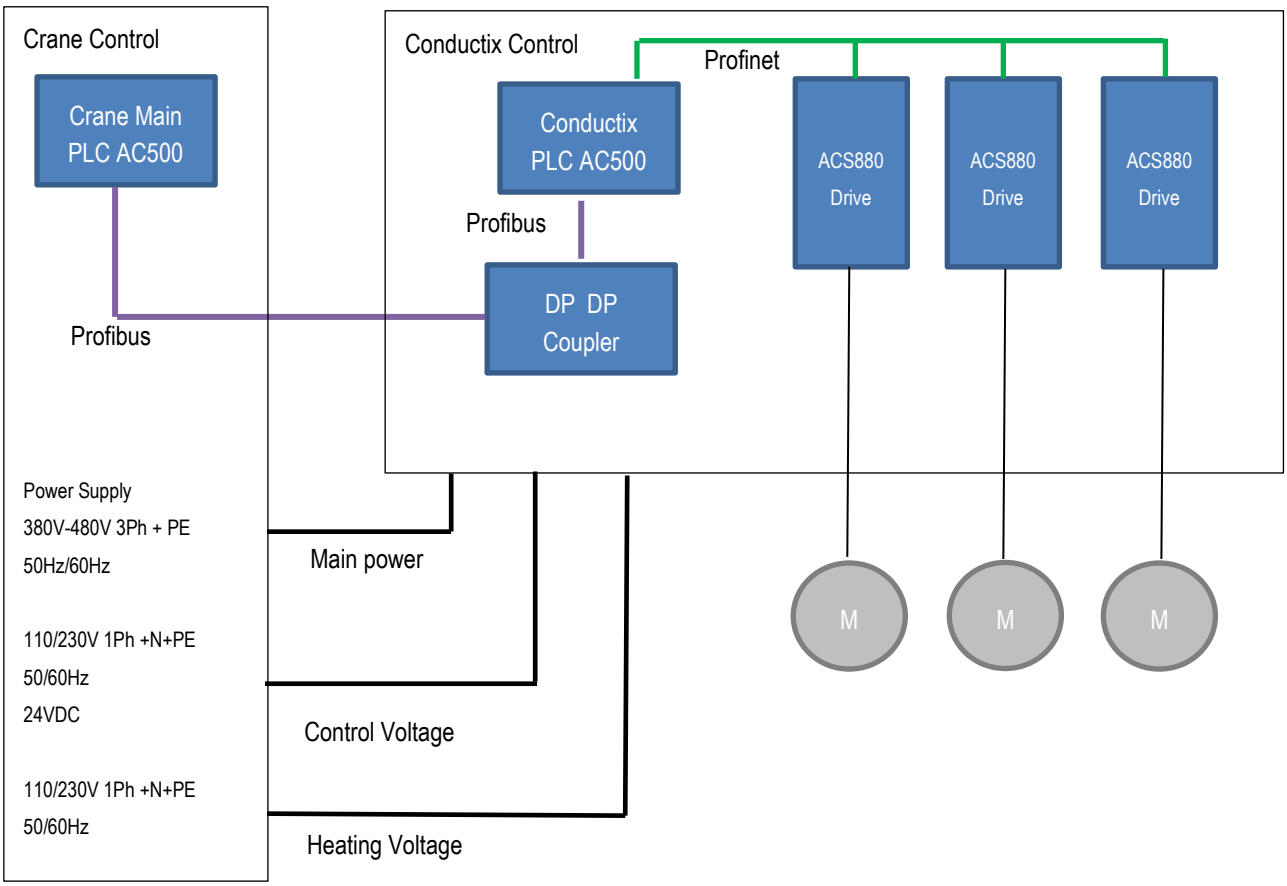
Each motorized festoon is controlled by its own frequency converter depending on the main trolley speed and the position of the festoon. When the land-side (optional: also water-side) final position is reached, the corresponding festoon will be switched-off by a limit switch.

In generator and brake operation, the energy that is fed back by the motors will be dissipated in a braking resistor.

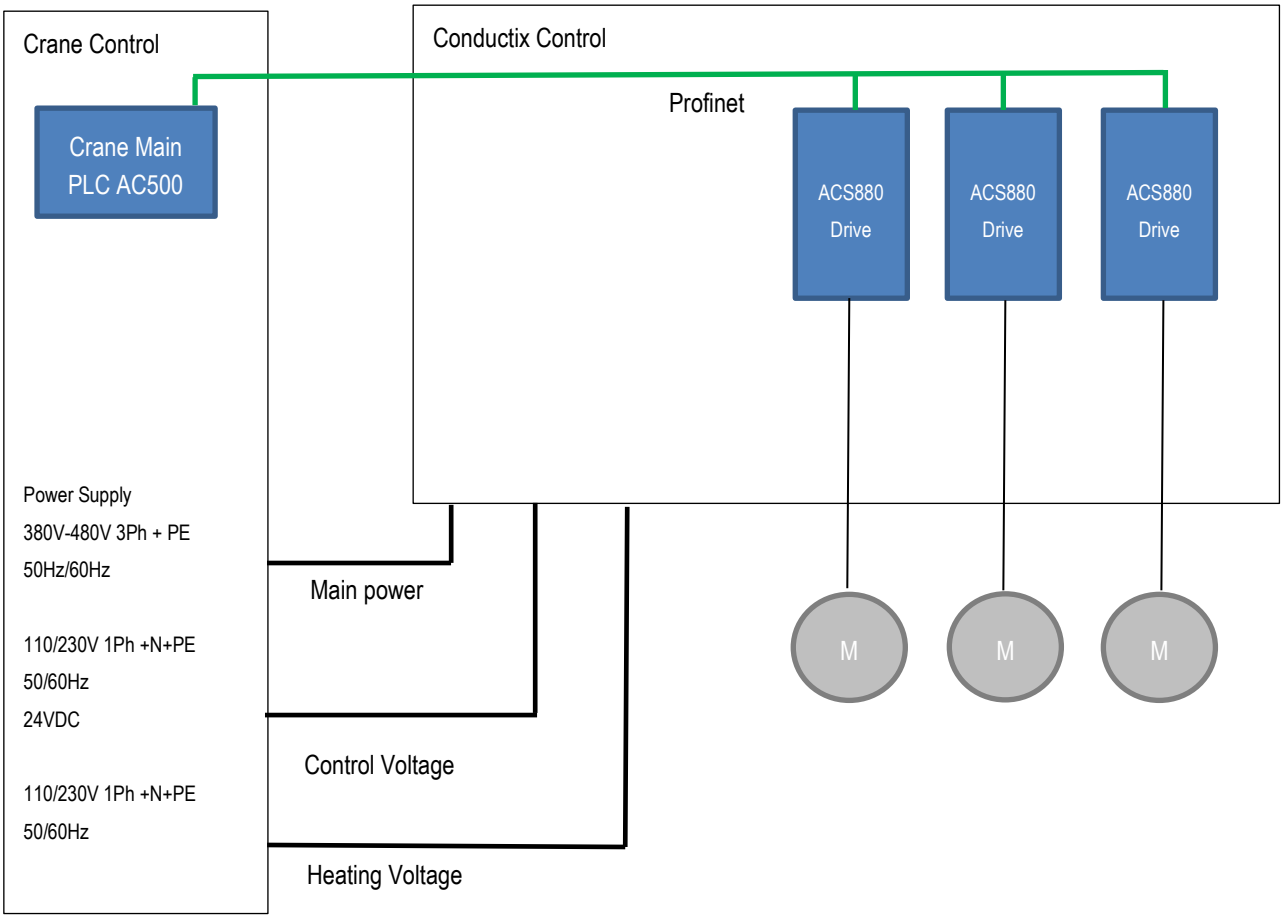
The interface between crane control (ABB AC500) and festoon control (ABB AC500) is done by Profibus DP connection. A DP-DP-Coupler is used as interface module for all interface signals between the crane PLC control and the control of motorized festoons.
It is also possible to integrate the PLC control of the festoon drives into the crane main PLC.
The frequency converter are controlled by the PLC via Profinet connection.

For standalone applications, a separate PLC AC500 (PM573) is used for the motorized festoons. As frequency converter, the ABB ACS880 will be used.

4.1.1 Drive Control in Conductix PLC



4.1.2 Drive Control in Crane PLC



Control of drives in Crane PLC

4.2 Scope of supply

The control is mounted in a switch cabinet, completely wired, including frequency converters with appropriate reactors and fuses, switching devices, coupling relays, panel lighting, heater and fan. It has to be installed in an air-conditioned electrical operating area.

The frequency inverters are parameterized according to the system calculation. The software module for implementation into the Conductix-Wampfler PLC is included in the scope of supply, too.

The dimensioning and manufacturing of the control is carried out according to the relevant instructions of DIN VDE/IEC.

All the electrical equipment is marked according to the circuit diagram. Wiring cables will be labeled according to the terminal designation on the equipment.

The documentation consists of
- components scheme,
- circuit diagram,
- terminal diagram,
- cable list.

Documents are drawn with the help of the E-CAD system WSCAD and supplied as PDF file.
The frequency converter parameters and PLC parameters are supplied as a data file.

