

Operating Manual

Interroll ZoneControl



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Content

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1 About this document

1.1 Information about this operating manual

This operating manual covers the following Interroll ZoneControl.

Throughout this manual, the term "control system" is used as an alternative for referring to these models.

The operating manual is a component of the product and contains important advice and information regarding the different operating phases of the ZoneControl. It describes the ZoneControl at the time of shipping from Interroll.

The currently applicable version of this operating manual can be found online at: www.interroll.com/support/

All the information and advice in this operating manual has been compiled with respect to applicable standards and regulations as well as the current state of the art.

- To ensure safe and faultless operation and to fulfil any warranty claims that may apply, read this operating manual first and observe its instructions.
- Keep this operating manual within close reach of the ZoneControl.
- Pass this operating manual onto every subsequent owner or user.



The manufacturer assumes no liability for damage and malfunctions that occur as a result of non-compliance with this operating manual.



Should you still have any unanswered questions after reading this operating manual, please contact Interroll customer service. Contact details for your region can be found online at www.interroll.com/contact/

Please direct any comments and suggestions regarding our operating manuals to manuals@interroll.com

About this document

1.2 Warning notices in this document

Warning notices are provided in the context in which danger can occur and describe the nature of the danger in question. They are structured according to the following examples:



SIGNAL WORD

Type and source of hazard

Consequence(s) in the event of non-compliance

➤ Measure(s) for avoiding hazard

Signal words indicate the type and severity of the consequences if measures to avoid the hazard are not observed.



DANGER

Denotes an imminent hazard.

If measures to avoid the hazard are not observed, death or severe injury will occur.

➤ Preventive measures



WARNING

Denotes a potentially hazardous situation.

If measures to avoid the hazard are not observed, death or severe injury may occur.

➤ Preventive measures



CAUTION

Denotes the possibility of a hazardous situation.

If measures to avoid the hazard are not observed, minor or moderate injury may occur.

➤ Preventive measures

NOTE

Denotes a situation that can lead to material damage.

- Preventive measures
-

1.3 Symbols



This symbol indicates useful and important information.



This symbol indicates a requirement that must be fulfilled before carrying out assembly or repair work.



This symbol indicates general information relating to safety.



This symbol indicates an action that needs to be performed.



This symbol indicates a listed item.

Safety-related information

2 Safety-related information

2.1 State of the art

The Interroll ZoneControl has been constructed with respect to applicable standards and the current state of the art and has been delivered in a condition that is safe to operate. Nevertheless, hazards can occur as a result of use.



Non-compliance with the instructions in this operating manual can result in life-threatening injuries.

In addition, the applicable local accident prevention regulations for the area of application and general safety regulations must be adhered to.

2.2 Proper use

The ZoneControl may only be used in an industrial environment for industrial purposes within the stipulated performance limits that are given in the technical specifications.

It controls an Interroll RollerDrive and must be integrated into a conveyor unit or conveyor system before commissioning.

2.3 Improper use

Any use that goes beyond the proper use is considered improper, unless this has been authorised by Interroll Engineering GmbH where applicable.

The equipment must not be installed in areas in which substances could form explosive atmospheres/dust atmospheres or for application in the medical/pharmaceutical sector.

It is considered improper use to install the equipment in exposed spaces that are open to potentially adverse weather conditions, or areas in which the technology would suffer from the prevailing climactic conditions and could potentially malfunction as a result.

The ZoneControl is not intended for use by private end users. The equipment must not be used in a residential environment without further examination and without the use of EMC protective measures that have been adapted accordingly.

It must not be used as a safety-relevant component or for performing safety-relevant functions.

2.4 Qualification of personnel

Non-qualified personnel are unable to identify risks and are therefore exposed to higher levels of danger.

- Only qualified personnel may be assigned with the tasks outlined in this operating manual.
- The operating company is responsible for ensuring that personnel adhere to the locally valid rules and regulations for working in a safe and risk-aware manner.

This operating manual is intended for the following target audiences:

Operators

Operators are trained in how to operate and clean the Interroll ZoneControl unit and follow the safety regulations.

Service engineers

The service engineers have a specialist technical education or have successfully completed a training course from the manufacturer. They carry out repair and maintenance work.

Qualified electricians

Qualified electricians have a specialist technical education. Moreover, due to their knowledge and experience as well as knowledge of applicable regulations, they are able to carry out work on electrical equipment in an appropriate manner. They are able to identify hazards independently and prevent electrical damage to persons and property.

All work on electrical equipment must generally only be performed by a qualified electrician.

Safety-related information

2.5 Dangers



Here, you will find information about the different types of dangers or damage that can occur in connection with the operation of the ZoneControl.

Injury to persons

- Maintenance and repair work on the unit must only be carried out by authorised technical personnel in compliance with the applicable provisions.
- Before switching on the ZoneControl, ensure that no unauthorised personnel are situated in the vicinity of the conveyor/conveying system.

Electricity

- Installation and repair work must only be carried out when the system has been disconnected from the power supply. Switch off the power to the ZoneControl and ensure that it cannot be unintentionally switched on again.

Work environment

- Remove any materials and objects that are not required from the working area.
- Wear safety shoes.
- Stipulate that the material to be conveyed must be set down carefully and monitor this to ensure it is carried out correctly.

Faults in operation

- Regularly check the ZoneControl for visible damage.
- If smoke develops, immediately switch off the power to the ZoneControl and ensure that it cannot be unintentionally switched on again.
- Immediately contact specialist personnel to determine the cause of the malfunction.

Maintenance

- Since the product in question requires no maintenance, it is sufficient to simply examine the ZoneControl for visible damage on a regular basis.
- Never open up the ZoneControl.

Unintentional start-up

- Ensure that the connected RollerDrive/motors cannot start up unintentionally, particularly during assembly and maintenance work or in the event of a fault.

2.6 Interface to other devices

The integration of the ZoneControl into a conveyor system can create additional potential hazards. Such potential hazards are not covered by this operating manual and must be analysed during the development, installation and commissioning of the conveyor system as a whole.

- Following the integration of the ZoneControl into a conveyor system, the entire system must be checked for any new potential hazards that may be present before the conveyor is switched on.

2.7 Operating modes/operating phases

Standard operation

Operation in the installed condition at the end customer as a component in a conveyor in an overall system.

Special operation

Special operation encompasses all operating modes/operating phases that are necessary to guarantee and maintain safe standard operation.

Special operating mode	Comments
Transport/storage	-
Assembly/commissioning	In de-energised state
Cleaning	In de-energised state
Maintenance/repair	In de-energised state
Fault location	-
Troubleshooting	In de-energised state
Decommissioning	In de-energised state
Disposal	-

Safety-related information

2.8 Applicable documentation

In order to ensure proper use of the RollerDrive, additional operating manuals/documentation relating to the following must be consulted:

- Power supply unit
- RollerDrive
- Description of the conveyor system/unit



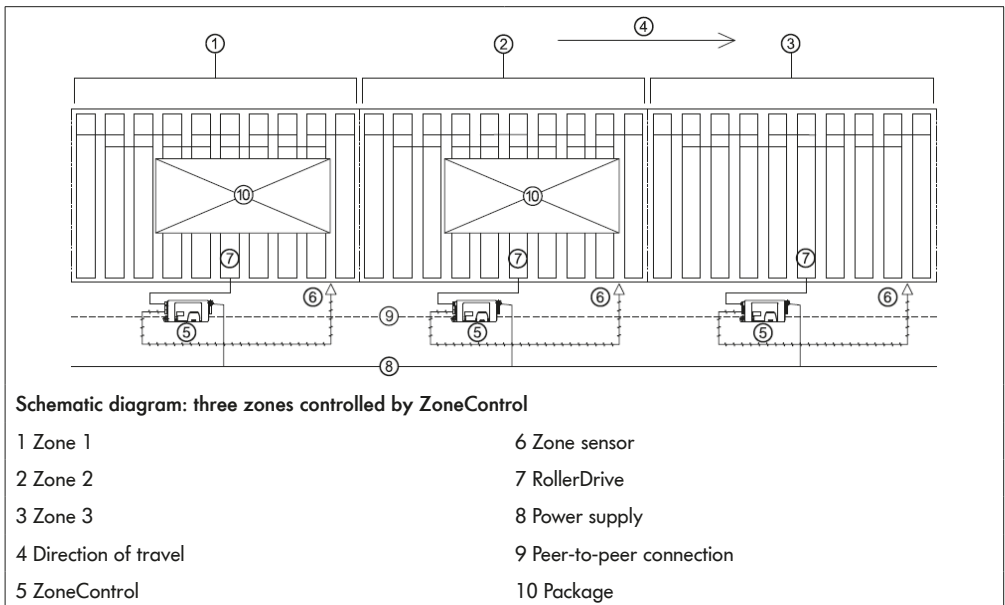
Also ensure that you adhere to the information given in the operating manuals of the connected devices.

