SIEMENS

Introduction 1

Overview 2

Initial Setup 3

Additional Notes and Important Information 4

SITRANS

Siemens WW100 Weighfeeder with Integrated Sinamics S110 CU305DP Control Module

Application examples

08\2020
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Legal information

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indicates that death or severe personal injury **may** result if proper precautions are not taken.

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indicates that minor personal injury can result if proper precautions are not taken.

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Table of contents

1 Introduction 4

1.1 Objective 4

1.2 Equipment 4

1.3 Disclaimer 4

2 Overview 5

3 Initial Setup 6

3.1 Pre-Start Up Warning 6

3.2 Powering Up the Sinamics S110 Drive and Control Unit 6

3.3 Loading the Software Application Data Set 7

3.4 BOP20 Key Sequences – Parameter P0003 8

3.5 Parameter P0003 – Expert Mode 9

3.6 Setting the Maximum RPM - P2000 9

3.7 Reversal of Belt Direction - Parameter P1113 10

3.8 Saving the Application Data to Non-Volatile Memory and the Micro Memory Card 11

4 Additional Notes and Important Information 12

4.1 Inputs and Outputs 12

4.2 Resolution of the Analog Input 12

4.3 Emergency Stop Wiring Overview 13

4.4 Faults and Alarms 13

Introduction 1

1.1 Objective

The objective of this application guide is to help the user become familiar with the application commissioning and setup of the Sinamics S110 Control Unit and WW100 Weighfeeder. This application guide mainly focuses on the commissioning of the Drive Unit itself. Please refer to the BW500 Operating Instructions and WW100 Weighfeeder Operating Instructions for additional commissioning details.

1.2 Equipment

Equipment	MLFB Part Number
PM340 Power Module	----------
1 Phase 208 – 240 VAC	6SL3210-1SB12-3UA0
3 Phase 380 – 480 VAC	6SL3210-1SE11-3UA0
S110 460V Line Choke	6SE64003CC002AD3
CU305DP Control Module	6SL3040-0JA00-0AA0
BOP20 Keypad	6SL3055-0AA00-4BA0
Drive Cliq Cable	6FX50022DC101xx0
Motor Power Cable	6FX0022CG0xxxx0
Servo Gear Motor 0.24 kW	1FK70325AK711UU5
WW100 Weighfeeder	7MH7180 (Root Number)
24 Volt 4 Amp DC Power Supply	6EP1332-1SH51 – Not included, must be ordered!
WW100 Start Stop Controller	7MH77231JA – Not included, must be ordered!
BW500 Integrator	7MH7152-1BA0-xxxA

1.3 Disclaimer

Note

While every effort is made to verify the following information, no warranty of accuracy or usability is expressed or implied.

Overview

2

This application guide is an addition to the operating instructions. Please review WW100 operating instructions to ensure you are familiar with configuring the weighfeeder.

The WW100 Weighfeeder is configured with a Sinamics S110 CU305DP control and power module. These modules can be ordered with either a 380-480 Volt 3-phase or 208-240 Volt single-phase supply depending on your existing power source at the location of the weighfeeder.

The Weighing Technologies group at Siemens has developed a standard application program for the WW100 Weighfeeder. The software application program is specific to the electrical interconnection as shown in the accompanying Schematics. Please refer to **Inputs & Outputs** (Page 12)under **Additional Notes** and Important Information for an overview of the interconnection inputs.

This Application Guide defines the appropriate start up procedures to quickly and effectively commission the Sinamics S110 Drive of the WW100 Weighfeeder:

- Pre-Start up **Warning**, See Memory Card Safety precautions!
- Important Command and Drive Data Set Notes
- Powering up the Sinamics CU305DP Control Unit
- Loading the Software Application Data Set
- BOP20 Key Sequences – Parameter P0003
- Setting the Drive's Maximum Speed – Parameter P2000
- Reversal of Belt Direction – P1113
- Saving the Application Data to Non-Volatile Memory and the Micro Memory Card
- Additional Notes and Important Information

Initial Setup

3

3.1 Pre-Start Up Warning

WARNING
New devices are shipped with factory default values in Non-Volatile MEMORY! P977 should be used with CAUTION when saving the Application Data to the Micro Memory Card. If the project has not been loaded in the Non-Volatile MEMORY, your application software on the MICRO MEMORY CARD will be overwritten and LOST!

