SMM

Material Consumption Monitor for

Hopper Receiver

Date：Nov., 2022

Version：Ver.A (English)

SHINI

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1. General Description

📖 Read this manual carefully before operation to prevent damage of the machine or personal injuries.

The SMM series works in pairs with the vacuum hopper receiver and loader, installed at the bottom of the hopper and loader. After material loading, real-time readings of material conveying from the material storage tank to the receiver will be made. SMM will filter and describe the data it collected. Then it will display the actual amount of materials conveyed, making it easy for management and operators to compare the expected and actual output of the equipment at any time.

Picture 1-1：Material Consumption Monitor for Hopper Receiver SMM-50

1.1 Coding Principle

SMM - xx - C

→ Handy controller

→ Weighing Range (Unit: kg)

→ Shini Material Consumption Monitor
for Hopper Receiver
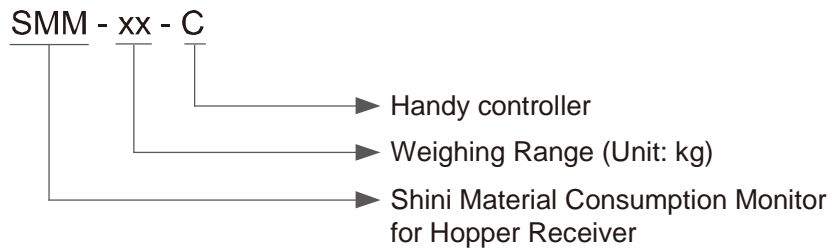
1.2 Features

1) Real-time material consumption monitoring.

2) Production batch control.

3) Statistical Material throughput.

4) Precision up to ±1%

5) The parts in contact with materials are made of stainless steel to ensure no material contamination.

6) Standard communication function via RS485

All service work should be carried out by a person with technical training or corresponding professional experience. The manual contains instructions for both handling and servicing. Chapter 6, which contains service instructions intended for service engineers. Other chapters contain instructions for the daily operator.

Any modifications of the machine must be approved by SHINI in order to avoid personal injury and damage to machine. We shall not be liable for any damage caused by unauthorized change of the machine.

Our company provides excellent after-sales service. Should you have any problem during using the machine, please contact the company or the local vendor.

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+86 (0)23 6431 0898

1.3 Safety Regulations

Strictly abide by the following safety regulations to prevent damage of the machine or personal injuries.

1.3.1 Safety Signs and Labels

All the electrical components should be installed by professional technicians.

Turn off the main switch and control switch during maintenance or repair.

Warning! High voltage!

This sign is attached on the cover of control box!

Warning! Be careful!

Be more careful at the place where this sign appears!

Attention!

No need for regular inspection because all the electrical parts in the control unit are fixed tightly!

1.3.2 Working Environment

Don't use this machine indoors containing corrosive gases and with direct sunlight.

Use the machine indoor, in dry environment with max. temperature +45℃ and humidity no more than 80%.

1.4 Exemption Clause

The following statements clarify the responsibilities and regulations born by any buyer or user who purchases products and accessories from Shini (including employees and agents).

Shini is exempted from liability for any costs, fees, claims and losses caused by reasons below:

1) Any careless or man-made installations, operation and maintenances upon machines without referring to the Manual prior to machine using.

2) Any incidents beyond human reasonable controls, which include man-made vicious or deliberate damages or abnormal power, and machine faults caused by irresistible natural disasters including fire, flood, storm and earthquake.

3) Any operational actions that are not authorized by Shini upon machine, including adding or replacing accessories, dismantling, delivering or repairing.

4) Employing consumables or oil media that are not appointed by Shini.

