

Model no.: DT45

User's Manual

DT45-00160420

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1 General Description

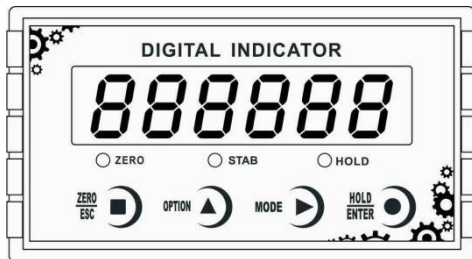
DT45 weighing indicator is specially designed for weight transmitting in industrial fields.

This indicator has the features of small volume, plenty communicating commands, stable performance, easy operation and practicability. It can be widely applied to concrete and bitumen mixing equipment, metallurgy furnace and converter, chemical industry and feed, etc. .

1.1 Functions and Characteristics

- Small volume, unique design, easy operation
- Applicable to all kinds of resistance strain gauge bridge load cell
- Front panel numerical calibration
- Multilevel of digital filter
- Automatic zero -tracking
- Automatically zero when powered on
- 4 set points
- 1 input and 2 outputs
- Serial communication interface:RS232 or RS485
- Calibration via serial interface
- Optional interfaces: Analog output, serial interface

1.2 Front Panel



DT45 Front panel

Main Display: 6 digits, for displaying weight and the information of parameters.

Status Indicator Lamp:

- **ZERO:** Light on when present weight is within $0 \pm 1/4d$.
- **STAB:** Light on when changes of weight values are within the range of motion detecting during motion detecting time.
- **HOLD:** Light on when indicator displays the value of D/A output.

Keypad:



: Zero/Esc, Used to exit from current operation or go previous.



: Used to scroll optional values of parameter and to make flashing digit increase 1 while data inputting.



: Function Selecting Key, To make flashing position move to the right digit when data inputting.



: Confirming Key. Used to confirm present operation.

1.3 Technical Specifications

1.3.1 Common:

Power supply: **DC24V±5%**

Working temperature: **-10~40℃**

Max humidity: **90%R.H without dew**

Power consumption: **About 10W**

Dimension: **110×89×60 (mm)**

1.3.2 Analog:

Load cell power: **DC5V 200mA (MAX)**

Input impedance: **10M Ω**

Zero steady range: **0.00~12mV(Load cell 3mV/V)**

Input sensitivity: **0.1uV/d**

Input range: **0.00~15mV(Load cell 3mV/V)**

Transfer mode: **Sigma - Delta**

A/D conversion speed: **15, 30, 60, 120, 480, 960 times/sec**

Non-linearity: **0.01% F.S**

Gain drift: **10PPM/°C**

Display Precision: **1/100,000**

1.3.3 Digital:

Weight display: **6 digits red high-brightness LED**

Minus display: **"-"**

Overload display: **"OFL"**

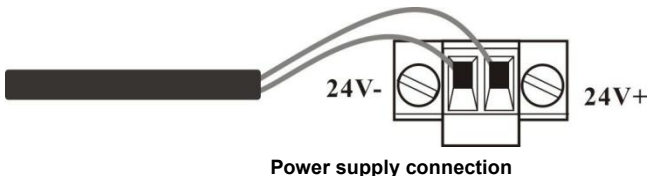
Decimal point: **5 kinds (optional)**

Function keys: **4 keys soniferous keypad**

2 Installation and Wiring

2.1 Connection of Power Supply

DT45 weighing indicator connects DC24V power supply as follows:



2.2 Connection of Load Cell

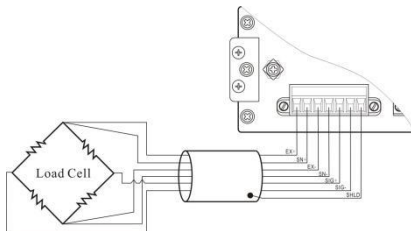
DT45 weighing indicator connects bridge type resistance strain gauge load cells by 6 wires or 4 wires as follows. When you use 4-wired load cells, you must bridge the SN+ with EX+ and bridge the SN- with EX-.

The signal definition of each port of the load cell connector is as follows:

EX+: Excitation+ **EX-:** Excitation- **SN+:** Sense+ **SN-:** Sense- **SIG+:** Signal+ **SIG-:** Signal-

6 wires	EX+	SN+	EX-	SN-	SIG+	SIG-	Shield
4 wires	EX+		EX-		SIG+	SIG-	Shield

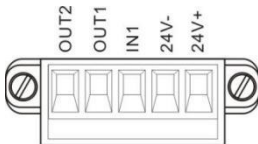
2.2.1 6 wires connection



Note:

1. As load cell output sensitive analog signal, please use shield cable to separate with other cables, especially AC power.
2. 4 wires connection is suitable for short distance and stable temperature or low precision field, otherwise use 6 wires connection.
3. For more load cells parallel connection, their sensitivity (mV/V) should be same.

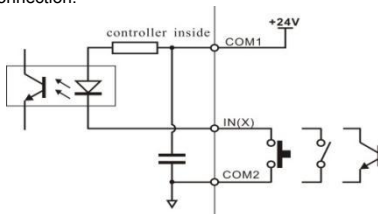
2.3 I/O terminals



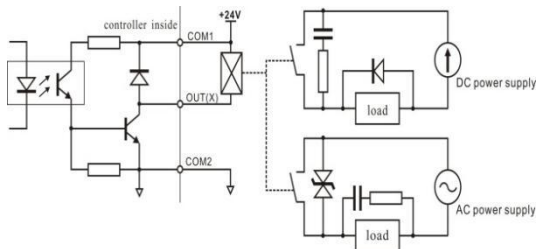
I/O tolerant definition as follows:

Output		Input	
OUT1	Stable	IN1	Reset all
OUT2	OFL		

Indicator input terminal connection:



Indicator input terminal connection:



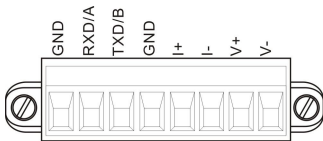
2.4 Optional Expansion Board Output

DT45 weighing indicator supports analog output, RS232 or RS485 as optional output function, please confirm it when place orders.

2.4.1 Analog Output (Optional)

At normal displaying status, press **HOLD ENTER**  to check the analog output.