3 Product information

3.1 Product description

The ZoneControl is used to facilitate zero pressure accumulation conveying, meaning that goods are transported without coming into contact with each other. To achieve this, the conveyor is sub-divided into zones. One zone consists of a RollerDrive, several idler rollers, a ZoneControl and corresponding sensors.

Zero pressure accumulation conveying is achieved by there being only one product in every zone and by the zones retaining the package until the downstream zone is detected as being „free“ by the corresponding sensor. When accumulation occurs, a signal is transmitted upstream to retain the next package. A gap is always left between the goods being transported so that no accumulation pressure occurs.



The sensor in zone 1 has detected a package. The ZoneControl in zone 1 sends a request to zone 2 to ask whether the package can continue to be conveyed. Since zone 2 also contains a package, its ZoneControl denies permission until this package has been transferred to zone 3 (singulated release mode) or at the very least its onward transport has been started.

In singulated release mode, the package is only conveyed on if the package in the downstream zone has fully left this zone. In train release mode, the packages are virtually transported simultaneously (with a time delay of approx. 125 ms to reduce peak current when starting up.)

The ZoneControl in zone 1 only activates the RollerDrive in this zone after it receives the corresponding signal from the ZoneControl in zone 2.

Product information

Functions

- The speed and direction of rotation of a RollerDrive EC310 (or EC300 with adapter cable) can be controlled.
- The signals from two sensors (start and zone sensors) can be evaluated.
- The feeding of packages into the start zone can be controlled by a sensor or by an external signal.
- Transport logic can be influenced by external control signals (ZONE_START, ZONE_STOP, ZONE_STATUS, CLEAR, DIR_RET), enabling different functions:
 - Automatic stop at personal gates
 - Individual zone stops within the conveyor line
 - Clearing the entire system in or against the set direction of rotation
 - Feed-in/removal of packages outside of the start and end zone (for instance in conjunction with an external handling system)
- The control signals can either be processed in PNP mode or in NPN mode.
- Regenerative braking: When the RollerDrive motor brakes, it acts as a generator and feeds energy back into the power supply. The ZoneControl is fitted with a brake chopper.

Speed settings

The speed of the RollerDrive can be adjusted in two different ways by ZoneControl:

- Internally at eight levels by means of three DIP switches
- Externally continuously via the analog input SPEED (is handled with priority and enables more fine-tuned adjustment)

The speed setting is converted to an analog control voltage by the ZoneControl and output by the RollerDrive as a reference setting. This reference setting is independent of the RollerDrive gears and their diameter.

Speed setting of the see „Speed setting“, page 40.

The acceleration and braking behaviour of the RollerDrive is defined by its own moment of inertia, the gears used, the conveying speed, the moment of inertia of connected conveyor rollers, the selected torque transmission and the goods transported.

Feedback of energy / Overvoltage protection

If the RollerDrive is stopped by the ZoneControl or if the speed is reduced abruptly, the kinetic energy of the package is regeneratively converted into electrical energy in the motor. This energy is then fed back into the ZoneControl, resulting in increased voltage in the DC-net. This is limited to a non-critical level (28 V) by the integral brake chopper. However, if there are enough other consumers attached to the DC-net, the voltage rise will be low and the energy will be fed back in, resulting in the energy being available to other consumers in the DC-net and energy-savings being made if conditions are favourable.

Temperature protection

If operational conditions mean that the brake chopper is switched on so often that the upper temperature limit of approx. 90 °C (measured internally) is reached, then the ZoneControl switches off. If temperature protection is active, this is shown on the LED display. When the ZoneControl has cooled down, the RollerDrive restarts automatically when a signal is pending.



CAUTION

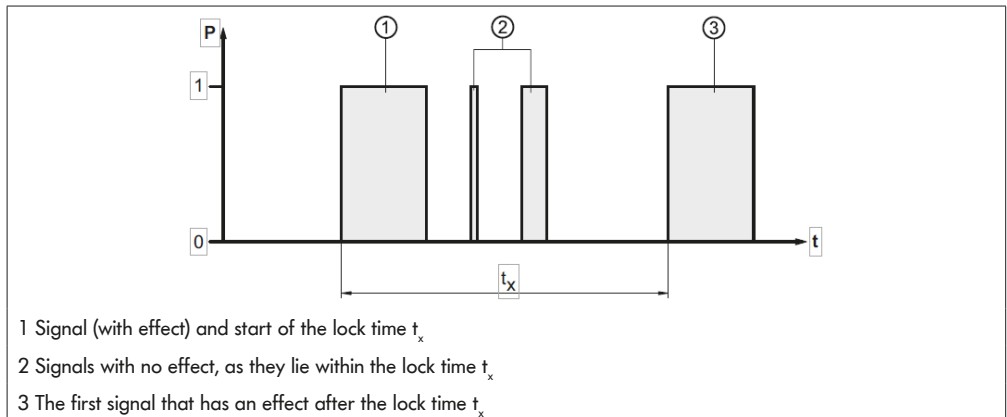
Unintended start-up of the RollerDrive following the ZoneControl cooling down!

Danger of crushing of limbs and damage to goods!

➤ Ensure that no start signal is pending during the cooling-down process.

Lock period for signal modifications / Debouncing

The external signal inputs, the sensor connections and the DIP switches are protected by the firmware to guarantee operation in the event of edge-unstable and bouncing input-levels. This means that after a signal status change, there is a time gap of 20 ms in which no additional status change is accepted. The sample applies to the sensor inputs, where signal status changes are only processed 50 ms after a signal modification.



After-run time

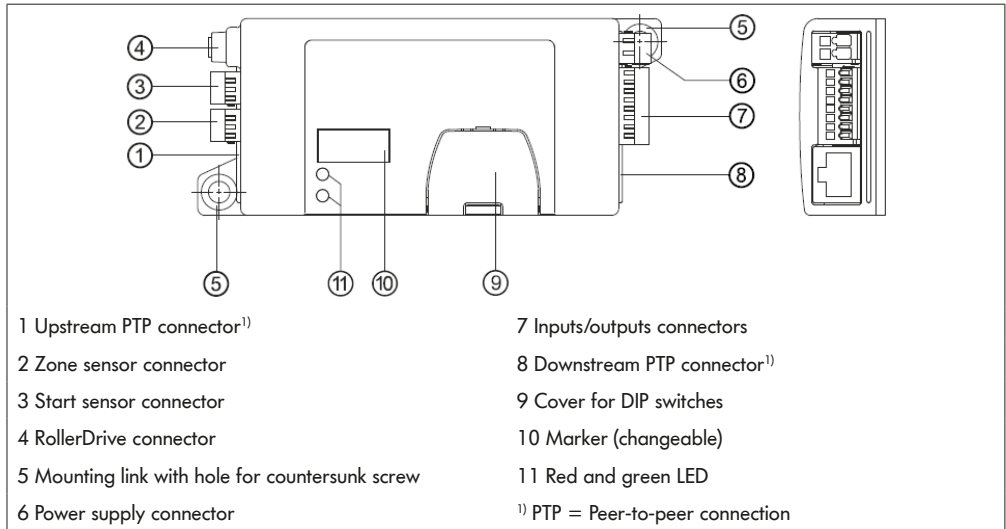
Once a package has left the sensor of a zone, then the RollerDrive in this zone continues to run for additional 4 seconds. At the end of 4 seconds, the RollerDrive stops, providing no new package is transferred from the upstream zone.

This feature provides the following benefits:

- Energy-savings by switching off the RollerDrive if no further packages have to be transported.
- Avoidance of unnecessary start/stop operation if there are no gaps between the packages.

Product information

3.2 Setup



3.3 Scope of delivery

The ZoneControl contains the following components:

- ZoneControl
- Mating plug for power supply (WAGO 734-102/xxx-xxx)
- Mating plug for power supply (WAGO 734-102/xxx-xxx)
- Spare tool for power supply mating plug (black)
- Spare tool for inputs/outputs mating plug (yellow)

3.4 Label

The information on the label is used to identify the ZoneControl.



3.5 Technical data ZoneControl

Rated voltage	24 V DC, protected extra-low voltage (PELV)
Voltage range	19 bis 26 V DC (no polarity protection) ¹⁾
Current consumption	with RollerDrive: 3 to 5 A without RollerDrive: 0,08 to 0,5 A
Protection classification	IP 20
Cooling	Convection
Ambient temperature in operation	0 °C to +40 °C
Ambient temperature during transport and storage	-20 °C to +70 °C
Air humidity	5 to 95 %, condensation not permissible
condensation not permissible	Max. 1000 m

¹⁾ A single ZoneControl is protected against reverse polarity connection of the operation voltage. Polarity protection is gone as soon as assemblies are connected via PTP.

Product information

3.6 Meaning of the LEDs

The LEDs indicate the operating condition of the ZoneControl and the RollerDrive and provide information about the operating voltage.

