Material Handling

Zero Pressure Accumulation M221 Project Template User Guide

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The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

BEFORE YOU BEGIN

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

⚠ WARNING

UNGUARDED EQUIPMENT

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

START-UP AND TEST

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

⚠ CAUTION

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

Failure to follow these instructions can result in injury or equipment damage.

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

OPERATION AND ADJUSTMENTS

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Book

At a Glance

Document Scope

This document describes a conveying application based on Modicon M221 Logic Controller.

The project is an example of an application used to control a Zero Pressure Accumulator (ZPA). It contains hardware architecture for a maximum of 4 zones.

This document is adapted to those individuals knowledgeable and experienced in Material Handling technologies.

The following basic knowledge is required:

- Basic information on functionality, structure and configuration of the controllers, drives and HMI displays
- Programming in Ladder Diagram (LD) or Instruction List (IL) language

Validity Note

This document has been updated with the release of SoMachine 4.1 Material Handling add-on.

This document has been updated with the release of SoMachine Basic 1.2.

Related Documents

Title of Documentation	Reference Number
SoMachine Basic Generic Functions Library Guide	EIO0000001474 (ENG) EIO0000001475 (FRE) EIO0000001476 (GER) EIO0000001477 (SPA) EIO0000001478 (ITA) EIO0000001479 (CHS)
SoMachine Basic Operating Guide	EIO0000001354 (ENG) EIO0000001356 (FRE) EIO0000001410 (GER) EIO0000001357 (SPA) EIO0000001358 (ITA) EIO0000001359 (CHS)

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

Product Related Information

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Chapter 1
Application Functions

What Is in This Chapter?

This chapter contains the following topics:

Introduction

This document is intended to provide a quick introduction and programming example to the described application. It is not intended to replace any specific product documentation, nor any of your own design documentation. On the contrary, it offers additional information to the product documentation for installing, configuring and implementing the application.

The architecture described in this document is not a specific product in the normal commercial sense. It describes an example of how Schneider Electric and third-party components may be integrated to fulfil an industrial application. A detailed functional description or the specification for a specific user application is not part of this document.

Your specific application requirements can be different and will require additional and/or different components, configuration and/or programming logic than that is found in this document. In that case, you will have to adapt the information provided in this document to your particular needs. In all and any cases, pay particular attention in conforming to any safety information, different electrical requirements and normative standards that would apply to your adaptation.

⚠ WARNING

REGULATORY INCOMPATIBILITY

Be sure that all equipment applied and systems designed comply with all applicable local, regional and national regulations and standards.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: There are some major logical and physical components in the application example described herein. They cannot be substituted without completely invalidating the architecture, descriptions, instructions, wiring diagrams and compatibility between the various software and hardware components specified in this document. You must be aware of the consequences of component substitutions or modifications in the architecture described in this document as they can impair the compatibility and interoperability of software and hardware.

A residual risk, as defined by EN/ISO 12100-1, Article 5, will remain if:

- it is necessary to modify the recommended logic and if the added or modified components are not properly integrated in the control circuit.
- you do not follow the required standards applicable to the operation of the machine, or if the adjustments to and the maintenance of the machine are not properly made (it is essential to strictly follow the prescribed machine maintenance schedule).
- the devices connected to any safety outputs do not have mechanically-linked contacts.

⚠ CAUTION

EQUIPMENT INCOMPATIBILITY

Read and thoroughly understand all device and software documentation before attempting any component substitutions or other changes related to the application examples provided in the document.

Failure to follow these instructions can result in injury or equipment damage.

Operational Function of the Zero Pressure Accumulator

Zero Pressure Accumulation (ZPA) is a conveyance scheme in which goods move from zone to zone without touching each other. Hence, even in an accumulation of conveyable units, there is no pressure applied on the units, such as in a gate controlled system. Zone conveyors can be of any type, though 24 Vdc Geared Motor Driven Roller conveyor is popularly used along with many dedicated hardware zone controllers.