The definition of analog output as below:



The definition of analog output:

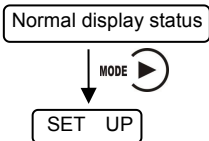
V+: voltage-output+, **V-**: voltage-output-

I+: current-output +, **I-**: current-output -

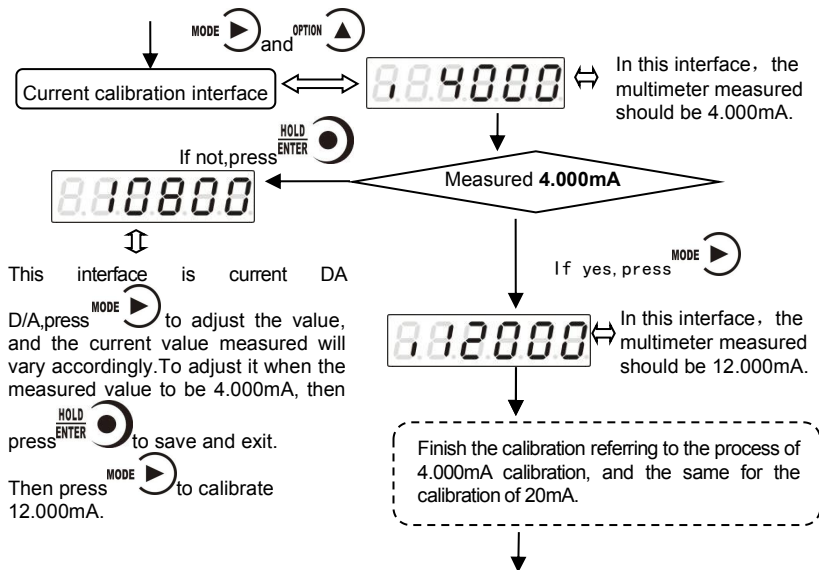
Analog output two types:

- 1) **Voltage output: 0-5V/0-10V is optional .**
- 2) **Electric current output: 4-20mA/0-20mA/0-24mA is optional.**
- 3) **User-define function, users can define analog output type and output range.**

The analog output has been calibrated before the delivery of the indicators, so users do not need to make calibration. If analog output is abnormal, users can calibrate by themselves as follows: (Suggestion: please calibrate under the instruction of professionals)





Note: only support calibration under current mode. 4 points must be finished for current calibration.





This interface is the highest point calibration of analog output.

In the interface of highest point calibration, press  to enter into analog display value interface, the display will be 5 digits (initial value is **24000**, means

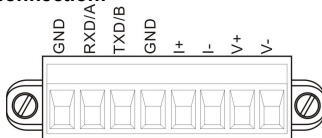
24.000mA), press  to input the value measured by the multimeter.

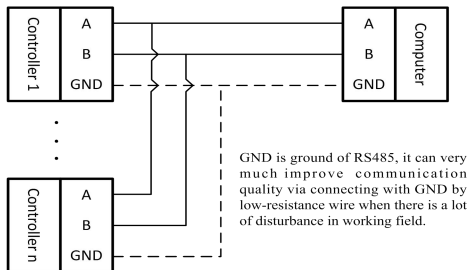
Note: Analog output calibration, highest point must be calibrated.

2.4.2 Serial Interface RS485 Output

Serial Interface RS485 output is optional, please refer to chapter 6.0 for communication protocol.

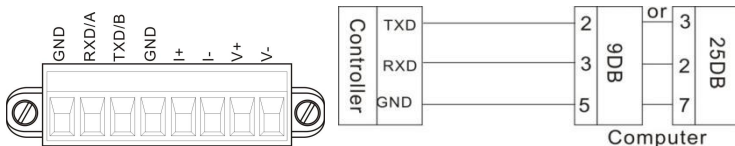
RS485 serial interface connection:





2.4.3 Serial Interface RS232 output (Optional)


RS232 serial interface connection:



3 Calibration

3.1 Instruction

(1) Calibration procedure must be executed when a DT45 indicator is put in use at the first time, the preset parameters may no longer meet the user's needs, and any part of the weighing system was changed. Position of decimal point, minimum division, maximum capacity, zero, and gain can be set and confirmed through calibration.

(2) If you want to set only one parameter, please press  to save parameter's

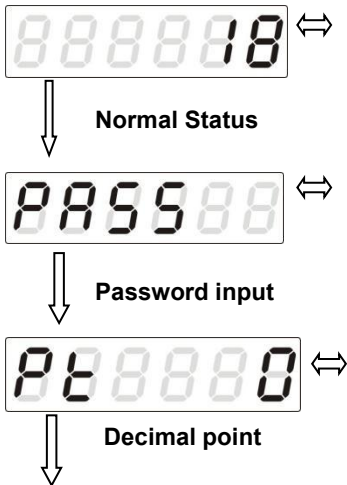
value and then press  to exit.


(3) Please see section **3.7** for parameters' instruction.


(4) Please record each value in the blank table in section 3.4 during calibration for the emergency use in future.

(5) See chapter **9** for error alarm message that may be displayed during calibration.


3.2 Flow Chart of Calibration





1. Under this status, press  (twice), indicator will display **CAL**, then

press  to enter password input.

2. After password is input, the indicator will display **CALON** for one second, then go to next step.

3. Press  to select a desired value for decimal point among **0**, **0.0**, **0.00**, **0.000** and **0.0000**, and then

press  to save it and enter next step. If there's no need to change the value,

press  directly to enter next step.



Min. division







Max. capacity




Millivolt value display



4. Press  to select a desired value for min. division among **1, 2, 5, 10, 20** and **50**, and then to save it and enter next step.
If there's no need to change the value, then press  directly to enter next step.

5. Input max. capacity ($\leq \text{min. division} \times 100000$), press  to save it and enter next step.
If there's no need to change the value, then press  directly to enter next step.


6. Under this status, press  to enter zero calibration.
Display value near the output value in millivolt between **SIG+ / SIG-** of load cell.
See section **3.3** for details about this function.




Zero calibration



7. Unloaded scale first, when **STAB** lamp is on,

press **HOLD ENTER**  to finish zero calibration.

If there's no need to calibrate zero,

press **ZERO ESC**  directly to enter gain calibration.

