METTLER TOLEDO

IND320

Industrial Weighing Terminal

TECHNICAL MANUAL

WARNING

1、Only qualified personnel should perform installation, programming, and service.

2、For continued protection against shock hazard connect to properly grounded outlet only

CAUTION

Non-hot plug

Please cut off the power before connect or examine and repair the electrical equipment。

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Content

Chapter 1 Introduction

This Chapter Covers

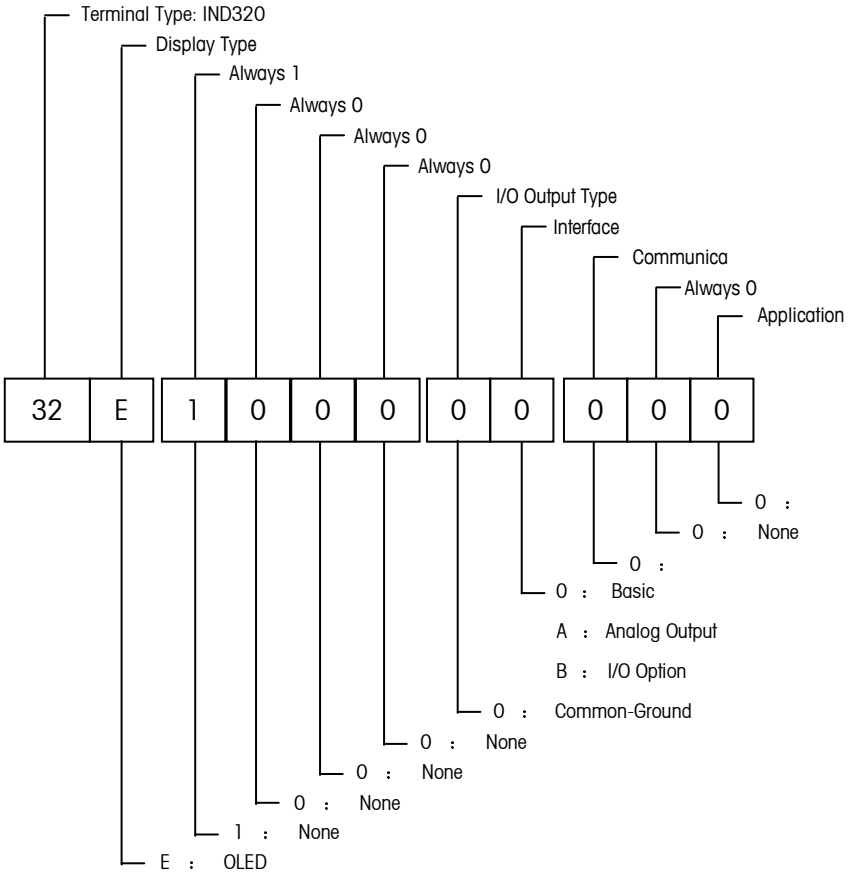
- IND320 Overview
- Model Identification
- Physical Dimensions
- Options and Interfaces
- Display and Keyboard

Thank you for using IND320 industrial weighing terminal. The IND320 represents the latest in METTLER TOLEDO technology and is the most suitable terminal for batching and blending application.

IND320 FEATURES

- Panel-Mount, installed on the console or control cabinet
- Connect upto six 350Ω analog load cells, excitation voltage: 10V
- 128*32 dot-matrix OLED display. Present weight and target weight display at the same time when batch running.
- A standard RS232/RS485 serial interface used for communication or printing output
- 18-36VDC Input, low Power Consumption: 8W
- Support two types of I/O connection: Common-Ground or Common-Source
- Extend I/O option board for 4 Allot(up to 4 materiels)
- Optionl 4~20mA/0~10V analog output board
- Do calibrate, zero, tare and some other functions by PLC or upper computer.
- Support 3 batch recipes, easily controlled by the terminal and upper computer.
- CalFREE™ calibration without test weights
- The minimum load weight is as low as 20%*CAP to reduce the work of commissioning equipment while ensuring precision.
- Operating Environment: –10° to 40° C (14° to 104° F) at 10% to 95% relative humidity noncondensing.
- Storage Environment: –40° to 60° C (–40°to 140° F) at 10% to 95% relative humidity noncondensing.
- Provides type 4x and type 12 protection – comparable to IP65 rating

Model Identification

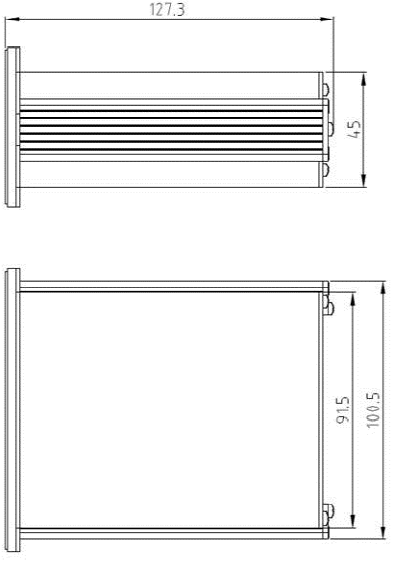


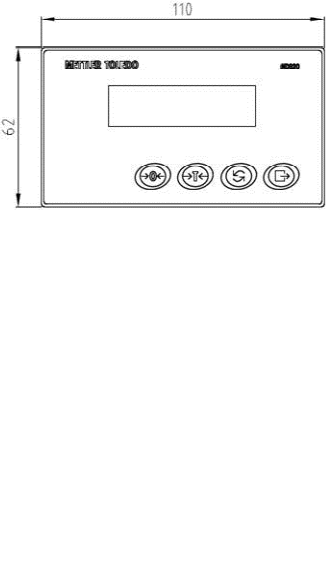
IND320 (OLED Display) Type:

OLED Display Series			
BOM NO.	Model	Type	Configuration
30036073	32E-1000-00-000-000	E00	Single Materiel Batch
30036074	32E-1000-0B-000-000	E02	1~4 Materiel Batch (Common-Ground I/O Option)
30036075	32E-1000-0A-000-000	E08	Single Materiel Batch (Analog Output Option)

Physical Dimensions

Front Panel	110mm*62mm
Enclosure Size	127.3mm*91.5mm*45mm
Cutout Dimensions	92.5mm*45.5mm





Options

Analog Output Option Board

The Analog Output Option Board provides a channel isolated 4-20 mA or 0-10 VDC analog signal output.

- Do calibration of weighing system before analog output adjustment.
- The IND320 analog precision is 16 bit, and the A/D precision should not be less than 14 bit.
- Analog interface board support 1~10VDC/4~20mA output at the same time.

Chapter 2 Installation

This Chapter Covers

- Power Requirements
- Ferrites
- Load Cell Connections
- Discrete I/O Connections
- Serial Connections

This Chapter provides installation instructions for the IND320 terminal.

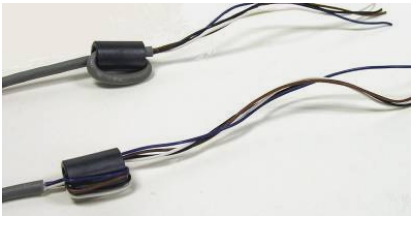
Power Requirements

The IND320 requires 24VDC and the safe input voltage range from 18V~36VDC. Power consumption is 8 watts maximum. Use the cables and connectors attached to install the power supply and pay attention to the negative and positive.

- Inversing connection between negative and positive will not hurt the terminal. But the terminal can not start normally.
- **The IND320 requires DC power. It will be broken when connected to 220VAC.**

Ferrites

In order to meet certain electrical noise emission limits and to protect the IND320 from external influences, it is necessary to install a ferrite core on each cable connected to the terminal.



Load Cell Connections

Load Cell Type: resistance strain sensor

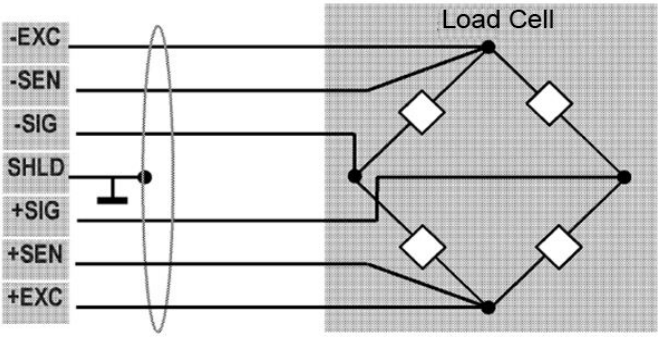
Load Cell Excitation Voltage ： 10V

Load Cell Connection Type: 6-Wire/4-Wire

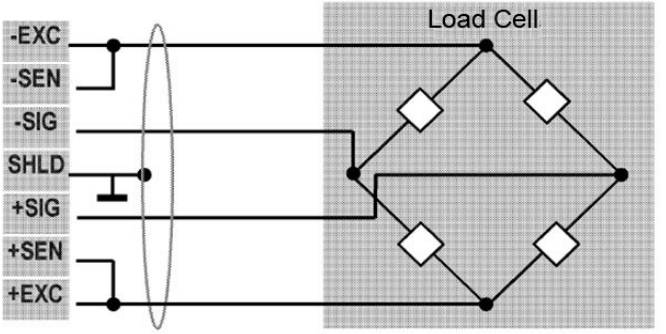
Load Cell Resolution: 0.1uV

Drive Capability: Six 350 Ohm Load Cells

The IND320 terminal analog loadcell terminal strip wiring for standard 6-wire cable ：



The IND320 terminal analog loadcell terminal strip wiring for standard 4-wire cable ：



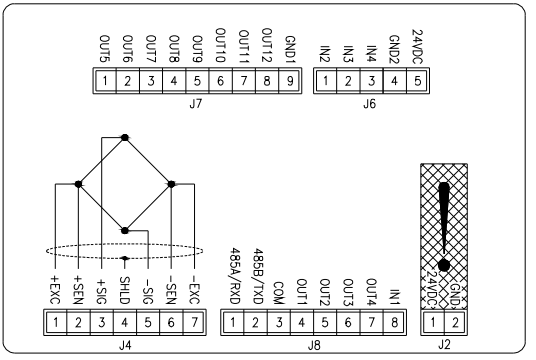
➢ In order to protect sensor signal from external influences, connect the SHLD to cable

shielding layer of the load cell.

