Material Working

Drilling Machine With M221
Project Template User Guide

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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 the project template based on Modicon M221 Logic Controller and an HMI STU 855 display for drilling application.

The following knowledge is required:

- Information on functionality, structure, and configuration of the controllers, drives, and HMI displays.
- Programming in Ladder Diagram (LD).

Validity Note

This document has been created with SoMachine V4.1 SP1 Lexium 28 add-on.

Related Documents

Title of Document	Reference Number
iEM3100 series / iEM3200 series, Energy Meters, User Manual	DOCA0005EN
LXM28A and BCH2 Servo drive System, Product manual	0198441114054
Altivar 12, Variable speed drives for asynchronous motors, User manual	BBV28581 (ENG)
Altivar 312, Variable speed drives for asynchronous motors, Programming manual	BBV46385 (ENG)
SoMachine Basic - Generic Functions Library Guide	EIO0000001474

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

Product Related Information

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

Some of the equipment constituted by the architectures presented herein have been designed to operate outside of any hazardous location. Therefore, only install the equipment herein in zones known to be free of a hazardous atmosphere.

⚠ DANGER

POTENTIAL FOR EXPLOSION

Install and use this equipment in non-hazardous locations only.

Failure to follow these instructions will result in death or serious injury.

Consult the individual product documentation of the equipment described in the present document for specific safety 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.

Applicable Terminology

The products described in the present document are designed to specific standards and the technical terms, terminology and the corresponding descriptions in this manual are intended to use the terms or definitions of those pertinent standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as "safety function", "safe state", "fault", "fault reset", "failure", "error", "error message", "dangerous", etc.

Among others, these standards include:

Standard	Description
EN 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2008	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2008	Digital data communication for measurement and control: Functional safety field buses.
IEC 62061:2005	Safety of machinery. Functional safety of safety-related electrical, electronic, and programmable electronic control systems
2006/42/EC	Machinery Directive
2004/108/EC	Electromagnetic Compatibility Directive
2006/95/EC	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 61800 series	Adjustable speed electrical power drive systems
IEC 61158 series	Digital data communications for measurement and control – Fieldbus for use in industrial control systems

Finally, the term "zone of operation" may be used in conjunction with the description of specific hazards, and is defined as it is for a "hazard zone" or "danger zone" in the EC Machinery Directive (EC/2006/42) and ISO 12100-1:2010.

Chapter 1
Drilling Machine Application Template

Introduction

The project template is an application example for controlling a drilling machine. It contains a hardware configuration for a drilling machine with four axes and programs for controlling feeder conveyor, drilling motor, and horizontal and vertical movement. It also contains a configuration for various drives. You can parameterize and control the drive through an HMI.

For downloading this project template to a M221 Logic Controller and HMI, a PC with the following software installation is necessary:

- SoMachine which integrates SoMachine Basic and Vijeo-Designer, or
- SoMachine Basic and Vijeo-Designer as standalone applications.

This project template is developed for an M221 Logic Controller with an HMIS5T (HMIS65/S85).

NOTE: You can also use this project template with other HMIs after necessary adaptations.

Chapter 2
Drilling Machine Architecture

Overview

This chapter describes the drilling machine architecture.

What Is in This Chapter?

This chapter contains the following topics:

Hardware Architecture

Overview

The following figure shows a supported hardware architecture of a drilling machine. Altivar 312 is prescribed for the feeder conveyor, Altivar 12 for vertical movement of the drilling axis and Lexium 28 is prescribed for the horizontal movement. A digital output is used to switch the drilling motor On/Off.

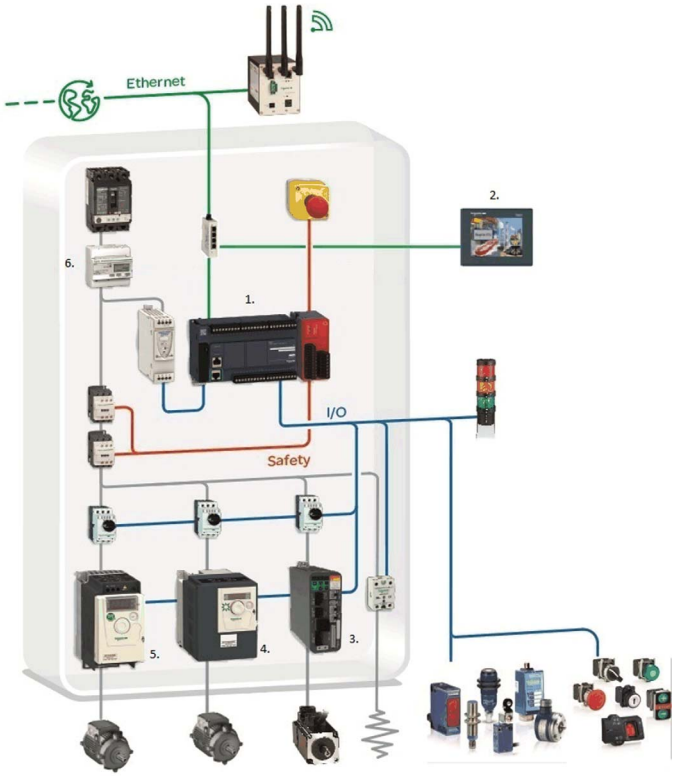
To keep the project template as easy as possible, a standard TVDA is used and following devices are simulated in the project template:

- Limit switches for UP- and DOWN-position of the vertical axis
- Device for drilling spindle
- Clamps (with limit switches) to fix the plank in the machine
- Limit switch for detection of the plank

NOTE: The components above must be extended in the final application/machine.

Used Architecture

The following figure shows the used architecture:



