

**METTLER TOLEDO**

**IND140**

Industrial Weighing Terminal  
**TECHNICAL MANUAL**



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## INTRODUCTION

This publication is provided solely as a guide for individuals who have received Technical Training in servicing the METTLER TOLEDO product.

Information regarding METTLER TOLEDO Technical Training may be obtained by writing to:

METTLER TOLEDO

111 Changxi road, Changzhou, jiangsu

213001, P.R.C.

+86 (519) 664-2040

This manual correctly describes the operation and functionality of the IND140 Terminal

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Mettler-Toledo (ChangZhou) Scale & System Ltd.  
Legal Metrology



Declaration of Conformity  
Konformitätserklärung  
Déclaration de conformité  
Declaración de Conformidad  
Conformiteitsverklaring  
Dichiarazione di conformità

We

Mettler-Toledo (ChangZhou) Scale & System Ltd.  
111 ChangXi Road, ChangZhou, JiangSu, 213001, P.R.China

declare under our sole responsibility that the product,  
erklären, in alleiniger Verantwortung, daß dieses Produkt,  
déclarons sous notre seule responsabilité que le produit,  
declaramos, bajo nuestra sola responsabilidad, que el producto,  
verklaren onder onze verantwoordelijkheid, dat het product,  
dichiariamo sotto nostra unica responsabilità, che il prodotto,

Model/Type: IND140.XX/T600.XX

To which this declaration relates, is in conformity with the following standard(s) or other normative document(s),  
auf das sich diese Erklärung bezieht, mit/der/den folgenden Norm(en) oder Richtlinie(n) übereinstimmt.  
Auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s).  
Al que se refiere esta declaración es conforme a la(s) norma(s) u otro(s) documento(s) normativo(s).  
Waarmee deze verklaring verwijst, aan de volgende norm(en) of richtlijn(en) beantwoordt.  
A cui si riferisce questa dichiarazione è conforme alla/e seguente/i norma/e o documento/i normativo/i.

EC marking	EC Directive:	Applicable Standards:
	73/23/EEC Low Voltage Directive	EN60950
	89/336/EEC EMC Directive	EN55022:1998+A1
For non-automatic weighing instrument used in an Article 1,2 (a) application, additional metrological marking according to Annex IV of Council Directive 90/384/EEC must be attached to the instrument		
year 0103	90/384/EEC Non-automatic Weighing Instruments Directive	EN45501 1)

1) valid only for IND140.XX/T600.XX in connection with approved load cells.

111 ChangXi Road ,ChangZhou, JiangSu,213001,PRC,June,2004,Mettler-Toledo (ChangZhou) Scale & System Ltd.

Yang JiaWu  
Quality Assurance Manager

## PRECAUTIONS

**READ** this manual before operation or servicing this equipment.

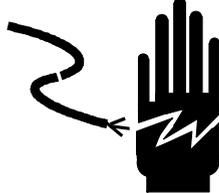
	 <b>WARNING</b>
	<p>DISCONNECT ALL POWER TO THIS UNIT BEFORE INSTALLING, SERVICING, CLEANING, OR REMOVING THE FUSE. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.</p>

**FOLLOW** these instructions carefully.

	 <b>CAUTION</b>
	<p>OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.</p>

**SAVE** this manual for future reference.

**DO NOT** allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment.

	 <b>WARNING</b>
	<p>ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.</p>

**ALWAYS DISCONNECT** this equipment from the power source before cleaning or performing maintenance.

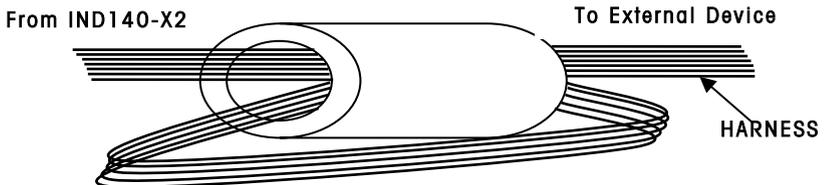
	 <b>WARNING</b>
	<p>FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD, CONNECT TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG.</p>

**CALL METTLER TOLEDO** for parts, information, and service.

 <b>CAUTION</b>
<p>BEFORE CONNECTING OR DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT, ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT, OR BODILY HARM.</p>

**Note:** If the unit has been stored or transported in below freezing temperatures, allow the unit to warm up to room temperature before turning on AC power.

 <b>CAUTION</b>
<p>ALL EXTERNAL I/O WIRING OF THE IND140-X2 ARE THROUGH THE BEAD CORES IN ORDER TO THE RADIO INTERFERENCE REQUIREMENTS OF COMMUNICATIONS.</p> <p>The following drawing is using sketch.</p>



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## INTRODUCTION

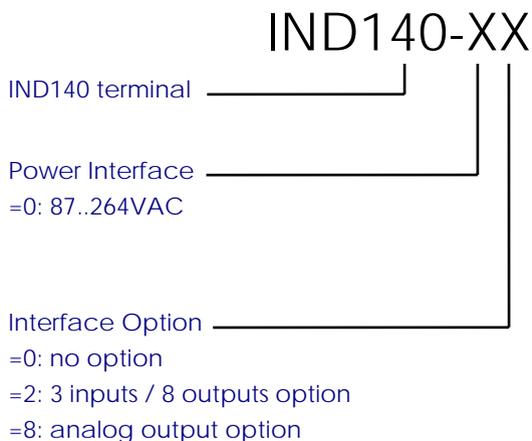
This manual provides detailed information for installing, programming, and servicing the IND140 Industrial Weighing Terminal.

Review all instructions and safety precautions carefully. Installation and service procedures should be performed only by authorized personnel.

If you encounter problems not covered in this manual, please contact your local authorized METTLER TOLEDO representative.

## MODEL IDENTIFICATION

Use the information below to confirm the correct model number for the IND140 terminal with which you will be working. The model number is found on the data plate on the top side of the IND140 terminal.



## **SPECIAL FEATURES**

### **For use e.g. in**

- Batching -
- Bagging -
- Filling System -
- Weighing System -

**OIML class up to 3000d** (*in preparation*)

**Driver up to 6 load cells 350Ω**

**1x RS-232/485, Modbus protocol supported**

**Metal (aluminum & stainless steel) housing**

**Power-in: 87...265V AC / 49...63Hz**

**Dual Numeric LED Displayers & 10 LED indications**

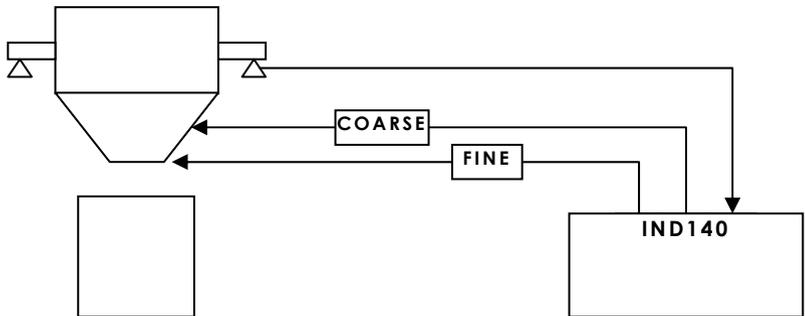
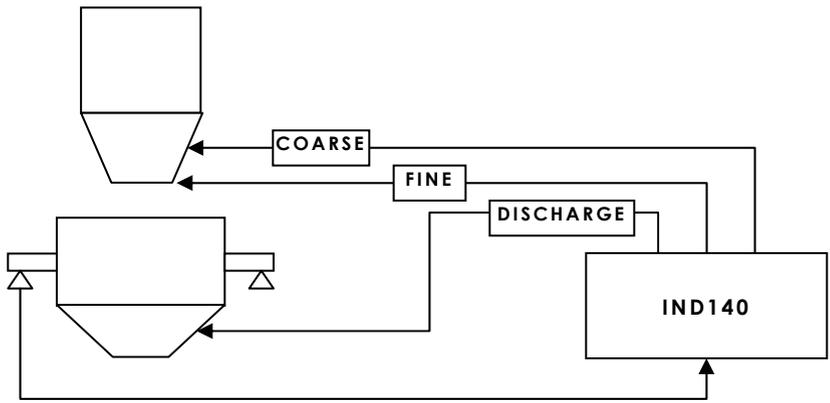
**4 membrane keys**

### **Process Control Interface:**

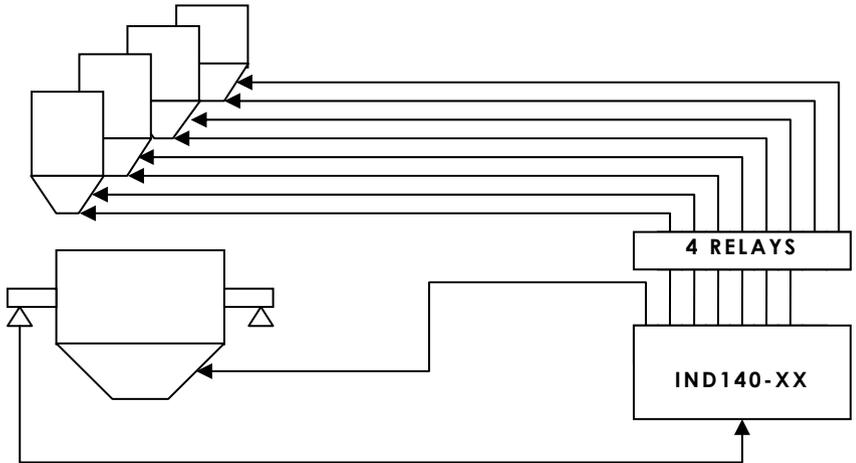
- 1x Input, 4x Output (OC-type) (for IND140-00/08 modes)
- 3xInput, 8xOutput (OC-type) (for IND140-02 modes)
- Analogue output 4-20mA, 0-10V (for IND140-08 modes)

## APPLICATION EXAMPLES

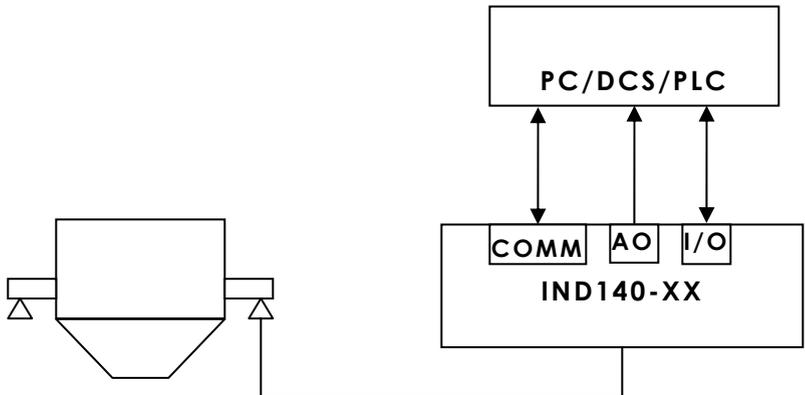
### -Bagging/Drum-filling



**-Batching**



**-Weighing in System**



# INSTALLATION

## WARNINGS/PRECAUTIONS

ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CASE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

## INSPECTION AND CONTENTS CHECKLIST

If you will be responsible for installing the IND140 terminal, please follow the procedures listed here.

If the IND140 terminal's shipping container appears damaged upon delivery, check inside for damage. File a freight claim with the carrier if necessary.

If the container was undamaged, unpack the container if you have not already done so. Keep the original packing materials for future use.