8. The process of gain calibration is as follows. If there's no need to do gain calibration, press

ZERO
ESC



directly to enter serial ports calibration switch setting.

Gain Calibration



0000.0000

Load the weight close to 80% of max. capacity. Display value is millivolt value.

000.878

HOLD ENTER to enter weight input.

0000000

Input the value of loaded weight.

0020000

HOLD ENTER to finish gain calibration.

5000000






Serial ports
calibration switch

Password setting



Normal status



9. Press  to enter setting interface,
press  to choose the switch position,
press  to set password. If don't need to set
switch position, then press  to enter password
setting.
10. See section 7.2 for reference to set password.
If there's no need to set password,
press  directly to go back to normal
status.

3.3 Millivolt Value Display

This function is mainly used for system test, position-error test for weighing mechanism and linearity test for load cell.

1. System Test

(1) If display data changes with loaded weight changes, it shows that connection of load cell is correct and weighing mechanism works well.

(2) If display value is OFL (or -OFL), it means that loaded weight on load cells is too large (or too small). Please unload the weight (or load more), if display value is still OFL (or -OFL), the possible reasons are as follows:


- There is something wrong with weighing mechanism, please check and clear.
- The connection of load cell is incorrect, please check and clear.
- Load cells may be damaged, please replace.

2. Position-error Test for Weighing Mechanism

Load a same weight on each corner of weighing mechanism and record displayed millivolt value respectively. If differences among these values are obvious, please adjust weighing mechanism.

3. Linearity Test for Load Cell

Load same weight for several times, and record displayed value every time. If one or two values are obviously much larger or smaller than any others, it means that the linearity of load cell is bad.

***NOTE: You must use**  **to zero display data before weight is loaded for each time.**

3.4 Calibration with Weights

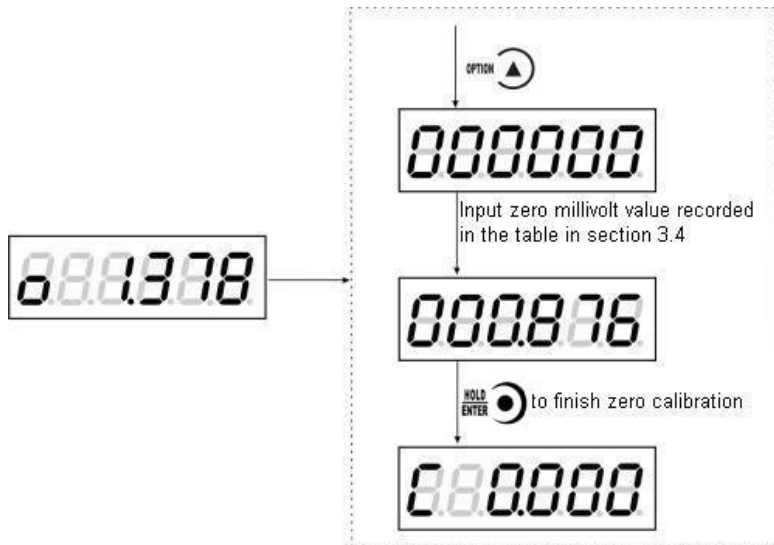
During calibration with weight, please record the zero millivolt value, gain millivolt value and the loaded weight value in the blank table below. If it is not convenient to load a weight to calibrate, these values can be used for calibration without weights.

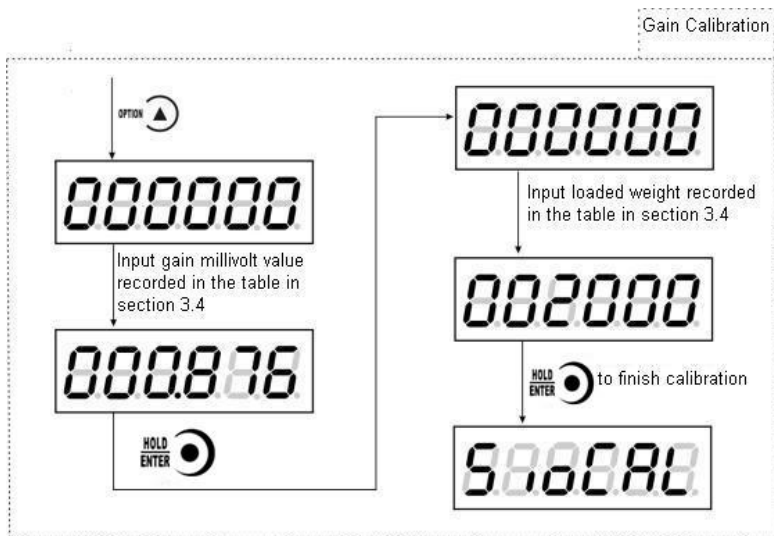
	Zero millivolt value(mV)	Gain millivolt value(mV)	Loaded Weight	Date	Remarks
1					
2					
3					
4					
5					

3.5 Millivolt Calibration

When it is not convenient to load a weight to calibrate, alibration can be done without weights using recorded data in the table in section 3.4.

However, this method is just used for some emergencies, it will make calibration result incorrect if load cells, or indicator has been replaced.





3.6 Calibration Switch for Communication Interface

When calibrate the transmitter through serial port(Rs、SP1 or Modbus), must set to “ON” status for the calibration switch for communication interface.

3.7 Explanation for Calibration Parameters

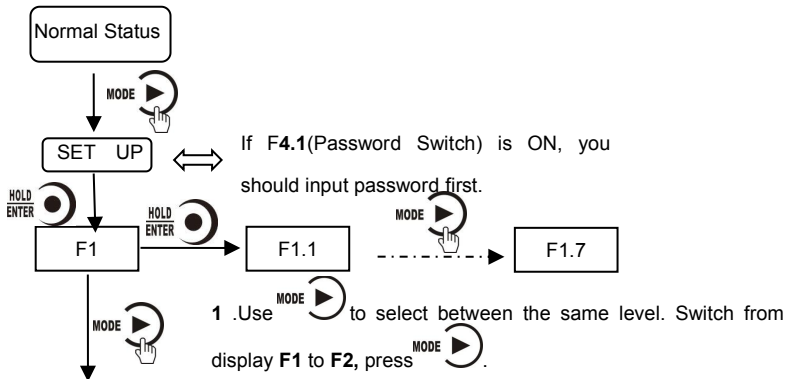
Symbol	Parameter	Types	Value of parameter	Default
Pt	Decimal Point	5	0 0.0 0.00 0.000 0.0000	0
1d	Min. Division	6	1 2 5 10 20 50	1
CP	Max. Capacity		$\leq \text{Min. Division} \times 100000$	10000
t	Millivolt Value			
o	Zero			
C	Gain			
SIOCAL	Switch for Calibration via serial interface			OFF
PASS	Password Setting			000000