4.3 Description of the interface module

For applications with drive control in the Conductix PLC the DP-DP-Coupler is used as interface module for all interface signals between the crane PLC control and the control of motorized festoons (festoon PLC). It is applicable for PLC ABB AC500.

As frequency converter ABB ACS880 will be used. There are different types of communication:

- Between crane PLC and festoon PLC: Profibus for interface and fault signals.
- Between festoon PLC and festoon frequency converter: Profinet.

Details for interface signal exchange see following chapters.

The function blocks are pre-programmed with order-related parameters, parameter adjusting during commissioning can be necessary.

WARNING!

Injury due to wrong parameter adjustment!

Wrong parameter adjustment might cause malfunction of and damage to the festoon system.

→ Parameter adjustment only according to manufacturer instruction and in short steps!

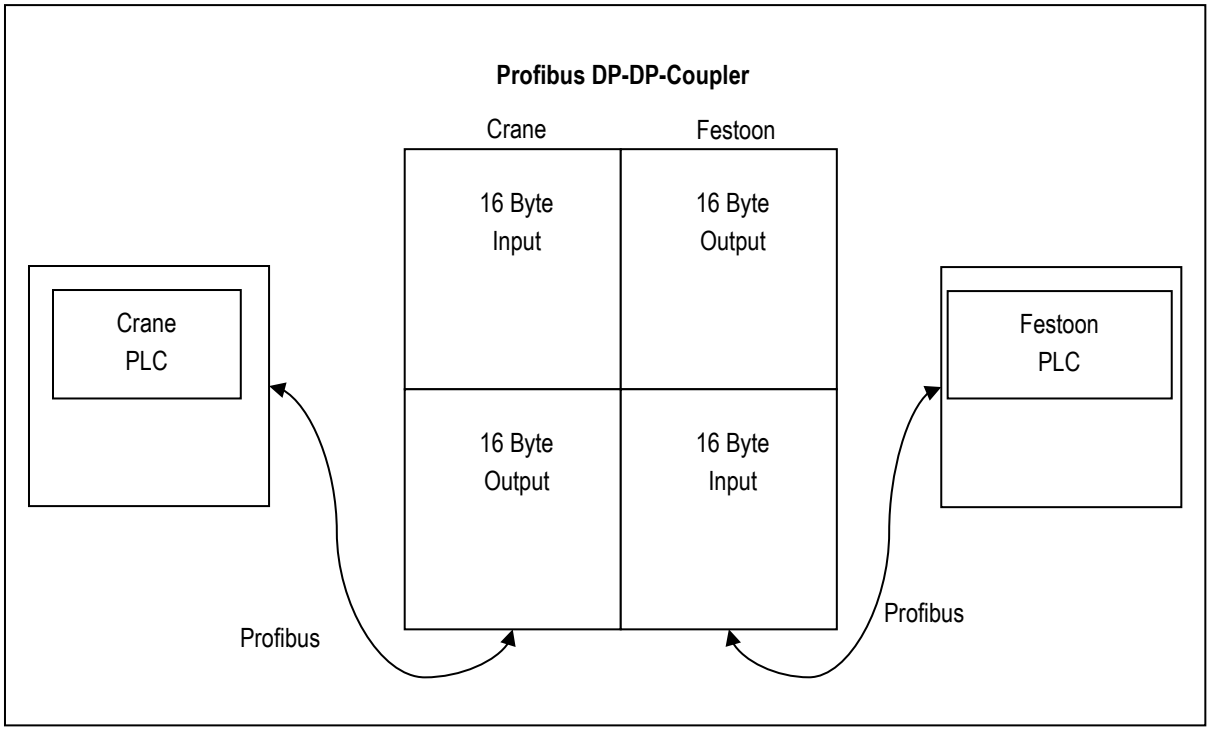
CAUTION!

Data block numbers:

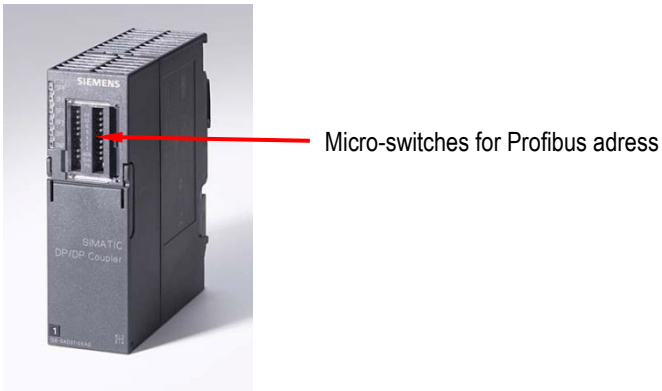
By changing of the numbers of function and data blocks no interference to modules of other manufacturers or functions is allowed!

4.4 Interface signal exchange by Profibus

The communication between crane PLC and festoon PLC is realized with a Profibus DP-DP-Coupler from Siemens.
The DP-DP-Coupler is configured with 16 Byte Input and 16 Byte Output signals. Important is the correct order of input and output signals. On crane PLC side, there are first 16 Byte input and then 16 Byte output signals. The data are consistent over the 16 Byte.



The Profibus DP-DP-Coupler has to be implemented as a slave user into the Profibus network of the crane PLC. The Profibus address has to be set in the Compact Control Builder Software and with the micro-switches on the Profibus DP-DP-Coupler.



4.5 Festoon PLC to Crane PLC

Size of interface data: 16 Byte input consistent

Input signals of crane PLC				
Byte	Bit	Signal	Format	Comment
0	0	Cable trolley ready	bit	All trolleys ready for operation, crane is allowed to drive with full speed when signal is „1“
0	1	Collective_failure	bit	Minimum one trolley has minimum one fault or more
0	2	Toggle_Bit_CXW_to_crane	bit	Toggle bit from Conductix to crane
0	3	Failure_toggle_bit	bit	Toggle bit failure (between crane PLC and CXW PLC)
0	4	Spare	bit	spare
0	5	Spare	bit	spare
0	6	Spare	bit	spare
0	7	Spare	bit	spare
1	0	F1_DI_1	bit	festoon 1 brake resistor
1	1	F1_DI_2	bit	festoon 1 freq. converter
1	2	F1_DI_3	bit	festoon 1 limit switch land side
1	3	F1_DI_4	bit	festoon 1 limit swich water side
1	4	F1_DI_5	bit	festoon 1 temperature OK
1	5	F1_DI_6	bit	reserve
1	6	F1_DO_1	bit	festoon 1 main contactor on
1	7	Spare	bit	
2	0	F1_failure_limit_switch_ws	bit	Festoon 1 failure limit switch water side
2	1	F1_failure_limit_switch_ls	bit	Festoon 1 failure limit switch land side
2	2	F1_failure_fuse_main_voltage	bit	Festoon 1 failure fuse main voltage
2	3	F1_failure_fc	bit	Festoon 1 failure frequence converter
2	4	F1_failure_brake_resistor	bit	Festoon 1 failure brake resistor
2	5	F1_failure_motor_temp	bit	Festoon 1 failure motor temperature
2	6	F1_failure_DC_Bus	bit	Festoon 1 failure DC Bus
2	7	F1_failure_profinet_profibus	bit	Festoon 1 failure profinet/profibus
3	0	F1_failure_local_mode_active	bit	Festoon 1 local mode active
3	1	Spare	bit	
3	2	Spare	bit	
3	3	Spare	bit	
3	4	Spare	bit	
3	5	Spare	bit	
3	6	Spare	bit	
3	7	Spare	bit	
4	0	F2_DI_1	bit	Festoon 2 brake resistor

Input signals of crane PLC				
Byte	Bit	Signal	Format	Comment
4	1	F2_DI_2	bit	Festoon 2 freq. converter
4	2	F2_DI_3	bit	Festoon 2 limit switch land side
4	3	F2_DI_4	bit	Festoon 2 limit swich water side
4	4	F2_DI_5	bit	Festoon 2 temperature OK
4	5	F2_DI_6	bit	reserve
4	6	F2_DO_1	bit	Festoon 2 main contactor on
4	7	Spare	bit	Spare
5	0	F2_failure_limit_switch_ws	bit	Festoon 1 failure number Byte 2
5	1	F2_failure_limit_switch_ls	bit	Festoon 2 failure limit switch water side
5	2	F2_failure_fuse_main_voltage	bit	Festoon 2 failure limit switch land side
5	3	F2_failure_fc	bit	Festoon 2 failure fuse main voltage
5	4	F2_failure_brake_resistor	bit	Festoon 2 failure frequence converter
5	5	F2_failure_motor_temp	bit	Festoon 2 failure brake resistor
5	6	F2_failure_DC_Bus	bit	Festoon 2 failure motor temperature
5	7	F2_failure_profinet_profibus	bit	Festoon 2 failure DC Bus
6	0	F2_failure_local_mode_active	bit	Festoon 2 local mode active
6	1	Spare	bit	
6	2	Spare	bit	
6	3	Spare	bit	
6	4	Spare	bit	
6	5	Spare	bit	
6	6	Spare	bit	
6	7	Spare	bit	Spare
7	0	F3_DI_1	bit	Festoon 3 brake resistor
7	1	F3_DI_2	bit	Festoon 3 freq. converter
7	2	F3_DI_3	bit	Festoon 3 limit switch land side
7	3	F3_DI_4	bit	Festoon 3 limit swich water side
7	4	F3_DI_5	bit	Festoon 3 temperature OK
7	5	F3_DI_6	bit	reserve
7	6	F3_DO_1	bit	Festoon 3 main contactor on
7	7	Spare	bit	Spare
8	0	F3_failure_limit_switch_ws	bit	Festoon 3 failure limit switch water side
8	1	F3_failure_limit_switch_ls	bit	Festoon 3 failure limit switch land side
8	2	F3_failure_fuse_main_voltage	bit	Festoon 3 failure fuse main voltage
8	3	F3_failure_fc	bit	Festoon 3 failure frequence converter
8	4	F3_failure_brake_resistor	bit	Festoon 3 failure brake resistor
8	5	F3_failure_motor_temp	bit	Festoon 3 failure motor temperature
8	6	F3_failure_DC_Bus	bit	Festoon 3 failure DC Bus