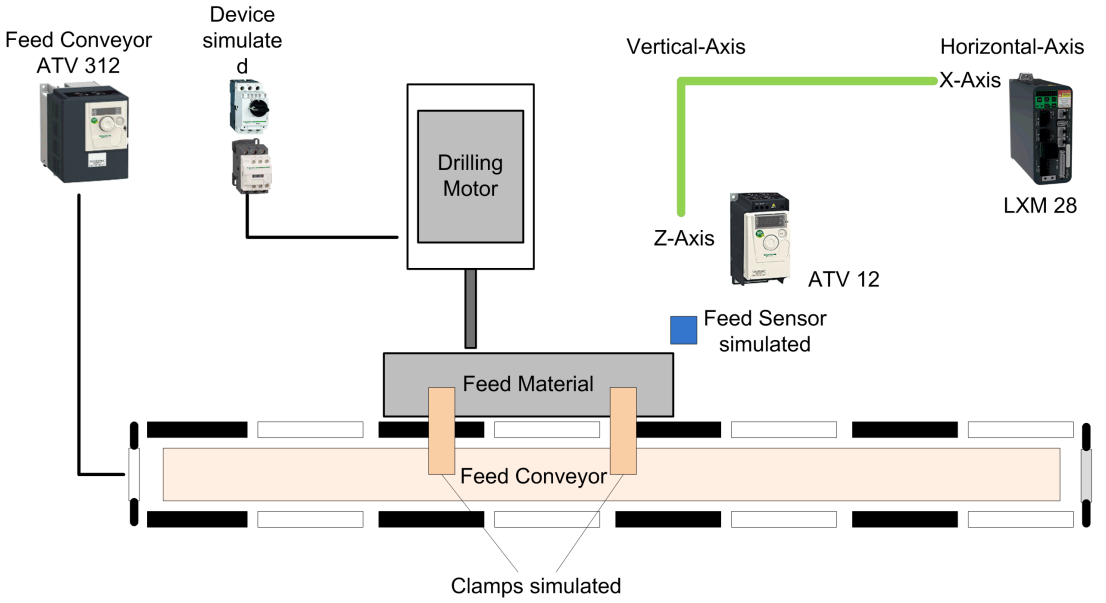
1 Modicon M221 Logic Controller
2 Magelis HMI STU 855
3 Lexium 28 servo drive
4 Altivar 312
5 Altivar 12
6 Power meter iEM3110

Material Working Application System Requirements

System Requirements

The application requires Lexium 28 servo drive for the horizontal movement (position of the holes) controlled by the Pulse Train Output (PTO) and Altivar drives for the vertical movement (driller up/down) and feed conveyor. The drilling motor drive and the clamps device are not defined and are simulated in the project template. The M221 Logic Controller is connected to the HMI through Modbus TCP/IP.

The following figure shows a drilling machine:



Chapter 3
Hardware Configuration

Embedded IOs

Overview

The inputs and outputs of the M221 Logic Controller are used to monitor the status and control of the drilling machine.

Input Variables

This table describes the input variable:

Input	Variable	Description
%I0.8	IX_ATV12_MCB_RDY	Vertical drilling axis Motor circuit breaker (MCB): ● TRUE: Ok ● FALSE: Not Ok
%I0.9	IX_ATV312_MCB_RDY	Conveyor axis Motor circuit breaker (MCB): ● TRUE: Ok ● FALSE: Not Ok
%I0.10	IX_LXM28_MCB_RDY	Horizontal axis Motor circuit breaker (MCB): ● TRUE: Ok ● FALSE: Not Ok
%I0.12	IX_ATV12_DRIVE_NO_FAULT	Vertical drilling axis Drive OK: ● TRUE: Ok ● FALSE: Not Ok
%I0.13	IX_ATV12_DRIVE_RUN	Vertical drilling axis Drive Run: ● TRUE: Ok ● FALSE: Not Ok
%I0.14	IX_ATV312_DRIVE_NO_FAULT	Conveyor axis Drive OK: ● TRUE: Ok ● FALSE: Not Ok
%I0.15	IX_ATV312_DRIVE_RUN	Conveyor axis Drive Run: ● TRUE: Ok ● FALSE: Not Ok
%I0.16	IX_LXM28_DRIVE_NO_FAULT	Horizontal axis Drive OK: ● TRUE: Ok ● FALSE: Not Ok
%I0.17	IX_LXM28_DRIVE_RUN	Horizontal axis Drive Run: ● TRUE: Ok ● FALSE: Not Ok

Input	Variable	Description
%I0.20	IX_LOC_REV	Button - start the drives in reverse direction
%I0.21	IX_LOC_STOP	Button - stop movements
%I0.22	IX_LOC_FWD	Button - start the drives in forward direction
%I0.23	IX_ENERGYMETER_PULSE	Pulse signal from energy meter indicating the energy consumption in 1000 p/kWh
%I1.0	IX_OUTPUT_ON_MODULE1	Safety output on
%I1.1	IX_SUPPLY_MODULE1	Supply available (A1/A2) on the safety module
%I1.2	IX_SUPPLYFAIL_MODULE1	Supply out of tolerance
%I1.3	IX_CH1_MODULE1	Channel 1 from the safety module is active
%I1.4	IX_CH2_MODULE1	Channel 2 from the safety module is active
%I1.5	IX_START_MODULE1	Start from the safety module is active
%I1.6	IX_K1_MODULE1	Relay K1 of the safety module is activated
%I1.7	IX_K2_MODULE1	Relay K2 of the safety module is activated
%I1.9	IX_S1_MODULE1	S1 from the safety module active
%I1.10	IX_S2_MODULE1	S2 from the safety module active
%I1.11	IX_S4_MODULE1	S4 from the safety module active
%I1.12	IX_WAITING_FOR_START_MODULE1	Safety module is waiting for start condition

Output Variables

This table describes the output variable:

Output	Variable	Description
%Q0.0	QX_PULSE_DRIVE_1	Pulse signal for LXM28 Drive 1
%Q0.2	QX_DIR_DRIVE_1	Direction signal for LXM28 Drive 1
%Q0.4	QX_TOWER_LIGHT_GREEN	Tower light indicating the system is under power and operates successful.
%Q0.5	QX_TOWER_LIGHT_WHITE	Tower light indicating at least one drive is running.
%Q0.6	QX_TOWER_LIGHT_RED	Tower light indicating at least one error is detected.
%Q0.7	QX_TOWER_LIGHT_BLUE	Tower light indicating an Estop situation is active (steady on) or needs to be reset (flashing).
%Q0.8	QX_LED_ESTOP_PWR_ACTV	LED on **E-Stop ACK**-button indicating an Estop situation is active (ready on) or needs to be reset (flashing).
%Q1.0	QX_ENABLE_MODULE1	Activation of safety outputs enabled
%Q1.1	QX_RESET_MODULE1	Deactivate module (current source de-energized)
%Q1.2	QX_KEEPALIVE_MODULE1	Safety function stays active even when TM3 bus is not running (timeout).

Output	Variable	Description
%Q2.0	QX_ATV12_DRIVE_MOTFWD	Vertical drilling axis: Command to operate the drive in forward (down) direction. Linked to an input of the drive.
%Q2.1	QX_ATV12_DRIVE_MOTREV	Vertical drilling axis: Command to operate the drive in reverse (up) direction. Linked to an input of the drive.
%Q2.2	QX_ATV12_DRIVE_RST	Vertical drilling axis: Command to reset the drive when an error is detected.
%Q2.3	QX_ATV312_DRIVE_MOTFWD	Conveyor axis: Command to operate the drive in forward direction. Linked to an input of the drive.
%Q2.4	QX_ATV312_DRIVE_MOTREV	Conveyor axis: Command to operate the drive in reverse direction. Linked to an input of the drive.
%Q2.5	QX_ATV312_DRIVE_RST	Conveyor axis: Command to reset the drive when an error is detected.
%Q2.6	QX_LXM28_DRIVE_RST	Horizontal axis: Command to reset the drive when an error is detected.
%Q2.7	QX_LXM28_DRIVE_ENABLE	Horizontal axis: Command to enable the drive.
%Q3.0	QX_ATV12_DRIVE_SPEED_REF	Vertical drilling axis: Speed reference for the ATV12.
%Q3.1	QX_ATV312_DRIVE_SPEED_REF	Conveyor axis: Speed reference for the ATV312.