LED green	LED red	Meaning	Behaviour of RollerDrive
Flashing ¹⁾	Flashing ¹⁾	Initialisation of ZoneControl	Depending on sensor assignment
On steady	Off	ZoneControl ready for operation	Stop
Flashing ¹⁾	Off	RollerDrive receives start signal	Rotates
On steady	Flashes once ¹⁾	RollerDrive faulty or not connected	Stop
On steady	Flashes twice ¹⁾	Fault in conveyor process (for instance jammed package)	Stop
On steady	Flashes three times ¹⁾	Shutdown due to excessive temperature in chopper resistance	Stop
Off	Flashes four times ¹⁾	System error (for instance PTP cable disconnected)	Stop
Off	On steady	Fuse triggered	Stop

¹⁾ Depending on the error, the LED flashes in different sequences (0.5 s on - 0.5 s off) within a period of 4 seconds.

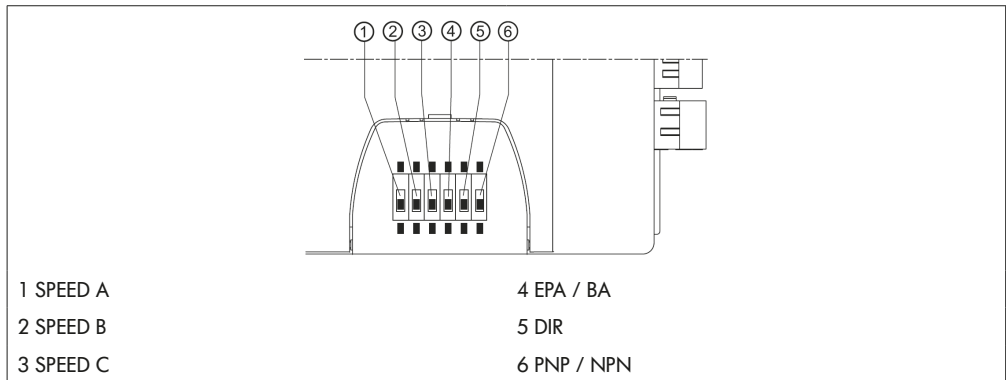
3.7 DIP switches

The DIP switches can be used to select the speed, direction of transportation, operating mode and logic conversion (PNP/NPN). Factory default of the DIP switches 1 to 3 is ON and that of DIP switches 4 to 8 is OFF.

DIP switches	ON	OFF
SPEED A, B, C	Speed setting (see „Speed setting“, page 40)	
EPA / BA	Train release mode (BA) ¹⁾	Singulated release (EPA) ¹⁾
DIR	RollerDrive rotates in an anticlockwise direction ²⁾	RollerDrive rotates in a clockwise direction ²⁾
PNP /NPN	Signals are emitted in accordance with NPN logic	Signals are emitted in accordance with PNP logic

¹⁾ see „Product description“, page 15

²⁾ The direction of rotation is seen from the connecting cable side, if the external input DIR_RET is not switched. Combined with a signal at the CLEAR signal input, the direction of rotation is reversed if the DIR_RET input is switched.



Product information

3.8 Meaning of signals

ZONE_STATUS

The ZONE_STATUS signal is the output signal of the handshake function of the ZoneControl. The assigned signal input is ZONE_START.

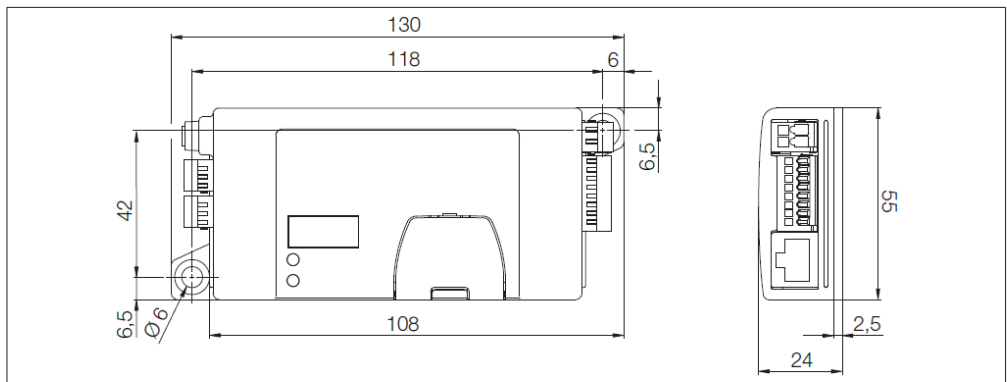
The ZONE_STATUS signal is active when:

- The ZONE_START signal is active.
- The start or zone sensor is occupied (by regular in-feed of a package or by placing a package on a previously empty zone).

The ZONE_STATUS signal gets in-active when:

- A package initially standing is conveyed into the following zone. When the zone sensor becomes free, the ZONE_STATUS gets in-active providing no further package is following.
- If a package does not reach the zone sensor, the system assumes after 5 seconds that the package has been manually removed and the ZONE_STATUS signal gets in-active.
- If a standing package is removed manually (and the zone sensor gets thereby freed), the RollerDrive continues rotating for 2 seconds. If the sensor is not occupied again during this time and no other package follows, the ZONE_STATUS signal gets in-active.

3.9 Dimensions



4 Transport and storage

4.1 Transport



Caution

There is a risk of injury if transported incorrectly!

- Only qualified and authorized persons should transport the product.
-

Please note the following:

- Do not stack more than four cardboard boxes on top of each other.
- Prior to transport, check whether the ZoneControl is correctly attached.
- Avoid heavy impacts during transport.
- Check each ZoneControl after transport for any visible damage.
- If any damage has been identified, photograph the damaged parts.
- In the event that damage has been incurred during transport, inform the shipping agent or Interroll immediately to ensure that you do not lose any potential damage claims.
- Do not expose the ZoneControl to any strong fluctuations in temperature, since this can lead to condensation forming.

4.2 Storage



CAUTION

Risk of injury due to improper storage.

- Ensure that the ZoneControl is stored safely.
-

Please note the following:

- Do not stack pallets on top of one another.
- Check each ZoneControl after storage for any visible damage.

Assembly and installation

5 Assembly and installation

5.1 Warning notices for installation

NOTE

An improper approach to installing the ZoneControl can lead to material damage or reduce the service life of the ZoneControl.

- To preserve the interior of the ZoneControl, do not allow the ZoneControl to fall or for it to be used in an improper fashion.
 - Check each ZoneControl before assembly for any visible damage.
 - Ensure that the ZoneControl is not tensioned during the assembly process (no bending or torsional load).
 - Do not drill any additional mount holes into the housing and do not enlarge any existing holes.
 - Ensure that the permitted operating temperature is under no circumstances exceeded as a result of external heat sources.
-

5.2 Assembling the ZoneControl

- Look for level surfaces that are suitable for mounting the ZoneControl on.
- Use the ZoneControl as a template and mark the middle of the two installation holes. For the distance between the installation holes, see „Dimensions“ on page 22.
- Drill two installation holes with diameters of 5.6–6 mm on the markings.
- Screw on the ZoneControl.
- Make sure the housing has not been distorted.

5.3 Warning notices for electrical installation



Caution

Risk of injury when working on electrical equipment!

- Electrical work should only be performed by qualified and authorised persons.
- Before installing, removing or connecting the ZoneControl, switch off the power to the conveyor system and ensure that it cannot be unintentionally switched on again.
- Set all the power supplies used to the same ground potential in order to avoid compensating currents via the ZoneControl.
- Ensure all components are earthed correctly. Improper earthing can lead to a build-up of static charge, which can result in a fault or premature failure of the ZoneControl.
- Ensure that current load at each terminal or terminal block does not exceed 10 A.
- Ensure that suitable switching devices and protective systems are in place that will allow the equipment to be operated safely.
- Only switch on the operating voltages when all cables are connected.

Note

Improper electrical installation can result in damage to the ZoneControl.

- Observe national regulations for electrical installation.
- Only operate the ZoneControl with a protective extra-low voltage (PELV) of 24 V or 48 V.
- Never operate the ZoneControl with an alternating voltage.
- Ensure that the polarity of the power supply is correct.
- Ensure that the existing electrical installation has no disruptive influence on the ZoneControl.
- Only use cables that are adequately dimensioned for the specific operating conditions.
- Ensure that the calculations for the drop in voltage in the cables are taken into account.
- Observe regulations for laying cables.
- Do not expose the connectors to excessively high tensile or pressure loads. If the connector cable is bent, this can damage the cable insulation and cause the ZoneControl to fail.
- Only use the specified mating plug (see „Inputs and outputs“, page 30) and the spare tool supplied.
- Ensure that the ZoneControl is not reverse connected. The ZoneControl will be damaged beyond repair when power is applied if the ZoneControl is reverse connected and there is a peer-to-peer connection.