Make sure the IND140 terminal package contains the following:

- ✓ IND140 industrial weight terminal
- ✓ IND140 technical manual
- ✓ Small size screw driver
- ✓ Spare fuse (0.5A/240VAC, only for IND140-00/02/08)
- ✓ 100Ohm/.25W Resistor for RS-485 connection

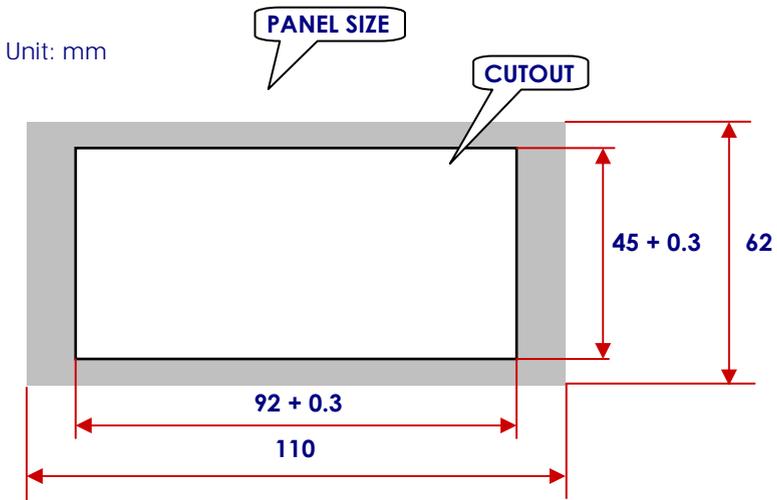
## PHYSICAL DIMENSIONS

The IND140 terminal measures:

- ✓ 4.33 in. ( 11cm ) wide x 2.44 in. ( 4.5 cm ) high at the front of the terminal; 6 in. ( 15 cm ) depth.

The enclosure of IND140 is designed to be mouted into a panel. The front panel and associated panel clamping mechanism are designed to provide a NEMA 4 (IP65) seal and accommodate a panel thickness from 10 to 16 gauge.

Refer to the following cutout diagram when installing the terminal.



## LOCATION/ENVIRONMENT

The first step in installing the IND140 terminal is to select the best location. Keep the following in mind:

- ✓ The IND140 terminal should only be operated between a temperature range of 14 to 104 °F (-10 to 40 °C) at 10% to 95% humidity, noncondensing.
- ✓ The storage temperature range for the IND140 terminal is from -40 to 140 °F (-40 to 60 °C ) at 10% to 95% humidity, noncondensing.
- ✓ The IND140 terminal panel meets NEMA 4X (IP65) requirements for a dust-tight and splash-proof enclosure, the rest meets IP2x requirements.

THE IND140 TERMINAL IS NOT INTRINSICALLY SAFE! DO NOT USE IN AREAS CLASSIFIED AS HAZARDOUS BY THE NATIONAL ELECTRIC CODE (NEC) BECAUSE OF COMBUSTIBLE OR EXPLOSIVE ATMOSPHERES.

Contact your authorized METTLER TOLEDO representative about hazardous area applications.

## TECHNICAL DATA

Model	IND140
Physical Dimensions	Width x Height x Depth: 110 x 62 x 150 mm Cut out size: 92 x 45 mm
Construction	Panel-mount; Metal housing and Stainless steel front panel
Protection Level	IP65 rating for front panel; IP2x rating for rest.
Power	Universal AC power supply works with 87...265 VAC single phase power sources; The fuse of 1A/250VAC is used in terminal, the size of fuse is 5 x 20mm.
Operating Temperature	-10°C to 40°C (14°F to 104°F)
Display	12 x digital LED (Green-Yellow); 12 x LED cursors (Green-Yellow);
Keypad	4 membrane keys
Beeper	Beeper could be enabled or disabled. Short beep: valid operation Long beep: invalid operation or scale overload Continuous beep: alarm or calibrating
Scale Interface	6-wires load cell interface, support maximum of 4...6 x 350ohm analog load cells

# ELECTRICAL CONNECTIONS

## POWER REQUIREMENTS

The terminal is provided with a universal power supply which operates from 87 to 265 VAC. The supply operates with a line frequency of 49 to 63 Hz. Power consumption is 12 Watts maximum.

- ✓ The power cord should connect to 'L' and 'N' terminals, '  ', needs to be connected to earth ground with good conditions.
- ✓ The integrity of the power ground for equipment is important for both safety and dependable operation of the IND140 terminal and its associated load cells. A poor ground can result in an unsafe condition if an electrical short develops in the equipment. A good ground connection is needed to minimize extraneous electrical noise pulses. The IND140 should not share power lines with noise-generating equipment. To confirm ground integrity, use a commercial branch circuit analyzer. If adverse power conditions exist, a dedicated power circuit or power line conditioner may be required.

## ANALOG LOAD CELL CONNECTIONS

Disconnect the power cord to the IND140 terminal. Make the appropriate load cell connection to the Main PCB for load cells.

- ✓ TO AVOID DAMAGE TO THE PCB OR LOAD CELL, REMOVE POWER FROM THE IND140 TERMINAL AND WAIT AT LEAST 30 SECONDS BEFORE CONNECTING OR DISCONNECTING ANY HARNESS.

The maximum cable length for analog load cell connections to the IND140 terminal depends on the total scale resistance (TSR) of the scale base. To calculate TSR:

$$\text{TSR} = \text{Load Cell Input Resistance (Ohms)} / \text{Number of Load Cells}$$

This chart gives recommended cable lengths based on TSR and cable gauge.

The IND140-00 terminal can drive up to six 350 Ohm analog load cells.

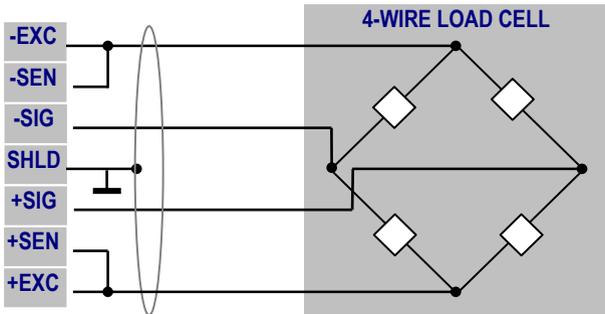
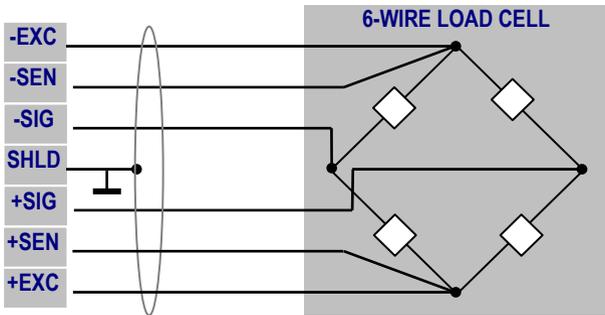
The IND140-08 terminal can power up to four 350 Ohm analog load cells.

Recommended Maximum Cable Length			
TSR (Ohms)	24 Gauge (feet)	20 Gauge (feet)	16 Gauge (feet)
350	800	2000	4000
87	200	600	1000
58	120	350	600

Once the length of the cable is determined, connect to load cell interface of the IND140 terminal main PCB. The pinout for this interface is labeled on the top of the terminal. The following diagrams describe the IND140 terminal analog loadcell terminal strip wiring for standard 6-wire cable, Masstron 6-wire cable, and standard 4-wire cable.

- ✓ If an increase in load results in a decrease in weight display, reverse the signal wires

Loadcell interface marks	Mastron 6-wire loadcell cable	Standard 6-wire load cell cable	Standard 4-wire load cell cable
+EXC	Black	White	Black (short two pins)
+SEN	Blue	Yellow	
+SIG	Red	Green	Red
SHLD	Yellow	Orange	Yellow or orange
- SIG	White	Black	White
- SEN	Brown	Red	Green
- EXC	Green	Blue	Green (short two pins)



### Minimum Increment Size for Analog Scale Input

The minimum increment size selection for an analog scale input is determined by total load cell capacity. Solve the following equation for calculating the minimum increment.

**Minimum Increment size**

$$= ( \text{LC Capacity} \times \text{Ratio} \times \text{uV per increment} ) / ( \text{cell output} \times \text{excitation} )$$

Load cell output is rated in mV/V (millivolts per volt of excitation), marked on load cell data tag. METTLER TOLEDO load cells are typically 2 mV/V. Other load cells can range from 1 mV/V to 3mV/V; The load cell capacity is the rated capacity marked on load cell data tag. The ratio is the total number of load cells in the system or the total lever ratio (if scale is a mechanical lever system conversion).

**Sample Calculation**

Refer to the following example of mV per increment calculation for a hopper scale installation.

✓ Load Cell Capacity	2500 kg
✓ Number of Load Cells	4
✓ Load Cell Output	2mV/V
✓ IND140 Excitation Voltage	10 VDC
✓ IND140 Minimum Input Signal per Increment	1uV/Inc

Use the following formula to calculate the minimum increment size:

**Minimum Increment size**

$$= ( \text{LC Capacity} \times \text{Ratio} \times \text{uV per increment} ) / ( \text{cell output} \times \text{excitation} )$$

Substituting this hopper scale parameters in the formula:

**Minimum Increment Size**

$$= ( 2500 \text{ kg} \times 4 \text{ load cells} ) / ( 2 \text{ mV/V} \times 10\text{V} / 1 \text{ uV} )$$

$$= ( 2500 \text{ kg} \times 4 \text{ load cells} ) / 20000$$

$$= 0.5 \text{ kg}$$

Acceptable weighing performance can be obtained when a selected increment size minimum is greater than 0.5 kg. At full scale, the maximum load cell output may not exceed 30mV.

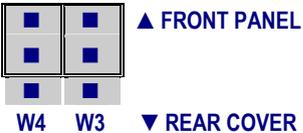
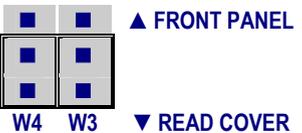
## SERIAL PORT

The serial port is bidirectional. It supports several communication protocols, as well as transmit data to a printer or remote display etc.

The serial port can be choised between RS-232 and RS-485 by just jumping the jumpers on the main PCB.

The maximum recommended cable length for RS-232 communications is 50 feet ( 15 meters), for RS-485 communications is 1000 feet ( 330 meters).

Parameter F3.5 must be set to 1 if RS-485 communication is selected.

PIN MARKS	JUMPERS POSITION	
	RS-232 type	RS-485 type
	 <p>▲ FRONT PANEL</p> <p>▼ REAR COVER</p>	 <p>▲ FRONT PANEL</p> <p>▼ REAR COVER</p>
<b>RXD/485B</b>	RXD	485B
<b>TXD/485A</b>	TXD	485A
<b>GND</b>	GOUND	GND

➤ **METTLER TOLEDO factory default is RS-232 type.**

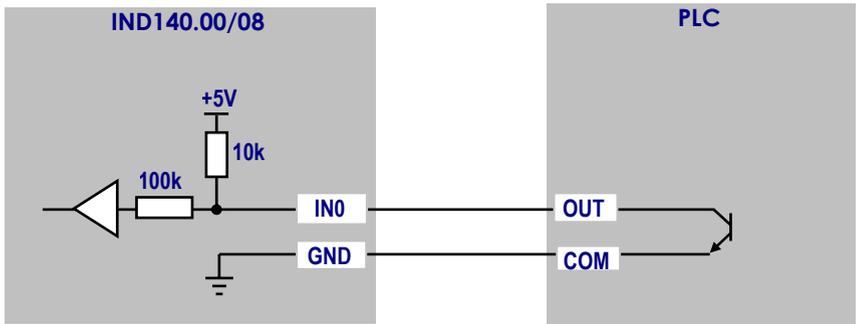
## DISCRETE INPUT WIRING

The IND140 terminal provides the internal voltage for discrete input logic circuit. DO NOT provide any voltage to these discrete inputs.

### IN0 Discrete Input

The input connections must be referenced to ground. A switch or relay contact may be used to make this connection. The remote device should hold the input at logic ground [GND] for at least 100 ms. Batch functions are performed when the input is held to ground (leading edge triggered). IN0 is non-isolated input. The maximum recommended cable length between the remote device and the IND140 terminal is 10 feet (3 meters).