This ZPA project template includes up to 4 zones. Each zone consists of two sensors. While one sensor is for detecting goods entry, the other sensor is for detecting goods exit.

Zero Pressure Accumulation Application Template

This application is for a Zero Pressure Accumulation (ZPA) conveying system. Zero Pressure Accumulation conveyor is designed to accumulate and release the products with zero forward pressure on the products.

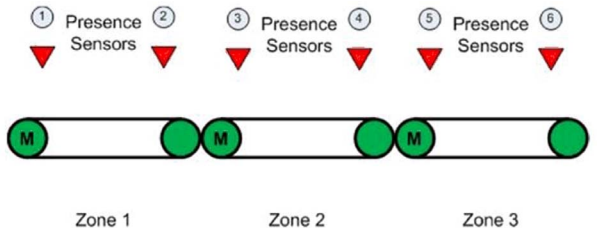
The ZPA conveying system is divided into 4 zones. These zones are controlled by M221 Logic Controller. Each zone consists of one fixed 24 Vdc geared motor and two zone sensors; entry sensor is used to detect the entry of the goods into the conveyor and the exit sensor is used to detect the exit of the goods from the conveyor.

Every zone includes specific application functions, mechanical equipment and an emergency system.

Among the four zones, the first zone is for input, the last zone is for output and the in between zones are standard ones.

You can configure the direction of the zones, either forward or backward.

Zero Pressure Accumulation with 3 zones is shown below.



Inputs

This table describes the digital inputs to control the Zero Pressure Accumulator (ZPA):

Element	Data Type	Description	Address
I_X_TRAINSTART	BOOL	Train start push button TRUE: automatic mode zone start FALSE: automatic mode zone stop	%I0.0
I_X_TRAINSTOP	BOOL	Train stop push button TRUE: zone motor running FALSE: zone motor stops	%I0.1
I_X_EMGY	BOOL	Emergency input TRUE: emergency in active FALSE: emergency stop active	%I0.2
I_X_REM_LOC	BOOL	Remote and local mode TRUE: remote mode FALSE: local mode	%I0.3
I_X_SEL_Z1	BOOL	Manual mode Zone1 selection TRUE: select Zone1 FALSE: no selection	%I0.4
I_X_SEL_Z2	BOOL	Manual mode Zone2 selection TRUE: select Zone2 FALSE: no selection	%I0.5
I_X_SEL_Z3	BOOL	Manual mode Zone3 selection TRUE: select Zone3 FALSE: no selection	%I0.6
I_X_SEL_Z4	BOOL	Manual mode Zone4 selection TRUE: select Zone4 FALSE: no selection	%I0.7
I_X_GDSENT_Z1	BOOL	Sensor to detect the goods entered in Zone1 TRUE: sensor active FALSE: sensor deactive	%I1.0
I_X_GDSEXIT_Z1	BOOL	Sensor to detect the goods exit in Zone1 TRUE: sensor active FALSE: sensor deactive	%I1.1
I_X_MOTORSTRT_Z1	BOOL	Zone1 motor start command	%I1.2
I_X_MOTORSTOP_Z1	BOOL	Zone1 motor stop command FALSE: motor stop TRUE: normal condition	%I1.3
I_X_GDSENT_Z2	BOOL	Sensor to detect the goods entered in Zone2 TRUE: sensor active FALSE: sensor deactive	%I1.4