2. Structure Characteristics and Working Principle

2.1 Working Principle
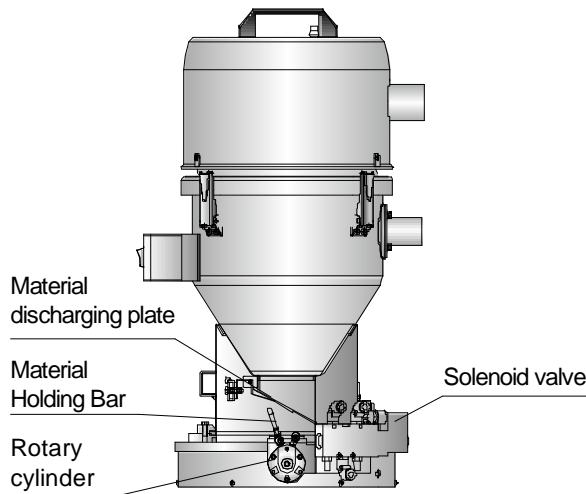
Picture 2-1：Working Principle SMM

After receiving the material loading signal from the autoloader, the cylinder rotary rod starts working, holds up the discharging plate of the loader, and then starts to weigh. After material loading, the controller will read the stabilized value and then release the autoloader, thus completing a weighing cycle. The optional handy controller displays current weight, accumulative weight, set target output, and other functions.

2.1.1 Single-unit Application

SMM is installed at the bottom of the hopper receiver or the autoloader. It enables real-time monitoring of material consumption. The operator can record the product qualification rate to adjust the equipment according to material consumption data and the qualified product quantity. SMM also can supply drying materials on demand to reduce the conventional drying and exchanging time. It improves productivity.
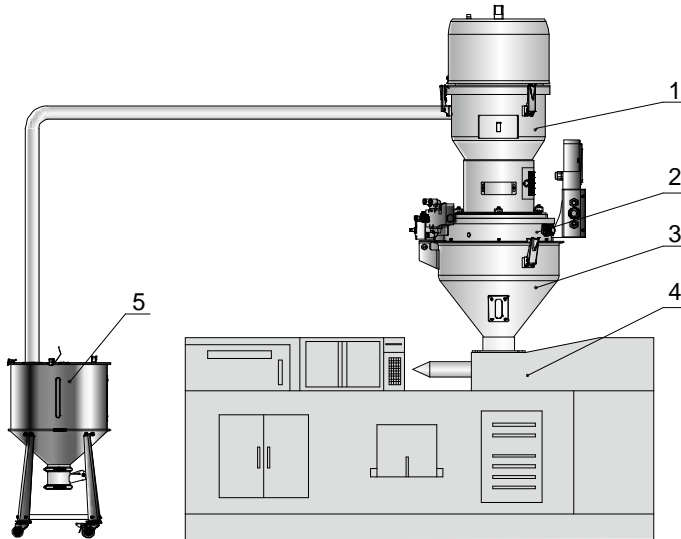
Picture 2-2：SMM Single- unit Application Diagram

1. Hopper Receiver / Autoloader   2. Material Consumption Monitor for Hopper Receiver

3. Material Hopper   4. Injection moulding machine   5. Material storage tank

2.1.2 Application of Central Conveying

When used in plastic production, SMM can upload the weighing data to the main control of central conveying via the communication port. The main control monitors the material consumption of each unit in real-time and makes adjustments. To arrange production reasonably and reduce material waste.
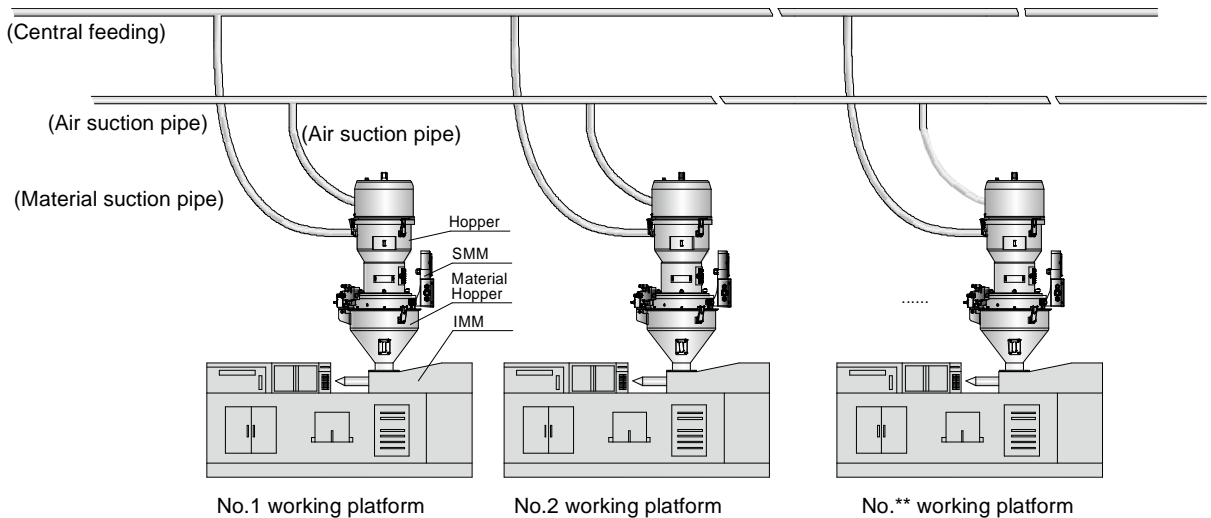
Picture 2-3：The Diagram of SMM Used in Central Material Conveying