#### Connect to PLC



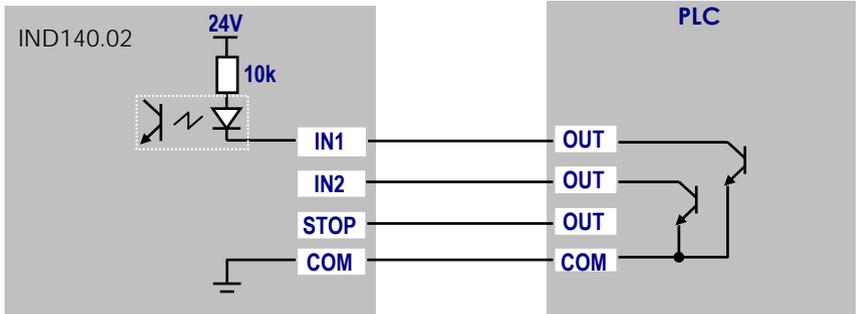
#### Connect to external switches or push buttons



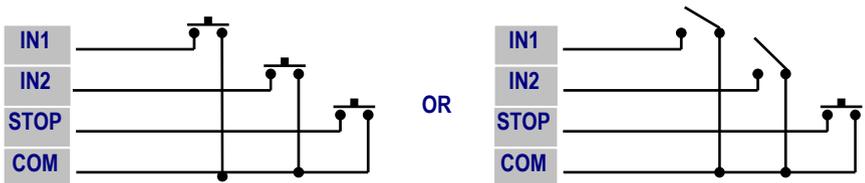
### IN1/IN2/STOP Discrete Input

The input connections must be referenced to COM. A switch or relay contact may be used to make this connection. The remote device should hold the input at logic ground [COM] for at least 100 ms. Batch functions are performed when the input is held to COM (leading edge triggered). IN1/IN2/STOP is optically isolated inputs. The maximum recommended cable length between the remote device and the IND140 terminal is 100 feet (30 meters).

#### Connect to PLC



#### Connect to external switches or push buttons



## **DISCRETE OUTPUT WIRING**

Discrete Outputs are negative-true, open collector type. External voltage supply is needed for discrete outputs.

### **Discrete Outputs on the main curcle board**

This outputs ( work with GND pinout ) can sink up to 20mA of current and have a maximum voltage of 26 volts DC from an external source. These discrete outputs are non-isolated.

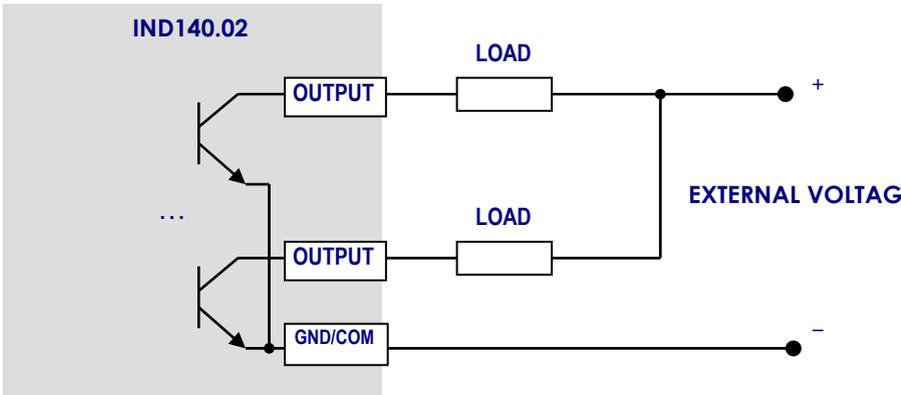
The maximum cable length between the remote device and IND140 terminal is 10 feet (3 meters).

### **Discrete Outputs on the option board (IND140-02)**

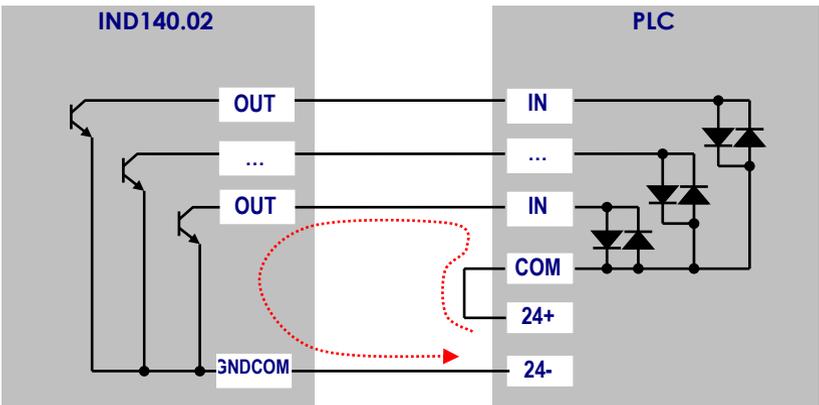
This outputs ( work with COM pinout ) can sink up to 300mA of current and have a maximum voltage of 60 volts DC from an external source. These discrete outputs are optically isolated.

The maximum cable length between the remote device and IND140 terminal is 100 feet (30 meters).

### Connect to Relays or Actuators



### Connect to PLC



## **ANALOG OUTPUT**

➤ *ONLY IND140-08 HAS THIS INTERFACE*

The Analog Output Option Interface provides a channel isolated 4-20 mA or 0-10 VDC analog signal output for gross weight or displayed weight. The outputs will be low when the displayed weight is at zero. When the displayed weight reaches maximum capacity, the outputs will increase to the maximum (20 mA or 10 VDC or specified analog). Any weight between zero and full capacity will be represented as a percentage of the output proportional to the percentage of full scale capacity. The Analog Output sub-menu lets you select the data source and calibrate analog zero and full-scale values. The IND140 terminal must be calibrated to the desired scale before making Analog Output adjustments.

## CONNECTIONS

### Cable

The maximum recommended cable length for the 0-10VDC output is 50 feet ( 15 meters ). The recommended cable for use with the analog output is shielded 2-conductor stranded 20 gauge cable (Belden #8762 or equivalent).

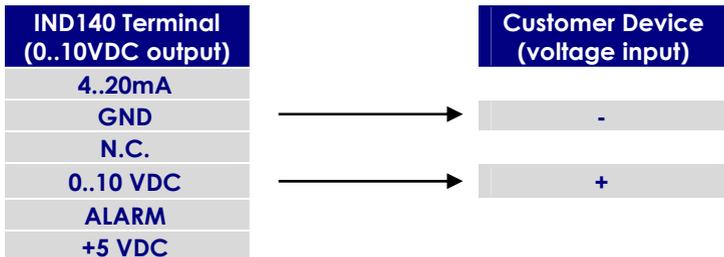
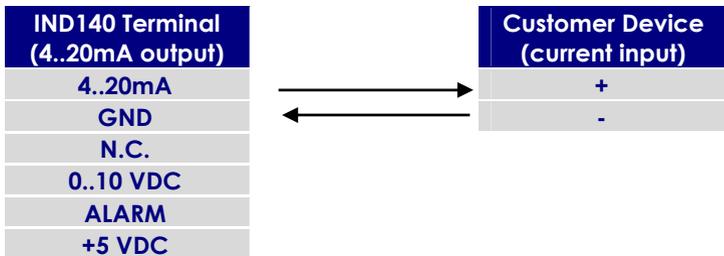
### Recommended Load Resistance

0...10VDC - 100k ohms minimum

4...20 mA - 500 ohms maximum

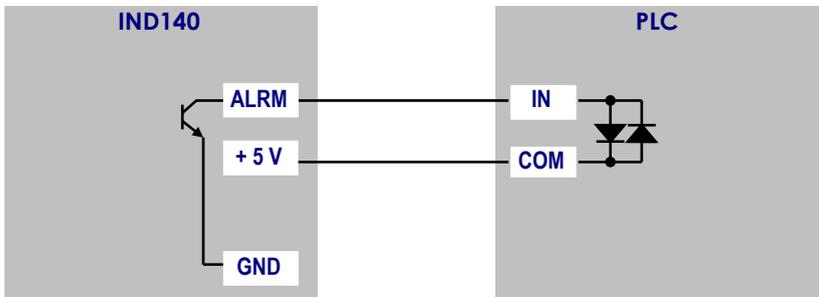
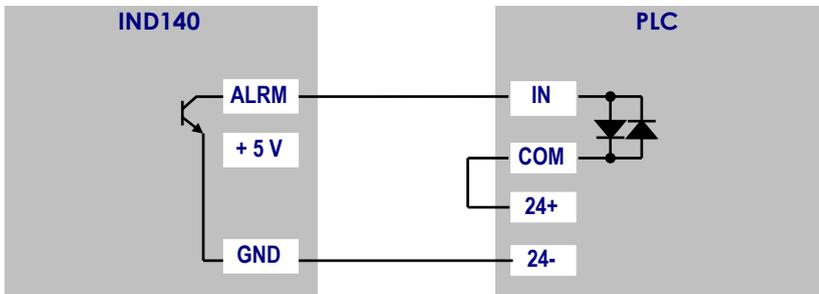
### Wiring

The Analog Output terminal strip is shown below.



The ALARM Output (Alarm) is a normally open connection to the GND Terminal during normal operation. If the IND140 terminal weight display goes to an over capacity or under zero display, or Setup is entered, the connection closes and the ALARM Output will be capable of sinking up to 30mA DC. The voltage source can be the +5V supplied with the Analog Output Option PCB or a maximum of +26 VDC external source.