NOTE: In the project template, some I/O for some of the machine parts are simulated in the application and no physical inputs are wired to the embedded I/O. Therefore, when you apply this template, you will need to wire these simulated I/O to the real-world devices that they represent, and then map those embedded I/O to the variables used in the application.

Chapter 4
Communication

Ethernet Modbus TCP/IP

Overview

The Modicon M221 Logic Controller is configured with a fixed IP address 172.20.10.91 and subnet mask 255.255.0.0.

The HMI is configured with a fixed IP address 172.20.10.92 and subnet mask 255.255.0.0.

Chapter 5
System Setup

What Is in This Chapter?

This chapter contains the following sections:

Section 5.1
Drive Configuration

Overview

The tables of parameters in this section describe a subset of parameters required for better performance and operation of the project template. For more information concerning the configuration of Altivar variable speed drives and Lexium servo drives, refer to the documentation of the drives.

⚠ WARNING

UNGUARDED MACHINERY

- 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.

NOTE: You must configure drives according to the machine and specific application conditions and circumstances.

What Is in This Section?

This section contains the following topics:

Drive for Horizontal Axis

Overview

The drive for horizontal axis is configured as follows:

Set the drive to factory settings.

Lexium 28 - Pulse Train Control Mode Setup

In this architecture, the Lexium 28 is operated in Pulse Train (PT) operation mode. During the PT operation mode, movements are carried out according to externally supplied reference value signals. A position reference value is calculated based on these external reference values plus an adjustable gear ratio.

The configuration of the Lexium servo drive for PT operation mode is described in this section.

There are several options to configure the drive:

- By the local HMI on the front of the drive
- By the configuration software SoMove installed on a PC*
- By the FDT/DTM as part of the SoMachine software installed on a PC*

(*linked to the serial communication connector CN3 on the front of the drive)

NOTE: If a device has already been configured for some other use, re-establish the factory settings. Instructions on how to do this can be found in the respective documentation.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that both wiring and mounting are correct before you start to configure the drive.
- Verify that an unintentional start of the connected motor will not endanger personnel or equipment in any way.

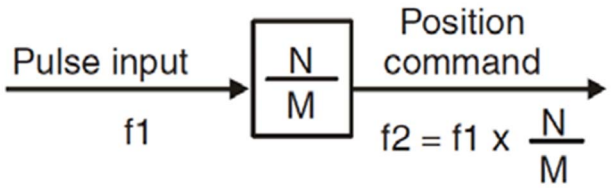
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Electronic Gear Calculations

During PT operating mode, the position command is calculated based on the external pulses and the electronic gear ratio. To properly configure the Lexium servo drive, you must provide a calibrated adjustable gear ratio. To help understand how to calibrate the gear ratio, as well as the position command in general, it is useful to be familiar with the abbreviations and acronyms found in the following table.

Short Form	Long Form	Description
Hz	Hertz	Unit for frequency, s^{-1}
rpm	revolutions per minute	Unit for rotational speed
pps	pulses (points) per second	Unit for the frequency of the position command, equivalent to Hz
ppr	pulses (points) per revolution	Unit for the resolution of an encoder

The gear ratio is determined by a pair of parameters, the gear factor numerator and denominator.



N Gear Factor Numerator (parameter `P1-44`)
M Gear Factor Denominator (parameter `P1-45`)

In the following discussion, the resolution of the motor (position command) is determined with 1280000 ppr. That is, there are 1280000 motor increments per one motor revolution, and is the default Lexium 28 encoder resolution for the servo motor.

By manipulating the gear factor parameters, you can calibrate the maximum frequency of input pulses with the maximum speed of your motor. Consider the following example with the following assumptions:

- The Electronic gear ratio (N/M) is equal to 1.
- The number of pulses required for one motor revolution is 1280000.
- The maximum output frequency of the pulse generator of your controller is 100 kHz.
- A factor of 60 sec./min. is used to convert calculations to revolutions per minute.

Then, for example, the maximum revolutions per minute would follow such that:
rpm_{max} = (maximum pulse frequency x (N/M) / pulses per revolution) x 60 sec./min.
rpm_{max} = (100000 Hz x 1 / 1280000 ppr) x 60 sec./min.
rpm_{max} = 4.6875

Clearly, with the controller pulse frequency at its maximum rate, it would only be possible to obtain a maximum rotational speed of approximately 5 rpm, well below, in all probability, the capacity of your motor. To obtain greater rotational speeds, you can modify the electronic gear ratio parameter. For example, say the maximum rotational speed of your motor is 3000 rpm (where rpm_{max} = 3000). Using simple algebra, you can calculate the gear ratio value (N/M) necessary to obtain the maximum rotational speed at the maximum pulse frequency of your controller. For example:

(N/M) = ((rpm_{max} / 60 sec./min.) x pulses per revolution) / maximum pulse frequency

(N/M) = ((3000 rpm / 60 sec./min.) x 1280000 ppr) / 100000 Hz

(N/M) = 640

Of course, the maximum rotational speed, in revolutions per minute, of your particular motor would need to be applied, but for the purposes of the present Drilling Machine project template, a gear ratio of 640 is used.

Position Calculations

Using the assumptive values in Electronic Gear Calculations above, you can determine the external pulses required for each revolution given the calculated gear ratio:

ppr_{ex} = pulses per revolution / gear ratio

ppr_{ex} = 1280000 ppr / 640

ppr_{ex} = 2000

Other factors must be taken into account when calculating position. In the present project template, a reduction gear box and a pulley are attached to the motor shaft. The reduction gear box ratio is 5, and the diameter of the pulley is 100 mm. Aside from the reduction gear ratio, you must calculate the circumference of the pulley wheel.

Pulley circumference = ∏x d

Pulley circumference = ∏x 100 mm

Pulley circumference ≅ 314.16 mm

For the purposes of the present project template, a movement resolution of 1 mm is desired. To calculate the pulses required to move 1 mm, use the calculated external pulses required, reduction gear box ratio and pulley circumference as follows:

Pulses for 1 mm resolution = (ppr_{ex} x reduction gear box ratio) / pulley circumference

Pulses for 1 mm resolution = (2000 ppr x 5) / 314.16 mm

Pulses for 1 mm resolution = 31.831

Therefore, 32 pulses are required to move the load a distance of 1 mm.