Important Command and Drive Data Set Notes

The following acronyms are referenced through the documentation required for the startup of your Sinamics S110 Drive and WW100 Weighfeeder.

- CDS: Command Data Set.
- DDS: Drive Data Set.

CDS refers to any parameters that may be changed or viewed and are associated with the Control Unit. This parameter set can be associated with any type of control mode change such as enable signals, control functions, inputs and outputs, etc.
DDS refers to any parameters that may be changed or viewed and are associated with the Drive Unit. This parameter set effectively changes the characteristics or dynamics of the motor, gearbox and belt speed of the WW100 Weighfeeder.

The most common change for this application would be the maximum RPM (Belt Speed) of the weighfeeder and possibly the **Reversal of Belt Direction, P1113** if required. The Design Speed (P14-BW500) of the weighfeeder application will be referenced when calculating the programmable maximum speed. Further details of the Design Speed and applicable settings can be found in **Setting the Maximum RPM – P2000** (Page 9) section.

3.2 Powering Up the Sinamics S110 Drive and Control Unit

Once all the necessary hardware and electrical connections (Drive Cliq Cable and Motor Power cable) have been installed, the system can be powered up.

Note

With only the 24 V DC power source active, the control unit and display will be maintained. However, faults or alarms may occur due to the loss of the Main AC power source to the PM340 module. The unit may require a Power cycle to clear the Faults or Alarms.

Turn off the 24 Volt DC supply and let the system power down. Turn main AC power source on then turn the 24 V DC supply on.

1. Apply the main power to the PM340 Power module. The drive will perform its boot sequence and the RDY LED should be a steady green when completed. If any errors display during the initial power up, please refer to the Fault Code (Page 13) section in the operating instructions listed below.
2. Remove all power sources from the Power module and Control module, Main AC and 24 V DC. Ensure device powers down completely.

3.3 Loading the Software Application Data Set

The following procedure defines the specific steps required to download the application software from the Micro Memory Card (MMC) to the Non-Volatile Memory (ROM). Perform a RAM-to-ROM save function within the CU305DP control unit, and back up the changed Application Data to the MMC card.

1. **Ensure all power sources to the drive are switched OFF.**
2. Insert the pre-programmed MMC into the card slot located below the BOP Display and ensure the card locks into place.
3. Apply main AC Power first and then the 24 Volt DC Power to the Drive. The CU305DP will recognize the card and automatically load or overwrite the Data Set 0 to the CU305 Non-Volatile memory. **This procedure will only work for Data Set 0; all other data sets will not be affected.**
4. The data is read and loaded to memory prior to performing a Run-up sequence of the drive. This procedure will take approximately 30 – 60 seconds longer at power up. When complete, the display will register a **F01650** fault.

   Note

   The Drive display should register a F01650 fault. This indicates that the drive is requesting an acknowledgement that the Emergency Stop Safety circuitry has been checked and is working! This fault can be acknowledged by pressing the Fn key.

5. Once the fault has been cleared, the display will indicate a **0.0** value in the lower right corner; this is the actual RPM display of the motor.

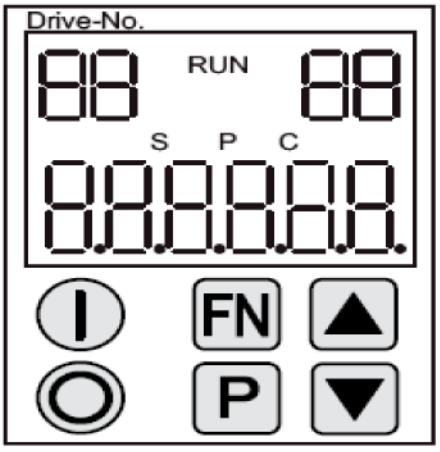
6. Once all necessary equipment has been connected and all sources of power applied for the activation of the inputs and outputs, the drive unit should now be ready to activate.
   - At this point, the **WW100 may begin to move** if the drive enables are set and if the Signal Source voltage (i.e. Potentiometer) or the Analog input has a potential higher than zero (0) volts!
   - The application will be set for a maximum motor speed of 2500 RPM, approximately 50 FPM or 0.254 meters/second. Refer to Setting the Drive's Maximum Speed – P2000 (Page 9)section to effectively set the maximum RPM for the application.