Input signals of crane PLC				
Byte	Bit	Signal	Format	Comment
8	7	F3_failure_profinet_profibus	bit	Festoon 3 failure profinet/profibus
9	0	F3_failure_local_mode_active	bit	Festoon 3 local mode active
9	1	Spare	bit	
9	2	Spare	bit	
9	3	Spare	bit	
9	4	Spare	bit	
9	5	Spare	bit	
9	6	Spare	bit	
9	7	Spare	bit	
10-11		F1 failure buffer FC	Word	Festoon 1 actual failure number of frequency converter
12-13		F2 failure buffer FC	Word	Festoon 2 actual failure number of frequency converter
14-15		F3 failure buffer FC	Word	Festoon 3 actual failure number of frequency converter

4.6 Crane PLC to Festoon PLC

Size of interface data: 16 Byte output consistent

Output signals of crane PLC				
Byte	Bit	Signal	Format	Comment
0 – 1		Actual trolley speed	Int	Set value in % from the ramp generator of crane frequency converter. Actual speed in -1000 to +1000 for -100 % to +100 % (positive in direction water side)
2 – 3		Spare speed	Int	
4 – 5		Actual trolley position	Int	Actual trolley position in m (Landside 0....xxx m Waterside)
4 – 7		Spare position	Int	
8	0	Crane Switch On	bit	Signal = 1: Crane switch is on. **Signal must not be switched off before actual speed of main drive is 0!**
8	1	Trolley position ok	bit	Position signal of main trolley is valid
8	2	Drive switch waterside	bit	Crane moves to waterside: actual trolley speed > 0
8	3	Drive switch landside	bit	Crane moves to landside: actual trolley speed < 0
8	4	Reset	bit	Reset signal from crane: Signal = 1 for reset of fault signal
8	5	Toggle bit from crane to CXW	bit	Toggle bit from crane to Conductix
8	6	Spare	bit	Spare
8	7	Spare	bit	Spare
9-10		Spare	Int	Spare
11-12		Spare	Int	Spare
13-14		Spare	Int	Spare
14-15		Spare	Int	Spare

4.7 Sending and receiving the Toggle bit

The Toggle bit is the inverted signal of Send Byte 4 Bit 5 “toggle bit from CXW to crane”.

The Toggle bit is the signal to the crane PLC, that the festoon PLC is running, constantly adapting the movements of the festoons to the movement of the main trolley. If the crane operates with the festoon PLC off, the movement of the main trolley and the festoon system is no longer synchronous. It is likely that the festoon system will be damaged, if crane operation continues. It is therefore essential to integrate the Toggle bit into the main drive stop circuit to stop the crane immediately, if the Toggle bit fails (festoon PLC is off).

Integrating the Toggle bit into the main drive stop circuit:
→ Adapt the crane PLC, so that Receive Byte 0 Bit 5 is copied to Send Byte 4 Bit 5.

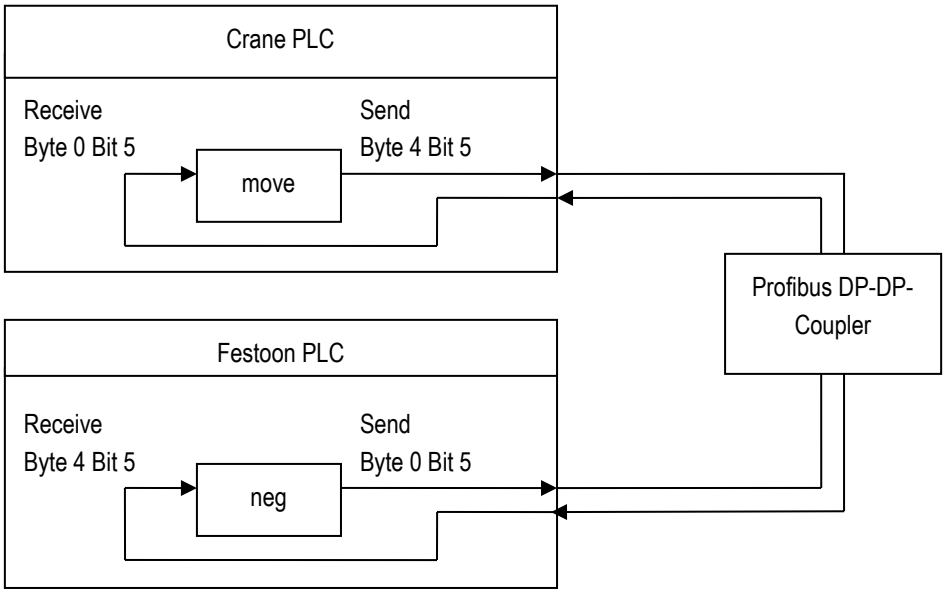
CAUTION!

Risk of damage to festoon system components!
When communication between crane PLC and festoon PLC is interrupted, the crane PLC will receive invalid signals. The movement of the main trolley and the festoon system is no longer synchronous.

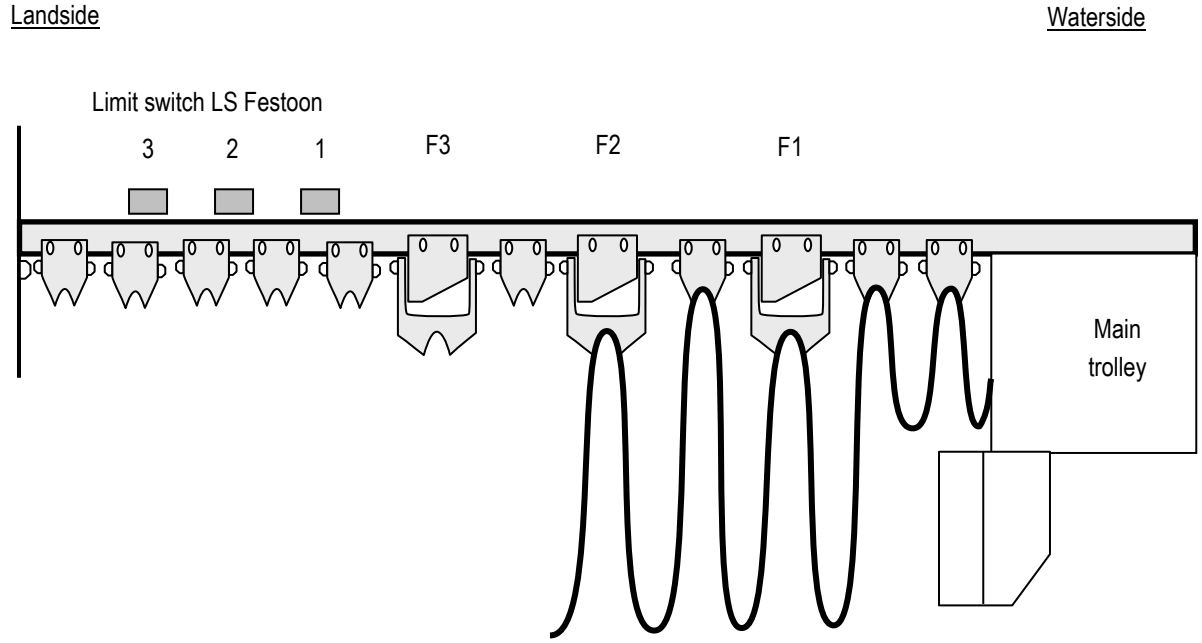
→ To avoid damage, integrate the Toggle bit into the main drive stop circuit to stop the crane immediately, if the Toggle bit fails (festoon PLC is off).