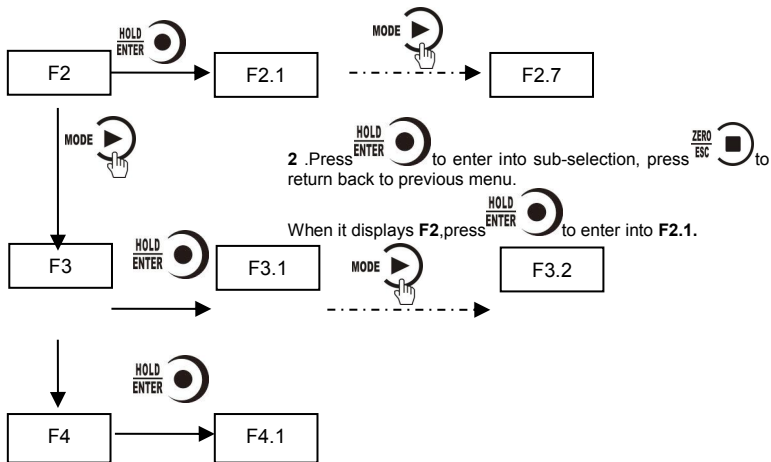
Log Table for Calibration Parameters

Parameter	Calibrated Value	Date	Remarks
Decimal Point			
Min. Division			
Max. Capacity			
Load cell sensitivity			
Password			

4 Working Parameters Setting

4.1 Flow Chart of Working Parameters Setting







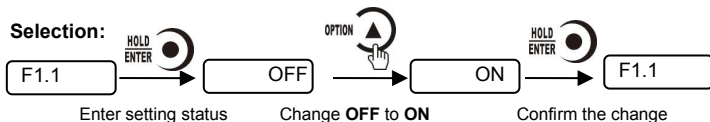
4.2 Parameter Setting Method

DT45 has 2 kinds of working parameters: Selection type and data type. For

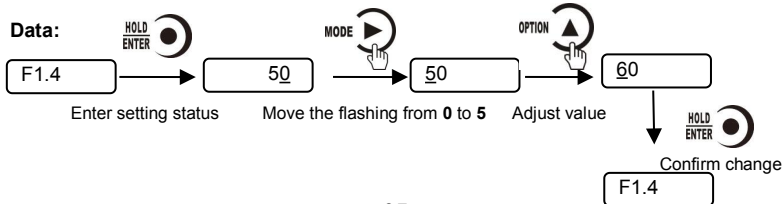
selection type parameters, press  to choose. For data type parameter in

parameter interface, press  to choose digit position, press  to set value.

Selection:



Data:



4.3 Descriptions of Operation Parameters

Code	Default	Description
F1	Null	The first major term of working parameter.
F1.1	OFF	Switch for Auto-Zeroing when power-on, OFF: disabled ON: enabled
F1.2	0	Zero-tracking Range (0~9d optional) . This parameter is for automatic calibration, disabled when is set "0".
F1.3	1	Motion Detecting Range (1~9d optional)
F1.4	50	Zeroing Range (00%~99% of Maximum capacity)
F1.5	5	Digital filtering parameter: (1-9 as optional) 0: without filtering 9: strongest digital filtering
F1.6	0	Stable filter parameter (the second filter based on the first filter) : (1-9 as optional) 0: without filtering 9: strongest digital filtering
F1.7	0	A/D conversion rate: 120,480,960,15,30,60 as optional

F2	Null	The second major term of working parameter.
F2.1	01	Scale no., indicator no.
F2.2	9600	Baud rate of serial port
F2.3	Cb920	Serial ports communication mode: Modbus-RTU: MODBUS RTU mode; r-Cont:SP1 continuous mode; r-SP1: SP1 command mode; tt:TOLEDOcontinuous mode; Cb920: Cb920 continuous mode. rE-Cont:rE continuous mode; rE- rEAd:rEcommand mode;
F2.4	7-E-1	Data format: 7-E-1: 7 data bits, even parity check, 1 stop bit; 7-O-1: 7data bits, odd parity check, 1 stop bit; 8-E-1: 8 data bits, even parity check, 1 stop bit; 8-O-1: 8 data bits, odd parity check, 1 stop bit; 8-n-1: 8 data bits, no parity check, 1 stop bit; 8-n-2: 8 data bits, no parity check, 2 stop bit;

F2.5	HiLo	MODBUS dual-byte register storage turn , Hi Lo : High byte in the front, low byte at the back; Lo Hi: Low byte in the front, high byte at the back
F2.6	nonE	Cont mode automatic sending time interval
F2.7	0	tt(TOLEDOcontinuous mode) If send the checksum。 0: not send, 1: send.
F3	Null	The third major term of working parameter. (For analog output only)
F3.1	0-5	Analog output: 4-20: 4-20mA 0-20: 0-20mA 0-24: 0-24mA 0-5: 0-5V 0-10: 0-10V I_out: Current customized V_out: Voltage customized In customized mode, F3.2-F3.5 parameters available
F3.2	3920	Minimum output
F3.3	4000	Zero point output

F3.4	20000	Maximum capacity output
F3.5	20020	Maximum output
F4	Null	The fourth major term of working parameter.
F4.1	OFF	Parameters password setting switch.
F4.2	000000	Parameters password setting:Valid when F4.1 is ON

4.4 Set point parameters

Code	Default	Description
P1-P4	Null	The first term of working parameters
PX.1	OFF	Change of state if need stable
PX.2	0.0	Change of state minimum duration
PX.3	P1.3=1 P2.3=5 P3.3=0 P4.3=0	Condition of validity: 0: forbid; 1: <; 2: <=; 3: ==; 4: >=; 5: >;

		6: !=; compare to minimum value 7: _<>_outside the range, need to set 2 edge value 8: =<__>=inside the range, need to set 2 edge value 9: external trigger. If it's IO, do 1 state change for 1 trigger, if it's command, then decide according to valid or invalid command.
PX.4	0	Set value 1 (Set value 1 and set value 2, choose the minimum to compare)
PX.5	0	Set value 2

Set point has 4 major terms which are user defined.