Test the functionality of the drive and weighfeeder. Also note the direction of belt travel; if incorrect, refer to **P1113** (Page 10) to invert the signal for belt direction.

Please refer to the Additional Notes and Important Information (Page 12) section for details on required enable signals.

3.4 BOP20 Key Sequences – Parameter P0003

Programming using the BOP20 Display and Keypad

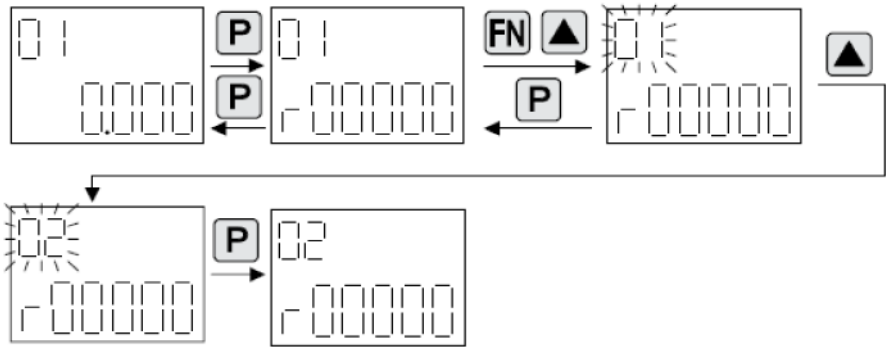


The keypad will be shipped in a separate carton with Part Number: 6SL3055-0AA00-4BA0 which will have to be installed onto the CU305DP Control Module! You can view the information for the display in the FH3 Manual starting on page 112.

Note

While commissioning using the BOP 20 interface standard equipment, there are two data sets to consider when changing parameters. The drive unit or DDS (Drive Data Set) will be identified as **02**. The Control unit CDS (Command Data Set) will be identified as **01**. This data set is indicated in the upper left corner of the Display. Each unit has its own set of parameters and is only available when in that specific display mode!

The following diagram illustrates how to switch from one unit to another using the BOP Keypad.



1. While holding the **Fn** key, press one of the arrow keys. This will allow you to change from Unit 01 to 02 as indicated by the flashing display.
2. Scroll to the appropriate selection using the arrow keys.
3. Once you have chosen the appropriate unit, press the **P** key to acknowledge the selection: the display will stop flashing.

3.5 Parameter P0003 – Expert Mode

1. To access the parameter sets or perform a drive or control parameter reset, **P0003** must be set to a value of 3 (**EXPERT MODE**). **P0003** can be accessed under Drive 01 with the arrow keys. Or, this parameter may already be set after the application software has been loaded.
2. Under Drive selection 01, scroll to **P0003** and press the **P** key to view the current setting. To change, press the Fn key: the display will begin to flash. Using the arrow keys, set the value of the first digit to 3. Acknowledge the change by pressing the P Key. You now have access to all of the parameter sets for both the Control Unit and Drive Unit.

3.6 Setting the Maximum RPM - P2000

Setting the Maximum RPM - P2000

The factory default value of the Drive configuration RPM is 6000. At the Siemens factory, we have set this to a maximum of **2500** as the weighfeeder should not exceed the corresponding belt speed of approximately **50 ft/min** or **0.254 meters/second**.