Assembly and installation

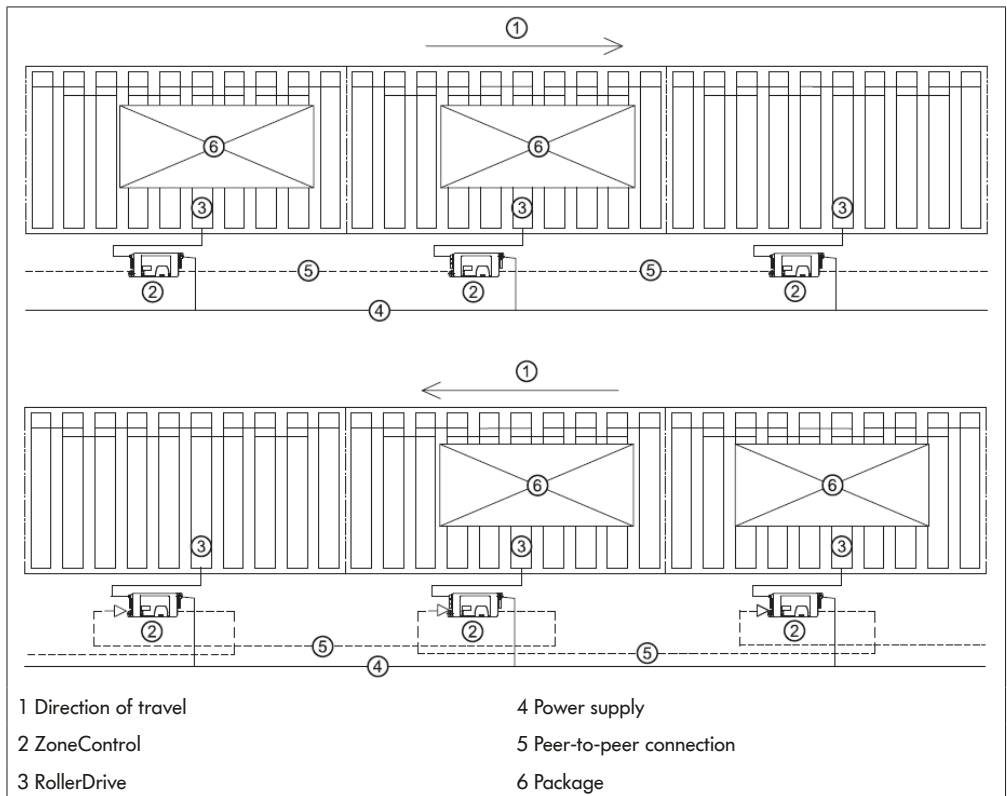
5.4 Electrical installation



The ZoneControl is fitted with an internal, non-replaceable fuse that serves exclusively to protect the device. The protection of the supply cables must be guaranteed by the operator.

The ZoneControl should be fixed to the side of the conveyor on which the RollerDrive cable is located. All of the connections should be routed to one side of the conveyor to simplify cabling.

The cabling of the PTP connection must always following the direction of the conveyor, that is to say that the PTP downstream connection of the upstream zone must be connected to the PTP upstream connection of the downstream zone etc. This also applies if one/several ZoneControl(s) have to be fitted on the other side of the conveyor.



Required cables:

Connection	Conductor cross-section / Information
Inputs/Outputs	Fine-strand: 0,08 bis 0,5 mm ²
	Fine-strand with end-splice: 0,25 bis 0,34 mm ²
	Stripped length: 5 to 6 mm
Power supply	Fine-strand: H05 (07) V-K 1,5 mm ²
	Optional with end-splice
	Stripped length: 6 to 7 mm
Peer-to-peer connection	Commercially-available Cat-5 cable (network or Ethernet cable)

- Prepare wire ends in accordance with the recommendations of the contact manufacturer.
- Insert the input/output and sensor wires into the mating plug using the yellow tool (see „Inputs and outputs“, page 30).
- Insert the power supply wires into the mating plug with the black spare tool.
- Insert the mating plug into the ZoneControl.
- Ensure that all of the ZoneControl are connected to a common ground.
- Adjust the SPEED A, SPEED B, SPEED C, EPA/BA and DIR DIP switches according to requirements (see „Operation“, page 39).
- Adjust the PNP/NPN DIP switch according to the signal level being used (applies to sensors and inputs and outputs).
- Insert the RollerDrive connector so that the “RD” label on the ZoneControl is visible and the label on the connector faces the rear (and is therefore not visible).
- Insert the plug of the PTP connection. When the ZoneControl is in the start zone and end zone, one PTP connection remains free. There is no need for an end resistor.

Assembly and installation

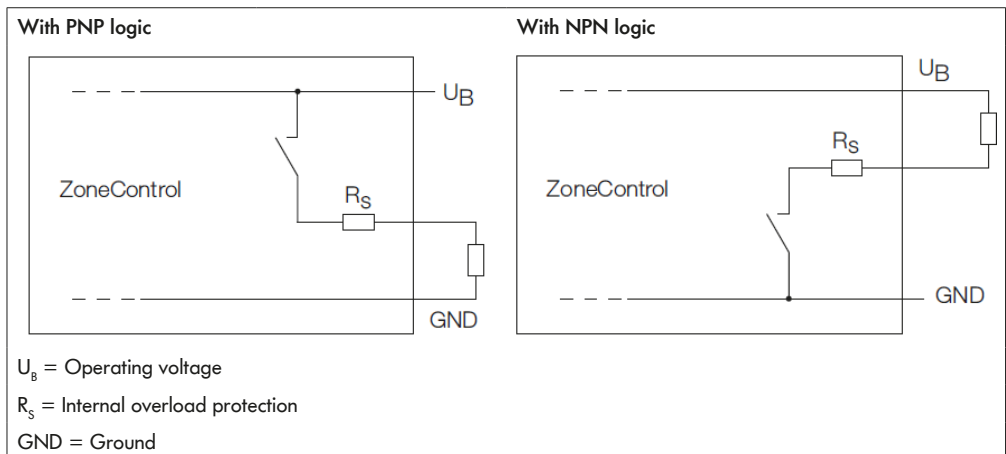
Signal status of inputs

PNP / NPN	Status	ZONE_STOP	ZONE_START	CLEAR	DIR_RET	START / ZONE_SENS_IN
PNP	active	+ 24 V	+ 24 V	+ 24 V	+ 24 V	+ 24 V
DIP = OFF	in-active	-	-	-	-	-
NPN	active	GND	GND	GND	GND	GND
DIP = ON	in-active	-	-	-	-	-

Signal status of outputs

PNP / NPN	Status	ZONE_STATUS	ERROR	EXT_ON
PNP	active	+ 24 V	+ 24 V	+ 24 V
DIP = OFF	in-active	-	-	-
NPN	active	GND	GND	GND
DIP = ON	in-active	-	-	-









Schematics of all outputs



5.5 Sensors

The following types of sensors can be connected (the sensor must be active if the package is in the detection area):

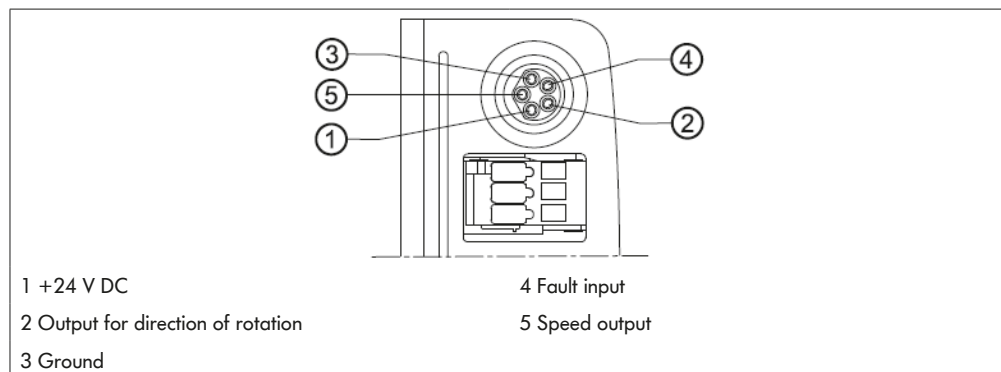
- Light scanner light-switching
- Light barrier dark-switching

	Type of sensor	Light- or dark-switching	Opener / Closer	Logical Output	Light beam	Switch symbol	Elektrical Output	
				Package detected			Switched on	Voltage
PNP	Light barrier (with reflector)	Dark-switching	Closer, normally open	No	not interrupted		No	-
				Yes	interrupted		Yes	24 V
	Light scanner	Light-switching	Closer, normally open	No	interrupted		No	-
				Yes	not interrupted		Yes	24 V
NPN	Light barrier (with reflector)	Dark-switching	Closer, normally open	No	not interrupted		No	-
				Yes	interrupted		Yes	0 V
	Reflective light scanner	Light-switching	Closer, normally open	No	interrupted		No	-
				Yes	not interrupted		Yes	0 V