Element	Data Type	Description	Address
I_X_GDSEXIT_Z2	BOOL	Sensor to detect the goods exit in Zone2 TRUE: sensor active FALSE: sensor deactive	%I1.5
I_X_MOTORSTRT_Z2	BOOL	Zone2 motor start command	%I1.6
I_X_MOTORSTOP_Z2	BOOL	Zone2 Motor stop command FALSE: Motor stop TRUE: Normal condition	%I1.7
I_X_GDSENT_Z3	BOOL	Sensor to detect the goods entered in Zone3 TRUE: sensor active FALSE: sensor deactive	%I1.8
I_X_GDSEXIT_Z3	BOOL	Sensor to detect the goods exit in Zone3 TRUE: sensor active FALSE: sensor deactive	%I1.9
I_X_MOTORSTRT_Z3	BOOL	Zone3 motor start command	%I1.10
I_X_MOTORSTOP_Z3	BOOL	Zone3 motor stop command FALSE: motor stop TRUE: normal condition	%I1.11
I_X_GDSENT_Z4	BOOL	Sensor to detect the goods entered in Zone4 TRUE: sensor active FALSE: sensor deactive	%I1.12
I_X_GDSEXIT_Z4	BOOL	Sensor to detect the goods exit in Zone4 TRUE: sensor active FALSE: sensor deactive	%I1.13
I_X_MOTORSTRT_Z4	BOOL	Zone4 motor start command	%I1.14
I_X_MOTORSTOP_Z4	BOOL	Zone4 motor stop command FALSE: motor stop TRUE: normal condition	%I1.15
I_X_RESET	BOOL	Reset to acknowledge the alarm TRUE: reset enable FALSE: reset disabled	%I3.0
I_X_DIR_EN	BOOL	Zone direction (1 / 2) enable signal TRUE: motor is enabled to run forward and reverse FALSE: motor is enabled to run in forward direction only	%I3.1
I_X_ACK_GDS	BOOL	Acknowledge good release TRUE: acknowledge goods FALSE: no acknowledge	%I3.2

Outputs

This table describes the digital outputs to control the Zero Pressure Accumulator (ZPA):

Element	Data Type	Description	Address
Q_X_MTRFWD_Z1	BOOL	Motor forward output for Zone1 TRUE: motor run Zone1 FALSE: motor stop Zone1	%Q0.0
Q_X_MTRREV_Z1	BOOL	Motor reverse output for Zone1 TRUE: motor run Zone1 FALSE: motor stop Zone1	%Q0.1
Q_X_MTRFWD_Z2	BOOL	Motor forward output for Zone2 TRUE: motor run Zone2 FALSE: motor stop Zone2	%Q0.2
Q_X_MTRREV_Z2	BOOL	Motor reverse output for Zone2 TRUE: motor run Zone2 FALSE: motor stop Zone2	%Q0.3
Q_X_MTRFWD_Z3	BOOL	Motor forward output for Zone3 TRUE: motor run Zone3 FALSE: motor stop Zone3	%Q0.4
Q_X_MTRREV_Z3	BOOL	Motor reverse output for Zone3 TRUE: motor run Zone3 FALSE: motor stop Zone3	%Q0.5
Q_X_MTRFWD_Z4	BOOL	Motor forward output for Zone4 TRUE: motor run Zone4 FALSE: motor stop Zone4	%Q0.6
Q_X_MTRREV_Z4	BOOL	Motor reverse output for Zone4 TRUE: motor run Zone4 FALSE: motor stop Zone4	%Q0.7
Q_X_ZONE_ON_ZPA	BOOL	Zone running status TRUE: zone motors running FALSE: zone motors stopped	%Q3.0
Q_X_ALARM_ZPA	BOOL	Zone alarm indication TRUE: alarm state FALSE: no alarm	%Q3.1
Q_X_UNLOADREADY	BOOL	Output to indicate the arrival of product TRUE: product reached to last conveyor FALSE: no product on last conveyor	%Q3.2

Use the following to stop Zero Pressure Accumulator (ZPA) of each zone:

Input	Address	Condition
I_X_EMGY	%I0.2	FALSE: emergency stop
I_X_TRAINSTOP	%I0.1	FALSE: train stop
I_X_MOTORSTOP_Z1	%I1.3	FALSE: motor stop
I_X_MOTORSTOP_Z2	%I1.7	FALSE: motor stop
I_X_MOTORSTOP_Z3	%I1.11	FALSE: motor stop
I_X_MOTORSTOP_Z4	%I1.15	FALSE: motor stop

NOTE: Stop input, emergency inputs are Normally Closed contact (NC).