The application for which this weighfeeder will be used has been engineered by a software tool at Siemens. From the data provided, certain parameters are generated identifying the **Design Rate, Design Speed, and Design Load**. You are interested in the **Design Speed**: this will aid in setting the Maximum RPM – P2000

Calculating P2000

Design Speed P14 refers to Parameter 14 of the Siemens integrator.

Imperial: P2000 = Design Speed (P14-BW500) * k Factor (47.28702)

Metric: P2000 = Design Speed (P14-BW500) * k Factor (9308.468)

Here are a few examples with both metric and imperial application data.

Design Speed	k Factor	P2000	Design Speed	k Factor	P2000
ft/min.	imperial	CU305DP	m/sec.	metric	CU305DP
10	47.28702	472.870	0.05080	9308.468	472.870
22	47.28702	1040.31	0.11176	9308.468	1040.31
35	47.28702	1655.05	0.17780	9308.468	1655.05
50	47.28702	2364.351	0.25400	9308.468	2364.351

1. To start, ensure you are under Drive No. **02**. Refer to BOP20 key sequences to change drive number.
2. Navigate to Parameter P2000 and check the preset value: the value should read 2500 after the application software has been loaded.
3. Press the **P** key to access and view the current setting.
4. To change this value, press the **Fn** key. The display will begin to flash. Sequentially pressing the **Fn** key will increment the display to the next higher digit. Using the arrow keys, set the value of the RPM.
5. Once the value has been set, press the **P** key to accept and exit **edit** mode.

Note

Although this value has been changed, it has only been saved in RAM memory. A RAM to ROM must be performed in order to be maintained.

6. To save this new setting, press and hold the **P** key for 3 seconds. The display will begin to flash indicating the RAM to ROM function is active. This will perform a RAM to ROM backup of all parameters.

3.7 Reversal of Belt Direction - Parameter P1113

P1113 – SetPoint Inversion Parameter. Drive 02 parameter

The design of the WW100 weighfeeder is such that the Servo Gear motor can be mounted on either the left or right hand side of the feeder. Given the versatility of the configuration, it is necessary for the motor shaft output to be reversible. Therefore, the following parameter **P1113** can be set to accommodate a forward or reverse operation. However, one must note that the BOP display for RPM may reflect a **negative - 0.00** value. This is not a concern to the operator or maintenance staff for regular operation of the drive.

If the weighfeeder is set up and you realize the belt is traveling in the reverse direction, simply go to **P1113** and set it to either **0** or **1** to change the direction of the belt. Follow the Ram to Rom procedure above to change and save the new setting.

3.8 Saving the Application Data to Non-Volatile Memory and the Micro Memory Card

Note

Any parameter changes that are made on the BOP are only maintained in the RAM memory. If the Power is cycled prior to performing a Save Function, the changes will be lost. Following either of the procedures below will ensure that all parameter changes are saved to either the ROM-Non Volatile Memory or both the ROM and Micro Memory Card.

RAM to ROM

The following steps should be followed to ensure proper storage of a Changed Data Set. Any parameters changed via the BOP 20 are only stored in the RAM memory. The RAM to ROM function must be performed in order to properly store the data set.

1. Once all the parameter changes for the application have been completed, the data set (parameters) must be saved to the non-volatile memory for proper storage.
2. At any point during the commissioning, the data can be saved to non-volatile memory. This is initiated by **pressing and holding the P key for three seconds**. The display will begin to flash indicating the **RAM to ROM** function is active.
3. When complete, the display will stop flashing and remain solid.

RAM to ROM & Micro Memory Card, P977=1.

1. Ensure P0003 is set to a value of **3 – Expert**.
2. With the **Power ON**, insert the Micro Memory Card into the card slot below the BOP Display and ensure the card locks into place.
3. Navigate to P0977, **Drive 01** parameter: the default value is **0**. Any other value initiates a function within the CU305DP Control Unit.
4. Set this to a value of **1**. The display will begin to flash indicating that the save function is active. The Data Set currently active in the RAM will be saved to the ROM (Non-Volatile Memory) as well as the MMC card. Please note: this type of saving will overwrite any existing Data Set with the index of **0** on the Micro Memory Card. You should only have a Data Set with an index of **0**.