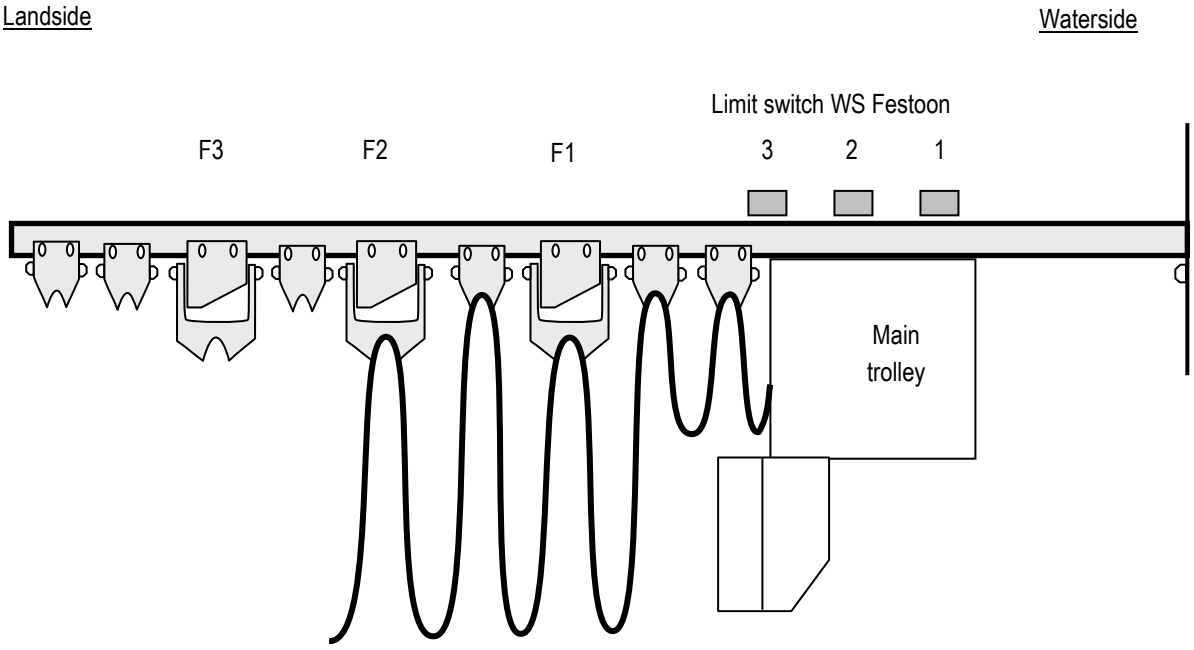
NOTICE!

Minimum signal change check frequency!
It is essential that the crane PLC checks for signal change of the Toggle bit **minimum one time per second**. If there is no signal change detected within one second, the crane has to stop immediately.

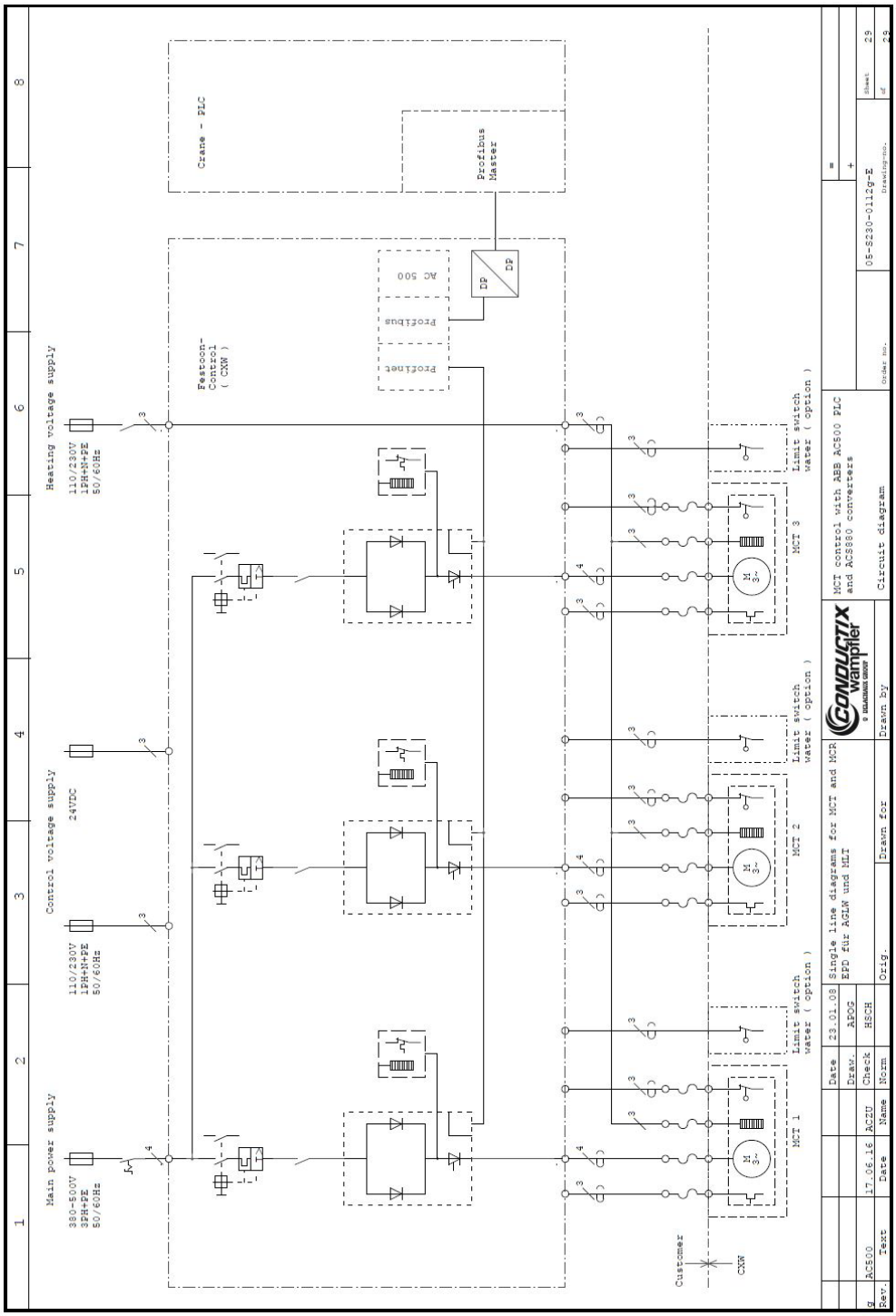


4.8 Schematic sketch of festoon system





4.9 Single Line Diagram



5 Transport, packing and storage

5.1 Transport

5.1.1 Safety advice for transport

WARNING!

Danger of death due to suspended loads!

Loads falling or swinging sideways in an uncontrolled manner can lead to severe injuries or death.

→ Never step under suspended loads.

→ Only use the attachment points provided; do not fasten lifting accessories to projecting machine parts or eyes built onto components.

→ Be sure the connection elements are firmly seated.

→ Use only authorized lifting accessories and connection elements with sufficient load capacity.

→ Do not use torn or worn ropes or straps.

→ Do not attach ropes or straps to sharp corners and edges, and do not knot or twist them.

→ Move loads only under supervision.

→ Set down loads before leaving the work area.

CAUTION!

Damage from improper transport!

Improper transport can result in substantial property damage.

→ Move the cabinet lying in the transport crate.

→ Act with care when unloading the packaged unit as well as during internal transport, and observe the symbols and the hazard information on the packaging.

→ Use only the attachment points provided.

→ Remove packaging only shortly before installation.

5.1.2 Transport inspection

Delivered goods must be checked for completeness and transport damage immediately after arrival.
If any transport damage is recognizable from the outside, proceed as follows:

- Refuse the delivery or accept it only with reservation.
- Note extent of damage on the transport documents or on the delivery note of the carrier.
- Initiate a complaint.

CAUTION!

Initiate your complaint soon!

Complain about each fault, as soon as you have noted it. Claims for damages can only be raised within the respective terms.

5.2 Packing

The individual packages have been packed according to the expected transport conditions. We have used environmentally sound packing material only.
The packing shall protect the individual components up to the assembly from transport damage, corrosion and other kind of damage. This is the reason why the packing material should not be destroyed and only be removed immediately before starting with the assembly.

Handling of packing material:

Dispose of packing material according to the respective legal regulations and local prescriptions.

CAUTION!

Environmental damage due to incorrect disposal!

Packaging material is a valuable resource and can be processed or recycled. In many cases, it can also be reused.

→ Dispose of packaging material in an environmentally responsible manner.

→ Follow all locally applicable disposal regulations; if necessary; engage a specialist company with disposal.

5.3 Storage

Store packed parts under the following conditions:

- Do not store outdoors.
- Store in a dry, dust-free place.
- Do not expose to aggressive media.
- Protect from direct sunlight.
- Avoid mechanical vibration.
- Storage temperature: +5°C to +40°C
- Relative humidity: < 85 %, avoid condensation
- In case of a storage time of more than 3 months, check the general condition of all parts at regular intervals. If required, refresh and renew the preservation.

CAUTION!

Observe additional advice on packaging!

You will possibly find some advice on the packages about storage, which is given additionally to the advice given here. These must be observed as well.

6 Assembly and commissioning

6.1 Safety

Personnel:

- Assembly and initial commissioning must only be carried out by especially trained staff.

The following personal protective equipment has to be worn when carrying out assembly works and initial commissioning:

- Protection clothes
- Protective helmet
- Safety shoes
- Protective gloves

WARNING!

Danger of death due to suspended loads!

Loads falling or swinging sideways in an uncontrolled manner can lead to severe injuries or death.

→ Never step under suspended loads.

→ Only use the attachment points provided; do not fasten lifting accessories to projecting machine parts or eyes built onto components.