The ALARM Output Connects to PLC



## MAIN PCB JUMPERS

### W1 JUMPER

On: Setup & Calibration Enable

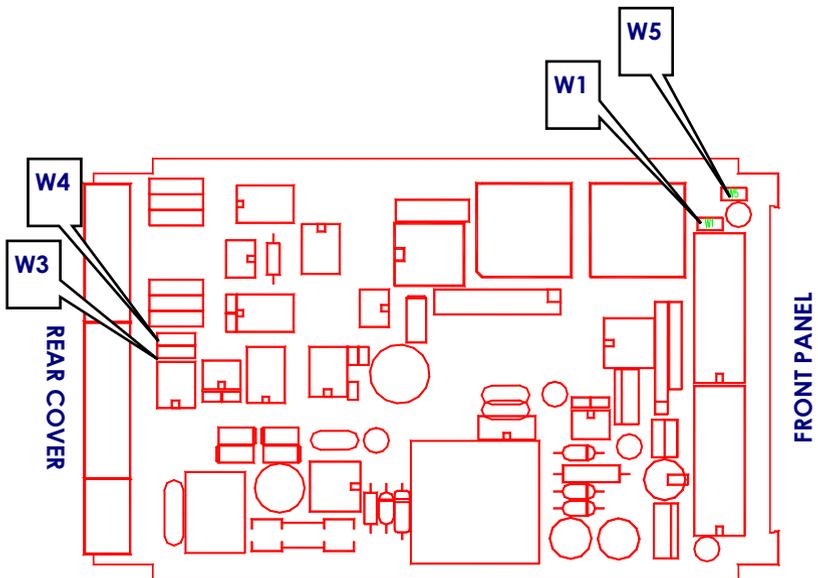
Off: Normal Operation = Off

### W5 JUMPER

Not Used

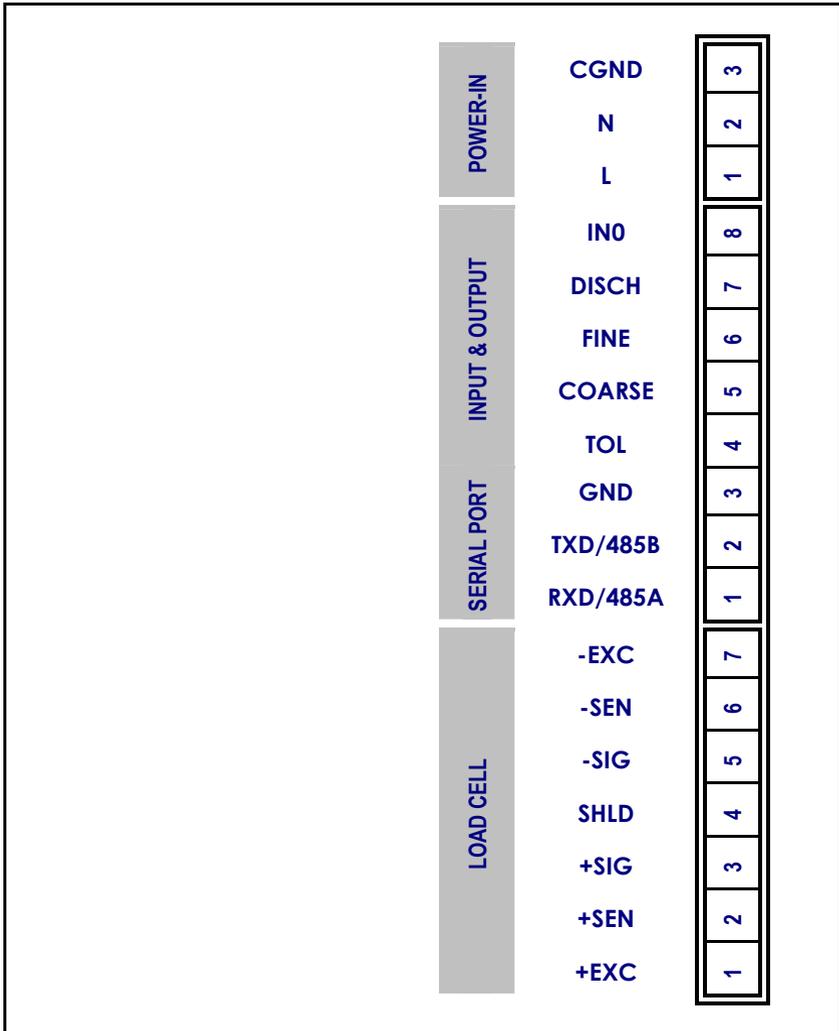
### W3/W4 JUMPERS

For RS-232 / RS-485 select, see "SERIAL PORT" part for detail.

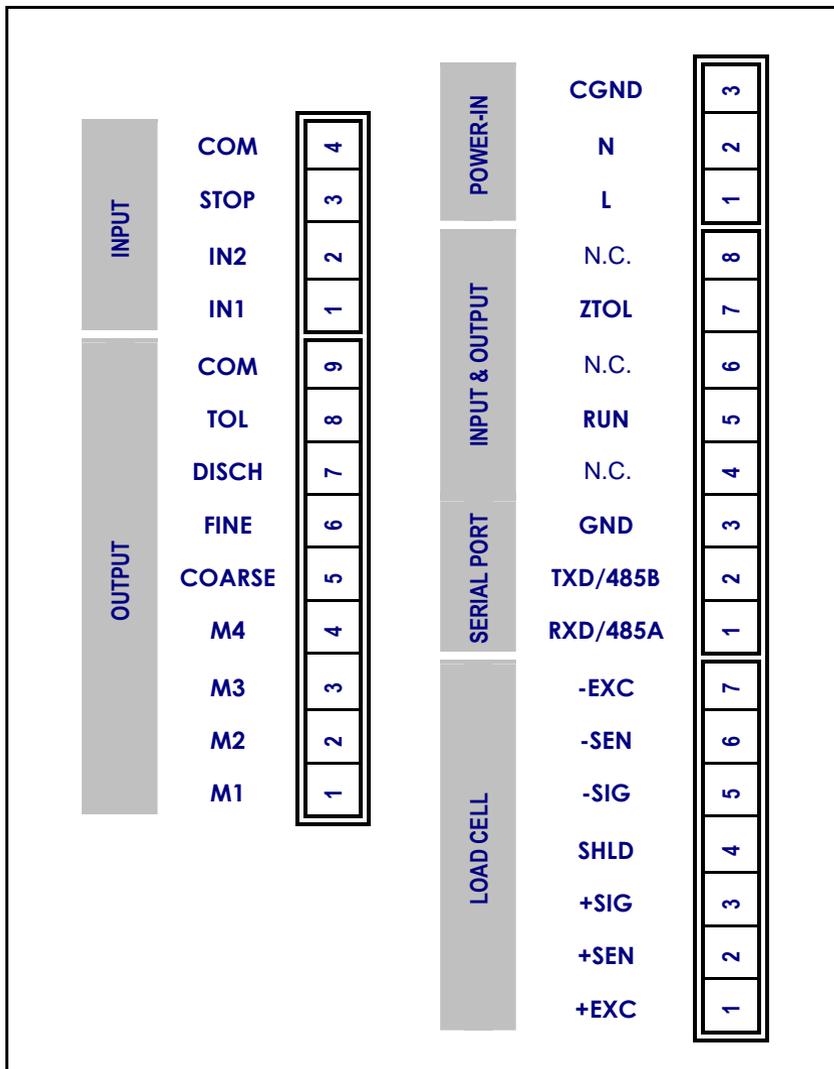


APPENDICES

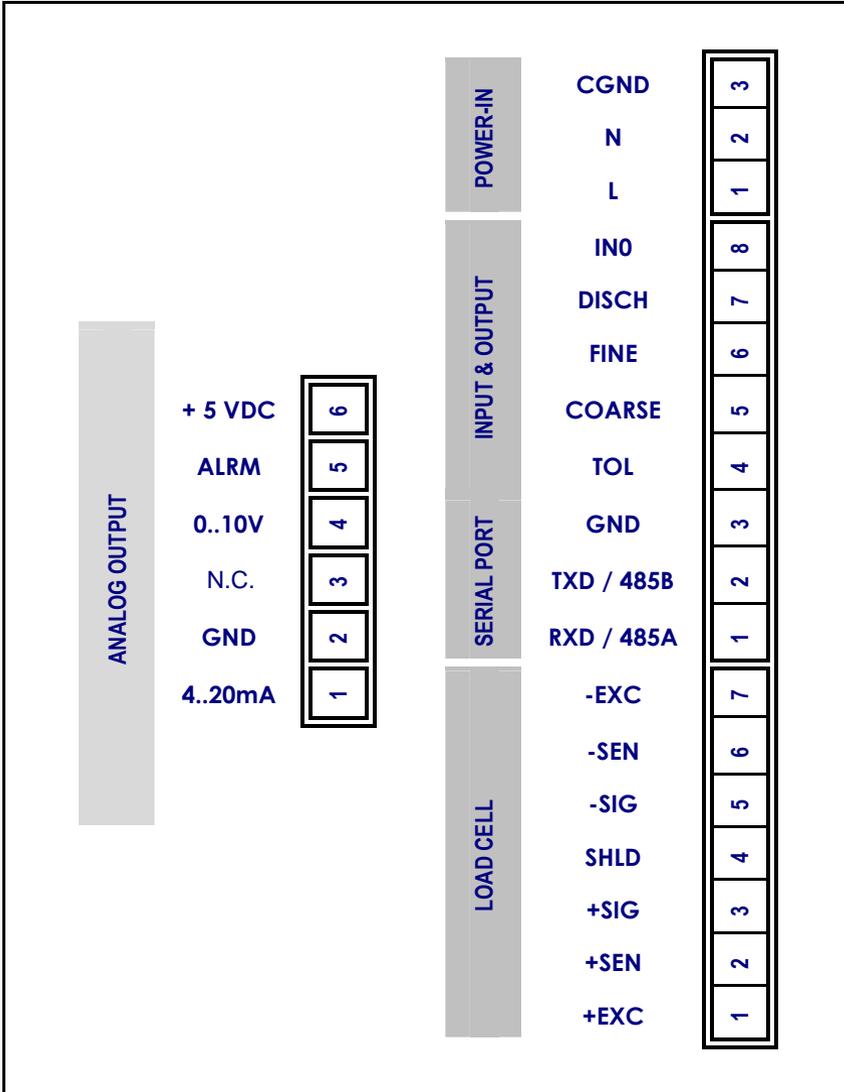
IND140-00 REAR COVER



IND140-02 REAR COVER

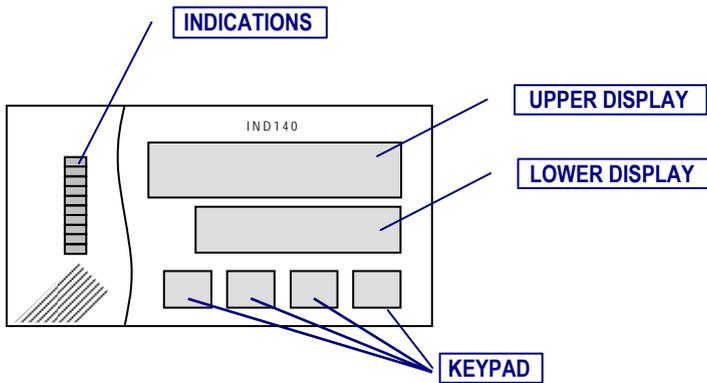


**IND140-08 REAR COVER**



# OPERATIONS

## FRONT PANEL



## DISPLAY INFORMATION AT POWER UP

As power up, a display segment test is followed by:

- ✓ All segments light after power up;
- ✓ Then the upper displayer shows the part number of the terminal software, the lower one shows the version information of the software; (require providing these informations for terminal repairing or replacing)
- ✓ Display the terminal address if the address is not zero;
- ✓ If there is no unfinished batch procedure before last power failure, or  $F6.10 = 0$ , then

The display weight is automatically set to zero if the weight is in the range of power-up-zero-weight (this range is set up in parameter F2.2.1); Then the terminal goes to normal weighing mode.

- ✓ If there is an unfinished batch procedure before last power failure, and  $F6.10 = 1$ , then

The Terminal goes to batch hold status, You may go on the unfinished batch procedure, or just stop it. Refer to the following chapter for detail operations.

### **WARNING**

*when  $F6.10 = 1$ , if there is an interference of power supply, it may bring on to lost stored setup parameters in the EEPROM.*

## NUMERIC DISPLAYERS DESCRIPTION

When in normal weighing mode ([GROSS] or [NET] cursor lights):

DISPLAYER	NORMAL WEIGHING	INSTRUCTION SELECT
UPPER	Gross or Net weight	Instruction Name
LOWER	Null or Tare weight	Null

When in batching process ([RUN] cursor lights):

DISPLAYER	MATERIAL FEEDING	MATERIAL DISCHARGING	INSTRUCTION SELECT
UPPER	The net weight of Material which is feeding	The total weight of all material on the scale	Instruction Name
LOWER	The target weight of material which is feeding	The total target weight of all materials	Null

When in recipe setup or programming mode:

DISPLAYER	SETUP MODE
UPPER	Setup Item name
LOWER	Item parameter

## INDICATION CURSORS

CURSOR	LIGHTING	FLASHING
>>	Material coarse feeding	-
>	Material fine feeding	-
Disch	Material(s) discharging	-
M1	Material 1 has feed	Material 1 is feeding
M2	Material 2 has feed	Material 2 is feeding
M3	Material 3 has feed	Material 3 is feeding
M4	Material 4 has feed	Material 4 is feeding
Run	Batch is running	Batch is held
Zero	The gross weight is within 0.25 division	-
Motion	The scale is in motion	-
Gross	the upper display shows gross weight,	
Net	the upper display shows net weight, the lower display shows tare weight.	

## BEEPER

- ✓ The beeper can be disabled by the parameter F2.7.

BEEP	DESCRIPTION
SHORT BEEP	The key operating is valid.
LONG BEEP	The key operating is invalid.
CONTINUAL SHORT BEEP	Calibration is in processing, or an inner error of terminal occurs (please refer to the error code which is displaying in the upper displayer, quit the error display by press any key), or The weight is not in valid display range (over or under range), or The weight is not change while in feeding or discharging process.