The Zero Pressure Accumulation project template operates in two different modes:
- Local mode by local HMI
- Hand mode by push buttons

Local Mode with Local HMI

Overview

Use the selector switch to select the operation of local mode. When the input is TRUE, the local mode is activated.

Once the local mode is activated, the application receive the Train Start and Train Stop command from the HMI. When the zones are alarm free, Train Start command is sent to the M221 Logic Controller over Modbus and all the zone motors start to run in a fixed speed. The Train Start command is considered as the automatic mode.

Automatic Mode

In Automatic mode, the state machine controls each zone of the conveyor as described below:

State	Description
Empty State	When there are no goods on the zone, it is defined as empty state. The detection of Empty state is considered when the entry and exit sensor is in FALSE condition and the loaded state is set to FALSE.
Loading State	When the goods enters the zone, the entry sensor detects the goods entering into the zone, this state will remain till the goods crosses the entry sensor.
Unloading State	If the exit sensor detects the goods leaving from the zone, the state is considered as Unloading.
Unloaded State	If the goods passed the exit sensor and goods are moved out either to the next zone or moved out of the conveyor, the state is considered as Unloaded state.

NOTE: The length of goods have to be smaller than the distance between the 2 sensors of each zone.

Manual Mode

When Train Stop command is executed, all the zone motors stop and switch into manual mode.

In manual mode, you can select the individual zone and start /stop of the zone. You set the input enabling direction to FALSE, the motors run in forward direction. If you set it to TRUE, you can operate the zone in reverse direction. In this mode, all the commands will be received by M221 Logic Controller from the HMI.

Hand Mode

Overview

When the mode selection input is FALSE, the hand mode is activated. In this mode, the train can be started with the Train Start signal or stopped with the Train Stop signal.

The two commands will be sent to the controller by a hardware input signal. Other operations are same as in local mode.

Zone Conditions

Zone Stop Condition

When all the four zones are filled with goods, the train comes to stop and waits for the goods to move out of the last zone and get acknowledged.

After acknowledge signal is received, the train starts again and all zone motors continue to run.

When goods entering a zone, the entry sensor detects it and the zone timer starts. If the goods do not reach the exit sensor within the configured time limit, the train will stop and you need to restart it.

In automatic mode, you can execute stop command to stop the Zero Pressure Acculumation (ZPA). With the release of stop command, ZPA will start again.

Emergency Stop Condition

Emergency input is of type Normally Close Contact. When the emergency push button is pressed, the ZPA stops and the related alarm is raised.

After clearing the alarm, you have to release emergency push button and press the hardware reset command to acknowledge. This informs the controller that ZPA is ready for operation.

Setting the Zone Timer

When the system is in local mode, the ZPA allows the setting of zone timer for each zone independent. The zone timer can be set in seconds. After the zone timer elapses, it stops the conveyor and alarm is raised.

You can configure the timer of each zone using the address given in the following table:

Address	Scenario	Description
%MW50	Timer 1 zone 1	Modbus register to set the value by HMI
%MW52	Timer 2 zone 2	
%MW54	Timer 3 zone 3	
%MW56	Timer 4 zone 4	
%M130	Set Timer 1	Modbus coil to set the Timer 1
%M131	Set Timer 2	Modbus coil to set the Timer 2
%M132	Set Timer 3	Modbus coil to set the Timer 3
%M133	Set Timer 4	Modbus coil to set the Timer 4

Zone Alarm Conditions

The following table gives the zone alarm conditions and their description.