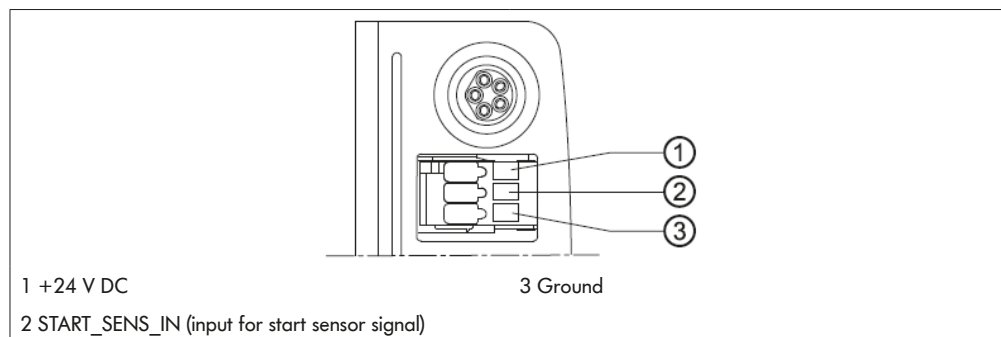
Assembly and installation

5.6 Inputs and outputs

RollerDrive connection: 8 mm snap-in, 5-pin, pin location in accordance with DIN EN 61076-2

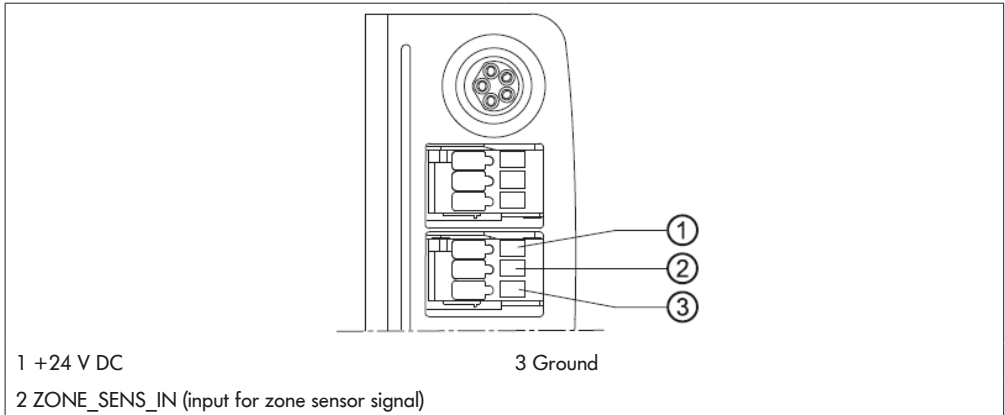


Start sensor connector: WAGO 733-103 mating plug

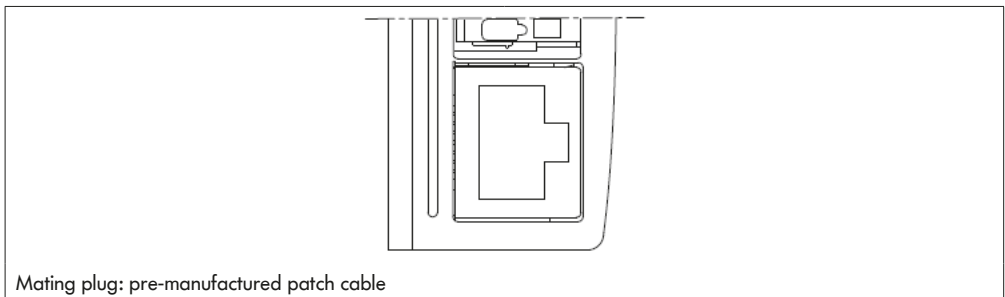


Assembly and installation

Zone sensor connector: WAGO 733-103 mating plug

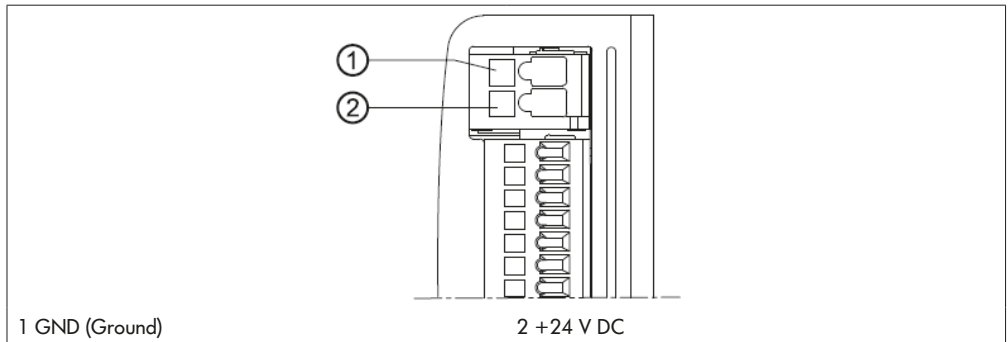


Upstream peer-to-peer connection: RJ45 socket, 8-pin Molex 43860

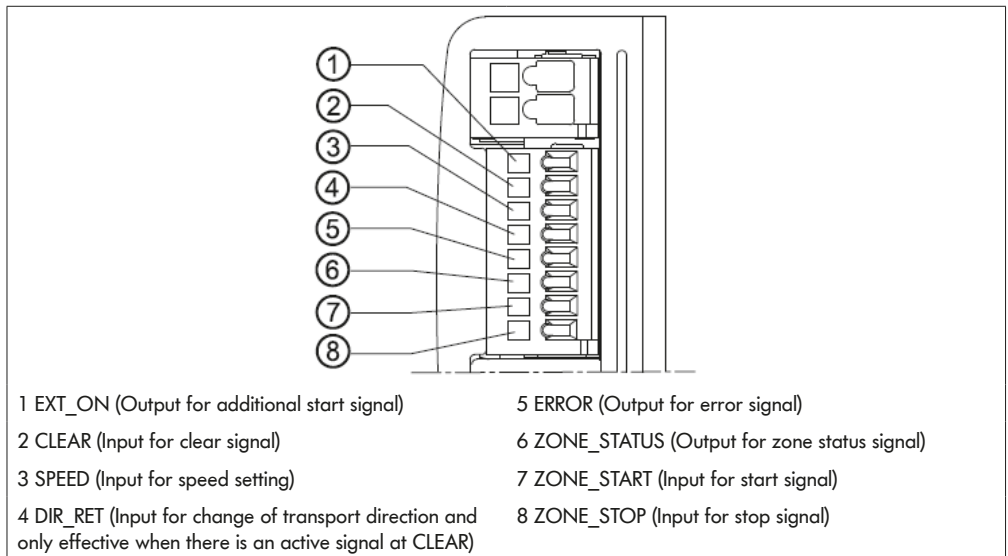


Assembly and installation

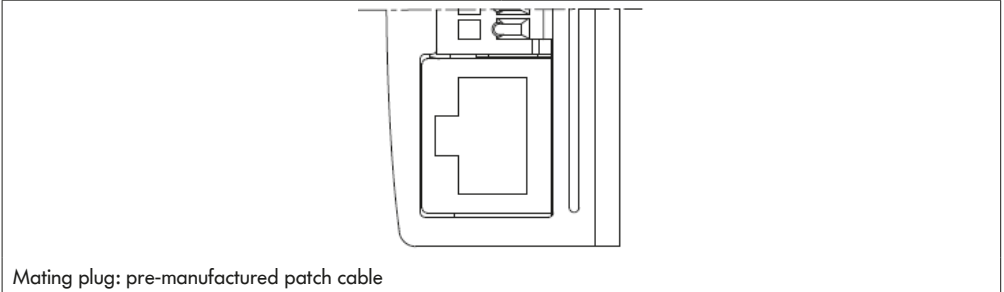
Power supply connector: WAGO 734-102 mating plug



Inputs/outputs connector: WAGO 733-108 mating plug



Downstream peer-to-peer connector: RJ45 socket, 8-pin Molex 43860



The electrical data for each connection is specified in the appendix (see „Electrical data of connectors“, page 50).