## KEY OPERATION

				
Gross weight is displaying ([GROSS] cursor lights)	“ZERO”	“TARE”	“SELECT”	“PRINT”
Net weight is displaying ([NET] cursor lights)	-	“CLEAR”	“SELECT”	“PRINT”
Batch is running ([RUN] cursor lights)	-	“SKIP”	“SELECT”	-
Instruction is displaying	“RETURN”	-	“SELECT”	“ENTER”
In recipe or parameter setup menu.	“RETURN”	-	“SELECT”	“ENTER”
Change parameter or selection	“ABORT”	“CHANGE”	-	“ACCEPT”
Editing a numeric data	“ABORT”	“CHANGE”	“SHIFT”	“ACCEPT”

### “ZERO” key

The ZERO key is used to compensate for small changes in weight when the scale platform is empty. These changes in weight are most often caused by material spilling onto the weighing platform. To zero the indication of weight, press this button.

When the current weight is in valid zero range (this range is set up in F2.2.2), and the scale is not in motion status ([MOTION] cursor is dead) :

Press this key will zero the scale, the gross weight goes to zero, and [ZERO] cursor lights.

**“TARE” key**

The TARE key is used subtract the weight of the object on the scale platform from subsequent indications of weigh. This is most often the weight of an empty container. Once this value is “tared”, the indication of weight will change to indicate net weight. To tare the Scale, place an empty container on the scale and press this button.

When the tare function is enable (F2.1=1), and the scale is not in motion ([MOTION] cursor is dead), press this key will tare the gross weight to net zero.

When the preset tare function is enable (F2.1=2), press this key, the lower displayer shows the tare data (If tare has never been preset or preset tare is zero, the default preset tare equals the present gross weight), Then press “PRINT” key will accept the displayed tare data;

or entry new preset tare, then press “PRINT” key to accept the new tare data, if the entried preset tare is zero, press “PRINT” key will tare the present gross weight to zero. Any time, abort the tare function by pressing “ZERO” key.

**“SELECT” key**

Repeatedly press this key to recall the instructions, the upper displayer shows instruction name.

**“PRINT” key**

(While F3.3=1 or 2)

When the scale is not in motion ([MOTION] cursor is dead), press this key will cause the weight data outputing from the terminal’s serial communication port.

**“CLEAR” key**

The CLEAR key is used to clear a previously entered tare value. To clear the tare value, press this button, the indication of weight will return to the gross mode, showing the total weight of the objects on the scale platform.

**“SKIP” key**

skip the current batch phase, and go to next phase.

**“ENTER” key**

Press this key will execute the present instruction, or goes into sub menu of the present instruction.

**“RETURN” key**

Return to above menu.

**“ABORT” key**

Abort data entry or parameter selection procedure.

**“CHANGE” key**

changes the numeric data entry digit (flashing digit) from 0 to 9.

**“SHIFT” key**

Shifts the flashing digit to next place.

**“ACCEPT” key**

Accepts and terminates a data entry.

## BATCH OPERATIONS

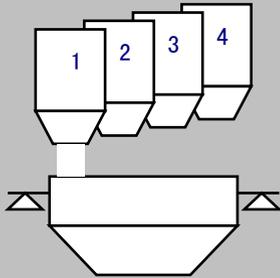
### BATCH PROCESS

Normally, in a batch process, all materials will sequentially feed into mixer (a scale), then opening the valve to discharge these materials. IND140 terminal could handle up to 4 materials feed and discharge. For 4 materials batching, there is a maximum of 5 phases for each batching loop. IND140 terminal could provide 4 batch modes to manage these 5 phases.

You may control these phases from keypad, or discrete input port, or serial port.

	5 PHASES OF BATCH PROCESSING				
	M1 FEED	M2 FEED	M3 FEED	M4 FEED	DISCHARGE
BATCH MODE 1 (F6.6=1/F6.7=1)	FEEd 1	FEEd 2	FEEd 3	FEEd 4	DiSch
	The feeding sequence is discretional				
BATCH MODE 2 (F6.6=1/F6.7=0)	FEEd 1	FEEd 2	FEEd 3	FEEd 4	Auto Discharge
	The feeding sequence is discretional				
BATCH MODE 3 (F6.6=0/F6.7=1)	FEEd				DiSch
BATCH MODE 4 (F6.6=0/F6.7=0)	run				

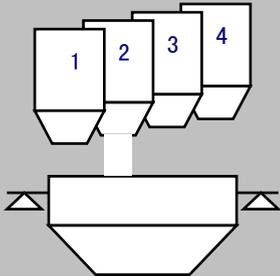
**FEEd 1 phase**



**Discrete Outputs**

- >>
- >
- Disch
- M1
- M2
- M3
- M4

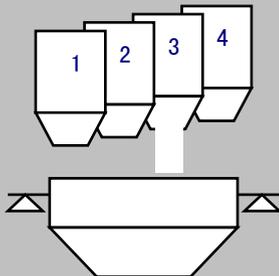
**FEEd 2 phase**



**Discrete Outputs**

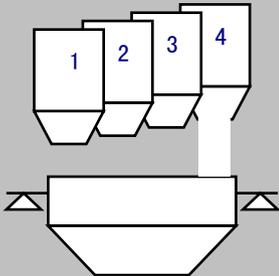
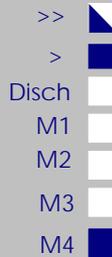
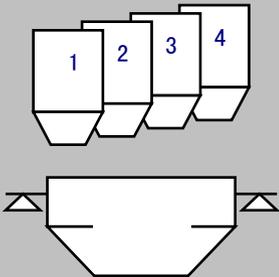
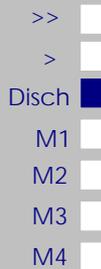
- >>
- >
- Disch
- M1
- M2
- M3
- M4

**FEEd 3 phase**



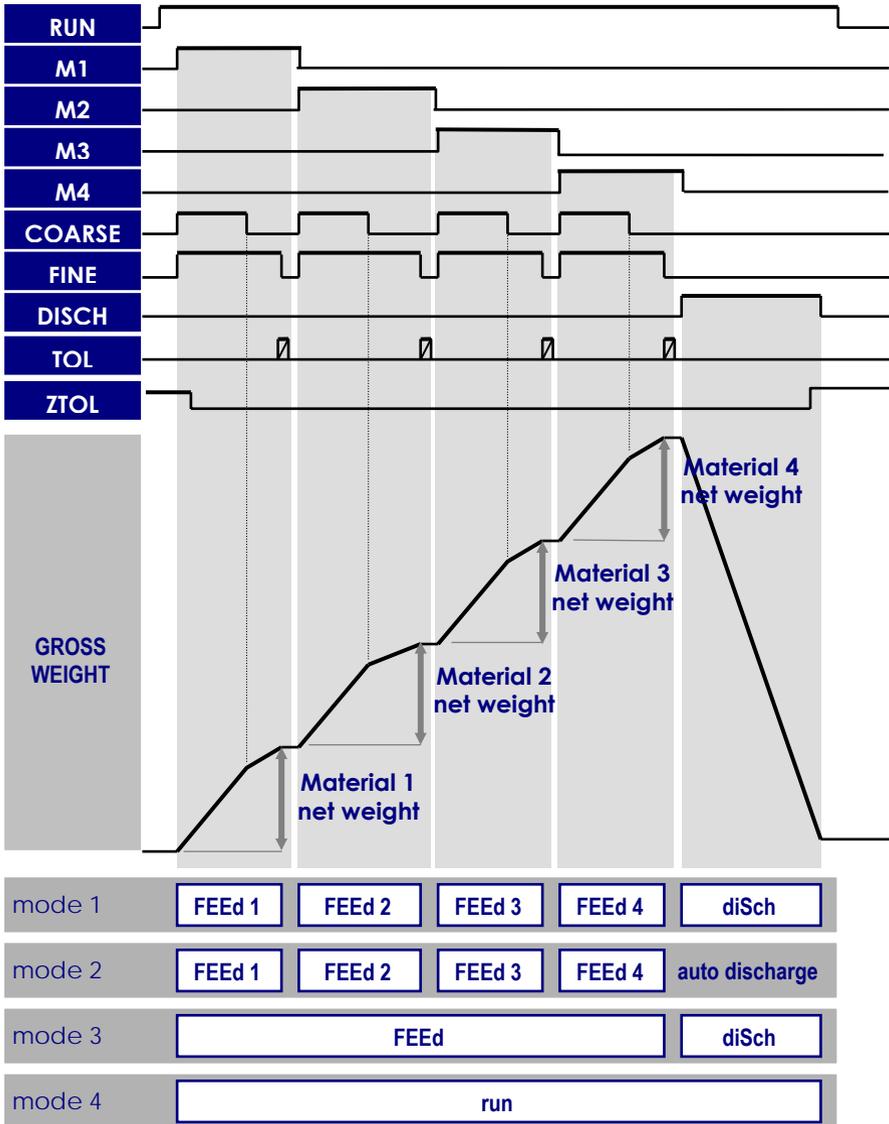
**Discrete Outputs**

- >>
- >
- Disch
- M1
- M2
- M3
- M4

**FEEd 4 phase****Discrete Outputs****diSch phase****Discrete Outputs****WARM-RESTART CAPABILITY**

IND140 has full warm-restart capability. If the IND140 needs to be restarted for any reason, such as a power outage, it can restart all batches in exactly the same state as when the system stopped. This allows production to continue without interruption, saving your time and materials.

TYPICAL BATCHING CYCLE



**DEFINITIONS OF DISCRETE INPUT AT BATCH MODE 1 / 2:**

INPUTS	DEFINE	DESCRIPTION
IN1	INSTRUCTION SELECT	After this pin shorts to COM for 100ms, the terminal will display next batch instruction.
IN2	INSTRUCTION IMPLEMENT	After this pin shorts to COM for 100ms, the terminal will implement the displaying batch instruction.
STOP	BATCH STOP	After this pin shorts to COM for 100ms, the terminal will force to stop the current batch process.

**DEFINITIONS OF DISCRETE INPUT AT BATCH MODE 3:**

INPUTS	DEFINE	DESCRIPTION
IN0	IMPLEMENT NEXT PHASE	After this pin shorts to GND for 100ms, the terminal will start the next batch phase.
IN1	FEED	After this pin shorts to COM for 100ms, the terminal will start the feed phase.
IN2	DISCHARGE	After this pin shorts to COM for 100ms, the terminal will start the discharge phase.
STOP	BATCH STOP	After this pin shorts to COM for 100ms, the terminal will force to stop the current batch process.

**DEFINITIONS OF DISCRETE INPUT AT BATCH MODE 4:**

INPUTS	DEFINE	DESCRIPTION
IN0	BATCH START	After this pin shorts to GND for 100ms, IND140 will start a new batch process or continue the held batch.
IN1	BATCH START	After this pin shorts to COM for 100ms, IND140 will start a new batch process or continue the held batch.
IN2	BATCH HOLD	After this pin shorts to COM for 100ms, IND140 will force to halt the current batch process.
STOP	BATCH STOP	After this pin shorts to COM for 100ms, IND140 will force to stop the current batch process.

**DEFINITIONS OF DISCRETE OUTPUT**

<b>OUTPUTS</b>	<b>DEFINE</b>
<b>M1</b>	Enable Material 1 feeding
<b>M2</b>	Enable Material 2 feeding
<b>M3</b>	Enable Material 3 feeding
<b>M4</b>	Enable Material 4 feeding
<b>COARSE</b>	Material coarse feeding
<b>FINE</b>	Material fine feeding
<b>DISCH</b>	Mixed Materials discharge
<b>TOL</b>	<p>If parameter F6.11 is '0', 'TOL' function is:                      The result of last material feeding is out of tolerance                      This signal lasts for 0.5 second.                      (the tolerance is defined by F6.4A parameter)</p> <p>If parameter F6.11 is not '0', 'TOL' function is:                      If the gross weight is greater than setpoint (setpoint is set in F6.11 item) more than a specified time (time is set in F6.11A item), 'TOL' activates high.</p>
<b>ZTOL</b>	The current gross weight is in the zero range (the range is defined by F6.1 parameter)
<b>RUN</b>	Batch is running or held.