Speed Calculations

Using the calculations from Position Calculations, the calculation of speed is straightforward. If the controller sends 32 pulses per second to the drive, the load will move at a rate of 1 mm per second, or simply a frequency of 32 Hz.

Positioning Example

Using the settings provided by the HMI, the values for speed and distance are calculated and set by the project template. For example, if you enter:
Distance = 317.8 mm
Speed = 70 mm/s

The project template makes the following calculations:
Pulses for distance = distance x pulses for 1 mm resolution
Pulses for distance = 317.8 mm x 31.831
Pulses for distance = 10116

Frequency for speed = speed x frequency for 1 mm/s
Frequency for speed = 70 x 31.831 Hz
Frequency for speed = 2228 Hz

The resulting values for distance and speed from the calculation example above are assigned to the associated pulse generator control function (for example: `%MC_MoveRelative_PTO0`).

NOTE: All calculations are made based upon the assumptions used in the project template. You must adapt these assumptions to fit your particular equipment.

I/O Assignment

The table lists the signals to control the Lexium 28:

Signal	Control terminal Lexium 28	Description
Servo on	DI1	Command to enable the drive.
Alarm reset	DI5	Command to acknowledge an alarm on the drive.
Negative inhibit limit switch	DI6	If FLASE drive is stopped immediately with alert `AL014`.
Positive inhibit limit switch	DI7	If FLASE drive is stopped immediately with alert `AL015`.
Operation stop	DI8	If FLASE drive is stopped immediately with alert `AL013`.
Servo on	DO1	Indicates if the servo drive is ready for operation (power stage enabled).

Signal	Control terminal Lexium 28	Description
Zero speed detected	DO2	Indicates if the velocity is less than the zero speed velocity.
Positioning completed	DO4	Indicates if the positioning process is completed. The position deviation is within the predefined tolerance.
Alarm detected	DO5	Indicates the alarm detection status of the drive.
Pulse signal (24 Vdc)	PULL_HI_P	The number and frequency of the pulses determine the movement of the motor.
Direction signal (24 Vdc)	PULL_HI_S	Determines the direction for the motor (1 = positive).

Configuration

To adjust the parameters, use the following path and values

Step	Action	Comment
1	Configure the control mode and the output direction with parameter [P1-01].	In this example, the parameter [P1-01] is set to 1100 hex. The meaning of the digits from right to the left is: 00: Pulse Train (PT) control mode via external pulses 1: Output direction (motor), positive = clockwise 1: Digital I/O settings ([P2-10] … [P2-22]) are changed to their default values after a power cycle.
2	Power cycle the drive.	In order to restore the default values for the I/O settings if selected in step 1 ([P1-01]).
3	Configure the external pulse input type [P1-00].	In this example, the parameter [P1-00] is set to 0022 hex. The meaning of the digits from right to the left is: 2: input pulse type = pulse + direction 2: input pulse filter = 100 kHz 0: input polarity = positive logic 0: source of pulse command = low-speed pulse
4	Configure the electronic gear ratio [P1-44] (nominator) and [P1-45] (denominator).	In this example, the electronic gear ratio is set to 640. This means for the two parameters: [P1-44] = 640 [P1-45] = 1

Step	Action	Comment
5	Configure the digital input functions [P2-10] to [P2-17].	In this example, the configuration of the digital inputs is: [P2-10] (DI1) = 0101 hex: Servo on, normally open [P2-11] (DI2) = 0100 hex: Not used [P2-12] (DI3) = 0100 hex: Not used [P2-13] (DI4) = 0100 hex: Not used [P2-14] (DI5) = 0102 hex: Alarm reset, normally open [P2-15] (DI6) = 0022 hex: Negative inhibit limit switch, normally closed [P2-16] (DI7) = 0023 hex: Positive inhibit limit switch, normally closed [P2-17] (DI8) = 0021 hex: Operational stop, normally closed
6	Configure the digital output functions [P2-18] to [P2-22].	In this example, the configuration of the digital outputs is: [P2-18] (DO1) = 0102 hex: Servo drive is on, power stage enabled [P2-19] (DO2) = 0103 hex: Zero speed detected [P2-20] (DO3) = 0100 hex: Not used [P2-21] (DO4) = 0105 hex: Positioning completed [P2-22] (DO5) = 0007 hex: No alarm is detected
7	Power cycle the drive.	After the configuration has been finished, power cycle the drive because some parameters only become effective after a power cycle.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Power cycle the drive after any configuration changes or adjustments (power removal followed by power reapplied).

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

After the configuration, an additional commissioning procedure needs to be performed. For example, a tuning of the drive system and the scaling of the axis.

For more information, refer to LXM28A and BCH2, Servo drive system, Product manual, 0198441114054-EN.

Drive for Vertical Axis

Overview

The drive for vertical axis is configured as follows:

Set the drive to factory settings.

Altivar 12 - Setup

To operate the Altivar 12 via hardwired signals as it is defined in this example, the I/O configuration has to be set for the drive. In addition to this, it is mandatory to set the parameter of the connected motor in the drive. Further configuration settings are dependent on your application and on the installation.

There are several options to configure the drive:

- By the local HMI on the front of the drive
- By a remote display terminal*
- By the software SoMove installed on a PC*

(* linked to the integrated communication port of the drive)

NOTE: If a device has already been configured for some other use, re-establish the factory settings. Instructions on how to do this can be found in the respective documentation.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that both wiring and mounting are correct before you start to configure the drive.
- Verify that an unintentional start of the connected motor will not endanger personnel or equipment in any way.

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

If necessary, disconnect the motor from the drive to prevent an unintentional motor start.

I/O Assignment

The signals to control the Altivar 12 are defined in the table below.

Signal	Control terminal Altivar 12	Description
Run forward	LI1	Command to start the drive in forward direction.
Run reverse	LI2	Command to start the drive in reverse direction.
Fault reset	LI3	Command to reset the drive in case of error state.
Drive no fault	R1A (relay output)	R1 is active if the drive has no error detected.
Drive run	LO-	Indicates whether the drive is in Run state.

Configuration

The following steps to set up the drive are based on the configuration by the local HMI on the front of the drive. All submenus and parameters listed in the table are accessible via `[CONFIGURATION] (COnF)`, `[FULL] (FULL)` menu.