- If the cable shielding layer is grounded, don't common-ground it with any other high power machine.
- Make sure the electric welding equipment is independently grounded to avoid damage to the load cells and terminal.
  - When using 4-Wire Load Cells; place Jumper between +EXC and +Sen, and place jumper between -EXC and -Sen.

Discrete I/O Connections

Common-Ground Model Connections



Input Characteristics :

	Input	Status
High-level	12 – 24V	Disabled
Low-level	0 – 5V	Enabled

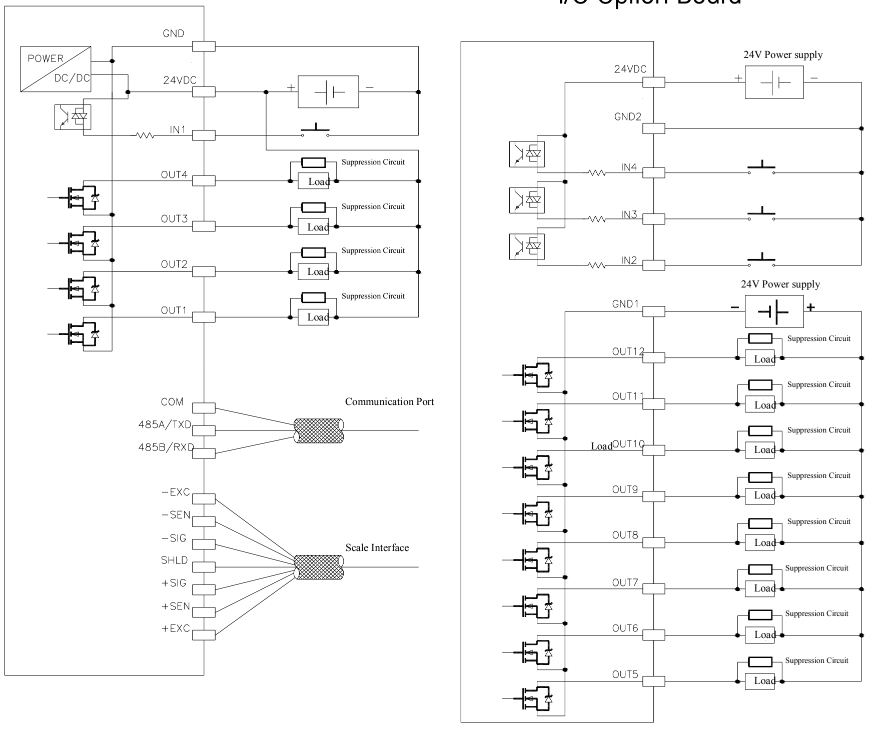
Output Characteristics :

	Output	Status
High-level	High impedance	Disabled
Low-level	Support 5V~30V Sinking Current	Enabled
Current	200mA per channel(Max)	

Common-Ground Main Board and Option Board Wiring Connections

Main Board

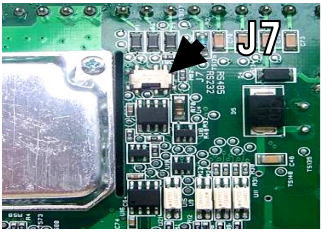
I/O Option Board



Serial Connections

The IND320 factory default is RS232 type. In order to use RS485 type, place the DIP switch J7 in the other side for RS485.

Open the back cover and draw out the main board and J7 (RS232/RS485 transfer switch) is on the back of the main board. The left side is for RS232, and the right side is for RS485.

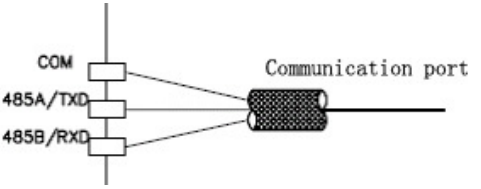


RS232 Connections

COM : Logic Ground

TXD : Transmit RS232

RXD : Receive RS232



RS485 Connections

485A : 485+

485B : 485-

DIP swich settings (4-bit black DIP swich K1)

Status	K1-1	K1-2	K1-3	K1-4
ISP Program Update	OFF	OFF	OFF	**ON**
Setup Forbidden	OFF	OFF	**ON**	OFF
System Setup Forbidden	OFF	**ON**	OFF	OFF
F1 Menu Protection	**ON**	OFF	OFF	OFF

Chapter 3 Operation

This Chapter Covers

- Key Operation
- Display
- Language Set
- Calibration
- Clear and Tare
- Report Printing
- Menu List

This chapter describes the basic operation of IND320, including key operation, display, parameter configuration, calibration and so on.

Key Operation

There are 4 softkeys in the front panel, which differ in function when the terminal is in different status.

- **Key operation when gross weight is displaying**

When gross weight is displaying ([GROSS] cursor lights), keypad functions are shown below:

Key	Function	Description
	**Zero**	Zero the indication of weight. When gross weight is displaying (batch process is not running), the displaying weight is within Keypad Zero range (the Keypad Zero range can be set in the parameters table,[Appl Setup] →[Keypad Zero]), and the scale isn't in motion.
	**Tare**	**Pushbutton Tare or Setting Tare** ➢ Pushbutton Tare When gross weight is displaying (batch process is not

		running), Pushbutton Tare are enabled([System Setup] →[Appl Setup]→[Tare Action]=[enable tare]), and the scale isn't in motion, press this key to tare. ➢ Setting Tare When gross weight is displaying (batch process is not running), and Setting Tare are enabled ([System Setup] → [Appl Setup] → [Tare Action] = [setting tare]), press this key, the lower displayer shows the tare data. Press  to accept the value, or enter new tare value and press  . Any time, abort the tare function by pressing 
	**Select**	Repeatly press this key to recall the instructions, the upper displayer shows instruction name.
	**Print**	When the scale is not in motion, press this key will cause the weight data outputing from the terminal's serial communiction port.

- **Key operation when net weight is displaying**

When Net weight is displaying ([NET] cursor lights), the keypad functions are shown below:

Key	Function	Description
	**Clear**	When net weight is displaying (batch process is not running), press this key to clear tare. The displayer shows the gross weight.
	**Select**	Repeatly press this key to recall the instructions, the upper displayer shows instruction name.
	**Print**	When the scale is not in motion, press this key will cause the weight data outputing from the terminal's serial

		communiction port.

- **Key operation when batch is running**

When batch is running, users can pause or stop the batch process.

Key	Function	Description
	Select	➢ **Pause** Pause batch process. Press this key can call [Continue] or [Emergency]. ➢ **Emergency** Stop batch process.
	Enter	Press this key will execute the present instruction

- **Access to Setup menu**

Key	Function	Description
	Enter	When the scale is at normal weighing (batch process is not running), When batch process is running, it's forbidden to access to the menu.

- **Browse menu**

The IND320 uses multilevel menu. Two menu items display at the same time, while the selected item is highlighted. The parameters can be changed by keypad.

Key	Function	Description
	Reture	Return to above menu
	Previous	Move the focus to the previous parameter
	Next	Move the focus to the next parameter
	Enter	Execute the present instruction, or go into submenu of the present instruction.

- **Parameter setting**

The parameters have several options or a numerical value. This section introduces the way to select option.

Key	Function	Description
	**Abort**	Return to above menu
	**Previous**	Select the previous option of the present parameter
	**Next**	Select the next option of the present parameter
	**Accept**	Accept the present option and return to above menu

- **Input numeric value**

This section introduces the way to input numeric value by keypad.

Key	Function	Description
	**Abort**	Return to above menu
	**Change**	Changes the numeric data entry digit (flashing digit) from 0 to 9.
	**Shift**	Shifts the flashing digit to next place.
	**Accept**	Accept and terminate a data entry

Display

● Diplay at power up

1. Display Terminal mode and word mark

2. Display software BOM number and version number.

● Display at normal weighing

Display at gross weighing status

[～] ： Scale is in motion

[E] ： Scale is empty.

[B/G] ： Gross weighing status

Display at net weighing status

[～] ： Scale is in motion

[E] ： Scale is empty

[T] ： Tare value

[Net] ： Net weighing status

● Display at batch process running

Display at feeding process

[Run] ： Batch process is runnning

[M1] ： Materiel 1 is in feeding(M2 for Materiel 2, M3 for Materiel 3, M4 for Materiel 4)

[>>] ： In fast feeding([>] In fine feeding)

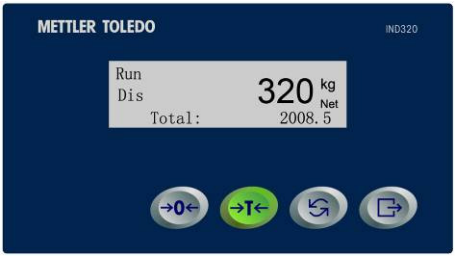
[Target 2000] ： The current target weight is 2000kg

Display at discharging process

[Run] ： Batch process is running

[Dis] ： In discharging

[Total: 2008.5] ： Feeding amount of the current batch



● Menu information display

The IND320 uses multilevel menu, while the parameters are sorted to help users to find the parameter in a short time. Two menu items display at the same time, while the selected item is highlighted. Change the menu items by  and  .

① ： Indicate first menu item

Beeper

Beeper	Description
Short beep	operation acceptd
Long beep	Illegal input or invalid operation.

Language Set

The IND320 supports Chinese and English display. Set the language in the menu.

Calibration

- **To make sure the linearity of calibration**

1. Install the load cells according to installation regulations including making the installation surface horizontal.To make the accuracy in measurement of load cells. Good rigidity of load cell support base is necessary in case of the distortion of the support base and a junction box for adjustment of angle differences while more than one load cell is in use.
2. The calibration of the IND320 uses two point adjustments. Use zero and one span point, while it's automatically judged if the load value is upper than the minimum requirement.
3. In theory, the load just needs to be greater than 20% of scale capacity to perform calibration, which enhances the flexibility and reduce the consumption of physical strength in calibration.
4. Because of the difference of the application environment and mechanical construction, users need to place appropriate load to perform calibration, in order to assure the linearity of the weighing system.

- **Standard Calibration**

Standard Calibration uses two points, zero and span point. Steps are as follows:

[System Setup] → [Scale Setup] → [Set Capacity]. Set the scale capacity in this item.

[System Setup] → [Scale Setup] → [Set Increment]. Set the increment in this item.

[System Setup] → [Scale Setup] → [Select Units]. Select the scale unit in this item.

1. Adjust Zero

Step 1: Access to the zero capture menu, [System Setup] → [Scale Setup] → [Adjust Zero]

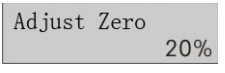
Step 2: Press Enter key  , the IND320 displays 

.