→ Be sure the connection elements are firmly seated.

→ Use only authorized lifting accessories and connection elements with sufficient load capacity.

→ Do not use torn or worn ropes or straps.

→ Do not attach ropes or straps to sharp corners and edges, and do not knot or twist them.

→ Move loads only under supervision.

→ Set down loads before leaving the work area.

WARNING!

Risk of injury due to improper installation or commissioning!

Improper installation and commissioning can result in serious injury and damage to property.

→ Before starting work, ensure sufficient installation room and check that the conditions to start the mounting are fulfilled.

→ Handle open, sharp components with care.

→ Maintain order and cleanliness in the installation area. Loosely stacked or piled components and tools are sources of accidents.

→ Mount components properly. Comply with specified screw tightening torques.

→ Secure components so they cannot fall or tip over.

WARNING!

Risk of injury due to defective emergency-stop circuit!

If the emergency-stop circuit does not work properly, movement of the festoons and the cable cannot be stopped safely in an emergency situation. This can cause serious injury or even death of personnel in the danger area.

→ Observe the installation instructions.

→ Install protective covers properly.

→ Installation may only be performed by trained personnel.

WARNING!

Risk of electric shock due to missing or defective protective covers!

Death, heart failure, and burns by electric arc are likely to follow when touching or getting close to openly accessible power line connections or electrical equipment under voltage. There is also a high risk of injury caused by overreaction after being shocked by electricity.

→ Install protective covers properly.

→ Installation may only be performed by trained personnel.

→ Never use equipment without protective covers mounted.

WARNING!

Risk of injury due to misconduct of the devices!

Incorrect device settings will lead to wrong and unpredictable action of the equipment. This can cause serious injury or even death of personnel in the danger area.

→ Observe the operation instructions.

→ Installation may only be performed by trained personnel.

→ Check the parameters and data sets.

→ Use only settings which match the function intended.

WARNING!

Electric shock caused by missing or defective protection devices!

Protection devices disconnect faulty circuits from power and thereby protect personnel and electrical equipment. If protection devices are missing or defective, overcurrent or circuit malfunction can damage electrical equipment, set it on fire, or set accessible parts under voltage. This can cause serious injury or even death.

→ Install protective devices according to regulations.

→ Installation may only be performed by trained personnel.

→ Check protection devices regularly.

WARNING!

Risk of electric shock when disconnecting or connecting connectors under voltage!

Disconnecting or connecting connectors under voltage can cause serious injury or even death.

→ Turn off the power supply voltage and the control voltage supply (24 V DC).

→ Ensure the device is disconnected from power.

→ Never separate or join connectors under voltage.

6.1.1 Grounding

Grounding the equipment is mandatory, regardless of the type of energy transmission. Follow these rules:

- Ground the unit by the shortest route
- Use a green-yellow cable

6.2 Preparations

Required tools:

- Insulated screwdriver for electrical work
- Insulated side cutters
- Stripping tools
- Press pliers for ferrules
- Meter for voltage, current, insulation
- Laptop with PLC and frequency converter software
- Crescent wrenches

6.3 Assembly

DANGER!

Injury due to improper installation!

Improper installation can result in serious injury and property damage.

→ The operation and maintenance personnel must have read and understood the operating instructions, in particular the guidelines on safety.

→ Installation of the festoon system must be performed by sufficiently qualified and trained specialists.

→ Protective gear for operation and maintenance personnel must be provided and used.

→ The system operator or his/her representative has to supervise that personnel keep safety and risks in mind when working on or with the system.

Reset button position

It is recommended to position the reset button near the storage of the festoon system.
Before pushing the reset button, authorized staff must carry out an inspection and take respective actions for fault correction.

CAUTION!

Always inspect the festoon system before system reset!
Fault signals which cause the PLC to stop system operation **are safety measures**. They have been designed and integrated into the system in order to protect personnel and machinery.
See chapter 9 for further information about System Reset.

Control panel installation

- The control panel has to be installed in an air-conditioned electrical room.
- The customer connects the external equipment outside the control panel (motors, limit switches etc.) according to the information given in the documentation.
- Power cables and signal cables have to be installed in separate cable trays.

CAUTION!

Risk of damage caused by wrong cable connection!
Wrong connected cables might cause damage to electrical components!

CAUTION!

Risk of damage caused by wrong cables!
Use of non-screened cables might cause malfunction of and damage to electrical components!
→ Use screened cables

CAUTION!

Avoid hum loops!
→ To avoid hum loops, correct dimensioning and installation of earth system of all panels has to be considered for 24 V DC power supply!

CAUTON!

Exemplary voltage and frequency range in this operating instructions!
Voltage and frequency ranges in this operating instruction reflect exemplary system design. Specified voltage and frequency ranges that match project-related requirements are written down in separate, project-related documents (Technical data sheet electrical or circuit diagram).

Description and numbering of interface terminals are usually order specific and may therefore differ from the description and numbering in this document. See also Technical data sheet electrical or circuit diagram for the values relating to your project.

All field devices are connected according to the documentation. Description and numbering of interface terminals are usually order specific and may therefore differ from the description and numbering in this document.

Signals from field devices to the customers crane PLC as potential-free contacts (wired to the terminal strip, signal level depends on PLC input module):

Designation	Signal level
Magnetic limit switch MCT 1, water-side	110/230 VAC
Magnetic limit switch MCT 1, land-side	110/230 VAC
Magnetic limit switch MCT 2, water-side	110/230 VAC
Magnetic limit switch MCT 2, land-side	110/230 VAC
Magnetic limit switch MCT 3, water-side	110/230 VAC
Magnetic limit switch MCT 3, land-side	110/230 VAC

For the connection of the festoon cables the customer has to provide a terminal box with the appropriate dimensions. Screened cables have to be used for fixed installed motor and temperature sensor cables and for signal cables.

MCT (Festoon) No.	Connection	Interface terminal
1	Motor phase U	-3T1-X1:U
1	Motor phase V	-3T1-X1:V
1	Motor phase W	-3T1-X1:W
1	Motor PE	-3T1-X1:PE
1	Motor screen	-3T1-X1:S
1	Motor temperature sensor	XMTH:2
2	Motor phase U	-4T1-X1:U
2	Motor phase V	-4T1-X1:V
2	Motor phase W	-4T1-X1:W
2	Motor PE	-4T1-X1:PE
2	Motor screen	-4T1-X1:S
2	Motor temperature sensor	XMTH:3
3	Motor phase U	-5T1-X1:U
3	Motor phase V	-5T1-X1:V
3	Motor phase W	-5T1-X1:W
3	Motor PE	-5T1-X1:PE
3	Motor screen	-5T1-X1:S
3	Motor temperature sensor	XMTH:4
1-3	Voltage temperature sensor [L]	XMTH:1
1-3	Motor anti-condensation heaters L	-XE:2
1-3	Motor anti-condensation heaters N	-XE:5
1-3	Motor anti-condensation heaters PE	-XE:PE

6.4 Testing and initial commissioning

WARNING!

Risk of injury due to improper commissioning!

Improper commissioning may cause dangerous situations for the personnel.

→ Prior to commissioning, test equipment according to the manufacturer's test list.

→ Never put motorized festoon system into operation without testing equipment according to the manufacturer's test list.

→ Before commissioning, make visual inspection and audit work required.

→ Refrain from any risky procedure.

→ Report damage to the motorized festoon system to the person in charge instantly.

→ Secure the motorized festoon system against accidental or unauthorized use.

→ Staying in the area of influence of the motorized festoon system is prohibited!

CAUTION!

Risk of crushing!

When the motorized festoon system operates, there is a risk of bruising of the limbs between the buffer and buffer plate, suspension and track beam, and between tooth-belt and pulleys.

→ Do not step into the danger area of the motorized festoon system when it is being operated.

CAUTION!

Risk of getting seized in the festoon system!

When the motorized festoon system operates, there is a risk of getting seized by parts of the festoon system.

→ Do not step into the danger area of the motorized festoon system when it is being operated.

CAUTION!

Danger of tripping on projecting parts!

When working on the motorized festoon system, there is a risk of tripping.

→ When walking in the work area and danger area of the festoon system, be careful of projections and depressions in the floor. No loose objects may be left on the floor.

Conditions of Commissioning

- A festoon system is usually commissioned by Conductix-Wampfler (CXW) Commissioning Engineers together with the Crane Manufacturer/Crane Control Manufacturer.
- For the duration of commissioning, the operator has to provide personnel needed for commissioning, such as operators, electricians, fitters, etc.
- Free access of CXW Commissioning Engineers and support personnel to the system must be guaranteed.

After Commissioning

After the commissioning has been successfully completed, an Installation Acceptance Certificate will be signed by both parties, certifying that the commissioning corresponds to all specified requirements.

→ Safely store the signed original hardcopy of the Installation Acceptance Certificate.

→ The operator has to send the complete actual PLC-Program (with the latest parameter changes included) and the frequency converter parameters by e-mail to: service.de@conductix.com.