3. Installation and Debugging

This series of models can only be used in environment with good ventilation.

⚠ Read this chapter carefully before installation of the machine. Install the machine by following steps.

Power supply should be fixed by qualified technicians!

3.1 Installation Notice

1) The machine can only be installed in the vertical position, make sure there's no pipeline, fixed structure and other object which may obstruct machine installation or cause items, human injuries above the selected location and adjacent areas.

2) The pipelines and cables connecting the hopper and loader installed on the SMM must be fixed properly without affecting the precision of the SMM.

3) Keep a 2m distance between the machine and flammable materials.

   Note: Make sure to keep 2m distance between the machine and inflammable substance.

3.2 Power Connection

1) Make sure the voltage and frequency of the power source comply with those indicated on the manufacturer nameplate that attached to the machine.

2) Power cable and earth connection should conform to your local regulations.

3) Use independent electrical wires and power switch. Diameter of electrical wire should not be less than those used in the control box.

4) The power cable connection terminals should be tightened securely.

5) The power voltage is AC/DC, 24V, 50/60Hz.

6) Power supply requirements:

   Main power voltage: +/- 5%

   Main power frequency: +/- 2%

7) ***Please refer to electrical drawing of each model to get the detailed power supply specifications***

3.3 Compressed Air Connection

<p align="center">Table 3-1：Specification of Req. Compressed Air</p>

Items	Range	Remarks
Quality grade	335	National standard GB/T 13277-1991, solid particle concentration doesn't exceed 5mg/m3, dew-point temp. is about -20 ℃, and oil content doesn't 25mg/m3.
Air pressure (bar)	4~7	--
Air flow (L/hr)	~10	--
Pipe size	Φ8	PU air pipe Φ8

3.4 Wire Connection

3.4.1 Wiring diagram
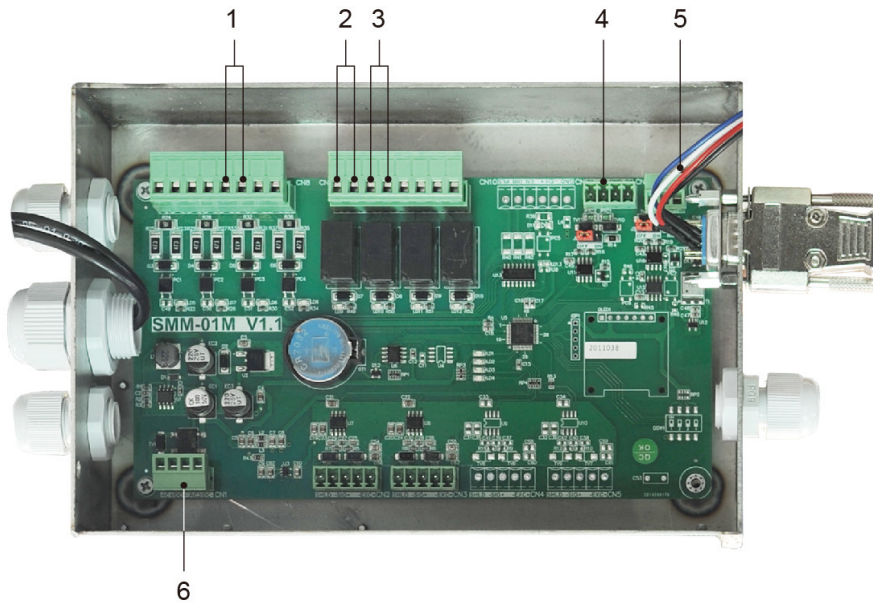
<p align="center">Picture 3-1：Wiring Layout</p>

<p align="center">Table 3-1：Wiring Description</p>

No.	Items	Description
1	Suction signal AC/DC24 AC110V220V	Suction action input signal
2	Alarm	Output amount reached alarm
3	The output amount is reached	Throughput reached dry contact output
4	Manual controller	Local manual controller
5	Remote data collection/monitoring	Remote RS485 communication
6	Power AC/DC 24V	Power input