Assembly and installation

5.7 Wiring diagrams

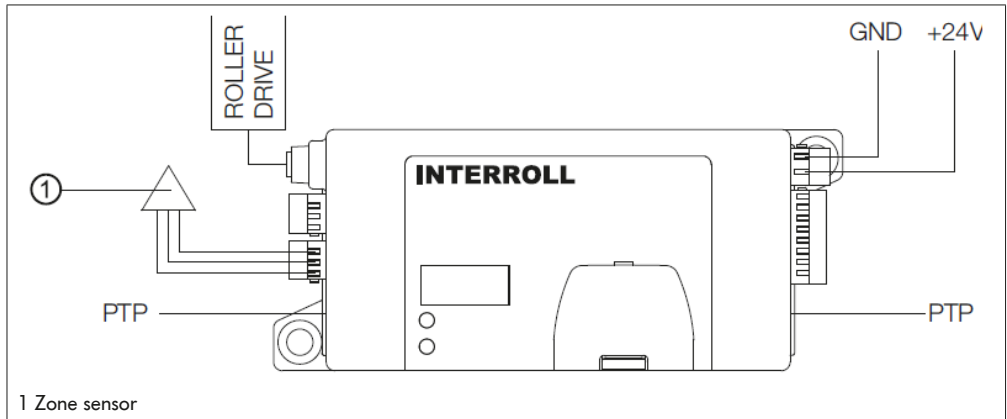
Abbreviations used:

+24 V Operating voltage

GND Ground (Earth)

PTP Peer-to-peer Connection

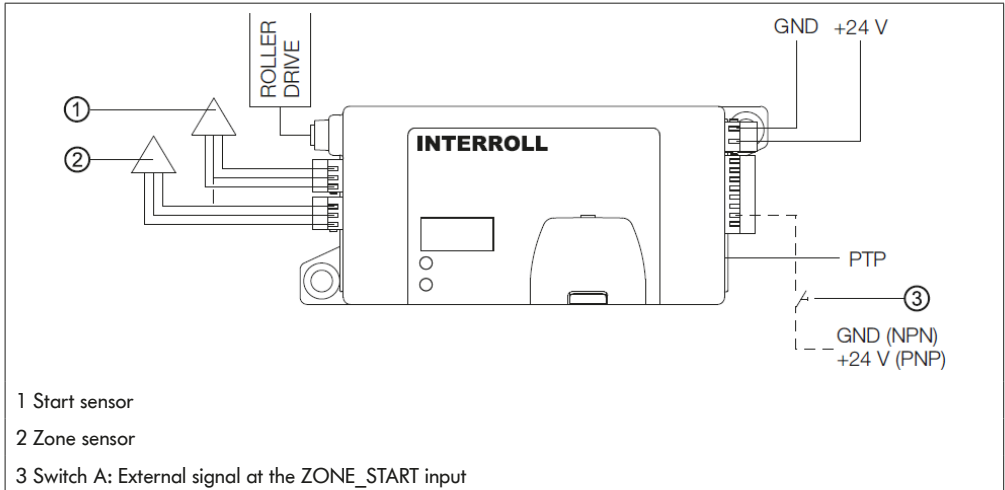
ZoneControl within the conveyor section



This ZoneControl can be located at any position between the start and end zone. This switch enables zero pressure accumulation conveying without additional functions.

The ZoneControl is connected to the adjacent ZoneControls via the Peer-to-Peer cable. The zone sensor is fed with operating voltage via the sensor connector.

ZoneControl at the start of the conveyor section



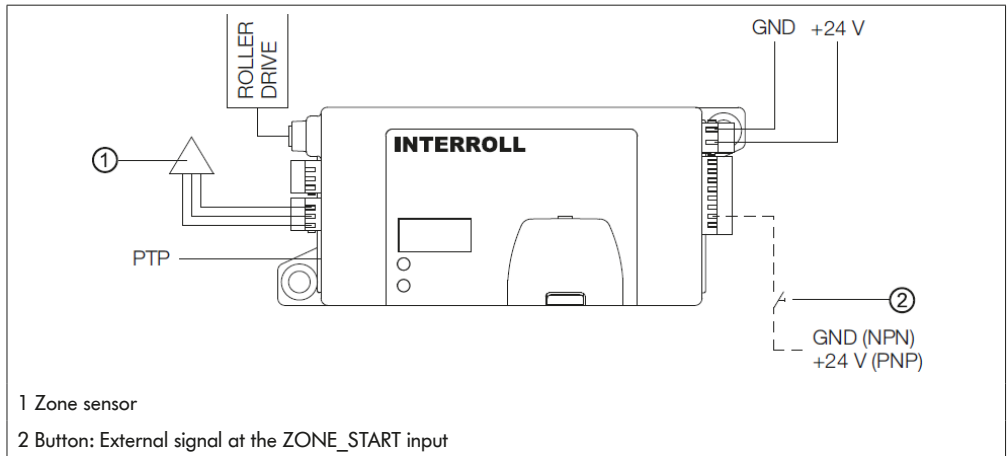
Handshake to the upstream conveyor section: The zone status (occupied or free) can be queried via the signal ZONE_STATUS. (see „ZONE_STATUS“, page 22). The first zone of the ZoneControl conveyor can be started in the following ways:

- Start sensor (button A is not needed)
- External signal at the ZONE_START input (symbolised by switch A; start sensor not needed)

The function of the switch can be provided using any switching element (e. g. PLC). The signal can be switched in NPN or PNP mode.

Assembly and installation

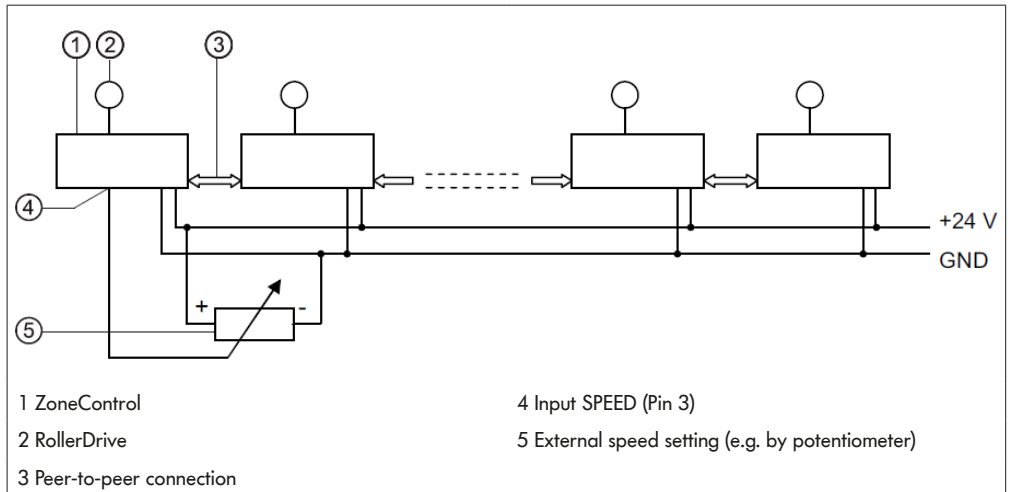
ZoneControl at the end of the conveyor section



When the package has reached the sensor in the last zone it is stopped by default. An external signal must be given at the ZONE_START input of the last zone to discharge. This can be a switch (refer to the example in the diagram above) or an external control (PLC). The signal can be switched in NPN or PNP mode. The status of the last zone is given by the ZONE_STATUS output. If there is no package in the relevant zone sensor's detection range and the ZONE_START signal is active, the RollerDrive does not rotate.

Depending on signal length and discharge mode (single or train release) either one or more packages will be released.

Connection of the external speed control



An external SPEED signal can be connected to control the speed of the whole conveyor externally. The signal should only be connected to one ZoneControl, as it is transmitted via the PTP connection to all other ZoneControl. The position of the ZoneControl within the conveyor and the cable length of the PTP connection is immaterial.

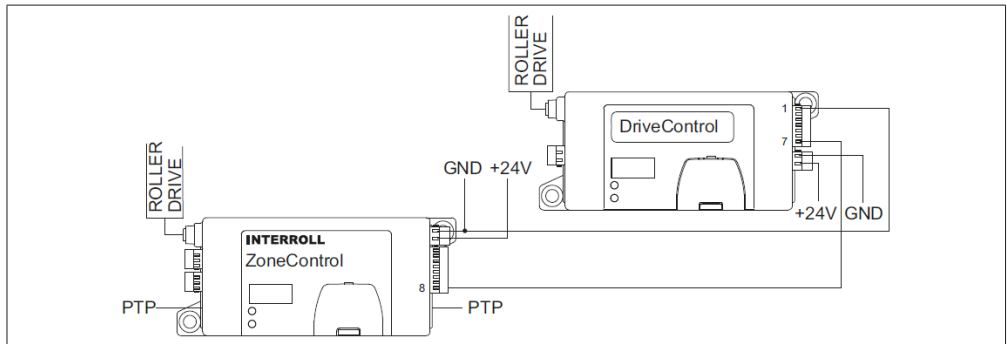
The voltage range for the SPEED signal is between 0 and 10 V DC with a maximum current of 2 mA. DC voltage must be kept stable to maintain a constant conveyor speed.

Assembly and installation

Connection of a second RollerDrive

There is an option with a conveyor to drive zones with other RollerDrive that are switched on and off synchronously to the RollerDrive of the ZoneControl. This can, for instance be necessary with heavy packages or long zones.

- Connect the EXT_ON output of the ZoneControl to the SPEED A input of a DriveControl 20.



- Connect the ground wire of the ZoneControl (GND) to the signal ground Common GND of the DriveControl 20. If possible, use the same power supply for the ZoneControl and DriveControl 20.
- Preselect a speed that is comparable to that of the ZoneControl on the DriveControl 20 using DIP switches SPEED A to D.
- If the function DIR_RET is to be used in the application, connect the DIR input of the DriveControl 20 to the DIR_RET signal of the ZoneControl and on the DriveControl 20 set the DIP switch DIR in such a way that the RollerDrive is rotating in the correct direction.



Changes to the speed via an external SPEED signal only affect RollerDrive that are connected directly to a ZoneControl. The RollerDrive that is connected to a DriveControl 20 do not experience any change of speed from the signal.