Press Select key  to choose '√', and then press Enter key  to perform zero adjust.

Step 3: The IND320 displays 

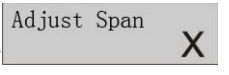
to inform the users to empty the scale.

Step 4: Press Enter key  , the IND320 performs zero capture. The IND320 displays 

. The guage '20%', '40'..... '100' indicates the status of the adjustment.

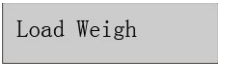
2. Adjust Span

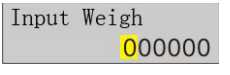
Step 1: Access to the span capture menu, [System Setup] → [Scale Setup] → [Adjust Span]

Step 2: Press Enter key  , the IND320 display 

s.

Press Select key  to choose '√', and then press Enter key  to perform span adjust.

Step 3: Press Enter key  , when the IND320 displays 

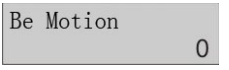
. Input the load weight in 

,

and press Enter key  to perform span capture.

- **In Motion**

If the scale is in motion when capture zero, the IND320 displays



1. Check the scale configuration.
2. Check the load cell. The replacement can be used to check if the load cell is damaged.
3. Check the signal port of the load cell. Replace a terminal to check if the signal port is damaged.
4. Check if the cable port is close.

- **Backup**

After calibration, the users can get the parameters. The menu path: [System Setup] → [Scale Setup] → [Get parameters]. The 'Zero Count', 'Load Weight', 'Span Count' are displayed in this item. Write down these parameters and input these parameters the next time to calibrate.

- **Free Calibration**

The Free Calibration provides access to the span calculation screen for precalibration of a scale without test weights.

➢ The Free Calibration procedure is applicable for normal precision process control, and it's forbidden in trade settlement status.

Steps:

1. Access to Free Calibration menu: 'System Setup' →'Maintenance' →'Free Cal'
2. Enter the load cell capacity and rated load cell output values in the associated fields:
   ➢ The total load cell capacity should be entered here. For example, for a tank with three 5000 kg cells, cell capacity would be 3 x 5000 kg or 15000 kg.
3. Enter the excitation/response rate (mV/V) of the load cell, the sensitivity of load cell, which is usually included in the nameplate of the load cell. The value is always 2.00000mV/V.

4. Empty the scale, perform [Zero Cal]
5. Calibration OK

Zero and Tare

- **Powerup Zero**

If Powerup Zero is enabled, the terminal tries to capture zero upon power up. If Powerup Zero capture is enabled and the weight on the scale is outside of the zero capture range, the display will indicate "EEE" or "-EEE" until the weight is removed and zero is captured.

Range: 0% (Powerup Zero is disabled), 2%(2%*CAP), 10%(10%*CAP)

Menu path: [System Setup]→[Appl Setup]→[Powerup Zero]

- **Keypad Zero**

If Keypad Zero is enabled, the front panel ZERO pushbutton will operate to capture zero reference points.

Range: 0% (Keypad Zero is disabled), 5% (5%*CAP), 10% (10%*CAP), 20% (20%*CAP)

Menu path: [System Setup]→[Appl Setup]→[Keypad Zero]

Operation: press key 

- **Pushbutton Tare**

When pushbutton tare is enabled, the TARE scale function key can be pressed when an empty container is on the scale to determine tare.

Range: 0~CAP

Menu path: [System Setup]→[Appl Setup]→[Tare Action], select [enable tare]

The terminal displays a zero weight and net mode. When the container is loaded and placed back on the scale, the terminal displays the net weight of the contents.

- **Preset Tare**

When setting tare is enabled, the known value for the empty weight of a container (tare) can be entered manually.

Range: 0~CAP

The terminal will then display the net weight of the contents of the container.

Keyboard tares are automatically rounded to the closest display division.

Clear Tare

Clear tare values by pressing the CLEAR key  when the IND320 is in the net mode

Print

The IND320 can connect to serial printer, supporting English/Chinese report forms printing.

- **Print Weight**

When the scale is in static and no batching, press the Enter key  to output the current gross weight, tare weight, and net weight via serial port.

- **Print Allot**

When no batching, long press Enter key  till short beep to access to setup menu.

[Print Action]→[Print Allot], and press Enter key  . The IND320 outputs all the target weights of current recipe, actual feeding weights and errors of the last recipe. See the Appendix for detail.

- **Print Total**

When no batching, long press Enter key  till short beep to access to setup menu.

[Print Action]→[Print Total], and press Enter key  . The IND320 outputs all the cumulation weights of current recipe. See the Appendix for detail.

- **Print Recipe**

When no batching, long press Enter key  till short beep to access to

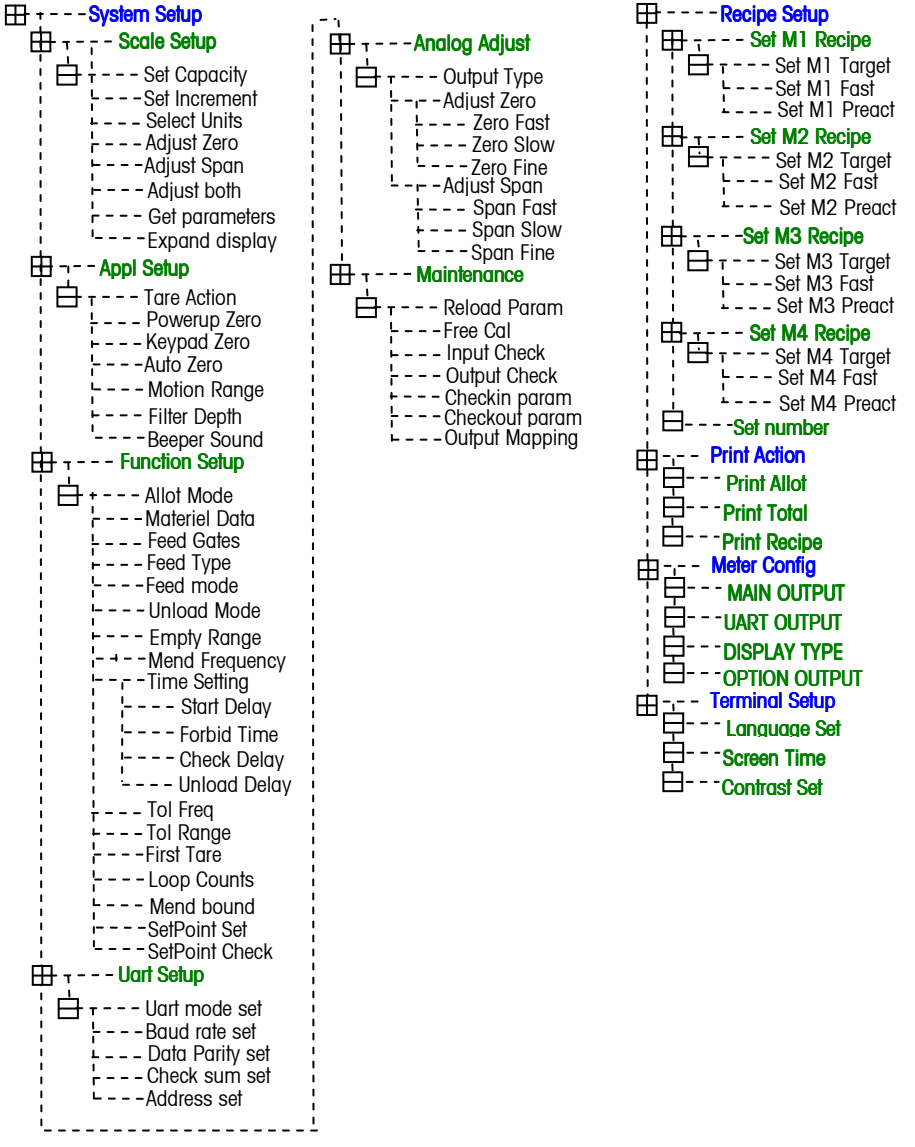
setup menu.

[Print Action]→[Print Recipe], and press Enter key  . The IND 320 outputs the detail of the current recipe. See the Appendix for detail.

- **Language Set**

The IND320 supports Chinese and English print, set the language to agree with the displaying language.

Menu Tree


System Setup
Scale Setup
Set Capacity
Set Increment
Select Units
Adjust Zero
Adjust Span
Adjust both
Get parameters
Expand display
Appl Setup
Tare Action
Powerup Zero
Keypad Zero
Auto Zero
Motion Range
Filter Depth
Beeper Sound
Function Setup
Allot Mode
Materiel Data
Feed Gates
Feed Type
Feed mode
Unload Mode
Empty Range
Mend Frequency
Time Setting
Start Delay
Forbid Time
Check Delay
Unload Delay
Tol Freq
Tol Range
First Tare
Loop Counts
Mend bound
SetPoint Set
SetPoint Check
Uart Setup
Uart mode set
Baud rate set
Data Parity set
Check sum set
Address set
Analog Adjust
Output Type
Adjust Zero
Zero Fast
Zero Slow
Zero Fine
Adjust Span
Span Fast
Span Slow
Span Fine
Maintenance
Reload Param
Free Cal
Input Check
Output Check
Checkin param
Checkout param
Output Mapping
Recipe Setup
Set M1 Recipe
Set M1 Target
Set M1 Fast
Set M1 Preact
Set M2 Recipe
Set M2 Target
Set M2 Fast
Set M2 Preact
Set M3 Recipe
Set M3 Target
Set M3 Fast
Set M3 Preact
Set M4 Recipe
Set M4 Target
Set M4 Fast
Set M4 Preact
Set number
Print Action
Print Allot
Print Total
Print Recipe
Meter Config
MAIN OUTPUT
UART OUTPUT
DISPLAY TYPE
OPTION OUTPUT
Terminal Setup
Language Set
Screen Time
Contrast Set