## OPERATION INSTRUCTION LIST

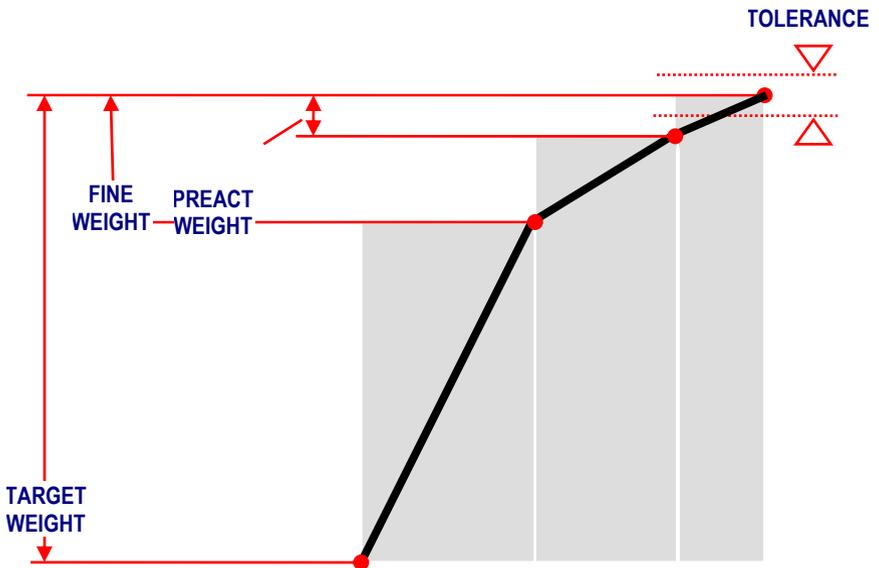
INSTRUCTION	DESCRIPTION	THE CONDITIONS OF THE INSTRUCTION AVAILABILITY
FEEd 1	Start the M1 auto feeding	While in batch mode 1 or 2:
FEEd 2	Start the M2 auto feeding	This material is enable (see also F6.8); And the target weight of this material is not null; And this material is not feed yet; And no feeding or discharging in present.
FEEd 3	Start the M3 auto feeding	
FEEd 4	Start the M4 auto feeding	
FEEd	Start all materials sequentially feeding	While in batch mode 3 or 4: The present recipe is not null, and these materials are not feed yet, and no feeding or discharging in present.

<b>DISCH</b>	Start the discharging	While in batch mode 1: At least one material has feed, and no feeding or discharging at present. While in batch mode 3: All materials have feed, and no feeding or discharging at present.
<b>Hold</b>	Hold the batch process	A material feeding or discharging at present.
<b>STOP</b>	Stop th current batch process	The batch is running or held.
<b>run</b>	Start batching, or continue the held batch	Batch is held or not running ([RUN] cursor is dead or flashing)
<b>rEPort</b>	Print out report of last batch result	F3.3=1 or 2, and a batch has finished.
<b>AccPrt</b>	Print out the material consumption list.	F3.3=1 or 2
<b>rECIPE</b>	Recipe setup menu	
<b>SETUP</b>	Parameter setup and Calibration menu  <b>You need enter the setup mode by pressing and holding "ENTER" key untill the [ on ] is displayed in the upper displayer.</b>	<b>The Jumper W1 is shorted.</b>

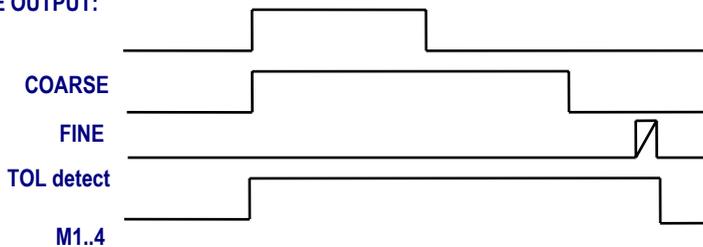
# RECIPE, SETUP AND CALIBRATION

## RECIPE SETUP

### Typical Feeding Phase and Recipe Data Definitions



### DISCRETE OUTPUT:



## RECIPE SETUP MENU

MENU		DESCRIPTION OPERATION
<b>rECIPE</b>	SELECT RECIPE (1/2/3)	The IND140 can store 3 suits of recipe. This step is to select a working recipe.
<b>rECIPE</b>	<b>M1 lights</b> Material 1 setup	The lower displayer shows the target weight of M1, press "ENTER" key will entry into M1 setup menu.
	<b>tArGEt</b> target weight	When material 1 feed is act, material 1 begins to coarse feed untill the specific weight (=tArGEt - FinE), then change to fine feed untill reach the next specific weight (=tArGEt - PrEAct), then stop material 1 feed phase. (FinE weight setup item is displayed only when F6.9.1=2) (Preact weight data may be generated automatically in batching process)
	<b>FinE</b> fine weight	
	<b>PrEAct</b> Preact weight	
<b>rECIPE</b>	<b>M2 lights</b> Material 2 setup	(this menu and its submenu is displayed only when F6.8 = 2/3/4)
	<b>tArGEt</b> target weight	
	<b>FinE</b> fine weight	(this item is displayed while F6.9.2=2)
	<b>PrEAct</b> Preact weight	
<b>rECIPE</b>	<b>M3 lights</b> Material 3 setup	(this menu and its submenu is displayed only when F6.8 = 3 or 4)
	<b>tArGEt</b> target weight	
	<b>FinE</b> fine weight	(this item is displayed while F6.9.3=2)
	<b>PrEAct</b> Preact weight	
<b>rECIPE</b>	<b>M4 lights</b> Material 4 setup	(this menu and its submenu is displayed only when F6.8 = 4)
	<b>tArGEt</b> target weight	
	<b>FinE</b> fine weight	(this item is displayed while F6.9.4=2)
	<b>PrEAct</b> Preact weight	

"TOLERANCE" is set up parameter F6.4 and F6.4A.

## PARAMETER SETUP AND CALIBRATION MENU

### Scale Interface Block

MENU		DESCRIPTION AND OPERATION
<b>F1</b>		
	<b>F1.1</b>	Scale Capacity Select (5~100,000)
	<b>F1.2</b>	Increment size (0.005~10)
	<b>F1.3</b>	Linear calibration (0/1)
	<b>F1.4</b>	Zero adjustment
	<b>E SCAL</b>	
	<b>F1.5</b>	Span adjustment

The selected capacity should less than the total load cells capacity.

See page 70 for valid increment size selection list.

0: disable  
1: enable  
this parameter takes effects in scale calibration procedure.

calibration procedure [CAL ] must be passed before enter this step, this step is just for scale zero point maintainence.

Empty scale, and keep it in static status, press [ENTER] key to capture zero point.  
During the zero capture, the cursor bar will show the progress, if scale motion occurs, the bar display will stop growing.  
Pressing ABORT key at anytime will abort this procedure.

calibration procedure [CAL ] must be passed before doing this step, this step is just for scale maintainence.

Add Ld		<p>Place test load on the platform, and input its weight data, the load should not greater than scale capacity and not less than 5% of scale capacity (<b>strongly suggest that the load is greater than 20% of scale capacity</b>), then press [ENTER] to act the span adjustment. The bar display will grow while scale readings are taken. Scale motion causes the growth stop.</p> <p>Pressing ABORT key anytime will abort this procedure.</p>
CAL	Scale Calibration procedure	<p>Before getting the right weight, the scale should be calibrated in this step.</p>
E SCAL		<p>Empty scale, and keep it in static status, press [ENTER] key to capture zero point.</p> <p>During the zero capture, the cursor bar will show the progress, if scale motion occurs, the bar display will stop growing.</p>
Add Ld	<p>Add load</p> <p>(this item may displayed only while F1.3=0)</p>	<p>Place test weight on the platform, and entry its weight data, the load should not greater than scale capacity and not less than 5% of scale capacity (<b>strongly suggest that the load is greater than 20% of scale capacity</b>), then press [ENTER] to act the span adjustment.</p>

<b>Add Hi</b>	<p>Add high load</p> <p>(this item may displayed only while F1.3=1)</p>	<p>Place test load on the platform, and input its weight data (the load should not greater than scale capacity and not less than 50% of scale capacity), then press [ENTER] to act the span adjustment.</p>
<b>Add Lo</b>	<p>Add low load</p> <p>(this item may displayed only while F1.3=1)</p>	<p>Place test load on the platform, and input its weight data (the load should not greater than 50% of scale capacity and not less than 20% of scale capacity), then press [ENTER] to act the span adjustment.</p>
<b>F1.6</b>	<p>Calibration Parameters</p>	<p>Please record these data, if the IND140 lost the setup data, you may input these data to recover the weighing function instead of re-calibration. C2 and C3 only display while F1.3=1.</p>
<b>C0</b>		<p>C0, C1, C2, C3</p>
<b>C1</b>		
<b>C2</b>		
<b>C3</b>		
<b>F1.7</b>	<p>Expand weight (0/1)</p>	<p>0: normal weight display 1: expand weight display (zero,tare,print,and batching function are also disabled in expana weight display mode)</p>
<b>F1.8</b>	<p>Terminal address (0-15)</p>	<p>0: no terminal address. 1~15: terminal address (in multi-drop communication, the terminal address must be set)</p>
<b>F1.9</b>	<p>Calibration units</p>	<p>0: g 1: kg 2: t</p>

Scale Applications Block

MENU		DESCRIPTION AND OPERATION
<b>F2</b>		
	<b>F2.1</b>	
	Tare Function (0/1/2)	0: inhibit tare function 1: enable direct tare function 2: enable preset or numeric tare function.
	<b>F2.2</b>	
	Zero Function	
	<b>F2.2.1</b>	
	Power-up Zero range (0~10)	Enable power-up-zero function within $\pm$ [0~10%] of Scale Capacity range. ( This function is invalid while F6.10 = 1)
	<b>F2.2.2</b>	
	Zero operation range (0~15)	Enable "ZERO" operation function within $\pm$ [0~10%] of Scale Capacity range.
	<b>F2.2.3</b>	
	AZM (0~4)	AUTO ZERO MAINTENANCE: This automatically compensates for small changes in zero resulting from material build-up or temperature changes. This setup item lets you select the weight range ( $\pm$ ) around gross zero within which the IND140 will capture zero. If residual weight on the scale exceeds the weight range, the IND140 terminal will not capture zero.  AZM within [0~3 increments] window. 0: inhibit AZM function 1: 0.5d 2:1d 3:2d 4:3d

<b>F2.4</b>	Motion Detect (0~10)	<p><b>MOTION SENSITIVITY SELECTION:</b> The motion detection feature determines when a no-motion condition exists on the scale. The sensitivity level determines what is considered stable.</p> <p>Stability detection occurs over predefined period of time and allows a predetermined "acceptable" amount of motion (in scale increments).</p> <p>0~10 increments motion sensitivity.</p>
<b>F2.5</b>	Digital Filter (0~9)	<p>0:no filter .. 9:heavy filter</p> <p>HINT: Heavy filter makes the weight readings are stable, and also makes weight readings update rate be slow.</p>
<b>F2.6</b>	Noise Filter (0/1)	<p>0:disable noise filter 1:enable noise filter</p> <p>NOTE: normally, in batching or filling system, this parameter is set to 0.</p>
<b>F2.7</b>	Beep (0/1)	<p>0:disable the beep 1:enable the beep</p>

**Serial Communication Setup Block**

MENU		DESCRIPTION AND OPERATION
<b>F3</b>		
<b>F3.1</b>	Output Format (0~6)	(only format 0 when the unit is in expand weight display mode F1.7=0) 0: METTLER TOLEDO continue output format 1: Command Print output format 2: Auto Print output format 3..5: reserved 6: MODBUS RTU protocol
<b>F3.2</b>	Checksum Byte (0/1)	(this item is visible only while F3.1=0) 0: disable checksum byte in METTLER TOLEDO continue output format. 1: enable
<b>F3.3</b>	Baud Rate (1200~19200)	1200/2400/4800/ <b>9600</b> /19200
<b>F3.4</b>	Parity Bit (0/1/2)	(only 2 selection is available when F3.1=3/4/5) (only 0 selection is available when F3.1=6) 0: 8 data bits, no parity bit 1: 7 data bits, odd parity bit 2: 7 data bits, even parity bit
<b>F3.5</b>	Communication Mode (0/1)	0: Full Duplex Communication 1: Half Duplex Communication (F3.5 must be set to 1 if RS-485 communication is selected.)