Step	Action	Comment
1	Switch on the power supply.	Do not give a run command to the drive.
2	Configure the I/O parameters under the menu `(FULL) -> (I_O-)`: • **[Type of control]** `(tCC)` • **[2 wire type control]** `(tCt)` • **[Logic inputs type]** `(nPL)` • **[R1 assignment]** `(r1)`	In this example, the drive is controlled in two wire control with transient detection. The inputs are of type positive logic. The output R1 indicates that the drive has no error detected. • `tCC` = 2C (2 wire) • `tCt` = trn (transient detection) • `nPL` = POS (positive logic) • `r1` = FLt (inactive when error state detected)
3	Configure the logical output LO1 under the menu `(FULL) -> (I_O-) -> (LO1-)`: • **[LO1 assignment]** `(LO1)` • **[LO1 output active level]** `(LO1S)`	In this example, the logic output indicates that the drive is running. • `LO1` = rUn (active in RUN state) • `LO1S` = POS (active high)
4	Configure the motor parameters under the menu `(FULL) -> (drc-)`: • **[Standard mot. freq.]** `(bfr)` • **[Rated mot. power]** `(nPr)` • **[Rated mot. volt.]** `(UnS)` • **[Rated mot. current]** `(nCr)` • **[Rated mot. freq.]** `(FrS)` • **[Rated motor speed]** `(nSP)`	Refer to the motor rating plate. Values have to be adjusted if the factory settings differ from your application.
5	Configure the parameter **[Reference Channel 1]** under the menu `(FULL) -> (CtL-) -> (Fr1)`.	In this example, the analog input AI1 is set for the parameter. `Fr1` = AI1

Step	Action	Comment
6	Configure the ramp parameters (FULL) -> (FUn-) -> (rPt-): ● **[Acceleration]** (ACC) ● **[Deceleration]** (dEC)	In most cases, the factory settings can be maintained for a quick start. But nevertheless, you have to verify the values.
7	Configure the parameter **[Reverse direction]** under the menu (FULL) -> (FUn-) -> (rrS)	The reverse direction is disabled per default and is activated by the assignment of a logic input. rrS = L2H (LI2 - start reverse)
8	Configure the **[Fault reset assignment]** under the menu (FULL) -> (Flt-) -> (rSF).	In this example, the logic input LI3 is used for the reset of a drive error. rSF = L3H (LI3 - reset fault)
9	Configure the parameter **[Motor thermal current]** under the menu (FULL) -> (Flt-) -> (tHt-) -> (itH).	Refer to the motor rating plate. Values have to be adjusted if the factory settings differ from your application.
10	Power cycle the drive.	If the configuration is finished, do a power cycle of the drive. Some parameters only become effective after a power cycle.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Power cycle the drive after any configuration changes or adjustments (power removal followed by power reapplied).

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

For more information, refer to the Altivar 12, Variable speed drives for asynchronous motors, User manual BBV28581.

Drive for Feeder Conveyor

Overview

The drive for feeder conveyor is configured as follows:

- Set the drive to factory settings.
- Set correct motor parameters

Altivar 312 - Hardwired Setup

To operate the Altivar 312 via hardwired signals as it is defined in this example, the I/O configuration has to be set for the drive. In addition to this, it is mandatory to set the parameter of the connected motor in the drive. Further configuration settings are dependent on your application and on the installation.

There are several options to configure the drive:

- By the local HMI on the front of the drive
- By a graphic display terminal
- By a remote display terminal
- By the configuration software SoMove installed on a PC*
- By the FDT/DTM integrated in SoMachine installed on a PC*

(* linked to the integrated communication port of the drive)

NOTE: If a device has already been configured for some other use, re-establish the factory settings. Instructions on how to do this can be found in the respective documentation.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that both wiring and mounting are correct before you start to configure the drive.
- Verify that an unintentional start of the connected motor will not endanger personnel or equipment in any way.

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

If necessary, disconnect the motor from the drive to prevent an unintentional motor start.

I/O Assignment

The signals to control the Altivar 312 are defined in the table below.

Signal	Control terminal Altivar 312	Description
Run forward	LI1	Command to start the drive in forward direction.
Run reverse	LI2	Command to start the drive in reverse direction.
Fault reset	LI3	Command to reset the drive in case of error state.
Drive no fault	R1A (relay output)	R1 is active if the drive has no error detected.
Brake control	R2A (relay output)	R2 is activated by the brake control logic of the ATV 312 and is used to control the external brake contactor.
Speed reference	AI1	Speed reference signal, 0-10 V

Configuration

The following steps to set up the drive are based on the configuration by the local HMI on the front of the drive. All submenus and parameters listed in the table are accessible via `[CONFIGURATION] (COnF)`, `[FULL] (FULL)` menu.

Step	Action	Comment
1	Switch on the power supply.	Do not give a run command to the drive.
2	Configure the parameters under the menu **[Settings]** `(Set-)`: ● **[Acceleration]** `(ACC)` ● **[Deceleration]** `(dEC)` ● **[Low Speed]** `(LSP)` ● **[High Speed]** `(HSP)` ● **[Mot. Therm. current]** `(ItH)`	In most cases, the factory settings can be maintained for a quick start. But nevertheless, you have to verify the values.
3	Configure the motor parameters under the menu **[Motor Control]** `(drc-)`: ● **[Standard mot. freq]** `(bFr)` ● **[Rated motor volt.]** `(UnS)` ● **[Rated motor freq.]** `(FrS)` ● **[Rated motor current]** `(nCr)` ● **[Rated motor speed]** `(nSP)` ● **[Motor 1 Cosinus Phi]** `(COS)`	Refer to the motor rating plate. Values have to be adjusted if the factory settings differ from your application.
4	Configure the I/O modules under the menu **[Inputs/Outputs CFG]** `(I_O-)`: ● **[2/3 wire control]** `(tCC)` ● **[2 wire type]** `(tCt)` ● **[Reverse]** `(rrS)` ● **[R1 Configuration]** `(r1-) -> (r1)`	In this example, the following values are set for the parameters: ● `tCC` = 2C (2 wire) ● `tCt` = trn (transition) ● `rrS` = LI2 (logical input LI2) ● `R1` = FLt (drive error detection status)

Step	Action	Comment
5	Configure the access level under the menu **[Command]** (Ctl-): ● **[Access level]** (LAC)	In this example, Level 2 is set for the parameter. LAC = L2 Access level 2 enables the access to advanced functions under the menu **[Application Funct.]** (Fun-), for example brake control.
6	Configure the reference channel under the menu **[Command]** (Ctl-): ● **[Ref. 1 channel]** (Fr1)	In this example, the analog input AI1 is set for the parameter. Fr1 = AI1
7	Configure the parameter for the brake control under the menu **[Application Functions]** (Fun-): ● **[Brake logic control]** (bLC-) -> (bLC)	In this example, the relay output R2 is set for the parameter. bLC = r2 The relay output R2 controls the release of the electro-magnetic brake on the motor. Further parameter can be set depending on your application.
8	Configure the **[Fault reset assignment]** under the menu **[Fault management]** (FLt-): ● **[Fault reset]** (rSF)	In this example, the logic input LI3 is used for the reset of a drive error. rSF = LI3 (logical input LI3)
9	Power cycle the drive.	If the configuration is finished, do a power cycle of the drive. Some parameters only become effective after a power cycle.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Power cycle the drive after any configuration changes or adjustments (power removal followed by power reapplied).