I	II	III	IV	Default	Description
System Setup	Scale Setup	Set Capacity		100	1~100,000
		Set Increment		0.01	0.001~50 Refer to the appendix for the table of capacity and increment
		Select Units		kg	Units: kg, g, t Calibration unit is the same as display unit
		Adjust Zero		×	Empty scale and keep it in static status, press  to perform zero adjustment.
		Adjust Span		×	Press  to perform span adjustment. Load weight on the scale, and input the value (20%~100% of the capacity). Press  to capture span.
		Adjust both		×	Press this key to adjust zero and span in turn.
		Get parameters	Zero Count Load Weigh Span Count		The zero calibration and span calibration parameters are displayed in this item. [Zero Count] is the terminal parameter corresponding to Zero. [Load Weigh] is the load value user inputing. [Span Count] is the terminal parameter corresponding to the load weight. Users can write down and keep

				these parameters in case of emergency. Reload these parameters will lead to the status right after calibration.
	Expand Display		×	Expands the displayed weight by 10. Expand display is just used temporarily. It's forbidden when batch process is running.
Appl Setup	Tare Action		enable Tare	disable tare enable tare(usually used in normal batching) setting tare. Preset tare must be lower than current gross value according to laws and regulations of measuring.
	Powerup Zero		0%	Options: 0%，2%，10% PowerUp Zero enables the IND320 terminal to capture a new zero reference point after power is applied. 0% Power-up Zero function is disabled. 2% Enable power-up zero function within ± 2 of Scale Capacity range. 10% Enable power-up zero function within ± 10 of Scale Capacity range.
	Keypad Zero		10%	Options: 0%，5%，10%，20% Enable "ZERO" operation function range. 0% Keypad Zero is disabled 5% Enable "ZERO" operation function within ± 5% of Scale Capacity range. 20% Enable "ZERO" operation function within ± 20% of Scale Capacity range.
	Auto Zero		0d	Options: 0~5d
	Motion Range		2d	Options: 0~10d The Motion Range determines if the scale is in motion. When the scale is in motion, Tare and Zero are disabled. When Motion Range=0, it's considered that the scale is in static all the time.
	Filter Depth		5	Options: 1~9 Heady filter makes the weight readings are stable, and also makes weight readings update rate be slow.

	Beeper Sound		√	Operation prompting sound Short beep: operation accepid Long beep: Illegal input or invalid operation.
Function Setup	Allot Mode	Work mode	4 Allot	Options: 4 Allot, Setpoint 4 Allot: 1~4 materiels batch, supporting double speed feeding mode. I/O option board is necessary while more than 2 materiels batch. Setpoint: 4 target weights should be set. When the current weight is lower than preset value, a control signal will output. *Refer to the next chapter for detail.*
	Materiel Data		4	Options: 1~4 In 4 Allot mode, set the maximum materiel number. Jump over the feed of the materiel whose target weight is zero. When all the target weights are zero, the batch can't start.
	Feed Gates		2	Options: 1, 2 Set if the feed type is single speed feeding system or 2-speed feeding system.
	Feed Type		Double	Options: Double, Single Double: In 2-speed feeding system, when the materiel is in fast feeding, the fine feed output is open. Single: In 2-speed feeding system, when the materiel is in fast feeding, the fine feed output is closed.
	Feed Mode		Auto	Options: Auto, Manual
	Discharge Mode		Auto	Options: Auto, Manual
	Empty Range		1.0%	Options: 0%~9.9%(of scale capacity)
	Mend Freqeuncy		0	Options: 0~9 Preact weight self-correcting freqeuncy 0：Preact weight self-correcting is disabled. 1~9：The actual weight is over (below) the target weight for several times, the terminal would correct the preact weight. The time is set in this

			item.
Time Setting	Start Delay	1.0S	Options: 0~9.9s After the setting time, batch start.
	Forbid Time	1.0S	Options: 0~9.9s After the setting time, compare the actual weight with the target weight.
	Check Delay	1.0S	Options: 0~9.9s After the setting time, check if the actual weight is out of toleration.
	Unload Delay	1.0S	Options: 0~9.9s After the setting time, close the gate.
Tol Freq		0	Options: 0~99 0：Forbidden the check 1~99：After several times batching, check if the actual weight of each materiel is out of toleration.
Tol Range		0	Options: 0%~99%
First Tare		√	Options: √、× √：Auto tare before feed the first materiel. Note: If 'Fist Tare' is set '√', 'Tare Action' should be 'enable tare'. ×：Do not tare before feed the first materiel.
Loop Counts		1	Options: 0~99
Mend bound		0.0%	0.0%~9.9% Preact weight self-correcting range. 0.0%: No limit of the preact weight self-correcting
SetPoint Set		0%	Options：0% ~ 99% 0： Set the function of OUT12 as "Out of Tolerance" 1~99: Set the function of OUT12 as "SetPoint", and set the SetPoint Weight as 1~99 of the scale capacity.

	SetPoint Check		0.0S	Options: 0~9.9s Set the SetPoint Check time in this item. If the gross weight isn't below the SetPoint Weight, neither after the SetPoint Check time, the OUT12 outputs high level signal and the display screen displays "OL". If not, the OUT12 outputs low level sinal.
Uart Setup	Uart mode set		Disable	Options: Disabled, MODBUS RTU, HOST Cmd, HOST Cont, MT Cmd, MT Cont, MT Cont-T600 *See appendix for detail*
	Band rate set		9600	Options: 300、600、1200、2400、4800、9600、19200、38400、57600、115200
	Data Parity set		8Bit none	Options: 8Bit none, 7Bit odd, 7Bit ever
	Check sum set		×	Options: √、× Only available in MT Count Mode √: Add a checksum at the end of the output string. ×: not add a checksum
	Address set		1	Options: 0~15 Only valid in MODBUS RTU Mode.
Analog Adjust	Output Type		Displayed weight	Options: Displayed weight, Gross weight Displayed weight: output the displayed weight Gross weight: output the gross weight
	Adjust Zero	Zero Fast Zero Slow Zero Fine	54696	Adjust Anolog Zero. Adjust the Anolog output to 0V or 4mA.
	Adjust Span	Span Fast Span Slow Span Fine	10965	Adjust Anolog Span. Adjust the anolog output to 10V or 20mA.
Maintenance	Reload Param			Set all the parameters back to factory default.
	CalFREE	Capacity		Set the capacity of all the load cells

			set		in this item.
			Delicacy set		Enter the excitation/response rate (mV/V) of the load cell
			Zero Cal		Perform Free Calibration, while make sure the capacity of all the load cells more than the capacity of the scale.
		Input Check			Check if the inputs are reliable. The IND320 has upto 5 inputs, which correspond to 5 signals. When the input is enabled, the signal displays "●". Otherwise the signal displays "○".
		Output Check			Check if the outputs are reliable. The IND320 has upto 12 outputs, which correspond to 12 signals. When the input is enabled, the signal displays "●". Otherwise the signal displays "○".
		Checkin Param			Backup the parameters The password is '3368'
		Checkout Param			Recover the parameters(one key recovery)
		Output Mapping		TOL	Options:TOL, UNLOAD, SLOW, FAST
Recipe Setup	Set M1 Recipe	Set M1 Target			Target weight of Materiel 1.
		Set M1 Fast			The item is available only in 2-speed feeding system. Fast feed until the current weight=the target weight – the fast weight. Then fine feed until the current weight=the target weight – the preact weight. Then close the hopper.
		Set M1 Preact			The preact weight of Materiel 1.
	Set M2 Recipe	Set M2 Target			The item is visualbe only while the [Materiel Data] is set more than 1. See M1 for the detail.
		Set M2 Fast			
		Set M2 Preact			

	Set M3 Recipe	Set M3 Target		The item is visualbe only while the [Materiel Data] is set more than 2. See M1 for the detail.
		Set M3 Fast		
		Set M3 Preact		
	Set M4 Recipe	Set M4 Target		The item is visualbe only while the [Materiel Data] is set 4. See M1 for the detail.
		Set M4 Fast		
		Set M4 Preact		
	Recipe Number			There are 3 recipes in the IND320. Set the current recipe in this item.
Print Action	Print Allot			Print all the target weights of current recipe, actual feeding weights and errors of the last recipe. See the Appendix for detail.
	Print Total			Print all the cumulation weights of current recipe. See the Appendix for detail.
	Print Recipe			Print the current recipe. See the appendix for the format.
Meter Config	MAIN OUTPUT			OC OE
	UART OUTPUT			RS232/485
	DISPLAY TYPE			OLED
	OPTION OUTPUT			NO OE OC ANALOG
Terminal Setup	Language Set			Options: English, Chinese
	Screen Time		Disable	Options: Disable, 30 minute, 10 minute, 2 minute
	Contrast Set		5	Options: 1~9

Parameter Configuration Table

Parameters			Sany Default Value	Set Value
System Setup				
Scale Setup				
	Set Capacity		100	
	Set Increment		0.01	
	Set Units		kg	
	Adjust Zero		X	
	Adjust Span		X	
	Adjust Both		X	
	Calibration Parameters	Zero Count	0000000	
		Load Weigh	0050.00	
		Span Count	080000	
	Expand Display		X	
Appl Setup				
	Tare Action		enable tare	
	Powerup Zero		0%	
	Keypad Zero		10%	
	Auto Zero		0d	
	Motion Range		2d	
	Filter Depth		5	
	Beeper Sound		√	
Function Setup				
	Allot Mode		4 Allot	
	Materiel Data		4	
	Feed Type		M1 M2 M3 M4	

			2	2	2	2	
	Feed Gates		Double				
	Feed Mode		Auto				
	Discharge Mode		Auto				
	Empty Range		1.0%				
	Mend Frequency		0				
	Time Setting	Start Delay	1.0 S				
		Forbid Time	1.0 S				
		Check Delay(1~4)	1.0 S				
		Discharge Delay	1.0 S				
	Tol Freq		00T				
	Tol Range		0.0%				
	First Tare		√				
	Loop Counts		1				
	Mend Range		0%				
	SetPoint Set		0%				
	SetPoint Check		0.0 S				
Uart Setup							
	Uart mode		Disable				
	Band rate		9600				
	Data Parity		8 Bit none				
	Check sum		X				
	Address		01				
Analog Adjust							

	Analog Output		Displayed weight	
Capture Zero	Coarse Adjust		54696	
	Slenderly Adjust			
	Fine Adjust			
Capture Span	Coarse Adjust		10965	
	Slenderly Adjust			
	Fine Adjust			
Maintenance				
	Reload Param		X	
	CalFREE		X	
	Input Check			
	Output Check			
	Checkin Param			
	Checkout Param			
	Output Mapping		TOL	

Chapter 4 Batch Operation

This Chapter Covers:

- Single Material Batch Mode
- 1~4 materials Batch Mode
- Setpoint Mode

This Chapter introduces the batch modes, I/O definition and connections. The IND320 supports 1~4 materiels single/double speed batch mode and Setpoint Mode.