## Analog output Setup Block

(only IND140-08 has this group)

Before acting the adjustment of analog output, please make sure the scale calibration is passed.

The analog output is not related to the load on the scale while doing analog output adjustment.

MENU		DESCRIPTION AND OPERATION
<b>F4</b>		(see Appendix for detail)
	<b>F4.1</b>	0: analog output corresponds with gross weight; 1: analog output corresponds with absolute value of display weight 2: reversed
	Analog Output Data Source (0/1/2)	
	<b>AL_nN</b>	Coarse adjustment of analog output for zero weight point
	<b>AL_n</b>	Fine adjustment of analog output for zero weight point
	<b>AL_</b>	Very fine adjustment of analog output for zero weight point
	<b>AH_nN</b>	Coarse adjustment of analog output for full scale capacity weight point
	<b>AH_n</b>	Fine adjustment of analog output for full scale capacity weight point
	<b>AH_</b>	Very fine adjustment of analog output for full scale capacity weight point
		Press [ENTER] key to adjustment routine, meanwhile, the lower displayer shows the AL and AH coefficients.
		During adjustment procedure, please monitor the analog output, to decrease the output by press [SELECT] key, to increase the output by press [TARE] key. Finally, press [ENTER] to save the adjustment and return, or press [ZERO] key to abort and exit the adjustment.
		Record the AL and AH coefficients for recovery in emergency use.

### Batching Setup Block

MENU		DESCRIPTION AND OPERATION
<b>F6</b>		
	<b>F6.1</b>	
	Zero Tolerance Range 0.0~9.9%F.S.	In discharging, When the weight reaches in this range, the discharge vavle will be closed after delaying the specific period time (the delay time is setup in F6.3.4)
	<b>F6.2</b>	
	Preact weight auto correct cycles (0~9)	When the unit continuously finds the last material feed results are all greater than target weight or all less than target weight, the unit will correct the pre-act weight as below: New preact weight of this material = last preact weight of this material - (average difference x 50%).

<b>F6.3</b>	Time	
<b>F6.3.1</b>	Start Delay Time	
<b>F6.3.2</b>	Comparison Inhibit Time	Parameter range is in 0.0~9.9s.
<b>F6.3.3</b>	Delay Time for Material Tolerance Judgement	For detail, please see Appendix for detail explanation.
<b>F6.3.3.1</b>	Delay Time for Material 1 Tolerance Judgement	
<b>F6.3.3.2</b>	Delay Time for Material 2 Tolerance Judgement	For mode IND140-00/08, F6.3.3.2/3/4 are invisible.
<b>F6.3.3.3</b>	Delay Time for Material 3 Tolerance Judgement	
<b>F6.3.3.4</b>	Delay Time for Material 4 Tolerance Judgement	
<b>F6.3.4</b>	Discharge Delay Time	

<b>F6.4</b>	Tolerance Detect Times etc =(0~99)	<p>etc=0: disable material tolerance detection</p> <p>etc=1~99: Every (ETC) times of batching, the unit will detect whether each materail feed is out of tolerance range (this range is set in F6.4A), if it is, the unit will output the alarming signal for 0.5 seconds in 'TOL' port after this material finished the feed course. (this kind of 'TOL' output function needs F6.11 is '0').</p> <p>Normal, this parameter is set to 1.</p>
<b>F6.4A</b>	Material feed tolerance range  0.0~9.9%F.S.	<p>(this item is invisuable while F6.4=0)</p> <p>Example: If F6.4=1, F6.4A=3.0%, M2 target weight is 200kg, If the actual weight of M2 is not in the range of 194~206kg, the 'TOL' port will set to 1 for 0.5 seconds after M2 fed.</p>
<b>F6.5</b>	Auto Tare Times ate =(0~99)	<p>(this item is invisuable while F2.1=0)</p> <p>Every (ATE) times of batch, before the next batch, the IND140 will do auto tare.</p> <p>Normal, this parameter is set to 1.</p>

<b>F6.6</b>	Feed Mode (0/1)	See BATCH OPERATION chapter for detail.
<b>F6.7</b>	Discharge Mode (0/1)	
<b>F6.8</b>	Materials Number (1/2/3/4)	(this item is always 1 for IND140-00 and IND140-08 terminal)
<b>F6.9</b>	Material Feed Speed	(the item is visible or not, is depended on F6.8)
<b>F6.9.1</b>	Material 1(1/2)	1: Single Feed speed (coarse) 2: Dual Feed speed (coarse and fine)
<b>F6.9.2</b>	Material 2(1/2)	
<b>F6.9.3</b>	Material 3(1/2)	
<b>F6.9.4</b>	Material 4(1/2)	
<b>F6.10</b>	Batch status memoriable (0/1)	0: disable batch status memoriable while power failure. 1: enable batch status memoriable while power failure. (see power-up sequence discription for detail.)
<b>F6.11</b>	Setpoint ( 0% ~ 99% )	0: 'TOL' is used for material tolerance out function; 1~99: the percents of scale capacity, used for 'TOL' setpoint outputs function.
<b>F6.11A</b>	Setpoint detection time ( 0.0 ~ 9.9 s )	If the gross weight is greater than setpoint (setpoint is set in F6.11 item) more than this setpoint detection time, 'TOL' actives high.

## Diagnosis Block

MENU		DESCRIPTION AND OPERATION
<b>F7</b>		
	<b>F7.1</b> Discrete Input Test	<p>For IND140-02 terminal, the lower displayer displays the status of input as "STOP/IN2/IN1/INO";</p> <p>For IND140-00/08 terminal, the lower display shows the status of input as "INO";</p> <p>You may input the signal and monitor the change from displayer.</p>
	<b>F7.2</b> Discrete Output Test	<p>After press [ENTER] key, the lower displayer shows the output status, you may change the output status by edit the data.</p> <p>BE NOTICED: PLEASE MAKE SURE THS SYSTEM IS SAFTY WHEN DO THIS TEST STEP.</p>

## SERIAL COMMUNICATIONS

The IND140 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.

## SIMPLE COMMANDS SERIAL INPUT

The IND140 terminal has an input mode that allows simple commands to be received. These commands duplicate the instruction functions which can be called from the front panel keyboard. Note that all characters are uppercase and no control characters need to be sent. All other ASCII characters are ignored. The following commands are recognized by the IND140 terminal when the output mode is programmed as METTLER TOLEDO demand or continuous (F3.3 = 0, 1 or 2).

COMMAND	FUNCTION
'P'	Print Weighing Data
'T'	Tare Request
'C'	Clear Tare Request
'Z'	<i>Zero Request</i>

## DEMAND OUTPUT

The IND140 terminal can be programmed for the demand mode by setting the parameter F3.3 to 1 or 2, the terminal will transmit serial data when a print command is issued using the PRINT key, an instruction, an autoprint cycle or a remote print request from a host.

### Weighin data label output format

GROSS: 563.5kg TARE: 0.0kg NET: 563.5kg

### Batch result label output format

Set parameter F3.4 to 1 for English format. If set the parameter F3.3 to 1 or 2, the following label is automatically printed output after a batch is finished.

BATCHING RESULT			
MATERIAL	TARGET(kg)	RESULT(kg)	TOLERANCE(kg)
1	510.0	509.5	- 0.5
2	160.0	161.0	+1.0
3	200.0	200.5	+0.5
4	90.0	92.0	+2.0
	960.0	963.0	+3.0

### Material consumption label output format

Set parameter F3.4 to 1 or 2 for English format.

MATERIALS CONSUMPTION	
MATERIAL	ACCUMULATION(kg)
1	12766
2	4012
3	5101
TOTAL:	24262

## CONTINUOUS OUTPUT

If the parameter F3.3 set to 0, the continuous output mode of the IND140 terminal is used to continuously send weight data, batch data and scale status information to a remote device such as a PC or a remote display, A data string will be output once each A/D cycle of the IND140 terminal.

Byte No.	DESCRIPTION
1	STX (= 02 Hex)
2	BIT STATUS BYTE A
	.0 Decimal pointer location:
	.1 001 = xxxxx0 010 = xxxxxx
	.2 011 = xxxxx.x 100 = xxxx.xx 101 = xxx.xxx
	.3 1= Coarse Feeding
	.4 1= Fine Feeding
	.5 Always = 1
.6 Always = 0	
3	BIT STATUS BYTE B
	.0 Gross = 0, Net = 1
	.1 Sign, Positive = 0, Negative = 1
	.2 Out of Range = 1 (Over capacity or Under Zero)
	.3 Motion = 1
	.4 Always = 1
	.5 Always = 1
.6 Always = 0	
4	BIT STATUS BYTE C
	.0 BATCHING STATUS:
	.1 000: no batching 001: material 1 is feeding 010: material 2 is feeding 011: material 3 is feeding 100: material 4 is feeding
	.2 101: discharging 110: the batching is holding 111: batch running (not in feeding or discharging)
	.3 Weighing Data Label Print Request = 1
.4 Expand Weight Mode = 1	

	<b>.5</b>	Always = 1	
	<b>.6</b>	Always = 0	
<b>(MSD)</b> 5 6 7 8 9 10 <b>(LSD)</b>		IN NORMAL WEIGHING MODE:  Display weight	
		IN FEEDING PHASES:  The actual weight of the feeding material	
		IN DISCHARGING PHASES:  The total actual weight of all the materials whiches are on the scale.	
		➤ <i>All data is in ASCII format, and not include decemal pointer.</i>	
		IN NORMAL WEIGHING MODE:  Tare weight	
		IN FEEDING PHASE:  The target weight of the material which is feeding	
		IN DISCHARGING PHASE:  The total target weight of all the materials.	
		➤ <i>All data is in ASCII format, and not include decemal pointer.</i>	
		<b>17</b>	Carriage Return, CR ( = 0D Hex )
		<b>18</b>	Check sum (Optioned by the parameter F3.4 )

## MODBUS RTU COMMUNICATION

If set the parameter F3.1 to 6, the IND140 can be slave servicing in MODBUS RTU network, the IND140 supports "03" and "06" functions. In this case, the parameter F1.8 will be address of the terminal.