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

For more information refer to the Altivar 312, Variable speed drives for asynchronous motors, Installation manual BBV46391.

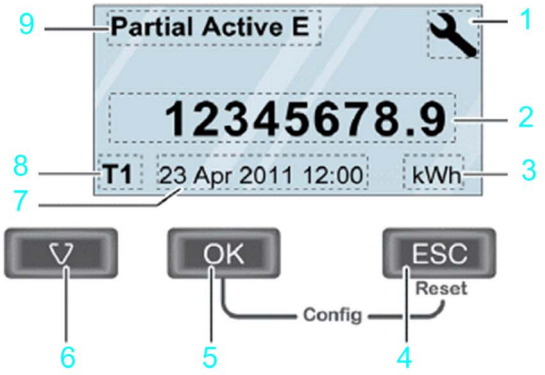
Section 5.2
Power Meter Configuration

iEM3110 Energy Meter - Setup

Overview

The energy meter features a sophisticated and intuitive human machine interface (HMI) with signaling LEDs, a graphic display, and contextual menu buttons for accessing the information required to operate the energy meter and modify parameter settings. The navigation menu allows displaying, configuring, and resetting parameters.

The graphic shows the general display:



1 Configuration mode
2 Values / parameters
3 Unit
4 Cancelation
5 Confirmation
6 Selection
7 Date and time (except for iEM3100 / iEM3200)
8 Tariff used (iEM3115 / iEM3155 / iEM3215 / iEM3255)
9 Functions / measurements

In addition to this system user guide the product manual for the iEM3110 energy meter has to be read carefully.

For more information, refer to iEM3100 series / iEM3200 series, Energy Meters, User Manual, DOCA0005EN.

Basic Configuration

Before starting the configuration of the energy meter, verify that the installation is correct.

Step	Action	Comment
1	Set date and time.	When the power is interrupted, the iEM3110 automatically resets the date and time. By default the required password is 0010.
2	Enter the configuration mode. Press and hold **ESC** + **OK** for at least 2 seconds.	The display switches to configuration mode.
3	Select the submenu **Wiring** and set the parameter for it.	The default wiring parameter is set to 3PH4W.
4	Select the submenu **Frequency** and set the parameter for it.	The default frequency parameter is set to 50 Hz.
5	Select the submenu **Pulse Output** and set the parameter for it.	The default pulse output is set to 100 imp/kWh. In this architecture, you have to set the value to 1000 imp/kWh
6	Leave the setup menu by pressing **ESC** .	–

NOTE: Further configurations can be done depending on your application needs. For more information, refer to iEM3100 series / iEM3200 series, Energy Meters, User Manual, DOCA0005EN.

Chapter 6
Application Software

Overview

This chapter describes the application software.

What Is in This Chapter?

This chapter contains the following topics:

Task Configuration

Overview

Task	POU	Type	Description
Master Task	• Init • System • Cycle • Program Reset • Steps • Altivar 312 Conv • Clamps simulation • Lexium 28 Position Calculation • Lexium 28 Horizontal • Drill Spindle Motor simulation • Altivar 12 Vertical • Altivar 12 Vertical LS simulation • Various simualtions • HMI I/O State • HMI Process	Periodic 10 ms	Contains the drilling application POUs. Runs with defined cycle time.
	Energy		Contains the Energy Efficiency application part.
Free POUs	• Get DateAndTime (SR0) • Set DateAndTime (SR1) • First Cycle (SR2)	Event	Contains the settings for date, time and necessary presettings of parameters in the 1st cycle.

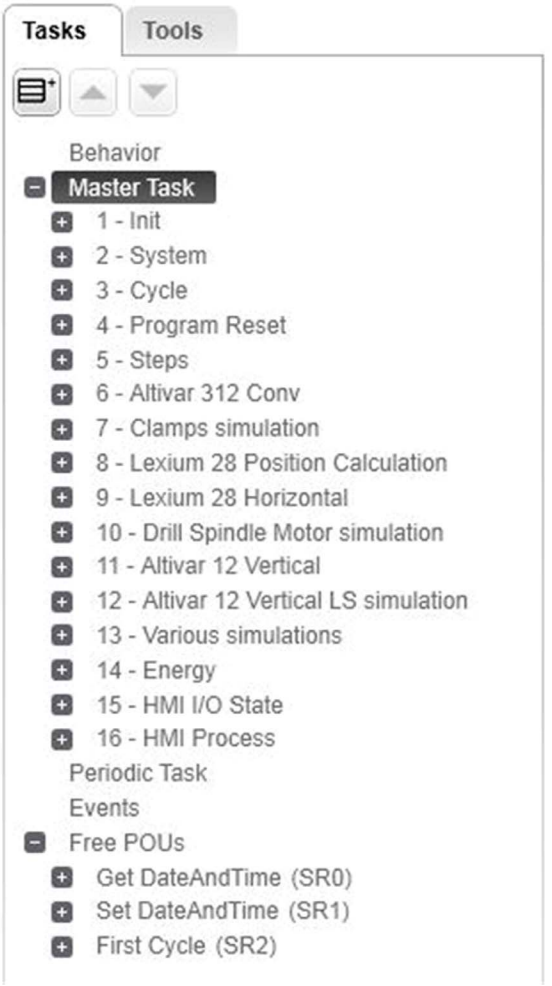
Drilling Control

Overview

The brief description of the project template contains the description of different modes, functionality, and the detected alarms.

Application_Mast

The application Master Task executes following POUs for drilling task and Energy Efficiency parameters.



Components of Application_Mast Task

The POUs are explained in detail in the sections thereafter.

Cyclic task is defined in the **Task Configuration** of the application.

Also, the application consists of POU `Energy` to monitor the different electrical reading from the power meter. The different parameters measured are listed as follows:

- Energy

Init

The POU `Init`, performs the following operations:

- Read date and time
- Generate auxiliary bits (Pulse, etc.)
- Generate necessary pre-settings
- Verifies the availability of different devices.
- Generates a detected alarm when devices are in error state.
- Verifies the Emergency E- Stop and the status of the safety door

System

The POU `System` performs the following operations:

- Diagnostic (state of safety module, E-Stop, Altivar, Lexium)
- Control the towerlight
- DateAndTime function

Cycle

The POU `Cycle` performs the following operations:

- Start release
- Start of drilling sequence
- Stop of drilling sequence

Program Reset

The POU `Program Reset` performs the following operation:

Reset the Step-Bits (in Manual mode)

Steps

The POU `Steps` performs the following operation:

Monitoring and control of process steps

Altivar 312 Conv

The POU `Altivar 312 Conv` performs the following operation:

Monitoring and control of Altivar 312 for feed conveyor

Clamps simulation

The POU `Clamps simulation` performs the following operation:

Monitoring and control of SIMULATED clamps device

NOTE: You must adapt this POU to your application.