Single Materiel Batch Mode

Single Materiel Batch Mode is vaild in Single Materiel Batch Terminal. Control signals including Fast Feed, Fine Feed, Discharge and Out of Tolerance are provided in single materiel batch mode to control filling of one materiel.

I/O Definition

Input	
IN1	START. IND320 will start a new batch process.

Outputs	
OUT1	Reservation Default: TOL, The result of last materiel feeding is out of tolerance.(The tolerance can be set in the menu) Options: TOL, DIS, FAST, SLOW
OUT2	FAST Fast feeding.This refers to the physical output connection that is used for the faster feed in a 2-speed feeding system. This output is not used in a single speed feeding system.
OUT3	FINE Fine feeding. This refers to the physical output connection that is used for the fine feed in a 2-speed feeding system or the only feed output in a single speed

	feeding system.
OUT4	DISCH Materiel discharge

Parameters Configuration

Menu	Set Value
[Function Setup] →[Allot Mode]	4 Allot
[Materiel Data]	1
[Feed Gates]	1 ： single speed feeding 2 ： 2-speed feeding
[Feed Type]	Double: open two gates in fast feeding Single: only open fast gate in fast feeding

Target Weight Setting

Long press the Enter key  to access to the setup menu, and then choose the 'Recipe Setup'. Set the recipe in the menu.

Parameters	Description
[Set M1 Target]	Target weight of Materiel 1
[Set M1 Fine]	Fine feed weight of Materiel 1
[Set M1 Preact]	Preact weight of Marterial 1
[Set Number]	1～3 Set the present recipe, while 3 recipes can be set in the IND320.

Auto Feed

1. Auto Feed + Auto Discharge

Batch Process

Input or Operation	Status	Output
	Normal weighing display	
IN1 valid short to 24V- No less than 10ms Press the key, after"Run feed"displaying, press key	→ Start Materiel 1 feeding	→ In 2-speed feeding system: OUT2(fast feeding)valid OUT3(fine feeding)valid Single speed feeding system: OUT3(fine feeding)valid When batch process is running, OUT2 closes according to the recipe and OUT3 closes when the feeding weight reaches the target.
	Discharge	→ OUT4 open
	Back to normal weighing display	→ OUT4 closed

1~4 Materiels Batch Mode

I/O Definitions

Inputs(Auto Feed, Auto Dischage)	
IN1	**Batch Start**. The IND320 will start a new batch process.
IN2	**Batch Start**. The IND320 will start a new batch process.
IN3	**Batch Hold**
IN4	**Batch Stop**

Inputs(Auto Feed, Manual Dischage)	
IN1	**Feeding Start**
IN2	**Feeding Start**
IN3	**Discharging Start**(the input is invalid before feeding done)
IN4	**Batch Stop**

Inputs(Manual Feed, Auto/Manual Dischage)	
IN2	**Batch Process Select**
IN3	**Batch Process Start**
IN4	**Batch Stop**

Outputs	
OUT1	Reservation Default: TOL Options: TOL, DIS, FAST, SLOW
OUT2	Running(open when batch process is running)
OUT3	Pause
OUT4	Empty
OUT5	M1 Output
OUT6	M2 Output
OUT7	M3 Output
OUT8	M4 Output
OUT9	Fast Feeding
OUT10	Fine Feeding
OUT11	Discharging
OUT12	Out of Tolerance

Parameters Configuration

Menu	Set Value
[Function Setup] →[Allot Mode]	4 Allot
[Materiel Data]	1～4
[Feed Gates]	1 ： single speed feeding 2 ： 2-speed feeding
[Feed Type]	Double: Double: Open these two gates in fast feeding Single:only open the fast gate in fast feeding

Target Weight Setting

Parameters	Description
[Set M1 Target]	Target weight of Materiel 1
[Set M1 Fine]	Fine feed weight of Materiel 1
[Set M1 Preact]	Preact weight of Materiel 1
[Set M2 Target]	Target weight of Materiel 2
[Set M2 Fine]	Fine feed weight of Materiel 2
[Set M2 Preact]	Preact weight of Materiel 2
[Set M3 Target]	Target weight of Materiel 3
[Set M3 Fine]	Fine feed weight of Materiel 3
[Set M3 Preact]	Preact weight of Materiel 3
[Set M4 Target]	Target weight of Materiel 4
[Set M4 Fine]	Fine feed weight of Materiel 4
[Set M4 Preact]	Preact weight of Materiel 4
[Set Number]	1～3 Set the present recipe, while 3 recipes can be set in the IND320.

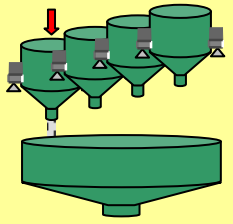
Auto or Manual

1. Auto Feed + Auto Discharge

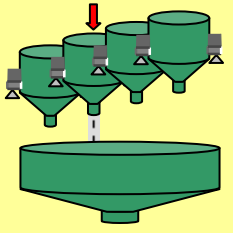
Batch Process

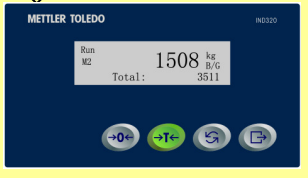
Input or Operation	Status	Output
	Normal weighing display	
IN2 valid short to 24V- No less than 10ms Press the key , after"Run feed"displaying, press key →	Start Materiel 1 feeding →	OUT2(Running) valid OUT5(M1 selected) valid In 2-speed feeding system: OUT9(fast feeding)valid OUT10(fine feeding)valid Single speed feeding: OUT10(fine feeding)valid When batch process is running, OUT9 closes according to the recipe and OUT10 closes when the feeding weight reaches the target.
	Start Materiel 2 feeding →	OUT2(Running) valid OUT6(M2 selected) valid In 2-speed feeding system: OUT9(fast feeding)valid OUT10(fine feeding)valid Single speed feeding: OUT10(fine feeding)valid When batch process is running, OUT9 closes according to the recipe and OUT10 closes when the feeding weight reaches the target.
	Start Materiel 3 feeding →	OUT2(Running) valid OUT7(M3 selected) valid

		In 2-speed feeding system: OUT9(fast feeding)valid OUT10(fine feeding)valid In single speed feeding system: OUT10(fine feeding)valid When batch process is running, OUT9 closes according to the recipe and OUT10 closes when the feeding weight reaches the target.
	↓	
Start Materiel 4 feeding	→	OUT2(Running) valid OUT8(M4 selected) valid In 2-speed feeding system: OUT9(fast feeding)valid OUT10(fine feeding)valid In single speed feeding system: OUT10(fine feeding)valid When batch process is running, OUT9 closes according to the recipe and OUT10 closes when the feeding weight reaches the target.
	↓	
Discharge	→	OUT11 valid
	↓	
Batch done Back to normal weighing display	→	OUT11 closed

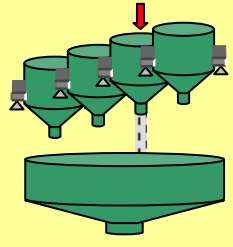


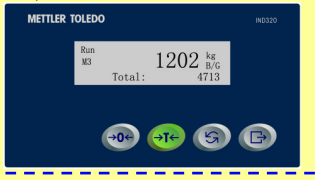
M1 Auto Feed



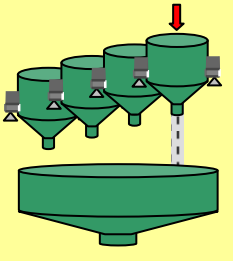


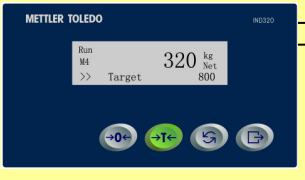
M2 Auto Feed

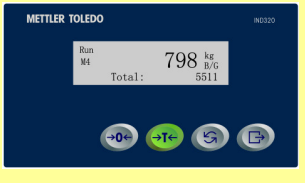




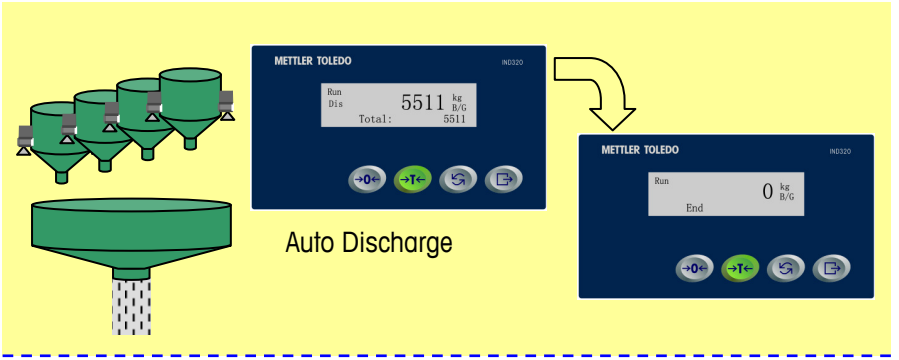
M3 Auto Feed







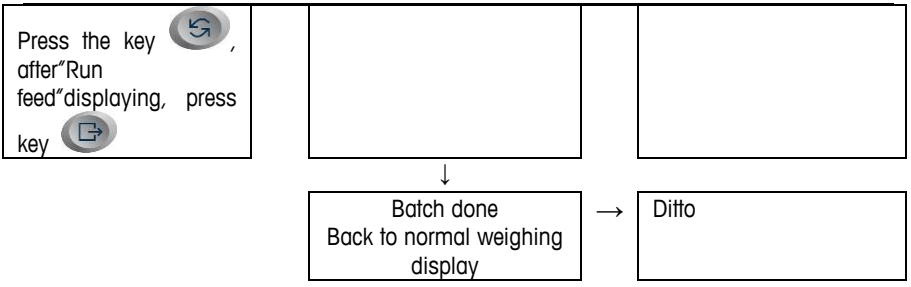
M4 Auto Feed

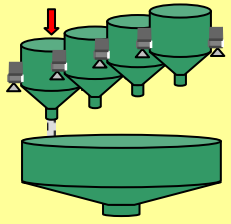


2. Auto Feed + Manual Discharge

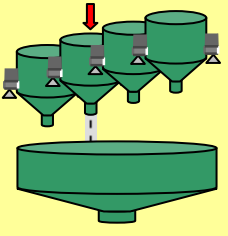
Batch Process

Input or Operation	Status	Output
	Normal weighing display	
IN2 valid short to 24V- No less than 10ms Press the key, after"Run feed"displaying, press key	Start Materiel 1 feeding	Ditto
	Start Materiel 2 feeding	Ditto
	Start Materiel 3 feeding	Ditto
	Start Materiel 4 feeding	Ditto
IN2 valid short to 24V- No less than 10ms	Discharge	Ditto