Address	Bit	The following data is write-only
40101	.0	
	.1	0001~0100:
	.2	which material (1...4)will be act.
	.3	
	.4	0001:
	.5	start auto feeding of the material which is given by bits
	.6	0~3
	.7	
	.8	Start batch (needs F6.6 and F6.7 are 0)
	.9	Hold batch
	.10	Stop batch
	.11	Discharge(needs F6.7 be 1, and all materials have fed.)
	.12	Tare the weight
	.13	Clear the tare
.14	Zero the scale	
40102	.0	
	.1	0001~0011:
	.2	select the working recipe (1~3)
	.3	
	.4	10:material one by one auto feeding mode (F6.6 = 1)
	.5	11:continues auto feeding mode (F6.6 = 0)
	.6	10>manual discharge mode (F6.7 = 1)
.7	11:auto discharge mode (F6.7 = 0)	
40103		Scale calibration : 0: capture zero point xxxx: capture load point(xxxx is test weight)

Address	Bit	The following data is read-only
40001		Gross Weight
40002		Net Weight
40003	.0	Material 1 is in fine feeding
	.1	Material 1 is in coarse feeding
	.4	Material 2 is in fine feeding
	.5	Material 2 is in coarse feeding
	.8	Material 3 is in fine feeding
	.9	Material 3 is in coarse feeding
	.12	Material 4 is in fine feeding
	.13	Material 4 is in coarse feeding
40004	.0	
	.1	0001-0011:
	.2	the current recipe (1-3)
	.3	
	.4	Batching is running
	.5	Batching is held
	.6	In discharging
	.7	All materials have feed, waiting for discharge.
	.8	Weight Increment Size:
	.9	0000=0.001 0001=0.002 0010=0.005
	.10	0011=0.01 0100=0.02 0101=0.05
	.11	0110=0.1 0111=0.2 1000=0.5
		1001=1 1010=2 1011=5 1100=10
	.12	The feed material is out of tolerance.
	.13	Scale in motion
.14	Feed mode ( same as the parameter F6.6)	
.15	Discharge mode ( same as the parameter F6.7)	
40005		Material 1 feed result
40006		Material 2 feed result
40007		Material 3 feed result
40008		Material 4 feed result

Address	The following is able to read and write
40009	Tare
40010	Target weight of material 1
40011	Target weight of material 2
40012	Target weight of material 3
40013	Target weight of material 4
40014	Fine feed weight of material 1
40015	Fine feed weight of material 2
40016	Fine feed weight of material 3
40017	Fine feed weight of material 4
40018	Preact weight of Material 1
40019	Preact weight of Material 2
40020	Preact weight of Material 3
40021	Preact weight of Material 4
40022	Zero range (F6.1)
40023	Preact weight auto correct cycles (F6.2)
40024	Start delay time (F6.3.1)
40025	Comparison inhibit time (F6.3.4)
40026	Discharge valve close delay time (F6.3.2)
40027	Delay time for material 1 tolerance judgement (F6.3.3.1)
40028	Delay time for material 2 tolerance judgement (F6.3.3.2)
40029	Delay time for material 3 tolerance judgement (F6.3.3.3)
40030	Delay time for material 4 tolerance judgement (F6.3.3.4)

Please find MODBUS information in the web site of <http://www.modbus.org>

## TROUBLESHOOTING

The IND140 terminal is designed to be virtually error-free and reliable. If problems do occur, do not attempt to repair the scale or terminal before the source of the problem has been determined. Record as much information as possible about what has happened including any error messages and physical responses of the terminal and/or scale. If the IND140 terminal is malfunctioning, perform the troubleshooting tests described in the next page to identify the problem.

## ERROR CODES AND ACTIONS

Error	Description	Corrective Measures
E 1	PROGRAM MEMORY ERROR	Check power supply voltages; Replace Main Logic PCB.
E 2	INTERNAL RAM ERROR	
E 3	EEPROM MEMORY ERROR	Check power supply voltages. Reprogram. Recalibrate. Replace Main PCB.
E 4	EXTERNAL RAM ERROR	Check power supply voltages; Replace Main Logic PCB.
E 7	A/D CIRCUIT MALFUNCTION; OR NO ANALOG LOAD CELL CONNECTED.	Program for correct load cell type. Check load cells and cables. Check power supply voltages. Replace Main PCB
E 16	INTERNAL MATH ERROR	Re-power-in
E 32	INSUFFICIENT TEST WEIGHT USED FOR CALIBRATION	Recalibrate using more test weight
E 34	TEST WEIGHT EXCEEDS 105% OF CAPACITY	Use less than 105% of capacity and recalibrate.
E 37	Scale is in motion during calibration.	Keep the scale in static status.
E 40	RAM ERROR	Reprogram. Replace Main PCB.
	POSITIVE MORE THAN ZERO CAPTURE LIMIT OF 20% OF SCALE CAPACITY	Remove material from scale base.
	NEGATIVE MORE THAN ZERO CAPTURE LIMIT OF 20% OF SCALE CAPACITY	Recalibrate Scale.

# APPENDICES

## APPENDIX 1: SCALE CAPACITIES AND INCREMENT SIZES

➤ The increments with dark background do not support MODBUS communication.

CAP	SELECTABLE INCREMENT SIZE									
5	0.005	0.01								
10	0.005	0.01	0.02							
15	0.005		0.02							
20		0.01	0.02							
30		0.01		0.05						
40	0.005		0.02							
50	0.005	0.01		0.05	0.1					
80		0.01								
100		0.01	0.02	0.05	0.1	0.2				
150				0.05		0.2				
200			0.02		0.1	0.2				
300					0.1		0.5			
400				0.05		0.2				
500				0.05	0.1		0.5	1		
800					0.1					
1000					0.1	0.2	0.5	1	2	
1500							0.5		2	
2000						0.2		1	2	
3000								1		5
4000							0.5		2	
5000							0.5	1		5 10
8000									1	

10000	1	2	5	10
15000			5	
20000		2		10
30000				10
40000			5	
50000			5	10
80000				10
100000				10

---

## APPENDIX 2: THE DIAGRAM OF ANALOG OUTPUT AND WEIGHT

While Weight  $\leq$  -20%FS (F.S. means full scale which is set in F1.1)

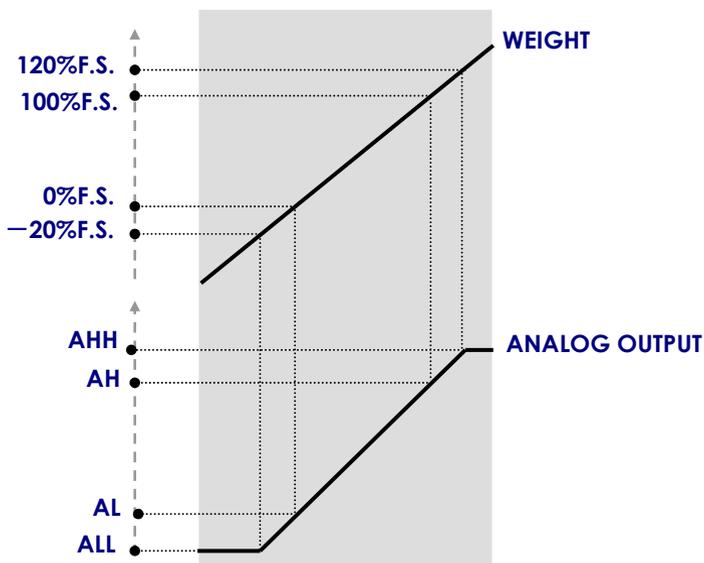
$$\text{Analog Output} = \text{AL} + 1.2 \times (\text{AH} - \text{AL})$$

While -20%FS  $<$  Weight  $<$  120%FS

$$\text{Analog Output} = \text{AL} + \text{WEIGHT} / \text{FS} \times (\text{AH} - \text{AL})$$

While Weight  $\geq$  120%FS

$$\text{Analog Output} = \text{AL} - 0.2 \times (\text{AH} - \text{AL})$$



## **APPENDIX 3: TIME PARAMETERS IN BATCHING**

### **START DELAY TIME**

After discharge valve is closed, the body of scale might vibrate for a short period, this setting may avoid this affection to start the batch. When the IND140 gets the feed or batch start command, the IND140 will delay for the setting time, then start to batch work. The time is set in F6.3.1.

### **COMPARISON INHIBIT TIME**

When start to feed or end to feed, because the weight is quickly change, the scale might vibrate for a short period, to avoid this affection for coarse/fine feed mode switch, IND140 will inhibit the weight comparison for in this period. The time is set in F6.3.2.

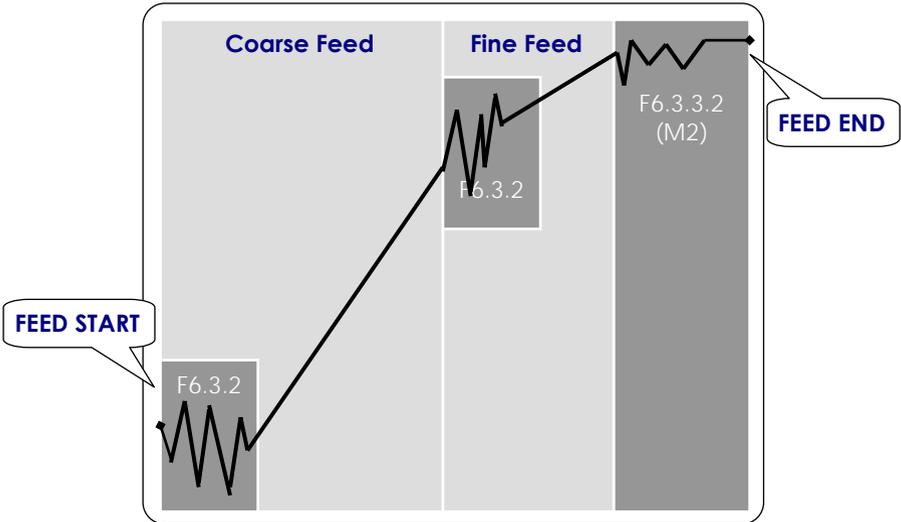
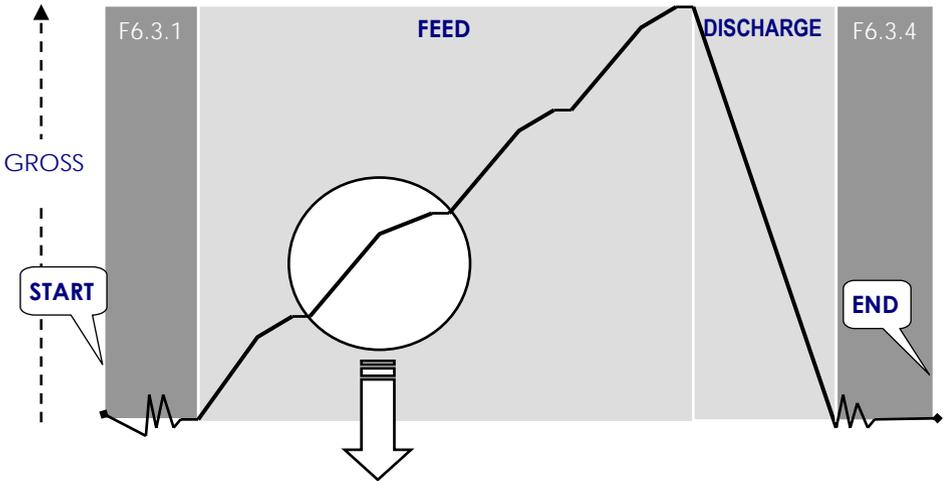
### **DELAY TIME FOR MATERIAL TOLERANCE JUDGEMENT**

To obtain the real weight of feed result, the unit will delay the setting time after a material feed is finished, then begins to record the result weight and do tolerance judgement. The times are set in F6.3.3.

HINT: these parameters could be used for the work delay among the each material feedings.

### **DISCHARGE VALVE CLOSE DELAY TIME**

In discharge phase, when the material weight in scale reaches to zero tolerance range (F6.1), then after the setting time, the unit then closes the discharge valve. The time is set in F6.3.4.



**APPENDIX 4: ZERO TOLERANCE RANGE & MODBUS RTU INTERFACE CONTRAST LIST**

F6.1	MODBUS RTU
0 %	0
1 %	1
2 %	2
3 %	3
4 %	4
5 %	5
6 %	6
7 %	7
8 %	8
9 %	9
10 %	10
0.1 %	11
0.2 %	12
0.3 %	13
0.5 %	14
0.8 %	15