6 Initial startup and operation

6.1 Commissioning

Pre-commissioning checks

- Ensure that the ZoneControl has been correctly fastened to the profile and that all screws have been correctly tightened.
- Ensure that there are no additional areas of danger caused by interfaces to other components.
- Ensure that the wiring is in accordance with the specification and legal directives.
- Check all protection devices.
- Ensure that no personnel stand in hazardous areas near the conveyor.

Inspection before each commissioning

- Check the ZoneControl for visible damage.
- Check the DIP switch settings (see „DIP switches“, page 21).
- Check all protection devices.
- Clearly specify and monitor the way goods are placed on the conveyor.
- Ensure that the RollerDrive is not blocked.
- Ensure that no personnel stand in hazardous areas near the conveyor.

6.2 Operation



Caution

Accidental start-up of the RollerDrive!

Danger of crushing of limbs and damage to goods!

- Ensure that no unauthorised persons are near the conveyor before switching on the operating voltage.
-

The ZoneControl is initialised after the operating voltage has been applied. The ZoneControl is then brought into a defined basic state and packages that are not within the detection range of a sensor are transported onto the next zone sensor. The RollerDrives in unoccupied zones rotate and RollerDrives in occupied zones do not rotate. The start and end zones are automatically detected if they are wired correctly. Initialisation mode takes 4 seconds. During the initialisation mode the zone sensor can be assigned as often as required.

Initial startup and operation

6.3 Speed setting

Internal speed setting on the ZoneControl

Requirement: The external SPEED input is not connected or in-active.

- Set the required speed using the DIP switches (see table).



It is not possible to stop the RollerDrive by connecting ground to the external SPEED input.

Setting of the SPEED DIP switches on the ZoneControl			Speed at gear ratio for RollerDrive EC310 [m/s]								
A	B	C	9:1	12:1	16:1	20:1	24:1	36:1	48:1	64:1	96:1
on	on	on	1,75	1,31	0,98	0,79	0,65	0,44	0,33	0,25	0,16
on	on	off	1,51	1,13	0,85	0,68	0,57	0,38	0,28	0,21	0,14
on	off	on	1,27	0,95	0,72	0,57	0,48	0,32	0,24	0,18	0,12
on	off	off	1,03	0,78	0,58	0,47	0,39	0,26	0,19	0,15	0,10
off	on	on	0,80	0,60	0,45	0,36	0,30	0,20	0,15	0,11	0,07
off	on	off	0,56	0,42	0,32	0,25	0,21	0,14	0,11	0,08	0,05
off	off	on	0,32	0,24	0,18	0,15	0,12	0,08	0,06	0,05	0,03
off	off	off	0,09	0,07	0,05	0,04	0,03	0,02	0,02	0,01	0,01

Nominal values at an ambient temperature of 20 °C

Setting of the SPEED DIP switches on the ZoneControl			Speed at gear ratio for RollerDrive EC5000 AI [m/s]								
A	B	C	9:1	13:1	18:1	21:1	30:1	42:1	49:1	78:1	108:1
on	on	on	2,01	1,39	1,00	0,86	0,60	0,43	0,37	0,23	0,17
on	on	off	1,73	1,20	0,87	0,74	0,52	0,37	0,32	0,20	0,14
on	off	on	1,46	1,01	0,73	0,63	0,44	0,31	0,27	0,17	0,12
on	off	on	1,32	0,91	0,66	0,57	0,40	0,28	0,24	0,15	0,11
off	on	on	0,91	0,63	0,46	0,39	0,27	0,20	0,17	0,11	0,08
off	on	off	0,64	0,44	0,32	0,27	0,19	0,14	0,12	0,07	0,05
off	off	on	0,36	0,25	0,18	0,15	0,11	0,08	0,07	0,04	0,03
off	off	off	0,09	0,06	0,04	0,04	0,03	0,02	0,02	0,01	0,01

Nominal values at an ambient temperature of 20 °C

Speed setting via external analog signal

Above a voltage of $> 1\text{ V}$, the SPEED signal has higher priority than the speed setting by the internal DIP switches. The speed of the RollerDrive is controlled by the external signal, irrespective of the position of the DIP switches.

- Set the speed of the RollerDrives by changing the external signal within a range of 1 to 10 V. Changes to the signal will only be applied if they differ by at least 0.1 V from the previous value.
- Set the external signal to 0 V to enable the internal speed setting by the DIP switch.



The specified analog speed applies to all zones of the ZoneControl conveyor.

6.4 External influence on zero pressure accumulation conveying

The ZoneControl has two control signals to specifically influence the otherwise automatic conveyor process:

- ZONE_START
- ZONE_STOPP

These signals enable the current conveyor logic of a zone to be interfered with to the extent that locally generated START-STOP processes can be integrated easily and simply into the parallel running global ZPA conveyor process.



Caution

Accidental start-up of the RollerDrive!

Danger of crushing of limbs and damage to goods!

- Before enabling the ZONE_START and ZONE_STOPP signals, ensure that no unauthorised persons are in the conveyor's hazard zones.

ZONE_STOPP

- Can be used at every zone.
- Package is conveyed to the zone sensor in the affected zone.
- When in-active, immediate transition to normal ZPA conveyor operation.
- The signal does not stop the RollerDrive immediately.

Initial startup and operation

ZONE_START

The ZONE_START signal is the input signal of the handshake function of the ZoneControl. The associated signal output is ZONE_STATUS (siehe „ZONE_STATUS“, Seite 22).

- Connected to the first zone of the conveyor:
 - The start signal leads to the RollerDrive in the first zone starting, providing that the zone sensor is not occupied.
 - If the zone sensor is occupied, the RollerDrive will not be started.
 - If the signal is active while a package is conveyed into the first zone, the RollerDrive will continue running until the package reaches the sensor (resulting in no Time-Out).
 - If the ZONE_START remains active after the package has left the first zone, the RollerDrive in the first zone will continue running without a timeout.
- Connected to a middle zone:
 - The RollerDrive in the zone starts running immediately and under compulsion disregarding any ZPA- or sensor status. (Caution: Risk of collision). If the signal gets inactive, the zone again follows the rules of zero pressure accumulation conveying. No initialisation takes place.
- Connected to the last zone:
 - If the last zone is occupied by a package, it is conveyed out of this zone. If no further package follows, the RollerDrive stops after 4 seconds (run-on).
 - If a further package is following, then it is also conveyed out of the zone (depending on the type of discharge set) providing ZONE_START continues to be active.
 - If the signal is only given as a pulse, a package is conveyed out of the zone, a further package would be conveyed to the zone sensor and stop there.
 - If the start signal is given and the last zone is not occupied, the RollerDrive does not run.
 - If the signal remains active and a package is conveyed to the last zone, the RollerDrive does not stop but the package is transported directly out of the zone.



The ZONE_START and ZONE_STOPP signals should be given as pulses to guarantee functional assignment to the ZPA conveyor process. The duration of the pulse should be shorter than the time the longest package takes to go through the shortest zone.

Complete clearing of a conveyor

A conveyor can be completely cleared by the CLEAR signal if required.

- Activate the CLEAR signal in the first or last zone of the conveyor.

The CLEAR signal is transmitted via the PTP cable to all other zones. It immediately overrides the running conveyor logic and it must be kept active as long as the clearing of the conveyor takes. It causes forced conveyance: All RollerDrive rotate simultaneously at the respectively preset speed and in the preset direction without taking the zone sensors into consideration.

Any CLEAR signal connected to an intermediate zone is ineffective. CLEAR cannot be active while the ERROR signal is activated.

As soon as the CLEAR signal is inactive again, the conveyor goes through an initialisation cycle.

If the DIR_RET signal is active parallel to the CLEAR signal, all of the connected RollerDrive rotate in the opposite direction than set by the DIP switch. DIR_RET and CLEAR must be connected to the same ZoneControl. The DIR_RET signal is only effective during CLEAR.

Maintenance and cleaning

7 Maintenance and cleaning



CAUTION

Risk of injury from following incorrect procedure.

- Maintenance and repair work must only be carried out by authorised and trained (specialist) personnel.
 - Maintenance and repair work must only be carried out when the system has been disconnected from the power supply. Switch off the power to the ZoneControl and ensure that it cannot be unintentionally switched on again.
 - Put up signs to indicate that maintenance or cleaning work is being carried out.
-

7.1 Maintenance

Checking the ZoneControl

The ZoneControl itself requires no maintenance. However, in order to prevent faults from occurring, the connections and fixings must be examined on a regular basis.

- In the course of regular inspection and maintenance work on the conveyor, ensure that the screws of the ZoneControl are still tight, that the cables are still arranged correctly and that the corresponding connections are correctly attached.

Replacing the ZoneControl

If a ZoneControl is damaged or defective, it must be replaced.



Do not attempt to open the ZoneControl.

- Install a new ZoneControl (see „Abandonment“, page 49 and see „Installing the ZoneControl in a conveyor system“, page 24).