5 I/O Definition

5.1 I/O Definition

Output/Input code table:

Output		
Code	Definition	Description
O0	None	No definition
O1	Stable	Effective output in stable status.
O2	Overflow	Effective output when overflow.
O3	Sp1	Effective output when set point 1 status output.
O4	Sp2	Effective output when set point 2 status output.
O5	Sp3	Effective output when set point 3 status output.
O6	Sp4	Effective output when set point 4 status output.

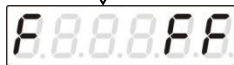
Input		
Code	Definition	Description
I0	None	No definition
I1	Zeroing	Effective input for zeroing, pulse input signals
I2	Sp1	If this signal is valid, Sp1 status will be regarded as invalid. Output valid state when comparison condition turns to invalid, and be effective again.
I3	Sp2	If this signal is valid, Sp2 status will be regarded as invalid. Output valid state when comparison condition turns to invalid, and be effective again.
I4	Sp3	If this signal is valid, Sp3 status will be regarded as invalid. Output valid state when comparison condition turns to invalid, and be effective again.
I5	Sp4	If this signal is valid, Sp4 status will be regarded as invalid. Output valid state when comparison condition turns to invalid, and be effective again.

I6	Reset all	Reset all parameter value when this signal is valid.
-----------	-----------	--

5.2 I/O testing





Normal Status



Under weighing status, press  (5 times), then display **TESTio**, press  enter into I/O testing interface.



Press  **OUT1** status flash, press  **OUT2** status flash.




This interface shows: **IN1** input valid, **OUT1** output valid.

6 Serial Communication

DT45 has RS232 or RS485 as optional to realize communication with upper computer. Support r-Cont、r-SP1、Modbus(bus)、tt TOLEDO、Cb920、rECont protocols and rErEAD protocol.

Serial communication terminal please refer to chapter 2.4.2、2.4.3. Baud rate and communication format setting please refer to F2.2、F2.3 and F2.4.

※Under main display (display weight value), long press  to enter into serial communication checking interface, it will display '-----' if no communication, and '-----' will flash if there's communication.

6.1 r-Cont

Indicator will send weighing data to host computer without command.

Data Format:

STX	Scale no.	Channel no.	Status	Value	CRC	CR	LF
-----	--------------	----------------	--------	-------	-----	----	----

Here:

STX —— 1bit, start character **02H**

Scale no. —— 2bits, **00~99**

Status —— 2bits, high byte:**40H**; low byte definition as follows:

D6	D5	D4	D3	D2	D1	D0
Null	Null	G./N. weight	+/-	Zero point	OFL	Stable
1	0	0	0: + 1: -	0: non/zero 1: zero	0: normal 1: OFL	0: not stable 1: stable

Weight Value —— 6 bits; when weight is+ (-) overflow,return to“space space **OFL** space”

CRC —— 2 bits,check sum

CR —— 1 bit, **0DH**

LF —— 1 bit, **0AH**

For example:

02 30 31 31 40 4120 20 20 37 30 30 32 34 0D 0A

Means: stable,positive data,present weight **700**

6.2 r-SP1

Code : **ASCII**

Operation code supported: **W**, write; **R**, read; **C**, calibrate; **O**, zero

6.2.1 Parameters Code Chart

Operation code	Para. code	Para. Name	number of character
R	WT	Read current status	8

		and weight	
R	SP	Read set point status	4
W	DC	Write mini. Division and max. capacity	8
R/W	PT	Decimal point digit	1
R	DD	Minimum division	2
R	CP	Maximum capacity	6
R/W	AC	Auto. Zeroing switch	1
R/W	TR	Zero tracking range	1
R/W	MR	Stable range	1
R/W	ZR	Zeroing range	2
R/W	FL	digital filtering para.	1
R/W	VC	steady filtering	1
R/W	AD	AD sample rate	1
R	PO	Set point output status	4
R/W	P1M~P4M	Set point to judge if need stability	1
R/W	P1T~P4T	Set point minimum duration time	3
R/W	P1F~P4F	Set point comparison condition to judge	1
R/W	P1L~P4L	Set point lower edge value to judge	6
R/W	P1H~P4H	Set point upper edge value to judge	6

R	AM	Absolute millivolt	7: D6D5D4D3D2D1D0; D6:++;D5-D0: corresponding ASCII for 6 digits millivolt,Decimal point is fixed to 3 digits
R	RM	Relative zero point on millivolt	7: D6D5D4D3D2D1D0 D6 : +/-;D5-D0: corresponding ASCII for 6 digits, Decimal point is fixed to 3 digits
C	ZY	Zero calibration with weight	
C	ZN	Zero calibration without weight	6
C	GY	Gain calibration with weight	6
C	GN	Gain calibration without weight	12
O	CZ	Zero clearing command	
O	P1S~P4S	Setting the corresponding set point	Valid when 9,command valid when external trigger and 1 status change for 1 external Trigger
O	P1C~P4C	Clear the corresponding set point	
R	ID	Read ID No.	6

6.2.2 Error Code Explanation

- 1: CRC check error
- 2: Operation code error
- 3: Parameters code error
- 4: Write data error
- 5: Operation invalid
- 6: Channel no. error

Note: Default channel no. of this indicator : **1 (31H)**

6.2.3 Command

Indicator will send weighing data to host computer after received command.