3.4.2 Wiring Diagram

Signal input

AC24~240V/DC24V

1	2	3	4	5	6	7	8
IN1-	IN1+	IN2-	IN2+	IN3-	IN3+	IN4-	IN4+

Material shortage — Shut-off — Suction

CN8

Output contact

5A/250VAC   5A/30VDC

1	2	3	4	5	6	7	8
COM1	NO1	COM2	NO2	COM3	NO3	COM4	NO4

Alarm — Output — Discharge

CN9

Display only

RS485-B   RS485-A   GND   VOUT

1	2	3	4
B	A	GND	Vo

CN6

HMI

RS485-B   GND   RS485-A

1	2	3
B	GND	A

CN7

CN1

AC1/DC1	AC1/DC1	AC2/DC2	AC2/DC2
1	2	3	4

AC24V/DC24V

Power

CN2

SHLD	SIG-	SIG+	EXC-	EXC+
1	2	3	4	5

SHLD — Signal — Incentive

Load Cell

CN3

SHLD	SIG-	SIG+	EXC-	EXC+
1	2	3	4	5

SHLD — Signal — Incentive

Load Cell

4. Application and Operation

4.1 Control Panel
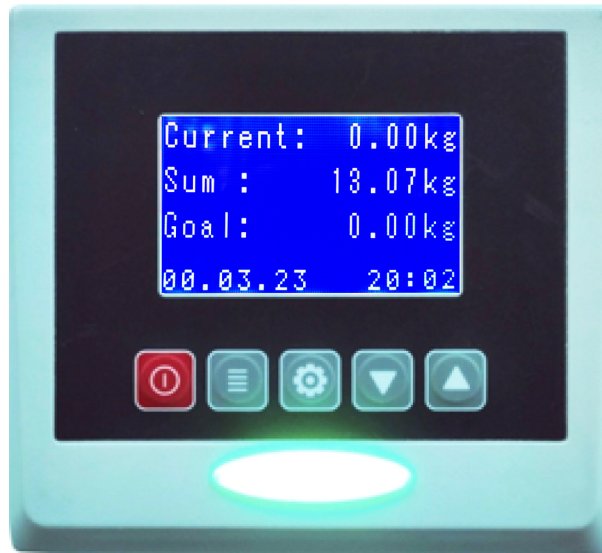
Picture 4-1：Control Panel

Table 4-1 Panel Press Key Description

No.	Symbol	Name	Function	Description
1		ON/OFF	Powered on/off	Start and stop the machine
2		MENU	Menu	Enter and exit the parameter setting
3		SET	Setting	Modify and confirm the machine parameter
4		DOWN	Down key	Page down various menus, and decrease the value.
5		UP	Up key	Page up various menus, and increase the value.

4.2 Operation Method

4.2.1 Display panel key function

Combination key description:

Total amount reset: Press and hold the <SET> and <DOWN> keys in the operation screen for 3 secs.

Current reset: Press and hold the <SET> and <UP> keys for 3 secs. in the operation screen (zero point compensation value unsaved after shutdown) .

Display panel LED light:

Red light: alarm, flickering time: 1 sec.

Yellow light: shutdown;　　　Green light: startup

Alarm: (Press any key to clear the alarm)

1) Comm. timeout：alarm signal
2) Stable timeout: Within the timeout, when the weight variation continues to exceed the dynamic range, the alarm output is ON (COM1 and NO1).
3) Weight completed: When the total weight reaches the set weight, the throughput completed output is OFF (COM2 and NO2).

4.2.2 Parameter Description

4.2.2.1 Weighing platform

1) Target: When the total weight reaches the target weight, the throughput completed output is OFF (COM2 and NO2).
   Option: 0~999.99kg, 0 means closing this function.

4.2.2.2 Stability

Set the judging condition for the accumulative function.