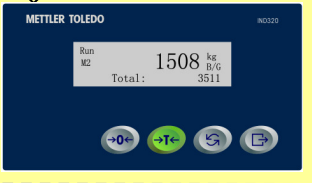

Press the key , after"Run feed"displaying, press key
Batch done
Back to normal weighing display
Ditto

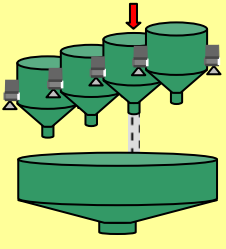


M1 Auto Feed

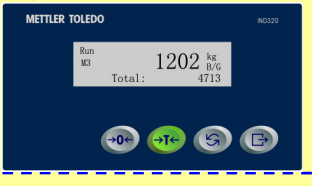


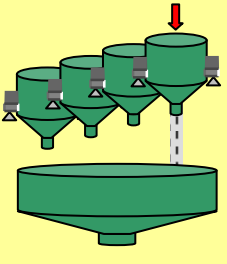
M2 Auto Feed

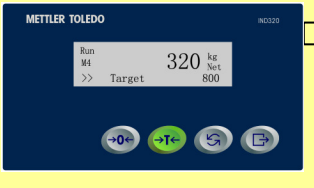




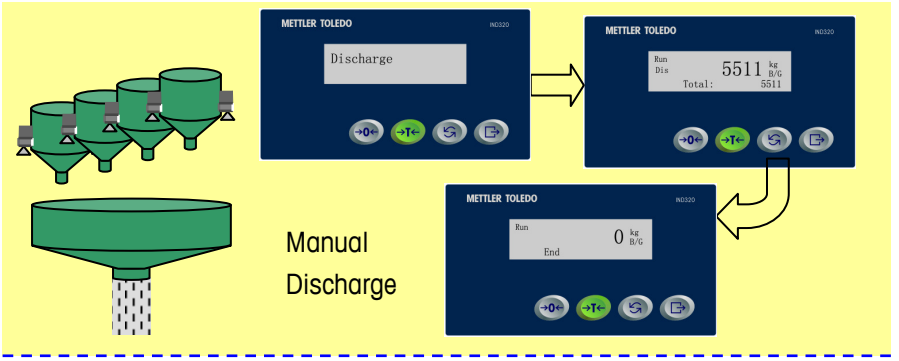
M3 Auto Feed







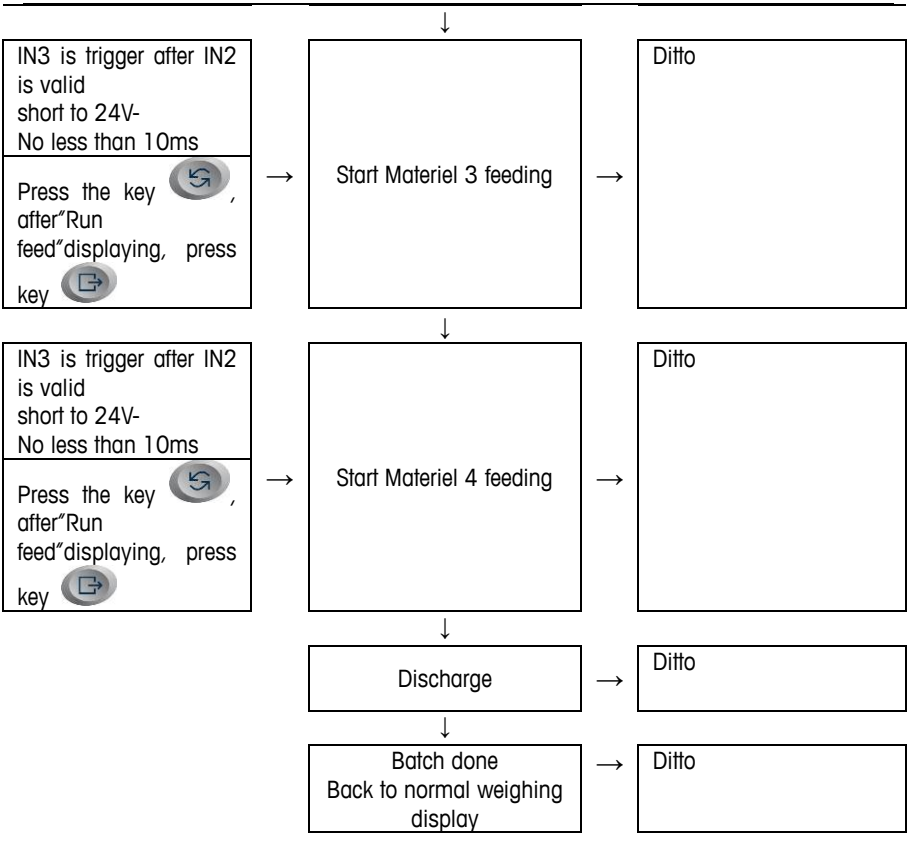
M4 Auto Feed

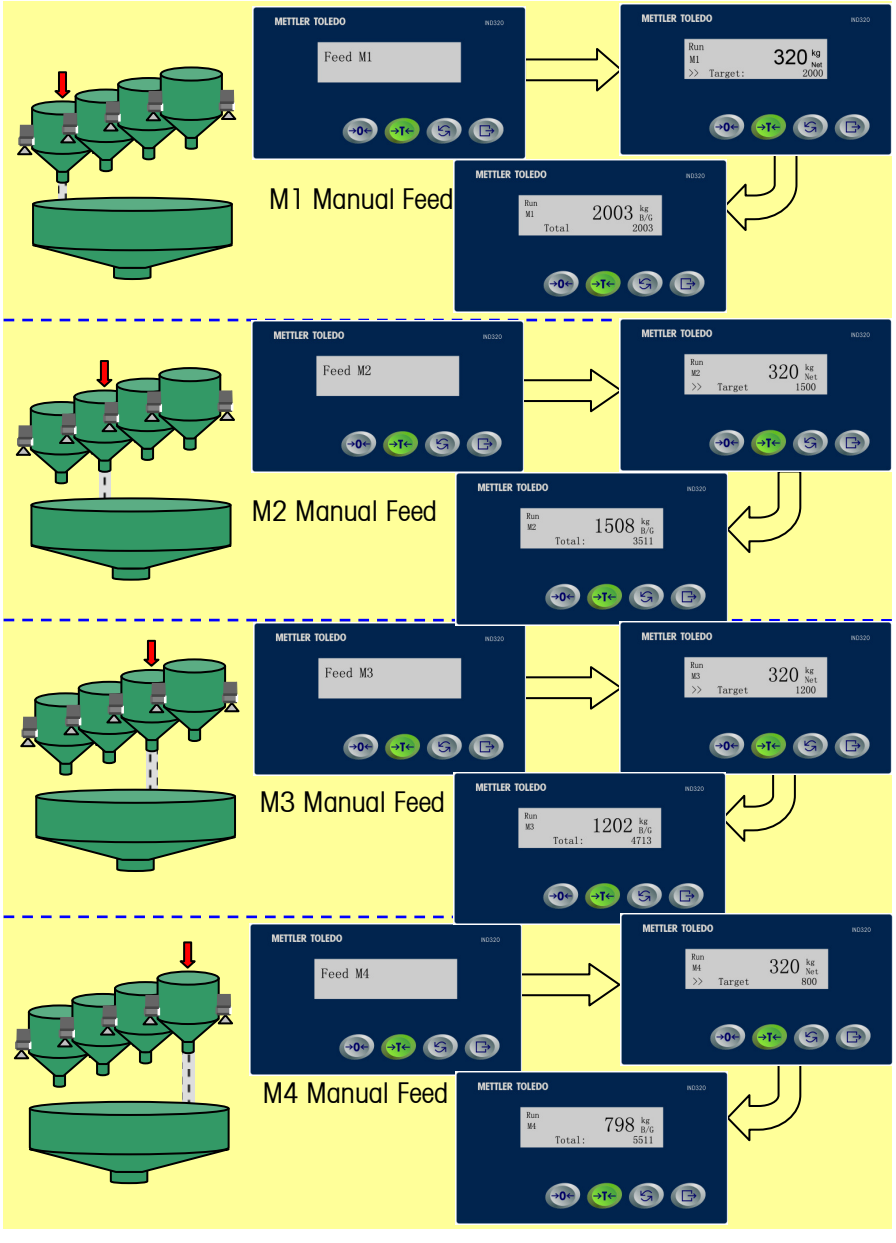


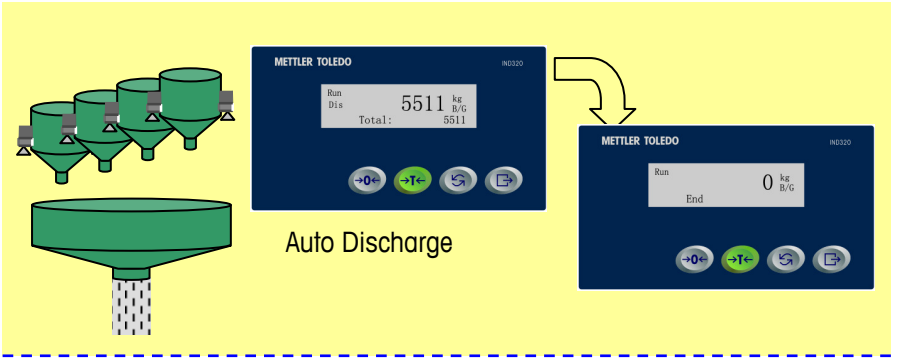
3. Manual Feed + Auto Discharge

Batch Process

Input or Operation	Status	Output
	Normal weighing display	
IN3 is trigger after IN2 is valid short to 24V- No less than 10ms Press the key , after"Run feed"displaying, press key	Start Materiel 1 feeding	Ditto
IN3 is trigger after IN2 is valid short to 24V- No less than 10ms Press the key , after"Run feed"displaying, press key	Start Materiel 2 feeding	Ditto


IN3 is trigger after IN2 is valid
short to 24V-
No less than 10ms
Press the key , after"Run feed"displaying, press key
Start Materiel 3 feeding
Ditto
IN3 is trigger after IN2 is valid
short to 24V-
No less than 10ms
Press the key , after"Run feed"displaying, press key
Start Materiel 4 feeding
Ditto
Discharge
Ditto
Batch done
Back to normal weighing display
Ditto