6.2.3.1 Host computer read present status

Send command:

STX	Scale no.	Channel No.	R	WT	CRC	CR	LF
------------	-----------	-------------	----------	-----------	------------	-----------	-----------

Correct response:

STX	Scale no.	Channel No.	R	WT	Status	Value	CRC	CR	LF
------------	-----------	-------------	----------	-----------	--------	-------	------------	-----------	-----------

Wrong response:

STX	Scale no.	Channel No.	R	WT	E	Error code	CRC	CR	LF
------------	-----------	-------------	----------	-----------	----------	------------	------------	-----------	-----------

Here :

STX —— 1bit, start character, **02H**

R —— 1 bit, **52H**

WT —— 2 bit, **57H 54H**

E —— 1 bit, **45H**

Status —— 2bits, high byte: **40H**; low byte definition as follows:

D6	D5	D4	D3	D2	D1	D0
Null	Null	G./N. weight	+/-	Zero point	OFL	Stable
1	0	0	0: + 1: -	0: non/zero 1: zero	0: normal 1: OFL	0: not stable 1: stable

Weight Value —— 6 bits; when weight is+ (-) overflow,return to“space space **OFL** space”

For example:

02 30 31 31 52 57 54 30 31 0D 0A

Correct response : **02 30 31 31 52 57 54 40 4130 30 33 37 35 33 33 36 0D 0A**
(**stable**present value **3753**)

Wrong response: **02 30 31 31 52 57 54 45 31 31 39 0D 0A** (CRC check error)

6.2.3.2 Read other parameters

Send command:

STX	Scale no.	Channel No.	R	Para. code	CRC	CR	LF
------------	-----------	-------------	----------	-------------------	------------	-----------	-----------

Correct response:

STX	Scale no.	Channel No.	R	Para. code	Value	CRC	CR	LF
-----	-----------	-------------	---	------------	-------	-----	----	----

Wrong response:

STX	Scale no.	Channel No.	R	Para. code	E	Error code	CRC	CR	LF
-----	-----------	-------------	---	------------	---	------------	-----	----	----

Here:

Para. Value——1bit

Para. code——2 bits,

For example:

02 30 31 31 524D52 3839 0D 0ACorrect response: **02 30 31 31 52 4D 52 36 34 33 0D 0A** (stable range: 6)Wrong response:**02 30 31 31 53 4D 52 45 32 30 39 0D 0A** (Operation code error)**6.2.3.3 Write max. Capacity and min. Division**

Send command:

STX	Scale no.	Channel No.	W	DC	Division value	Max. capacity	CRC	CR	LF
-----	-----------	-------------	---	----	----------------	---------------	-----	----	----

Correct response:

STX	Scale no.	Channel No.	W	DC	O	K	CRC	CR	LF
-----	-----------	-------------	---	----	---	---	-----	----	----

Wrong response:

STX	Scale	Channel	W	DC	E	Error code	CRC	CR	LF
-----	-------	---------	---	----	---	------------	-----	----	----

	no.	No.							
--	-----	-----	--	--	--	--	--	--	--

Here:

DC——2 bits, **44H 43H**

O——1 bit, **4FH**

K——1 bit, **4BH**

Division value——2 bits, **1/2/5/10/20/50**

Max. capacity——6 bits

For example:

02 30 31 31 57 44 43 30 35 30 31 30 30 30 30 36 30 0D 0A(division value 5, Max capacity 10000)

Correct response: **02 30 31 31 57 44 43 4F 4B 32 34 0D 0A**

Wrong response: **02 30 31 31 57 44 43 45 35 39 32 0D 0A** (Operation can't execute)

6.2.3.4 Write other parameters

Send command:

STX	Scale no.	Channel No.	W	Para. code	Para. value	CRC	CR	LF
------------	-----------	-------------	----------	-------------------	-------------	------------	-----------	-----------

Correct response:

STX	Scale no.	Channel No.	W	Para. code	O	K	CRC	CR	LF
------------	-----------	-------------	----------	-------------------	----------	----------	------------	-----------	-----------

Wrong response:

STX	Scale	Channel	W	Para.	E	Error	CRC	CR	LF
------------	-------	---------	----------	--------------	----------	-------	------------	-----------	-----------

	no.	No.		code		code			
--	-----	-----	--	------	--	------	--	--	--

For example:

02 30 31 31 57 5A 52 35 30 30 38 0D 0A (Write zeroing range to 50)

Correct response: **02 30 31 31 57 5A 52 4F 4B 36 31 0D 0A**

Wrong response: **02 30 31 31 57 5A 53 45 33 32 38 0D 0A** (Para. Code error)

6.2.3.5 Calibration Zero

1) Calibrate zero as per current weight (with weight)

Send command:

STX	Scale no.	Channel No.	C	ZY	CRC	CR	LF
------------	-----------	-------------	----------	-----------	------------	-----------	-----------

Correct response:

STX	Scale no.	Channel No.	C	ZY	O	K	CRC	CR	LF
------------	-----------	-------------	----------	-----------	----------	----------	------------	-----------	-----------

Wrong response:

STX	Scale no.	Channel No.	C	ZY	E	Error code	CRC	CR	LF
------------	-----------	-------------	----------	-----------	----------	------------	-----	-----------	-----------

Here:

Z——1 bit, 5AH

Y——1 bit, 59H

For example:

02 30 31 31 43 5A 59 39 34 0D 0A

Correct response: **02 30 31 31 43 5A 59 4F 4B 34 38 0D 0A**

Wrong response: **02 30 31 34 43 5A 59 45 36 32 30 0D 0A** (channel no. error)

2) Input millivolt calibration zero in the chart (without weight)

Send command:

STX	Scale no.	Channel No.	C	ZN	Zero millivolt value	CRC	CR	LF
------------	-----------	-------------	----------	-----------	----------------------	------------	-----------	-----------

Correct response:

STX	Scale no.	Channel No.	C	ZN	O	K	CRC	CR	LF
------------	-----------	-------------	----------	-----------	----------	----------	------------	-----------	-----------

Wrong response:

STX	Scale no.	Channel No.	C	ZN	E	Error code	CRC	CR	LF
------------	-----------	-------------	----------	-----------	----------	------------	------------	-----------	-----------

Here:

ZN——2 bits, 5AH4EH

Zero millivolt value——6 bits

For example:

02 30 31 31 43 5A 4E 30 31 32 36 31 30 38 31 0D 0A

Correct response:**02 30 31 31 43 5A 4E 4F 4B 33 37 0D 0A**

Wrong response:**02 30 31 31 43 5A 4E 45 34 30 34 0D 0A** (Write data error)

6.2.3.6 Gain calibration

1) With weights

Send command:

STX	Scale no.	Channel No.	C	GY	Weight value	CRC	CR	LF
------------	-----------	-------------	----------	-----------	--------------	------------	-----------	-----------