7.2 Cleaning

Under humid conditions, dust and dirt can cause a short circuit. Therefore, ensure dirty environments are cleaned regularly to prevent short circuits that could damage the ZoneControl.

NOTE

The ZoneControl can be damaged if it is cleaned improperly.

- Never immerse the ZoneControl in fluids.
-
- If necessary, vacuum any dust or dust that is present.
 - To clean the ZoneControl more thoroughly, disconnect it from the power supply, detach it and wipe it with a damp cloth.

Troubleshooting

8 Troubleshooting

8.1 Troubleshooting

Symptom	Possible Cause	Help
ZoneControl is not working or is working incorrectly	No power supply	<ul style="list-style-type: none">➤ Check whether the output voltage of the power supply is within the specified voltage range.➤ Check the connections and correct if necessary.
	Wrong position of the DIP switches	<ul style="list-style-type: none">➤ Check and if necessary correct the position of the DIP switches (see „DIP switches“, page 21).
ZoneControl faulty or damaged	Internal fuse triggered or faulty	<ul style="list-style-type: none">➤ Replace the ZoneControl.
RollerDrive is not working	RollerDrive is faulty or no power supply	<ul style="list-style-type: none">➤ Check whether the output voltage of the power supply is within the specified voltage range.➤ Check the connections and correct if necessary.
		The ERROR signal is automatically reset after elimination of the fault and the ZoneControl immediately performs a local reinitialisation of the affected zone.
Conveyor process interrupted	Packages jammed	<ul style="list-style-type: none">➤ Remove jammed packages. <p>The ERROR signal is automatically reset after elimination of the fault and the ZoneControl immediately performs a local reinitialisation of the affected zone.</p>

Symptom	Possible Cause	Help
Conveyor process interrupted	Overheating of chopper resistor to > 90 °C	➤ Allow to cool down. The ERROR signal is automatically reset after elimination of the fault and the ZoneControl immediately performs a local reinitialisation of the affected zone.
	PTP cable disconnection	➤ Check all of the PTP cable connections.
Systemfehler	PTP cable disconnection	➤ Switch operating voltage off and on to reinitialise the conveyor system.

The error signal is active in the event of the following faults:

- RollerDrive fault
- RollerDrive not connected
- Fuse faulty
- Upper and lower levels of permitted operating voltage transgressed
- Operating voltage has reverse polarity
- Chopper resistor overheating
- System error
- Time-Out: zone sensor does not become free within 5 seconds

Troubleshooting

8.2 Deviations in the conveying process

Removing a package from the detection area of the zone sensor

The zone sensor is freed by manual intervention (withdrawal or removal of a package that has already stopped) or by sliding back:

The ZoneControl detects this state and let the RollerDrive run for 2 seconds in the zone in order to move the package back into the detection area of the zone sensor. Within the 2 seconds there is no signal sent via the PTP link to the upstream zone that the zone is free. This is to prevent an other package from moving in the zone. If the sensor is not occupied by a package within 2 seconds, a free signal is sent to the upstream zone (the ZONE_STATUS signal becomes in-active).

Time-out when leaving the zone sensor

A package does not leave the current detection zone of the zone sensor or does not reach the target area of the downstream zone (e.g. by temporary removal of the package). This can be caused by a blockage on the conveyor track, for instance by the package becoming snagged or a barrier on the conveyor track.

Once the RollerDrive has started, the occupied zone sensor must become free after 5 seconds. If the sensor is still occupied at the end of this time period, the RollerDrive stops. The ERROR output becomes active and the next ZoneControl displays an error by means of the error LED. An assumption is made that the package is blocking the conveyor.

The time period of 5 seconds can result in long packages not being able to be conveyed at a slow speed.

The error can be reset by pushing the package manually into the detection area of the zone sensor in the downstream zone. By doing this, a zone sensor that did not become free, should no longer be occupied. After elimination of the fault, the affected zone runs a local initialisation.

Time-out when reaching the zone sensor

As soon as a package has left the detection area of a zone sensor, the package has 5 seconds time to occupy the zone sensor in the subsequent zone. This means that the RollerDrive in the following zone runs for at least 5 seconds, providing its zone sensor is not previously occupied. At the end of the 5 seconds, the ZoneControl assumes that the package has been removed and stops the RollerDrive. No error is active.

A further package that is occupying the zone sensor in the upstream zone, is only transported into this zone on expiry of the 5 seconds, as this zone only transmits a free signal after 5 seconds.

9 Decommissioning and disposal



CAUTION

Risk of injury from following incorrect procedure.

- Decommissioning must only be carried out by authorised, qualified personnel.
 - Only decommission the ZoneControl when the system has been disconnected from the power supply.
 - Switch off the power to the ZoneControl and ensure that it cannot be unintentionally switched on again.
-

9.1 Decommissioning

- Remove all cables from the ZoneControl.
- Loosen the screws that have been used to attach the ZoneControl to the conveyor frame.
- Remove the ZoneControl from the conveyor frame.

9.2 Disposal



The operating company is responsible for disposing of the ZoneControl according to correct procedure. In doing so, the industry-specific and local provisions for disposing of the ZoneControl and its packaging must be observed.

Appendix

10 Appendix

10.1 Electrical data of connectors

Inputs/outputs connectors

Inputs ZONE_START, ZONE_STOP, DIR_RET, CLEAR, START_SENS_IN and ZONE_SENS_IN

Properties	24 V logic, debounced, GND reference potential	
Reverse polarity protection	max. 30 V DC	
Overvoltage protection	max. 30 V DC	Permanent, free of harmonic waves
Logic level low	0 to 5 V DC	npn = active
Input current low	max. 3 mA	
Logic level high	15 to 28 V DC	pnp = active
Input current high	max. 4,5 mA	
Response time for repeated signal change	min. 20 ms	

Outputs ZONE_STATUS, ERROR, RD_EXT_ON

Properties	not short circuit proof	
Output current	50 to 100 mA	At an operating voltage of 30 V, max. 500 ms
Logic level low	0 to 5,5 V DC	open collector, @ 50 mA, Reference GND
Logic level high	12,5 to 30 V DC	open collector, @ 50 mA, Reference GND

RollerDrive connector

Power supply (Pin 1, 3)

Nominal value	24 V DC	
Voltage range	18 to 26 V DC	
Residual ripple	max. 600 mV _{pp}	
Rated current	0 to 2,3 A	
Peak current	max. 5 A	max. 250 ms > 2.3 A, time-dependent current flow triangular, duty factor ≤ 19 %
Return electric strength	max. 35 V DC	absence of harmonic waves max. 500 ms; after 500 ms the reserve voltage must be 30 V, duty factor max. 27 %

Direction of rotation output (Pin 2)

Properties	not electrically isolated, short circuit-proof, infeed of external voltage not permitted	
Overvoltage protection	max. 30 V DC	
Clockwise direction of rotation	max. 4 V	logical 0
Output current low	max. 1 mA	Load resistance = 57 kΩ
Anticlockwise direction of rotation	min. 7 V	logical 1
Output current high	max. 0,2 mA	with short circuit

Appendix

Input error (Pin 4)

Properties	Not galvanically separated	
Reverse polarity protection	Max. 30 V DC	
Max. voltage	30 V DC	
Logic level, low	Max. 8.5 V DC	at 1.5 mA Logic level 0 = L = no error
Residual current, low	1.5 mA Max. 5 mA	
Logic level, high	12 to 30 V DC	Logic level 1 = H = error
Residual current, high	Max. 0.01 mA	

Speed output (Pin 5)

Properties	Not galvanically separated	
Speed setting range for motor control voltage	2.3 to 10 V DC	RollerDrive rotates
Stop range	0 to 2 V DC	RollerDrive does not rotate
Accuracy of motor control voltage	5%	Motor control voltage between 2.3 and 10 V DC at 21 °C
Ripple of motor control voltage	250 mV _{pp}	50 Ω
Max. load for motor control current	0.16 to 2 mA	Input resistance for RollerDrive: 66 kΩ
Rate of change	4.5 to 5 V/ms	0–100% motor control voltage

10.2 Translation of the original Declaration of Conformity

EU Declaration of conformity

EMV-Richtlinie 2014/30/EU

RoHS-Richtlinie 2011/65/EU

The manufacturer

Interroll Engineering GmbH
Höferhof 16
42929 Wermelskirchen
Germany

hereby declares that the

• Interroll ZoneControl

conforms to the applicable provisions and the associated CE marking in accordance with the aforementioned Directives.

List of the coordinated standards that have been applied:

EN 60947-5-3:1999/A1:2005
EN 61000-6-2:2005/AC:2005
EN 61000-6-3:2007/A1:2011/AC:2012
EN 60204-1:2006/AC:2010

Authorised for compiling technical documentation:

Interroll Engineering GmbH, Höferhof 16, 42929 Wermelskirchen, Germany



Jörg Schiffler
Product Compliance Officer, Interroll Engineering GmbH
Wermelskirchen 07.02.2019

INSPIRED BY EFFICIENCY

EN | 04/2019 | Version 2.0