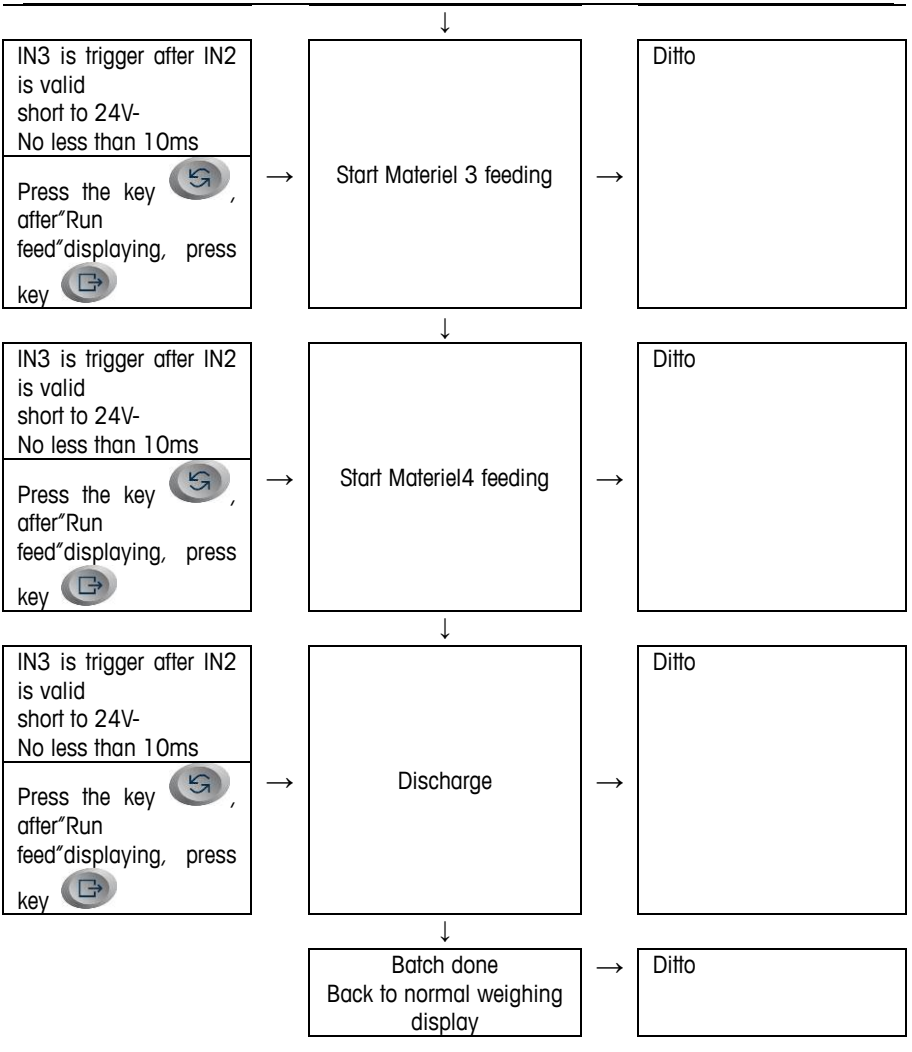

METTLER TOLEDO
Feed M1
Run
M1
>> Target:
320 kg Net
2000
Run
M1
Total
2003 kg B/G
2003
M1 Manual Feed
Feed M2
Run
M2
>> Target
320 kg Net
1500
Run
M2
Total:
1508 kg B/G
3511
M2 Manual Feed
Feed M3
Run
M3
>> Target
320 kg Net
1200
Run
M3
Total:
1202 kg B/G
4713
M3 Manual Feed
Feed M4
Run
M4
>> Target
320 kg Net
800
Run
M4
Total:
798 kg B/G
5511
M4 Manual Feed

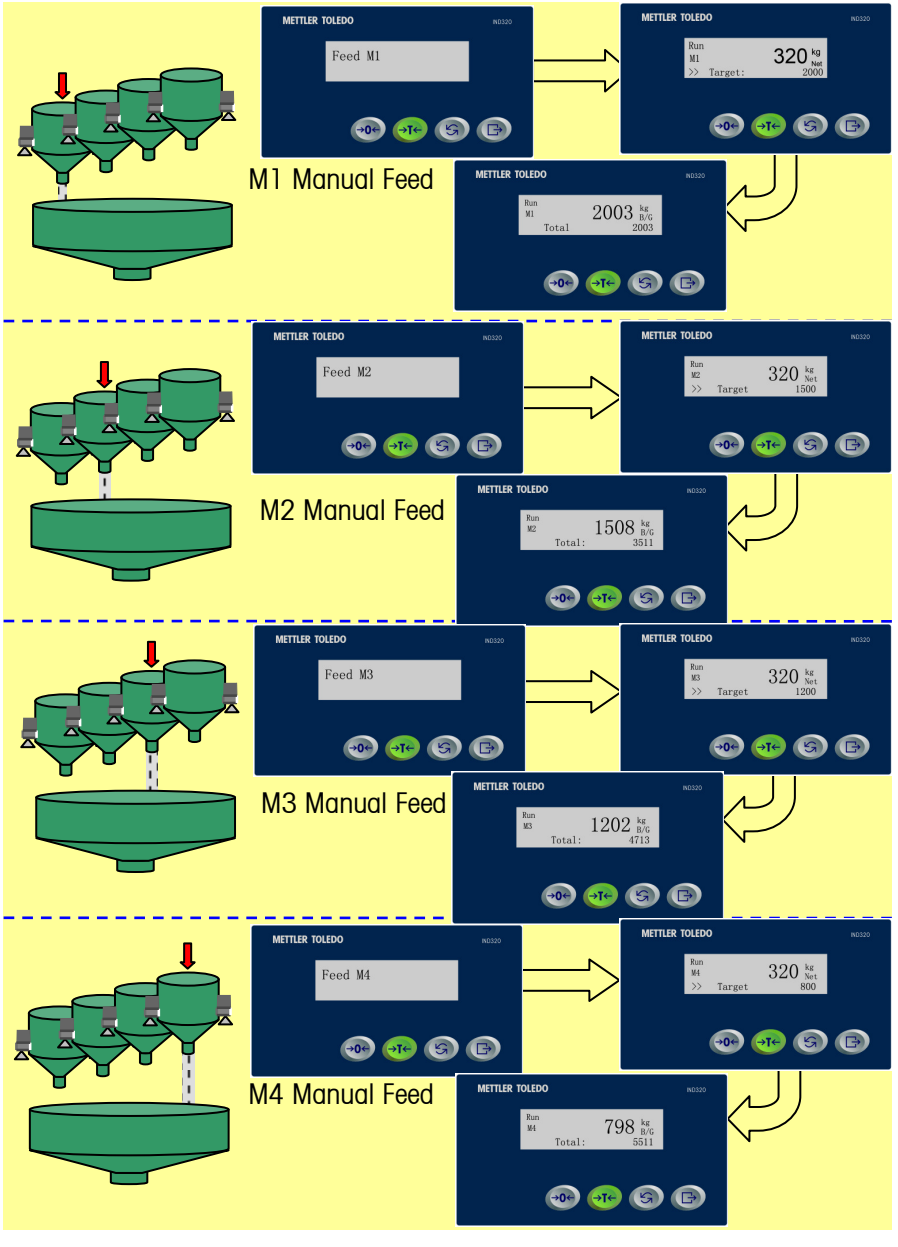


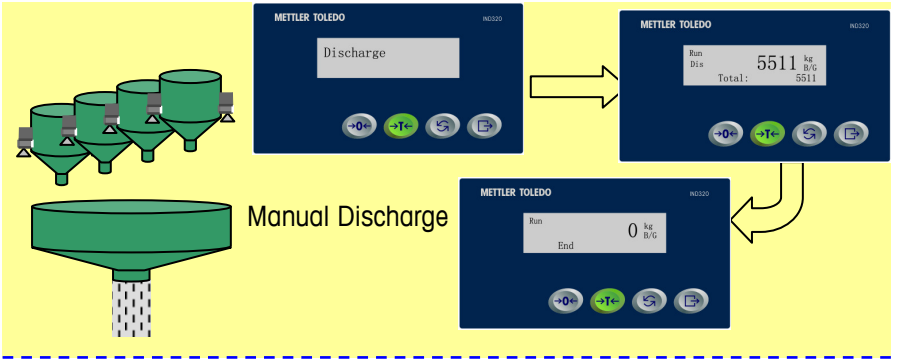
4. Manual Feed + Manual Discharge

Batch Process

Input or Operation	Status	Output
	Normal weighing display	
IN3 is trigger after IN2 is valid short to 24V- No less than 10ms Press the key , after"Run feed"displaying, press key	Start Materiel 1 feeding	Ditto
IN3 is trigger after IN2 is valid short to 24V- No less than 10ms Press the key , after"Run feed"displaying, press key	Start Materiel 2 feeding	


IN3 is trigger after IN2 is valid
short to 24V-
No less than 10ms
Press the key , after"Run feed"displaying, press key
Start Materiel 3 feeding
Ditto
IN3 is trigger after IN2 is valid
short to 24V-
No less than 10ms
Press the key , after"Run feed"displaying, press key
Start Materiel4 feeding
Ditto
IN3 is trigger after IN2 is valid
short to 24V-
No less than 10ms
Press the key , after"Run feed"displaying, press key
Discharge
Ditto
Batch done
Back to normal weighing display
Ditto


METTLER TOLEDO
IND320
Feed M1
Run
M1
320 kg Net
>> Target: 2000
Run
M1
2003 kg B/G
Total 2003
M1 Manual Feed
Feed M2
Run
M2
320 kg Net
>> Target 1500
Run
M2
1508 kg B/G
Total: 3511
M2 Manual Feed
Feed M3
Run
M3
320 kg Net
>> Target 1200
Run
M3
1202 kg B/G
Total: 4713
M3 Manual Feed
Feed M4
Run
M4
320 kg Net
>> Target 800
Run
M4
798 kg B/G
Total: 5511
M4 Manual Feed



Setpoint Mode

I/O Definition

Inputs	
IN1	Zero
IN2	Tare
IN3	Clear Tare

Outputs	
OUT1	SP3 Valid when the present weight is above the weight of SP3
OUT2	SP2 Valid when the present weight is above the weight of SP2
OUT3	SP1 Valid when the present weight is above the weight of SP1
OUT4	Empty

Parameters Setting

Menu	Setting Value
[Function Setup] →[Allot Mode]	Setpoint

Target Weight Setting

Parameters	Description
[Set Setpoint1]	Set the weight of Setpoint1
[Set Preact1]	Set the preact weight of Setpoint1
[Set Setpoint2]	Set the weight of Setpoint 2
[Set Preact2]	Set the preact weight of Setpoint2
[Set Setpoint3]	Set the weight of Setpoint 3
[Set Preact3]	Set the preact weight of Setpoint3

Chapter 5 Appendix

Communications

MODBUS RTU

The IND320 terminal has a bi-directional RS-232/485 port that can be programmed for several functions. The input can be used to provide simple commands from another device or if programmed in the MODBUS RTU mode, or receive more in-depth information. The output can be configured for simple output to a printer or computer, continuous output to a remote display, or as a more advanced MODBUS RTU interface.