6.5 Checklist initial commissioning

Activity	Checked
Inspection of mechanical parts	
Visual inspection of correct mechanical installation of the magnetic limit switches.	
Visual inspection of the correct arrangement of the trolleys on the track beam. The trolley numbers from the driver terminal are numbered in the direction of end terminal.	
Visual inspection of the correct mounting height of the driver terminal and end terminal.	
Check the towing ropes, damping devices and wind retaining devices.	
Check arrangement and tight clamping of the cables on the festoon cable supports.	
Check adjustment and protection of the lateral guide rollers.	
Check the tooth belt tension.	
Inspection of electrical parts	
Visual inspection of the cabinet or mounting plate for transport damage.	
Check all terminal screws on motor protection circuit breaker for firm seat.	
Check the system for correct wiring (cabinet, limit switch, motor …).	
Check motor cable for correct connection.	
Check shield (screen) connections.	
Check limit switch signals (simulation with separate magnets).	
PLC-Program integrated in the festoon PLC.	

6.6 Carrying out initial commissioning

Activity	Checked
Interface signals between crane and Conductix-Wampfler installation.	
Check the direction of rotation of the motors and the correct assignment Frequency converter 1 = Motor 1	
Make Motor ID for all motors.	
Test festoon system for correct function at this crane speed: 10 %	
Check function of the waterside and landside limit switch.	
Improve the crane speed by adjusting the parameters for the scaling factor for the speed of the motorized festoons.	
Test festoon system for correct function at this crane speed: 100 %	
Check automatic limitation of main trolley speed to 120 m/min in case of failure of the festoon system.	

7 Operation

7.1 Safety

Danger of death due to suspended loads!

Loads falling or swinging sideways in an uncontrolled manner can lead to severe injuries or death.

WARNING!

→ Never step under suspended loads.

→ Only use the attachment points provided; do not fasten lifting accessories to projecting machine parts or eyes built onto components.

→ Be sure the connection elements are firmly seated.

→ Use only authorized lifting accessories and connection elements with sufficient load capacity.

→ Do not use torn or worn ropes or straps.

→ Do not attach ropes or straps to sharp corners and edges, and do not knot or twist them.

→ Move loads only under supervision.

→ Set down loads before leaving the work area.

Risk of injury due to improper operation!

Improper operation can result in serious injury and property damage.

WARNING!

→ Perform all operating steps as specified in this manual.

→ Before starting work ensure that all covers and safety devices are installed and working properly.

→ Never disable safety systems.

→ Maintain order and cleanliness in the installation area. Loosely stacked or piled components and tools are sources of accidents.

Danger to life due to heavy weight, electric energy and moving machinery!

Unauthorized persons who do not meet the requirements described in chapter 2.2 do not understand the danger in the working area. They might get run over, get crushed, they might touch electrically live parts or manipulate equipment in a dangerous way.

WARNING!

→ Keep unauthorized persons away from the working area.

→ In case of doubt, address the persons and direct them away from the working area.

→ Stop work as long as unauthorized persons are in the working area.

WARNING!

Misconduct of the devices due to incorrect instrument setting!

Incorrect instrument settings might lead to uncontrollable behavior of devices, which can lead to serious injury and even death.

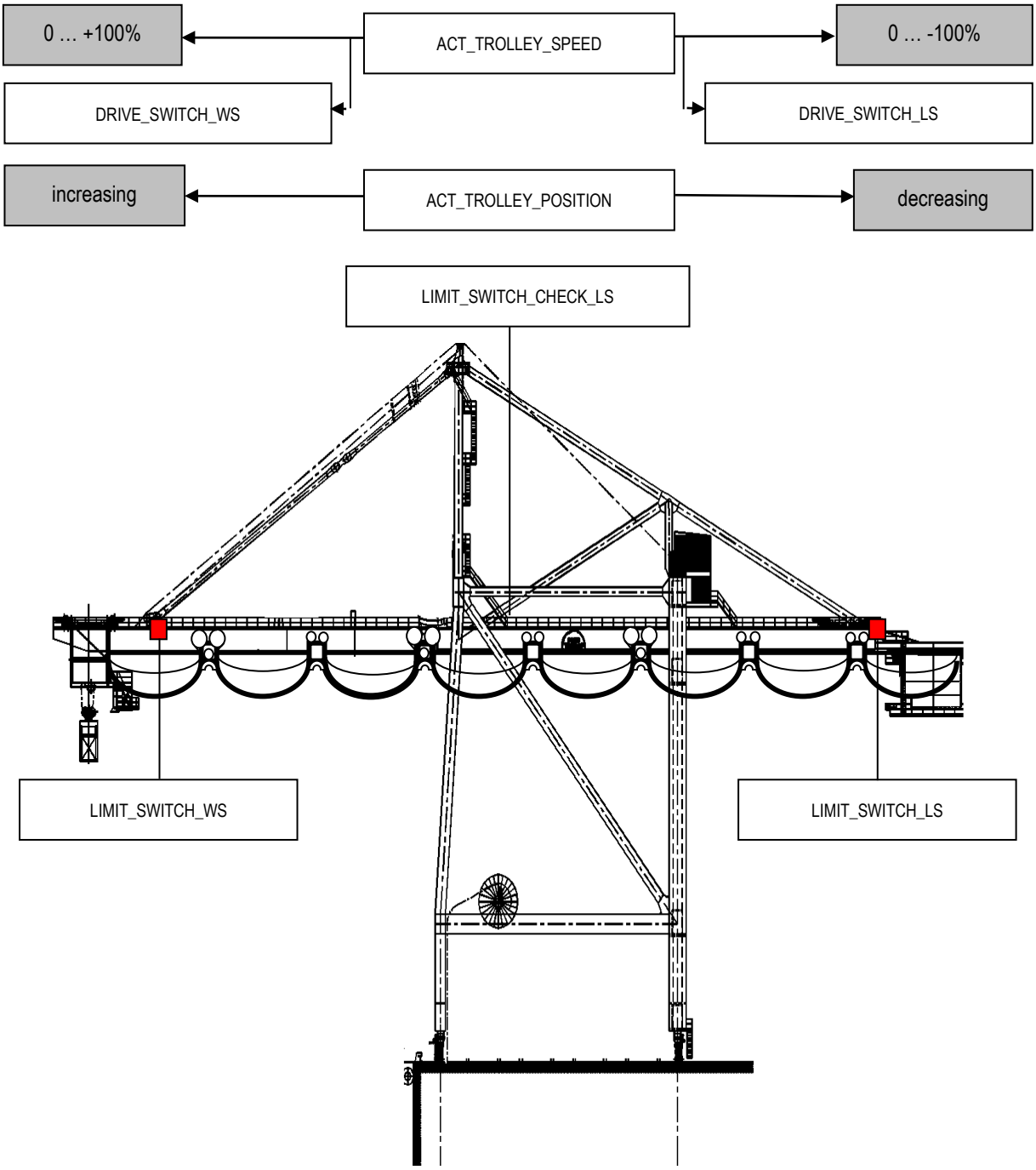
→ Never change parameters and data sets without consulting the manufacturer.

→ Do not change settings of protective devices.

Personnel:

- Operation by trained personnel only!

7.2 Overview and Definition



7.3 Main contactor ON

Signal (CRANE_SWITCH_ON) sets output for drive main contactor (MAIN_CONTACTOR_ON).

Signal (CRANE_SWITCH_ON) for the drive of the motorized festoon mustn´t switch off before actual speed of main trolley is 0 to ensure motor deceleration of the motorized festoon according to the designated ramp-down time.

Formal operand	Format	Factory setting	Function
CRANE_SWITCH_ON	BOOL		Crane main switch ON
MAIN_CONTACTOR_ON	BOOL		Output main contactor of drive(Drive Output)

7.4 Analysis of crane signals

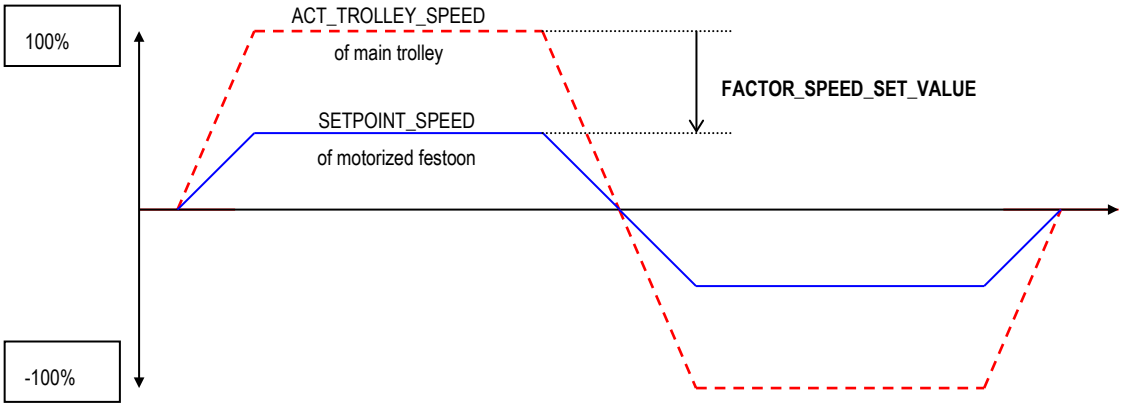
- At lower speed range, motorized festoons are controlled by the joystick signals "negative/positive direction".
- At higher speeds and for detection of acceleration and deceleration, scaled main trolley speed is used for festoon speed calculation. See chapter 7.5.