1) Suction filtering: When there's suction signal, it will record current weight, and deduct the recorded weight during the final accumulation.
   Option: ON means to turn on this function, OFF means to turn off this function.
2) Dynamic range: When the weight variation is less than the dynamic range, it means that the weighing platform has stabilized.
   Option: 1~10g, OFF means to turn off this function.
3) Stable time: When the weight variation continues to be less than the dynamic range within the stable time, it means that the weighing platform has stabilized.

Option: 0.1~1.0 secs., OFF means to turn off this function.

4) Timeout: When the weight variation continues to exceed the dynamic range within the timeout, the alarm output is ON (COM1 and NO1).
Option: 3~10 secs. , OFF means to turn off this function.

4.2.2.3 Reset

When the sensor signal drifts, the compensation function made can make the display value maintained at zero.

1) Auto zero tracking: When the weight variation is less than the auto zero tracking range, it will make zero point compensation (zero point compensation value unsaved after shutdown).
Option: 1~10g, OFF means to turn off this function.

2) Startup reset: After starting up, it will carry perform once zero point compensation (zero point compensation value unsaved after shutdown).
Option: ON means to turn on this function, OFF means to turn off this function.

3) Press key reset: Turn on or off the function of current reset combination key
Option: ON means to turn on this function, OFF means to turn off this function.

4) Current reset: When the displayed value >0kg, it will perform once zero point compensation for current weight (zero point compensation value unsaved after shutdown).
Option: ON means to perform once reset for current weight, and it will display 0kg finally.

5) Total weight reset: When the weight >0kg, it can reset the total weight.
Option: ON means to perform once total weight reset: and it will display 0kg finally.

4.2.2.4 Calibration
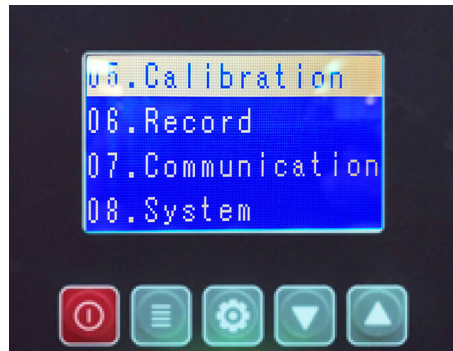
Picture 4-2：Calibration Screen

1) Press the <MENU> button from the main interface to select calibration, and press the<SET>button to enter the calibration screen.
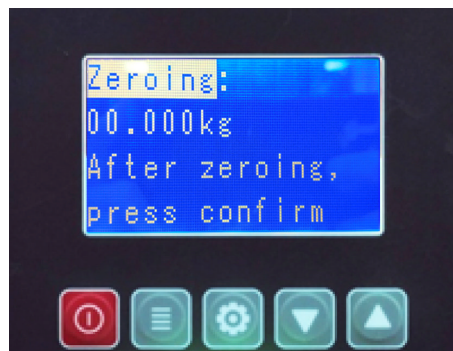
Picture 4-3：Weight Screen 1

2) Reset the weight 1, clear the weighing platform, and press <MENU> button to confirm.

Picture 4-4：Loading Screen 1

Waiting for loading.....100%, and enter weight 2 after it.
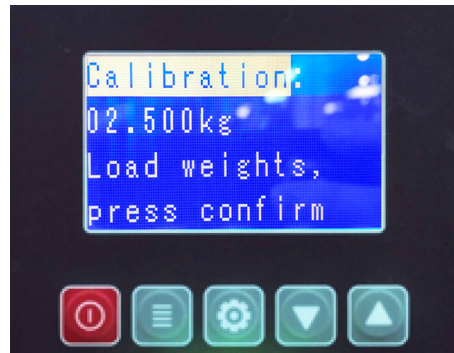
Picture 4-5： Weight Screen 2

3) Place the weight on the weighing platform, press the <SET> button and move it to left and select the value to be changed. Enter the weight value by pressing the <DOWN> or <UP>keys, as 2532g shown above, and press the<MENU>button to confirm.

Picture 4-6：Loading Screen 2

Waiting for loading.....100%, and press the < ON/OFF > key to exit and finish the calibration.

4) Place the weights in different positions on the weighing platform and observe the weight variation. If it is within ± 10, there is no problem. If not, please check if it affects the weighing sensor installation or replace the controller for testing.

4.2.2.5 Record

It can check the last 8 weight records (clear the historical records: please click the<SET>button for 3 secs.).