Additional Notes and Important Information 4

4.1 Inputs and Outputs

All inputs and outputs identified on the schematics act as discreet I/O to the CU305DP Control Module. All related functions for the I/O are programmed internally to the Control Unit, therefore, requiring specific **States** and or **Change in States** for proper drive functionality.

Please review the electrical schematics to understand what inputs are required for Hand or Automatic mode enable signals as well as the Analog Speed reference signals.

Each of the labeled inputs has been programmed into an **AND/OR** gate function, and therefore is required for operation of the drive. A brief description below will help explain the input requirements:

Label	Input	Description
Hand	DI 0 (X133.1)	Manual Mode, Local Operation only. Potentiometer Control.
Off	----------	Not connected. No Mode signal present!
Automatic	DI 1 (X133.2)	For DCS or PLC Master Control.
DCS Enable	DI 2 (X133.3)	Required for DCS or PLC Master Control.
Stop	DI 3 (X133.4)	Maintained Active High Input.
Start	DI 8 (X132.1)	Momentary Low to High Input to set RS Flip Flop.
Emerg.Stop Ch 1.	DI 16 (X130.1)	Required Active HIGH Input for Motor Control
Emerg.Stop Ch 2.	DI 17- (X130.3)	Required Active HIGH Input for Motor Control

Manual Mode: Requires only the Hand input **HIGH** and an analog reference signal.

Automatic Mode: Requires the Automatic and DCS enable inputs **HIGH** and an analog reference signal.

4.2 Resolution of the Analog Input

This is extremely important when determining the maximum speed of the weighfeeder. Set P2000 according to the calculated results or within 15% of this value. This will optimize the resolution of the analog control signal. The better the resolution, the better the control function for maintaining Rate, Load, or Speed. You may also consider increasing the RPM (Design Speed) of the drive. Depending on the setup of the application, maximum speed vs. maximum loading, this will accommodate material shortages in a shearing application and allow for infrequent increases in speed to maintain a programmed Rate or Load.

4.3 Emergency Stop Wiring Overview

As detailed in the electrical schematics, the Emergency Stop circuit is a critical component of the drive and its operating state. The Sinamics S110 Drive has built-in Safety Integrated Functions. When wired correctly, this circuit functions as a Category 3 safety stop for the drive and corresponding motor. At the same time, the circuit performs an additional dual purpose function for the application.

First	The drive realizes a change in state of the dual channel input. If either of these inputs are lost, the drive brings the motor shaft to a controlled stop via the Safe Torque Off mode.
Second	The purpose of the dual channel input is to monitor both the Positive and Common channel of the DC power source. In turn, the dual channel digital output of F-DO 0(16) is wired in series to the corresponding control relays (refer to schematics) which function as a cutout of the Mains Power in the event of an Emergency Stop situation.

4.4 Faults and Alarms

The Fn key has been programmed as a **Fault Acknowledgment** input. Most faults not requiring a power cycle can be acknowledged by pressing the Fn key.

System Faults: faults that will cause the drive to shut down and remain down until the condition causing the fault has been cleared. Once the condition has been cleared, the fault must be acknowledged.

System Alarms: alarms that will not affect the functioning of the Drive but only be displayed. These will continue to be displayed until the condition clears. Once the condition is cleared, the alarm will clear from the display.

A complete list of the faults and alarms can be found in the following manuals, which are included in the SITRANS WW100 – Operating Instructions.

S110_FH3_Funct_Man.pdf	Sec. 5.3 Page 102 General Information – Properties Of.
S110_FH6_Funct_Blocks.pdf	Sec. 4.0 Page 151 Overview of Faults and Alarms, List
S110_LH7_List_Man.pdf	Sec. 3.0 Page 796 Overview of Faults and Alarms, List

Each of these manuals explains in detail the conditions, potential causes, possible remedies, and methods of acknowledging and/or the requirements to do so. In any case, a fault or alarm may be searched by the actual fault number to investigate a possible cause and remedy in each of the manuals.