Correct response:

STX	Scale no.	Channel No.	C	GY	O	K	CRC	CR	LF
------------	-----------	-------------	----------	-----------	----------	----------	------------	-----------	-----------

Wrong response:

STX	Scale no.	Channel No.	C	GY	E	Error code	CRC	CR	LF
------------	-----------	-------------	----------	-----------	----------	------------	------------	-----------	-----------

Here:

GY——**2 bits**, **47H 59H**

Weight value——**6 bits**: Write in weight value

For example:

02 30 31 31 43 47 59 30 30 30 32 30 30 36 35 0D 0A (Write in: weight value **200**)

Correct response: **02 30 31 31 43 47 59 4F 4B 32 39 0D 0A**

Wrong response: **02 30 31 35 43 47 59 45 36 30 32 0D 0A** (Channel no. error)

2) Without weights

Send command:

STX	Scale no.	Channel No.	C	GN	Gain millivolt	Weight value	CRC	CR	LF
-----	-----------	-------------	---	----	----------------	--------------	-----	----	----

Correct response:

STX	Scale no.	Channel No.	C	GN	O	K	CRC	CR	LF
-----	-----------	-------------	---	----	---	---	-----	----	----

Wrong response:

STX	Scale no.	Channel No.	C	GN	E	Error code	CRC	CR	LF
-----	-----------	-------------	---	----	---	------------	-----	----	----

Here:

Gain millivolt——**6 bits**

Weight value——**6bits**

For example:

02 30 31 31 43 47 4E 30 30 31 39 34 30 30 30 30 32 30 30 35 36 0D 0A (Write in: weight value **200**, corresponding gain millivolt **0.194**)

Correct response: **02 30 31 31 43 47 4E 4F 4B 31 38 0D 0A**

Wrong response: **02 30 31 31 43 48 4E 45 33 38 35 0D 0A** (Para. Code error)

6.2.3.7 Zeroing

Send command:

STX	Scale no.	Channel No.	O	CZ	CRC	CR	LF
------------	-----------	-------------	----------	-----------	------------	-----------	-----------

Correct response:

STX	Scale no.	Channel No.	O	CZ	O	K	CRC	CR	LF
------------	-----------	-------------	----------	-----------	----------	----------	------------	-----------	-----------

Wrong response:

STX	Scale no.	Channel No.	O	CZ	E	Error code	CRC	CR	LF
------------	-----------	-------------	----------	-----------	----------	------------	------------	-----------	-----------

For example:

02 30 31 31 4F 43 5A 38 34 0D 0A

Correct response: **02 30 31 31 4F 43 5A 4F 4B 33 38 0D 0A**

Wrong response: **02 30 31 31 4F 43 5A 45 35 30 36 0D 0A** (Operation can't execute)

6.2.3.8 CRC computation

All the values in front of the parity bit add together and convert to decimal data, then convert the last 2 bits to **ASCII** code (decade in front and the unit at the back).

For example

The following is a frame of data:

0	3	3	3	4	4	5	3	3	0	0
----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------

Add 02~5A: 180(Hex), convert to decimal data: 384. We can calculate from this

that the check code is **38,34** for the data frame.

6.3 tt TOLEDO Protocol

When choose "tt" protocol in working parameter F2.3, indicator will send datas in continuous mode with TOLEDO protocol.

Continuous sending mode format as below:

[illegible]

A B C			display weight(6 bits)	6 ↑ 30H	Checksum
0	0	0	0	0	0
0	0	1	1	1	1
0	1	0	2	2	2
0	1	1	3	3	3
1	0	0	4	4	4
1	0	1	5	5	5
1	1	0	6	6	6
1	1	1	7	7	7

Here:start character is standard **ASCII** start character **02(STX)**

status byte **A** definition as below:

D0	0	1	0	1	0
D1	1	1	0	0	1
D2	0	0	1	1	0
Decimal point	x	.x	.xx	.xxx	.xxxx

D3 D4 D6 为 0(not change) D5 is 1(not change)

status byte **B** definition as below:

D6	D5	D4	D3	D2	D1	D0
Status			Stable	Overflow	symbol	G.W.
Is 0 (not change)	Is 1 (not change)	Is 1 (not change)	1-unstable 0-stable	1-overflow 0-normal	1-negative 0-positive	Is 0 (not change)

status byte **C** is reserved, output 20H.

6.4 Cb920

When **F2.3=Cb920** in working parameter, indicator will send weighing data continuously without command under **Cb920** protocol.

Data format:

Status	,	G.W.	0/1	Symbol	Display	Unit	CR	LF
--------	---	------	-----	--------	---------	------	----	----

Here :

Status — 2 bits, **OL:** (4FH 4CH) OFL; **ST:** (53H 54H)Stable; **US:** (55H 53H)unstable

, — 1 bit, separator 2CH

G.W. — 2 bits, **GS: gross weight 47H 53H**

0/1 — 1 bit, (30H/31H) interleaved transmission

Symbol — 1 bit, 2BH (+) , 2DH (-)

Display — 7 bits, including decimal point

Unit — 2 bits, blank space (20H 20H)

CR — 1 bit, 0DH

LF — 1 bit, 0AH

For example: When indicator send the following automatically:

53 54 2C 47 53 31 2B 20 20 31 39 30 2E 31 20 20 0D 0A

Means: Stable、G.W.、Data value is positive、current weight is **190.1**

6.5 rECont

Indicator will send weighing data to the upper computer continuously without any command.

Return data frame format specification :

Status	,	GS	,	+/-	Display	Unit	CR	LF
--------	---	-----------	---	-----	---------	------	-----------	-----------

2bits	2C	47 53	2C	2B/2D	7bits	6B 67	0D	0A
--------------	-----------	--------------	-----------	--------------	--------------	--------------	-----------	-----------

Here:

Status — **2 bits**, **OL(OFL):4FH 4CH; ST(stable):53H 54H; US(unstable):55H 53H**

Display value — **7bits**, including decimal point, high bit is blank if no decimal point.

For example: When indicator send the following automatically:

53 54 2C 47 53 2C 2B 30 31 31 2E 31 32 30 6B 67 0D 0A

Means: Stable, Data value is positive, display value is **11.120kg**

6.6 rEREAD

Indicator will send weighing data to the upper computer under command.