4.2.2.6 Communication

1) Address：Modbus RTU address of human machine interface.
   Option: 1~50

2) Baud rate: Modbus RTU baud rate of human machine interface.
   Option：9600,19200, 57600, 115200

3) Check bit：none

4) Stop bit：1

4.2.2.7 System

1) Date: the last two numbers of the year AD: month, date

2) Week：Monday ~Sunday

3) Time：(24-hour system) hr.: min.: sec.

4) Language：Chinese, English

4.2.2.8 About

1) Controller software version: in YYMMDD. Example: 200102 as in 2020/Jan/01.

2) Displayer software version: in YYMMDD. Example: 200102 as in 2020/Jan/01.

4.2.3 Modbus

Table 4-2：HMI Comm. Specification Table

Modbus RTU Comm. Format	
Address	1~50 (default value:1)
Baud rate	9600,19200, 57600,115200 (default value：115200)
Data bit	8-bit
Check bit	-
Stop bit	1-bit
Command	0x03,0x04,0x06,0x10

Note: Please refer to Appendix 1 and 2 for parameter addresses of the controller.

4.2.3.1 Modbus Calibration steps:

1) Set b3=1 of the comm. address 107 to enter the calibration mode.

2) Clear the weighing platform to reset the calibration, and set the comm. address 119 and 120 to reset the weight.

3) Waiting for b4=1 of the comm. address 13 to complete sampling.

4) Place weights for range calibration, and set the comm. addresses 121 and

122 to calibrate the weight.

5) Wait for b4=1 sampling completion for comm. address 13.

6) It can read comm. addresses 2 and 3 to display the current weight.

7) After setting the b3=0 for comm. address 107, it will exit the calibration mode automatically (It will store the calibration data automatically).

4.2.3.2 Modbus Parameter Storage Description:

After all parameters are modified, set the b5=1 of comm. address 107 to save all data. After the saving, it will reset the b5 of comm. address automatically.

5. Trouble-shooting

Failures	Possible reasons	Solutions
Comm. overtime	Comm. wire reversely connected	Re-adjust the comm. cable correctly
	Comm. wire breaks	Adjust or replace
	Comm. wire bad contact	Adjust the comm. cable properly
	Circuit board failure	Repair or replace the circuit board
Large weighing error	Weighing sensor mount error or damaged	Repair or replace
	Correction error	Re-calibrate
	The zero point state of the machine has been damaged by human operations or other factors after calibration.	Re-calibrate
	Sensor jammed	Repair
	The sensor is touched by other parts	Repair
	Circuit board failure	Repair or replace the circuit board
Weighing unable to count	Suction signal is reversely connected or disconnected	Re-adjust the suction signal wire
	Circuit board failure	Repair or replace the circuit board
The controller screen is light off	The cable of display screen disconnected	Re-adjust the wiring
	Display screen failure	Repair or replace the manual controller display screen
	Circuit board failure	Repair or replace the circuit board.

Appendix

Table 1: Modbus Parameters

Address (Decimal system)	R(read)/ W(write)	Name	Description	Unit
0	R	Software version H	in YYMMDD	
1	R	Software version L	Example 200102, as in 2020/Jan/01.	
2	R	Current weight H	0~999.99	kg
3	R	Current weight L		
4	R	Total weight H	0~999.99	kg
5	R	Total weight L		
6	R	Year	20YY, 23=2023	
7	R	Month	1~12 (hexadecimal)	
8	R	Date	1~31 (hexadecimal)	
9	R	Week	1~7 (7:Sunday) (hexadecimal)	
10	R	Hour	0~23 (hexadecimal)	
11	R	Min.	0~59 (hexadecimal)	
12	R	Sec.	0~59 (hexadecimal)	
13	R	Bit status	[bit 8]：Equipment switch(1:open) [bit 7]：Output completed (1: completed) [bit 6]：Stable timeout (1：timeout) [bit 5]：Saved data (1：ON) [bit 4]：ADC sampling completed (1：completed) [bit 3]：Calibration mode (1：ON) [bit 2]：Logs reset (1：ON) [bit 1]：Total reset (1：ON) [bit 0]：Zero point reset (1：ON)	
14	R	Target weight H	0~999.99	kg
15	R	Target weight L	0：OFF	
16	R	Weight compensation	±9.999 0：OFF	kg
17	R	Negative filtering time	0~5.0 0：OFF	s