Input	Description	Causes	Condition
I_X_EMGY	Emergency push button	–	FALSE: emergency stop
I_X_GDSENT_Z1 and I_X_GDSEXIT_Z1	Multiple goods on same conveyor Zone1	Zone1 entry and exit sensor detected at the same time	TRUE: Zone1 entry and exit sensors are on
I_X_GDSENT_Z2 and I_X_GDSEXIT_Z2	Multiple goods on same conveyor Zone2	Zone2 entry and exit sensor detected at the same time	TRUE: Zone2 entry and exit sensors are on
I_X_GDSENT_Z3 and I_X_GDSEXIT_Z3	Multiple goods on same conveyor Zone3	Zone3 entry and exit sensor detected at the same time	TRUE: Zone3 entry and exit sensors are on
I_X_GDSENT_Z4 and I_X_GDSEXIT_Z4	Multiple goods on same conveyor Zone4	Zone4 entry and exit sensor detected at the same time	TRUE: Zone4 entry and exit sensors are on
I_X_MOTORSTOP_Z1	Wire break stop push button Zone1	–	FALSE: Zone1 motor stop
I_X_MOTORSTOP_Z2	Wire break stop push button Zone2	–	FALSE: Zone2 motor stop
I_X_MOTORSTOP_Z3	Wire break stop push button Zone3	–	FALSE: Zone3 motor stop
I_X_MOTORSTOP_Z4	Wire breakstop push button Zone4	–	FALSE: Zone4 motor stop
X_TIMEOUT_Z1	Timer elapse for Zone1	–	TRUE: Zone1 time out FALSE: normal condition
X_TIMEOUT_Z2	Timer elapse for Zone2	–	TRUE: Zone2 time out FALSE: normal condition
X_TIMEOUT_Z3	Timer elapse for Zone3	–	TRUE: Zone3 time out FALSE: normal condition
X_TIMEOUT_Z4	Timer elapse for Zone4	–	TRUE: Zone4 time out FALSE: normal condition
I_X_TRAINSTOP	Train stop input push button wire break	–	FALSE: all 4 Zone motor stops

The address to configure the zone alarm is given below:

Address	Scenario	Message
%I0.2	Emergency input not released or wire break condition	Emergency push button not released
	Entry and exit sensor gets on the same conveyor	Multiple goods on same conveyor
%I1.3	Stop push button signal for Zone1 not high or wire break condition	Wire break stop push button Zone1
%I1.7	Stop push button signal for Zone2 not high or wire break condition	Wire break stop push button Zone2
%I1.11	Stop push button signal for Zone3 not high or wire break condition	Wire break stop push button Zone3
%I1.15	Stop push button signal for Zone4 not high or wire break condition	Wire break stop push button Zone4
%I0.1	Main Stop push button signal for Zone not high or wire break condition	Train stop input push button wire break
%TM0	Goods entry should reach exit of zone1 with set time by user	Timer elapse for Zone1
%TM1	Goods entry should reach exit of zone2 with set time by user	Timer elapse for Zone2
%TM2	Goods entry should reach exit of zone3 with set time by user	Timer elapse for Zone3
%TM3	Goods entry should reach exit of zone4 with set time by user	Timer elapse for Zone4

Chapter 2
Hardware Configuration

What Is in This Chapter?