Formal operand	Format	Factory setting	Function
DRIVE_SWITCH_WS	BOOL	-	Input from joystick: "waterside direction"
DRIVE_SWITCH_LS	BOOL	-	Input from joystick: "landside direction"
ACTUAL_TROLLEY_SPEED	INT		Actual main trolley speed in -1000 to +1000 for -100 % to +100%

7.5 Scaling of speed setpoint value of motorized festoon

To adjust the speed of the motorized festoon (motor speed setpoint value), the actual main trolley speed has to be multiplied by a scaling factor. The scaling factor will be calculated for each festoon drive by Conductix-Wampfler experts. If necessary, the scaling factor has to be adjusted during commissioning.

Formal operand	Format	Factory setting	Function
FACTOR_SPEED_SET_VALUE	REAL		Scaling main trolley speed to speed setpoint value of festoon [0.0-1.0] (in Parameters)



7.6 Monitoring overspeed

In case of pushing or pulling of the motorized festoon by the main trolley, the speed setpoint value of the motorized festoon will be corrected by the control.

7.7 Switching off by limit switches

The speed setpoint value will be reduced according to the adjustable deceleration ramp up to the given stop frequency, if the positive or negative direction limit switch is actuated by the motorized festoon.

8 Service and maintenance

8.1 Safety

WARNING!

Risk of injury due to improper maintenance works!

Improper maintenance works may cause serious injuries to persons and damage to properties.

→ Prior to starting work make sure that the conditions to start the mounting are fulfilled.

→ Ensure that the workplace is clean and tidy! Loose components and tools, that are lying around may cause accidents.

→ If components have been removed, ensure that they are mounted correctly, reinstall all fasteners and observe the screw tightening torques.

→ Observe the protective covers and contact guards.

→ Ensure proper coverage of power connections.

8.2 Maintenance schedule

The following chapters describe the maintenance works, which are required for an optimum and undisturbed operation.
The maintenance work carried out must be recorded in writing.
If signs of stronger abrasion are found during regular controls, shorten the maintenance intervals in accordance with the actual signs of wear.
For questions concerning maintenance works and intervals contact the manufacturer, see service address on the last page.

Interval	Maintenance work	To be effected by
Every 6 months	Filters of panel ventilator have to be changed	Expert

CAUTION!

Replace tooth-belts every 6.000 crane operating hours!

After 6.000 crane operating hours, both tooth-belts on the motorized festoons must be replaced. This replacement must be **triggered by the PLC/CMS by a warning signal** to the crane operator.

9 Fault diagnosis

WARNING!

Risk of injury due to improper fault clearance!

Improper fault clearance may cause severe injury or damage to property.

→ In case of disturbance contact the manufacturer.

→ Fault clearance must only be carried out by workers of the manufacturer or by personnel authorized by the manufacturer.

WARNING!

System damage from continuation of operation!

- Damage of buffers
- Damage of tooth-belts
- Possible injury from falling objects!

→ Thoroughly analyze all faults before remedying the related causes!

WARNING!

Death due to electric shock!

Work on electrical systems or production equipment may only be performed by specialized electricians or persons under the supervision and direction of an electrician in accordance with electrical rules (qualified specialists).

9.1 Procedure in case of alarms and faults

WARNING!

Severe system damage from continuation of operation!

In case of any fault of a drive unit of a festoon system, the superior control/crane control must react as follows:

- **immediately restrict the speed of the crane trolley to a max. of 50 % and to less than 120 m/min**
- visualize the fault in the CMS

Further crane operation in this emergency mode is only allowed temporary for max. 1 shift until the completion of the ship loading/unloading cycle

→ Conductix-Wampfler has to be informed in writing without delay.

→ The fault has to be analyzed followed by a visual inspection of all relevant parts.

After corrective actions as service or repair, the fault reset must only be given by authorized service staff.

It is recommended to position the reset button near the storage of the festoon system.

A fault message at a frequency inverter can be reset after the fault analysis and fault elimination by the control signal “reset”. During operation, the frequency inverter can generate sporadic alarm signals on the display. These are required for subsequent processing within the inverter program and do not have any influence on the operation of the system and can therefore be ignored.

9.2 Monitoring limit switch function

WARNING!

System damage from continuation of operation!

- Damage of buffers
- Damage of tooth belts
- Possible injury from falling objects!

By latching of the first priority signal (POSITION_OK) and programming of the position value (ACTUAL_TROLLEY_POSITION) limit switch signals will be monitored during operation according to following criteria:

- Main trolley position (ACTUAL_TROLLEY_POSITION) > (LIMIT_SWITCH_CHK_LS) and landside limit switch signal (LIMIT_SWITCH_LS) is OFF → fault signal (FAILURE_LIMIT_SWITCH_LS) will be latched.

- Main trolley position (ACTUAL_TROLLEY_POSITION) < (LIMIT_SWITCH_CHK_WS) and waterside limit switch signal (LIMIT_SWITCH_WS) is OFF → fault signal (FAILURE_LIMIT_SWITCH_WS) will be latched.

After having analyzed and corrected the reason of the wrong switching performance of the limit switch, reset is possible by the input (RESET).

In case of a fault, main trolley speed has to be limited to maximum 50 % and to less than 120 m/min!

Formal operand	Format	Factory setting	Function
ACTUAL_TROLLEY_SPEED	INT	-	Actual main trolley speed in -1000 to +1000
DRIVE_SWITCH_WS	BOOL	-	Input from joystick "waterside direction"
DRIVE_SWITCH_LS	BOOL	-	Input from joystick "landside direction"
LIMIT_SWITCH_WS	BOOL	-	Input limit switch water side. DI4, active when limit position not reached
LIMIT_SWITCH_LS	BOOL	-	Input limit switch landside. DI3 active when limit position not reached
ACTUAL_TROLLEY_POSITION	INT	-	Actual main trolley position in m
POSITION_OK	BOOL		Position measuring system no fault
LIMIT_SWITCH_CHK_WS	REAL	-	Position for monitoring limit switch signal waterside (in Parameters)
LIMIT_SWITCH_CHK_LS	REAL		Position for monitoring limit switch signal landside (in Parameters)
FAILURE_LIMIT_SWITCH_WS	BOOL		Output fault limit switch waterside
FAILURE_LIMIT_SWITCH_LS	BOOL		Output fault limit switch landside
RESET	BOOL		Input reset fault

9.3 Frequency converter

WARNING!

System damage from continuation of operation!

- Damage of buffers
- Damage of tooth belts
- Possible injury from falling objects!

Communication between CXW PLC and frequency converters is carried out with Profinet.
In case of a frequency converter fault a general fault signal (FAILURE_FC) occurs, the signal (CABLE_TROLLEY_READY) will be switched off. The main drive has to be stopped. Reason of fault signal has to be analyzed and fixed before reset of the fault (RESET).
Fault signal (FAILURE_FC) can be used for fault identification system of the crane. At same time, the alarm storage of the frequency converter (FAILURE_NUMBER_FC) may be read out.

In case of a fault, main trolley speed has to be limited to maximum 50 % and to less than 120 m/min!

Formal operand	Format	Factory setting	Function
CABLE_TROLLEY_READY	BOOL		Signal output festoons ready for operation
FAILURE_FC	BOOL		Signal output fault frequency converter
RESET	BOOL		Input reset fault
FAILURE_NUMBER_FC	WORD		Failure number of frequency converter

9.4 Brake resistor

WARNING!

System damage from continuation of operation!

- Damage of buffers
- Damage of tooth belts
- Possible injury from falling objects!

In case of a brake resistor fault a general fault signal (COLLECTIVE_FAILURE) occurs, the signal (CABLE_TROLLEY_READY) will be switched off. The main drive has to be stopped. Reason of fault signal has to be analyzed and fixed before reset of the fault (RESET).
Fault signal (FAILURE_BRAKE_RESISTOR) can be used for fault identification system of the crane.

In case of a fault, main trolley speed has to be limited to maximum 50 % and to less than 120 m/min!

Formal operand	Format	Factory setting	Function
CABLE_TROLLEY_READY	BOOL		Signal output festoons ready for operation
COLLECTIVE_FAILURE	BOOL		One or more faults on one or more festoons
FAILURE_BRAKE_RESISTOR	BOOL		Signal output fault brake resistor
RESET	BOOL		Input reset fault

9.5 Motor Temperature

WARNING!

System damage from continuation of operation!

- Damage of buffers
- Damage of tooth belts
- Possible injury from falling objects!

In case of a motor temperature fault a general fault signal (COLLECTIVE_FAILURE) occurs, the signal (CABLE_TROLLEY_READY) will be switched off. The main drive has to be stopped. Reason of fault signal has to be analyzed and fixed before reset of the fault (RESET).
Fault signal (FAILURE_MOTOR_TEMP) can be used for fault identification system of the crane.

In case of a fault, main trolley speed has to be limited to maximum 50 % and to less than 120 m/min!