18	R	Mat. shut-off filtering	0：OFF 1：ON	
19	R	Dynamic range	0~10 0：OFF	g
20	R	Stability time	0~1.0 0：OFF	s
21	R	Timeout	3~10 Less than 3：OFF	s
22	R	Auto zero tracking	0 ~ 10 0：OFF	g
23	R	Startup reset	0：OFF 1：ON	
24	R	Press key reset	0：OFF 1：ON	
25	R	Zero weight H	0~99.999	kg
26	R	Zero weight L		
27	R	Calibration weight H	0~99.999	kg
28	R	Calibration weight L		
29	R	Comm. address	1~50	
30	R	Baud rate	0：9600 1：19200 2：57600 3：115200	
31	R	Time record 1	[bit 15-8]：hour [bit 7-0]：min. (hexadecimal)	
32	R	Weight record 1H	0~999.99	kg
33	R	Weight record 1L		
34	R	Time record 2	[bit 15-8]：hour [bit 7-0]：min. (hexadecimal)	
35	R	Weight record 2H	0~999.99	kg
36	R	Weight record 2L		
37	R	Time record 3	[bit 15-8]：hour	

			[bit 7-0]：min. (hexadecimal)	
38	R	Weight record 3H	0~999.99	kg
39	R	Weight record 3L		
40	R	Time record 4	[bit 15-8]：hour [bit 7-0]：min. (hexadecimal)	
41	R	Weight record 4H	0~999.99	kg
42	R	Weight record 4L		
43	R	Time record 5	[bit 15-8]：hour [bit 7-0]：min. (hexadecimal)	
44	R	Weight record 5H	0~999.99	kg
45	R	Weight record 5L		
46	R	Time record 6	[bit 15-8]：hour [bit 7-0]：min. (hexadecimal)	
47	R	Weight record 6H	0~999.99	kg
48	R	Weight record 6L		
49	R	Time record 7	[bit 15-8]：hour [bit 7-0]：min. (hexadecimal)	
50	R	Weight record 7H	0~999.99	kg
51	R	Weight record 7L		
52	R	Time record 8	[bit 15-8]：hour [bit 7-0]：min. (hexadecimal)	
53	R	Weight record 8H	0~999.99	kg
54	R	Weight record 8L		
55	R	Negative filtering weight	0~9999	g
56	R	Shut-off filtering weight	0~9999	g

Table 2: Modbus Parameters

Address (Decimal system)	R(read) / W(write)	Name	Description	Default Value	Unit
100	W	Year	20YY, 23=2023		
101	W	Month	1~12 (hexadecimal)		
102	W	Date	1~31 (hexadecimal)		
103	W	Week	1~7 (7:Sunday) (hexadecimal)		
104	W	Hour	0~23 (hexadecimal)		
105	W	Min.	0~59 (hexadecimal)		
106	W	Sec.	0~59 (hexadecimal)		
107	W	Bit status	[bit 8]：equipment switch (1：open) [bit 7]：output completed (1：completed) [bit 6]：stable timeout (1：timeout) [bit 5]：saved data (1：ON) [bit 4]：ADC sampling completed (1：completed) [bit 3]：Calibration mode(1：ON) [bit 2]：Logs reset (1：ON) [bit 1]：Total reset (1：ON) [bit 0]：Zero point reset (1：ON)	0	
108	W	Target weight H	0~999.99	0	kg
109	W	Target weight L	0：OFF		
110	W	Weight compensation	±9.999 0：OFF	0	kg
111	W	Negative filtering time	0.1~5.0 0：OFF	0	s
112	W	Shut-off filtering weight	0：OFF 1：ON	0	
113	W	Dynamic range	0~10 0：OFF	0	g
114	W	Stability time	0~1.0	0	s

			0：OFF		
115	W	Timeout	3~10 Less than 3：OFF	3	s
116	W	Auto zero tracking	0 ~ 10 0：OFF	0	g
117	W	Startup reset	0：OFF 1：ON	0	
118	W	Press key reset	0：OFF 1：ON	0	
119	W	Zero weight H	0~99.999	0	kg
120	W	Zero weight L			
121	W	Calibration weight H	0~99.999	0	kg
122	W	Calibration weight L			