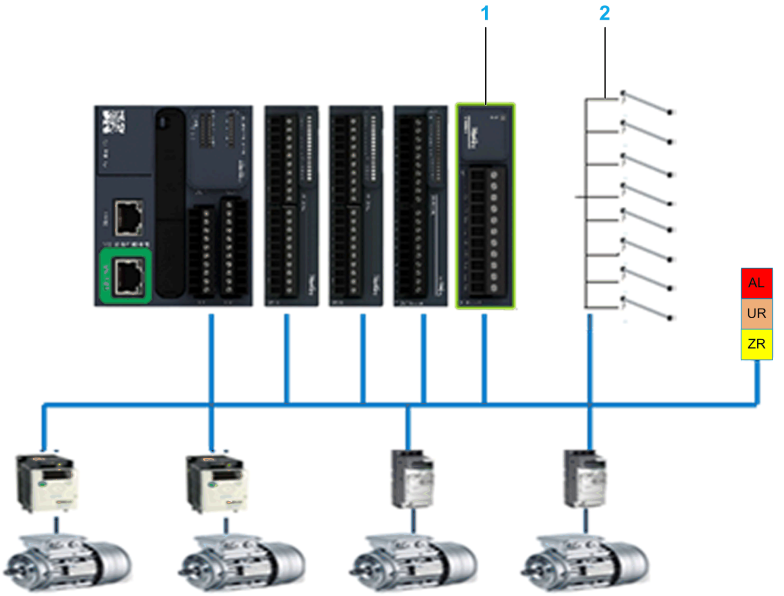
This chapter contains the following topics:

Template Architecture

The controller used in this application is a M221 Logic Controller. The other controllers are installed in the main cabinet. The TM3 distributed I/O modules communicate with the controller over Madcaps fieldbus. The motors and sensors are connected to the local I/O and TM3 modules.

This project template is capable of operating upto 4 zone equipment on the M221 Logic Controller.

Zero Pressure Accumulation upto 4 zones is shown in the figure given below.



1. Analog output for up to four Variable Speed Drive (VSD)
2 Zone Sensor Input (entry and exit) up to 4 zones

Communication

The described Zero Pressure Acculmulator conveyor architecture uses Modbus TCP for communication with other controllers.

The download of the SoMachine Basic application is done through USB.

Application Implementation

Overview

In the Zero Pressure Accumulator (ZPA) application, there are two sensors per zone with fixed speed geared motor. This project template supports upto four zones. The application allows the change of the zone direction, either forward or backward, in manual mode operation.

The inputs need to be swapped, if you have to perform the application in reverse direction in the automatic mode.

The reference address table for wiring is given below:

Digital Input	Forward Direction	Digital Input	Reverse Direction	Address
I_X_GDSENT_Z1	Goods Entry Zone1	I_X_GDSEXIT_Z4	Goods Exit Zone4	%I1.0
I_X_GDSEXIT_Z1	Goods Exit Zone1	I_X_GDSENT_Z4	Goods Entry Zone4	%I1.1
I_X_GDSENT_Z2	Goods Entry Zone2	I_X_GDSEXIT_Z3	Goods Exit Zone3	%I1.4
I_X_GDSEXIT_Z2	Goods Exit Zone2	I_X_GDSENT_Z3	Goods Entry Zone3	%I1.5
I_X_GDSENT_Z3	Goods Entry Zone3	I_X_GDSEXIT_Z2	Goods Exit Zone2	%I1.8
I_X_GDSEXIT_Z3	Goods Exit Zone3	I_X_GDSENT_Z2	Goods Entry Zone2	%I1.9
I_X_GDSENT_Z4	Goods Entry Zone4	I_X_GDSEXIT_Z1	Goods Exit Zone1	%I1.12
I_X_GDSEXIT_Z4	Goods Exit Zone4	I_X_GDSENT_Z1	Goods Entry Zone1	%I1.13

NOTE: Output mapping remains the same as per the project template

Setting Analog Value (speed) for Variable Speed Drive

In the case that Variable Speed Drives (VSD) are used to run the zones, the analog speed values can be set to M221 Logic Controller by a local or remote HMI. This value will updated to the Variable Speed Drive (VSD) through the analog reference speed command.

There is one common analog reference value that can be used for all the connected Variable Speed Drives (VSD).

The address mapping for the analog channels is listed below:

Analog Channel	Address	Setting Analog Value	HMI Address
W_ANALOG_VSD1	%MW402	W_HMI_SET_ANAL	%MW404:X0 (1st bit)
W_ANALOG_VSD2	%MW402	–	–
W_ANALOG_VSD3	%MW402	–	–
W_ANALOG_VSD4	%MW402	–	–