Lexium 28 Position Calculation

The POU `Lexium 28 Position Calculation` performs the following operations:

- Distance (between the holes) calculation from mm to pulses
- Park-Position calculation from mm to pulses
- Present position calculation from pulses to mm

Lexium 28 Horizontal

The POU `Lexium 28 Horizontal` performs the following operations:

- Monitoring and control of Lexium 28 for horizontal movement of the drill head axis (position of holes)
- Verifies the availability of the device to perform the operation
- Performs homing of horizontal axis
- A detected homing alarm is displayed in the **Alarm** page of the HMI screen

NOTE: Homing mode is used in the application. For more information on Homing mode, refer to the LXM28A and BCH2, Servo drive system, Product manual.

Drilling Spindle Motor simulation

The POU `Drilling Spindle Motor simulation` performs the following operation:

Monitoring and control of SIMULATED drill spindle device

NOTE: You must adapt this POU to your application.

Altivar 12 Vertical

The POU `Altivar 12 Vertical` performs the following operation:

Monitoring and control of Altivar 12 for vertical movement of the drill head

Altivar 12 Vertical LS simulation

The POU `Altivar 12 Vertical LS simulation` performs the following operation:

Monitoring and control the limit switch SIMULATION for vertical movement of the drill head (ATV12)

Various simulations

The POU `Various simulations` performs the following operation:

Monitoring and control of various SIMULATIONS (Axis homed, ATV-Spindle-Output, LS)

Energy

The POU `Energy` performs the following operation:

Monitoring the energy from the power meter

HMI I/O State

The POU `HMI I/O State` performs the following operation:

Map the status of I/Os to the memory objects for HMI communication

HMI Process

The POU `HMI Process` performs the following operation:

Map the process status to the memory objects for HMI communication

Operation Modes and Handling

Overview

In this project template the following operation modes are implemented.

Homing Mode of the Horizontal Axis

The Homing mode performs the following operations:

- Verifies the availability of the device to perform the operation.
- `MC_Home_PTO0` FB is used for homing of servo axis.
- Performs homing of horizontal axis.
- A detected homing alarm is displayed in the **Alarm** page of the HMI screen.
- A limit switch in the horizontal axis is needed to perform homing.
- To perform the Homing, the system must be in Manual mode. Then follow these steps:
  a. Select the HMI page **Lexium**.
  b. Select **Homing / Config**.
  c. Enter the value for **Homing Pos:** (usr)
  d. Press the button **Enable**.
  e. Press the button **Start Homing**.

NOTE: Homing mode is used in the application. For more information on Homing mode, refer to the LXM28A and BCH2, Servo drive system, Product manual.

Manual Mode

In Manual mode, you can perform the following actions manually by sending commands from the HMI:

- You can perform jog operation of the different axes.
- The command forward /reverse /speed has to be provided from the HMI screen.
- You can perform the homing of the horizontal axis when the system is in Manual mode.
- You can open and close the clamps from the HMI.

Auto Mode

The following preconditions must be performed in Manual mode:

- Homing is done for horizontal axis.
- Horizontal axis is in park position.
- Verical axis is in home position.
- Machine is empty (NO plank in machine), if not, remove plank from machine.
- Clamps are opened, if not, open clamps.
- All drives are stopped.

The Auto mode performs the following operations automatically:

- Starts the feeder conveyor and runs up to the plank reach the plank-LS (limit switch, simulated by a pre-defined time).
- Performs clamping operation to hold the object during drilling.
- Starts the drilling motor.

- Generates an alarm if an error is detected in the drilling motor.
- Moves the horizontal axis to first hole drill position.
- Moves the vertical axis down and up for drill the hole.
- Subsequent holes to the desired position.
- Move the horizontal and vertical axis until the holes are drilled.
- Moves the axes back to the park-/home position and stop the drill spindle motor after the completion of the drilling operation.
- Unclamp the object when the defined holes are drilled.
- Starts the feeder conveyor and runs for a pre-defined time to unload the material after drilling.
- Waits for the next cycle start command.

NOTE: If you have interrupted the auto sequence by switching in Manual mode you must remove the plank and move the axes in the home position in Manual mode.

Alarm Handling

The Alarm Handling resets the different detected alarms of the drives based on user input and performs the following operations:

- Verifies for the reset input from HMI
- Uses the `MC_Reset_xxx` FB to reset the detected alarms in the drives.
- Resets the vertical axis.
- Resets the horizontal axis.
- Resets the drilling drive.
- Resets the feeder conveyor drive.
- If the reset is successful, it resumes the operation.

Step-by-Step Description to Operate the Drilling Machine

Step	Action
1	Select the HMI page **Process Screen**.
2	Enter the **No of holes:**.
3	Enter the **Distance mm:** for the distance between the holes.
4	Enter the **Park pos mm:** for the parking position of the horizontal axis.
5	Move the horizontal axis in home position: **1.** Select the HMI page **Lexium**. **2.** Select **Homing / Config**. **3.** Enter the value for **Homing Pos:** (usr) **4.** Press the button **Enable**. **5.** Press the button **Start Homing**.
6	Move the horizontal axis in parking position: **1.** Select the HMI page **Lexium**. **2.** Select **Mode: Positioning**. **3.** Press the button **Enable**. **4.** Press the button **Absolut**.

Step	Action
7	Select the HMI page **Home**. **NOTE:** If the button **Start** is flashing then the start release is active. **NOTE:** In the list below the conditions for the start release is described.
8	Press the button **Start**. **Result:** Drilling sequence starts.

The conditions for the start release are as follows:

- Auto mode is selected
- E-Stop is OK
- All drives are OK
- All drives are stopped
- No plank or material is in the machine
- Clamps are opened, if not, open clamps via HMI page **Clamps**
- Vertical axis (Altivar 12) is in home position: UP (LS simulated in POU `Altivar 12 Vertical LS simulation`), if not, select operation mode **ManMode**.
- Select HMI page **Altivar - ATV12**
- Select ATV operation mode **AutoMode**.
- Press the button **Rev** and runs the ATV12 for minimum 4 seconds in reverse direction.
- Press the button **Stop**.
- Horizontal axis is in home position, if not, move the horizontal axis in home position as described above.
- Horizontal axis is in parking position, if not, move the horizontal axis in parking position as described above.