The data format is MODBUS RTU, supporting '03' and'06' command.

Menu path: [System Setup] → [Uart Setup] → [Uart mode set] = MODBUS RTU

- The MODBUS address of each terminal should be unique.

MODBUS DATA MAPPING

Address	Bit	Description (Read Only)
40001		Current gross weight
40002		Current displaying weight
40003	.0	1: Materiel 1 is in Fine Feeding
	.1	1: Materiel 1 is in Fast Feeding
	.2	1: Scale is empty
	.3	1: Present weight reaches the Setpoint1(valid only in Setpoint Mode)
	.4	1: Materiel 2 is in Fine Feeding
	.5	1: Materiel 2 is in Fast Feeding
	.6	1: Present weight reaches the Setpoint2(valid only in Setpoint Mode)
	.7	1: Present weight reaches the Setpoint3(valid only in Setpoint Mode)
	.8	1: Materiel 3 is in Fine Feeding
	.9	1: Materiel 3 is in Fast Feeding
	.10	0: (None)

	.11	1: Out of range (Over Capacity or Under Zero)
	.12	1: Materiel 4 is in Fine Feeding
	.13	1: Materiel 4 is in Fast Feeding
40004	.0 .1 .2 .3	0001~0011： The current recipe (1~3)
	.4	0: No batching 1: Batch running
	.5	0: (None) 1: The Batching is holding
	.6	0: (None) 1: Discharging
	.7	0: (None) 1: All materiels have feed, waiting for discharge (in manual discharging mode)
	.8 .9 .10 .11	Weight Increment Size: 0000=0.001 0001=0.002 0010=0.005 0011=0.01 0100=0.02 0101=0.05 0110=0.1 0111=0.2 1000=0.5 1001=1 1010=2 1011=5 1100=10 1101=20 1110=50
	.12	1: The feed materiel is out of tolerance
	.13	1: Scale in motion
	.14	0: Auto feeding; 1: Manual feeding
	.15	0: Auto discharging; 1: Manual discharging
40005		The actual feeding weight of Materiel1.
40006		The actual feeding weight of Materiel2. (hold the value till the next batch begins)
40007		The actual feeding weight of Materiel3. (hold the value till the next batch begins)
40008		The actual feeding weight of Materiel3. (hold the value till the next batch begins)
40039		High byte of the total amount of consumption of Materiel1

40040	Low byte of the total amount of consumption of Materiel1
40041	High byte of the total amount of consumption of Materiel2
40042	Low byte of the total amount of consumption of Materiel2
40043	High byte of the total amount of consumption of Materiel3
40044	Low byte of the total amount of consumption of Materiel3
40045	High byte of the total amount of consumption of Materiel4
40046	Low byte of the total amount of consumption of Materiel4

Address	Description(Read and Write)
40009	Tare value
40010	Target weight of Materiel 1
40011	Target weight of Materiel 2
40012	Target weight of Materiel 3
40013	Target weight of Materiel 4
40014	Fine feed weight of Materiel 1
40015	Fine feed weight of Materiel 2
40016	Fine feed weight of Materiel 3
40017	Fine feed weight of Materiel 4
40018	Preact weight of Materiel 1
40019	Preact weight of Materiel 2
40020	Preact weight of Materiel 3
40021	Preact weight of Materiel 4
40022	Empty range
40023	Mend Frequency
40024	Start Delay
40025	Unload Delay
40026	Forbid Time
40027	Check delay time for Materiel1 tolerance judgement
40028	Check delay time for Materiel2 tolerance judgement

40029		Check delay time for Materiel3 tolerance judgement
40030		Check delay time for Materiel4 tolerance judgement
40031		The weight of Setpoint1(valid only in Setpoint Mode)
40032		The weight of Setpoint2(valid only in Setpoint Mode)
40033		The weight of Setpoint3(valid only in Setpoint Mode)
40036		Preact weight of Setpoint1(valid only in Setpoint Mode)
40037		Preact weight of Setpoint2(valid only in Setpoint Mode)
40038		Preact weight of Setpoint3(valid only in Setpoint Mode)
40047	.0	1： Zero capture success
	.1	1： Span capture success
	.2	1: the load weight writed in the item is less than 1% of capacity of scale while adjusting span
	.3	1: the load weight writed in the item is more than capacity of scale while adjusting span
	.4	1: the load weight is too low.
	.5	1: batch process is running, so that calibration is forbidden.

Address	Bit	Description(Read only)
40101	.0	
	.1	0001~0100: set the Materiel Number to feed(M1~M4)
	.2	(set the Materiel Number in Manual Feed Mode)
	.3	
	.4	
	.5	0001: start the batch process
	.6	(valid only in Manual Feed Mode)
	.7	
	.8	Start batch(valid only in Auto Feed Mode)
	.9	Pause
	.10	Stop batch

	.11	Start manual discharge
	.12	Tare(valid only not in batch status, not in motion and enable tare)
	.13	Clear tare(not in batch status and enable tare)
	.14	Zero(not in batch status and not in motion)
	.15	Continue to feed or discharge
40102	.0	0000~0011：
	.1	Choose the recipe number
	.2	
	.3	
	.4	10: Manual feed mode
	.5	11: Auto feed mode
	.6	10: Manual discharge mode
	.7	11: Auto discharge mode
40103		Remote calibration 0: adjust zero XXXXX: adjust span(XXXXX is the load weight)

Host Command Mode

The weights data can be read by the command below in normal weighing status or when batch running. Response time is 1ms, while actual response time is affected by the baud rate, length of the cable, upper computer processing efficiency and so on.

R	E	A	D	CR	LF

Feedback data format

Feedback or the IND320	Description
S T , N T 0/1 + 1 9 9 . 8 k g CR LF	
	End tags: CR（0DH）, LF(0AH)
	Unit: kg/t/[none]
	Weight: without sign, 7 characters including a decimal point
	Sign: + or -
	0/1 send by turns
	NT=net weight GS=gross weight
	ST=in static US=in motion OL=over load

Host Continue Mode

In Host Continue Mode, the terminal sends weights data in normal weighing status or when batch running. The feedback data format is the same as in Host Command Mode.

MT Command Mode

In this communication protocol, the IND320 accepts the input of single byte ASCII, as follows:

Command	Description
P	Print
T	Tare
C	Clear Tare
Z	Zero

MT Continue Mode

The IND320 continuously sends data that consists 17 bytes or 18 bytes (with check sum), at the speed of 20 times a second.

The data format is shown below:

Byte	Bit	Description
1		STX(=02H)
2 Status Byte A	0	Decimal Point Location:
	1	001 = xxxxx0 010 = xxxxxx
	2	011 = xxxxx.x 100 = xxxx.xx 101 = xxx.xxx
		110 = xxxx00
	3	Fast feeding output 0=closed/1=open
	4	Fine feeding output 0=closed/1=open
	5	Always=1
	6	Always=0
3 Status Byte B	0	0=Gross/1=Net
	1	Sign, Positive=0/Negative=1
	2	Within the range=0/ Out of range=1(Over Capacity or Under Zero)
	3	0= In Static/ 1= In Motion
	4	Always=1
	5	Always=1

	6	Always=0
4 Status Byte C	0	Batching Status:
	1	000: No batching
	2	001: Materiel 1 is feeding 010: Materiel 2 is feeding 011: Materiel 3 is feeding 100: Materiel 4 is feeding 101: Discharging 110: The batching is held 111: Batch running (not in feeding or discharging)
	3	0=No Print Request/1=Weighing Data Label Print Request
	4	0=No expand weight/ 1= Expand weight mode
	5	Always=1
	6	Always=0
5		In Normal Weighing Mode
6		Display weight
7		In Feeding Phases:
8		The actual weight of the feeding materiel
9		In Discharging Phase
10		The total actual weight of all the materiels whiches are on the scale. All data is in ASCII format, and not include decemal pointer.
11		In Normal Weighing Status:
12		Tare weight
13		In Feeding Phases:
14		The target weight of the materiel which is feeding
15		In Discharging Phase:
16		The total target weight of all the materiels. All data is in ASCII format, and not include decemal pointer.
17		Carriage Return, CR (= 0DH)
18		Check sum. Valid when set to send check sum.

MT Cont-T600

The data format is the same with the mode of MT Continue mode.

Print Format

Print Allot

Current Allot List

Unit: Kg

No.	Target	Fact	Tol
1	510.0	509.5	-0.5
2	160.0	161.0	+1.0
3	200.0	200.5	+0.5
4	90.0	963.0	+2.0
	960.0	963.0	+3.0

Print Total

Dosage List

Unit: Kg

No.	Weight
1	12766
2	4012
3	5101
4	2383
Total:	24262

Print Recipe

Recipe Parameter

Unit: Kg

Recipe1 Parameter:

No	Target	Fine	Preact
1	0.00	0.00	0.00
2	0.00	0.00	0.00
3	0.00	0.00	0.00
4	0.00	0.00	0.00

Recipe2 Parameter:

No	Target	Fine	Preact
1	0.00	0.00	0.00
2	0.00	0.00	0.00
3	0.00	0.00	0.00
4	0.00	0.00	0.00

Recipe3 Parameter:

No	Target	Fine	Preact
1	0.00	0.00	0.00
2	0.00	0.00	0.00
3	0.00	0.00	0.00
4	0.00	0.00	0.00

The Mettler-Toledo factory that developed/manufactured/tested this product has passed:

- ISO9001 Quality Management System certification
- ISO14001 environmental management system certification
- GB/T28001 occupational Health and Safety Management System Certification

(Cover OHSAS18001 standards for all the technical content).

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