Formal operand	Format	Factory setting	Function
CABLE_TROLLEY_READY	BOOL		Signal output festoons ready for operation
COLLECTIVE_FAILURE	BOOL		One or more faults on one or more festoons
FAILURE_MOTOR_TEMP	BOOL		Signal output fault motor temp
RESET	BOOL		Input reset fault

9.6 DC BUS

WARNING!

System damage from continuation of operation!

- Damage of buffers
- Damage of tooth belts
- Possible injury from falling objects!

In case of a two low DC Bus Voltage after a switch on delay of (TON_RELEASE_FC) a general fault signal (COLLECTIVE_FAILURE) occurs, the signal (CABLE_TROLLEY_READY) will be switched off. The main drive has to be stopped. Reason of fault signal has to be analyzed and fixed before reset of the fault (RESET). Fault signal (FAILURE_DC_BUS) can be used for fault identification system of the crane.

In case of a fault, main trolley speed has to be limited to maximum 50 % and to less than 120 m/min!

Formal operand	Format	Factory setting	Function
CABLE_TROLLEY_READY	BOOL		Signal output festoons ready for operation
COLLECTIVE_FAILURE	BOOL		One or more faults on one or more festoons
FAILURE_MOTOR_DC_BUS	BOOL		Signal output fault DC Bus voltage
TON_RELEASE_FC	TIME	T#3s	Delay time after DC Bus voltage checked (Parameter)
RESET	BOOL		Input reset fault

9.7 Profinet/Profibus Connection to the drive

WARNING!

System damage from continuation of operation!

- Damage of buffers
- Damage of tooth belts
- Possible injury from falling objects!

In case of a loss of the Profinet or Profibus communication to one of the drives a general fault signal (COLLECTIVE_FAILURE) occurs, the signal (CABLE_TROLLEY_READY) will be switched off. The main drive has to be stopped. Reason of fault signal has to be analyzed and fixed before reset of the fault (RESET).
Fault signal (FAILURE_PROFINET_PROFIBUS) can be used for fault identification system of the crane.

In case of a fault, main trolley speed has to be limited to maximum 50 % and to less than 120 m/min!

Formal operand	Format	Factory setting	Function
CABLE_TROLLEY_READY	BOOL		Signal output festoons ready for operation
COLLECTIVE_FAILURE	BOOL		One or more faults on one or more festoons

Formal operand	Format	Factory setting	Function
FAILURE_PROFINET_PROFIBUS	BOOL		Communication to one of the drives lost.
RESET	BOOL		Input reset fault

9.8 History Fault

WARNING!

System damage from continuation of operation!

- Damage of buffers
- Damage of tooth belts
- Possible injury from falling objects!

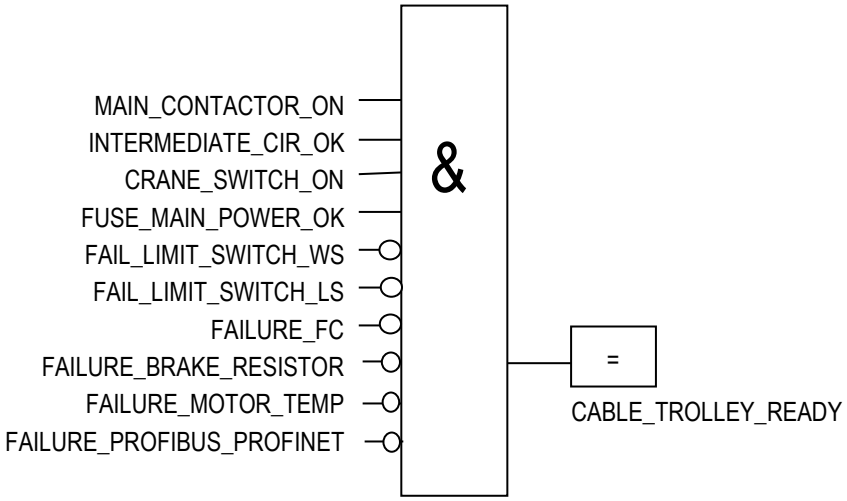
In the history fault function the last faults of festoon 1 to 3 are logged. The history can be used to detect which faults are occurred in the last time.

Formal operand	Format	Factory setting	Function
FESTOON_1_HISTORY_FAULT	ARRAY [1..100] OF STRING(60)		History faults of festoon 1
FESTOON_2_HISTORY_FAULT	ARRAY [1..100] OF STRING(60)		History faults of festoon 2
FESTOON_3_HISTORY_FAULT	ARRAY [1..100] OF STRING(60)		History faults of festoon 3

9.9 Enabling operation

The status bit (CABLE_TROLLEY_READY), indicating the correct function of the motorized festoon, has to be interlocked into the enabling sequence of the setpoint limiting of the main trolley speed. **If the signal is „0“, the main trolley speed has to be limited to maximum 50 % and to less than 120 m/min.**

Following preconditions are necessary for enabling operation:



10 Disassembly and disposal

10.1 Safety

DANGER!

Risk of fatal injury from electric shock!

Death, heart failure, burns and injury by electric arc are likely to follow when touching electrically life parts. There is also a high risk of injury caused by overreaction after being shocked by electricity.

Before working on parts potentially under voltage:

→ Disconnect system from power using the main switch.

→ If there is no main switch, disconnect the energy source from the system according to the instructions of the system manufacturer.

→ Secure system against reactivation,

→ confirm that power has been disconnected,

→ ground and short-circuit parts of the system disconnected from power,

→ cover or block off neighboring parts still carrying electrical current.

→ Before each time the device or system is started, test the insulation resistance according to locally applicable technical standards, directives, and law.

WARNING!

Risk of injury due to improper disassembly!

Stored residual energy, edged components, tips or corners at or in the device or at the required tools may cause injuries.

→ Make sure there is enough room prior to starting works.

→ Be careful with open, sharp-edged components.

→ Ensure that the workplace is clean and tidy! Loose components or tools that are lying around may cause accidents.

→ Dismount components properly. Note that some components have a heavy net weight. Use hoist units if required.

→ Secure components, so that they cannot fall down or turn over.

→ In case of questions, consult the manufacturer.

CAUTION!

Risk of stumbling and falling due to projecting components!

When approaching the motorized festoon system, there is the danger of stumbling.

→ When moving inside the working- and danger area of the motorized festoon system, watch out for depressions or bumps in the ground.

→ There must be no loose items are on the ground.

CAUTION!

Risk of crushing!

When the motorized festoon system operates, there is a risk of bruising of the limbs between the buffer and buffer plate, suspension and track beam, and between tooth-belt and pulleys.

→ Do not step into the danger area of the motorized festoon system when it is being operated.

WARNING!

Danger of death due to suspended loads!

Loads falling or swinging sideways in an uncontrolled manner can lead to severe injuries or death.

→ Never step under suspended loads.

→ Only use the attachment points provided; do not fasten lifting accessories to projecting machine parts or eyes built onto components.

→ Be sure the connection elements are firmly seated.

→ Use only authorized lifting accessories and connection elements with sufficient load capacity.

→ Do not use torn or worn ropes or straps.

→ Do not attach ropes or straps to sharp corners and edges, and do not knot or twist them.

→ Move loads only under supervision.

→ Set down loads before leaving the work area.

10.2 Disassembly

When the device has reached the end of its useful life, disassemble it and dispose of it in an environmentally compatible way.

Prior to starting the disassembly:

- Remove and dispose of operating and auxiliary material as well as remaining items in an environmentally compatible way.
- Disconnect the whole installation from power.
- Then clean assemblies and components properly and decompose them with regard to the valid local instructions for operational safety and environmental protection

10.2.1 Disassembly of the assembly group

DANGER!

Risk of fatal injury!

→ Pay attention to the safety instructions given in chapters 10, 6 and 2.6

Personnel:

- Execution by instructed personnel

Required tools:

- Insulated screwdriver for electrical work
- Insulated side cutters
- Meter for voltage
- Crescent wrenches

10.3 Disposal

If return or disposal arrangements have not been made, use decomposed components for recycling:

- Scrap metals.
- Provide plastic elements for recycling.
- Dispose of remaining components separately according the material consistence.

CAUTION!

Environmental damage due to incorrect disposal!

Electric scrap, electronic components, lubricants and other auxiliary materials are subject to hazardous waste treatment and may only be disposed of by approved specialist companies!

→ Dispose of electric scrap, electronic components, lubricants and other auxiliary materials in an environmentally responsible manner by handing these materials over to hazardous waste treatment authorities.

→ Follow all locally applicable disposal regulations; if necessary; engage an approved, specialist company with disposal.

The local authority or specialized service centers for disposal give advice as to environmentally compatible disposal.

11 Further documents

11.1 Spare parts list

Number of individual parts and the type (power, voltage) are order specific!

- PLC Relay Socket
- Coupling relay
- PLC Control
- Frequency Converter
- Filter mat
- Lamp use
- Motor protection switch

11.2 Applicable documents

- Mounting Instructions MAL0300-0004-E Festoons Systems for I-beam – 0365, 0370, 375
- Mounting Instructions MAL0300-0006-E Motorized Festoons Systems – 0380
- Operating instructions of ABB frequency converter (delivered together with the control panel or downloadable at Supplier Website)

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