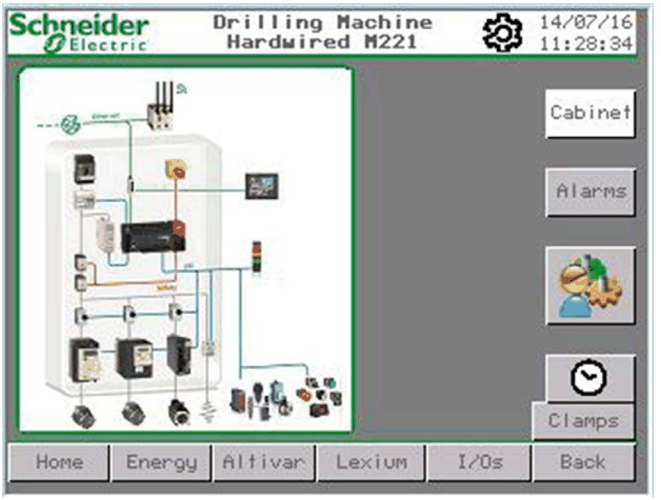
HMI STU855 Display

Overview

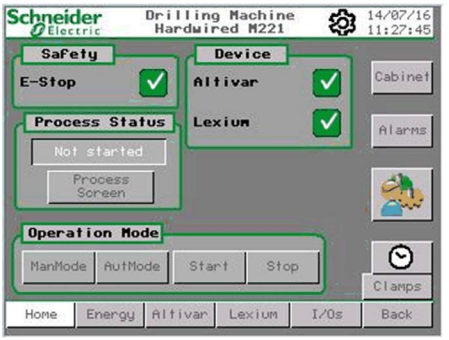
The panel used in this project template is a Magelis HMIS5T (HMIS65/S85). You can parameterize, control, and monitor the different operations of the drilling machine.

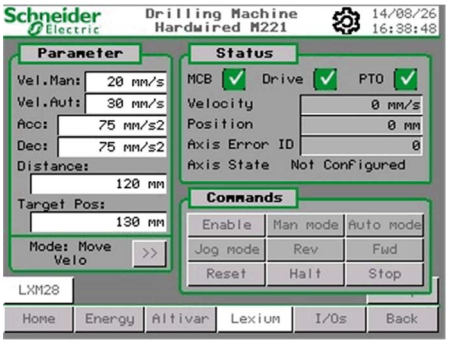
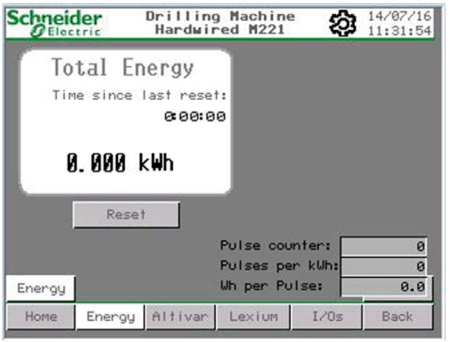
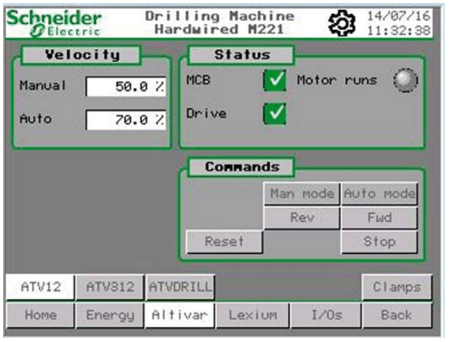
Programming of the Magelis HMI is done by using Vijeo-Designer software integrated in SoMachine or installed as a standalone application.

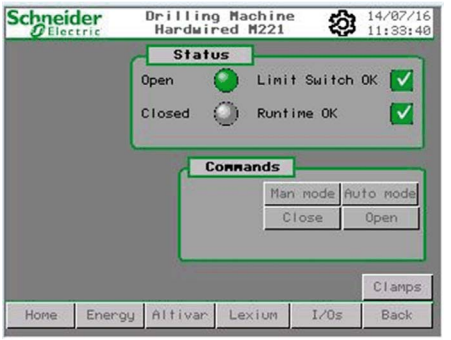
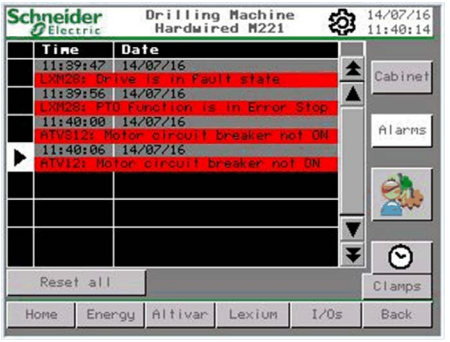
The panel below shows the different tabs available in HMI **Cabinet** screen:

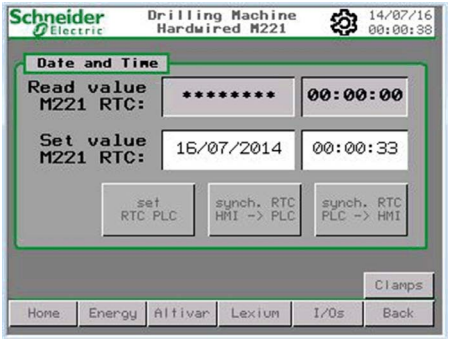
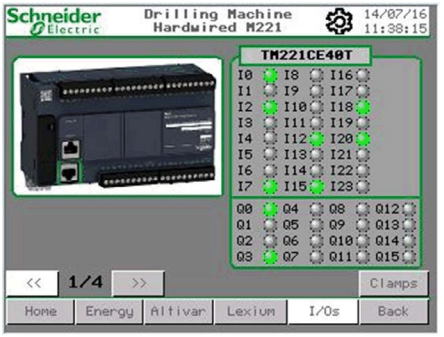


This table describes different tabs of the panel with description:

Tab	Panel	Description
Home		This panel shows the status of **Safety**, **Device** and **Process**. It gives the possibility to select the operation mode of the machine, and to start and stop the machine.

Tab	Panel	Description
Lexium		Here, you can manually operate LXM28 drives. Different modes are available in manual operation.
Energy		Here, you can monitor different energy efficiency parameters from the panels.
Altivar		This panel shows the status and selection of velocity in different modes and gives the possibility to operate the ATV drive in different operation modes by commands.

Tab	Panel	Description
Clamps		This panel shows the status and gives the possibility to operate the clamps in different operation modes by commands. **NOTE:** The Clamps do not exist physically in the architecture and are simulated by internal variables.
Process		This panel shows the process status and gives the following possibilities: ● to select the number of holes to be drilled, ● to enter the park position for the horizontal axis Lexium 28, and also ● to start and stop the machine.
Alarms		This panel shows the alarm history and gives the possibility to reset the alarms.

Tab	Panel	Description
DateAndTime		This panel shows the date and time and gives the possibility to set and synchronize the date and time.
I/Os		This panel shows the status of the embedded IOs from the M221.