Data format:

Data	R	E	A	D	CR	LF
explain	52H	45H	41H	44H	0DH	0AH

The return data frame is the same with that of **rECont** protocol, please refer to **rECont**.

- 1) Zero clearing command: ZERO ON<CR><LF> : **5A 45 52 4F 20 4F 4E 0D 0A**

Return YES<CR><LF> or NO? <CR><LF>

- 2) Calibration zeroing command: TARE ON<CR><LF> : **54 41 52 45 20 4F 4E 0D 0A**

Return YES<CR><LF> or NO? <CR><LF>

- 3) Read ID no.: GET ID<CR><LF> : **47 45 54 20 49 44 0D 0A**

Return ASCII code with 6 digits ID no.

6.7 Modbus

Indicator uses **RTU mode** to communicate, every 8-bit byte of the message are divided into 2pcs of 4-bit hexadecimal characters to transmit at binary code.

Code: Binary

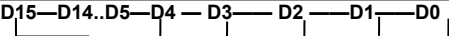
Function code:

Function code	Definition	Description
03	read the register	
06	preset single register	
16	preset several registers	Command only support preset double registers.
01	read coil	The length unit is bit.
05	write coil	

Exception code response

Code	Definition	Description
02	Illegal data address	Data address received from error code is not allowed
03	Illegal data value	Data wrote in is not in permissible range
04	machine fault	When indicator is trying to execute operation required, unrecoverable error is produced.
07	Unsuccessful programming request	Command received can't be executed under current condition.

6.7.1 Modbus communication address

PLC addr.	Display addr.	Description
The following items are only-read register(code 0x03)		
40001	0000	Present weight value(4bits including sign characters, the high bit is in the front)
40002	0001	
40003	0002	 <p> All is 0 0: + 0: non-zero 0: normal 0: unstable 1: - 1: zero 1: OFL 1: stable </p>
40004	0003	Reserve(permit to read, reading value is 0)
.....	
40006	0005	

The following items are two bytes and are available to read and write (write code 0x06, read code 0x03)		
40007	0006	Zeroing(zeroing when write in non-zero value)
40008	0007	Automatically zeroing when power on (0: OFF; 1: ON)
40009	0008	Zero tracking range (0-9d)
40010	0009	Stable range (1-9d)
40011	0010	Zeroing range (0%-99%)
40012	0011	Digit filter parameters(0-9)
40013	0012	Stability filter series(0-9)
40014	0013	AD sample rate: 0:15/s 1:30/s 2:60/s 3: 120 /s 4:480/s 5:960/s
40015~ 40018	0014~ 0017	Reserved
40019	0018	Decimal point place (0:0bit,1:1bit,2:2bits,3:3bits,4:4bits)
40020	0019	Minimum division (1/ 2/ 5/ 10/ 20/ 50)
The following items are available to read and write (writing code 0x10, read code 0x03)		
40021	0020	Maximum capacity (max.capacity≤mini.division×100000)
40022	0021	

40023	0022	Zero calibration with weights: write in 1 and calibrate zero with the current weight. Read: Absolute millivolt of current load cell
40024	0023	
40025	0024	Zero calibration without weights: Write millivolt value at zero; Write in range (load cell 3mV/V :millivolt value range within 0.02-12.000mV) millivolt value at zero when read.
40026	0025	
40027	0026	Gain calibration with weights. Write weight value(\leq max. capacity). Return millivolt at present weight value when read
40028	0027	
40029	0028	Gain calibration without weights; input gain millivolt(load cell 3mV/V:0.000 < millivolt< 15.000mV — zero millivolt).Read: millivolt value for gain calibration.
40030	0029	
40031	0030	Gain calibration weight without weights. input gain millivolt(\leq max. capacity) Read: weight value for gain calibration.
40032	0031	
40033~40040	0032~0039	reserved
40041	0040	Set point 1 stable or not (0: no; 1: yes)
40042	0041	Set point 1 min. duration time (0-999 : 0-99.9sec.)
40043	0042	Set point 1 valid condition
40044~40045	0043~0044	Set point 1 set value 1

40046~40047	0045~0046	Set point 1 set value2
40048	0047	Set point 2 stable or not (0: no; 1: yes)
40049	0048	Set point 2 min. duration time (0-999 : 0-99.9sec.)
40050	0049	Set point 2 valid condition
40051~40052	0050~0051	Set point 2 set value1
40053~40054	0052~0053	Set point 2 set value2
40055	0054	Set point 3 stable or not (0: no; 1: yes)
40056	0055	Set point 3 min. duration time (0-999 : 0-99.9sec.)
40057	0056	Set point 3 valid condition
40058~40059	0057~0058	Set point 3 set value 1
40060~40061	0059~0060	Set point 3 set value 2
40062	0061	Set point 4 stable or not (0: no; 1: yes)
40063	0062	Set point 4 min. duration time (0-999 : 0-99.9sec.)
40064	0063	Set point 4 valid condition
40065~40066	0064~0065	Set point 4 set value 1
40067~40068	0066~0067	Set point 4 set value 2
40069	0068	Output 1 user-defined
40070	0069	Output 2 user-defined
40071	0070	Input 1 user-defined

40072	0071	I/O output value	Note: available only when coil address 00016 is valid. Input write 1 valid, 0 invalid. Read 1 valid, 0 invalid
40073	0072	I/O input value	
Reserved			
40401	0400	Current weight value(4 bytes with symbolic number, high digit in front)	
40402	0401		
40403	0402	D15—D14……D4 0 D3 0:+ 1:- D2 0:non-zero 1:zero D1 0:normal 1:OFL D0 0:Stable 1:Unstable	
40404	0403	0	
40405	0404	6 digits without symbolic number, user ID no.	
40406	0405		
The following items are bit read only. (read code: 0x03)			
49001	9000	Version no.	If display10024, formatXX XXXX,main version no., hardware no., software no..So main version no.01, hardware no. 00, software no. 24
49002	9001		

49003	9002	Develop time	If display 141024, means 24 th Oct., 2014
49004	9003		
The following items are bit read only. (read code: 0 x 0 1)			
00001	0000	0: unstable; 1: stable	
00002	0001	0: normal; 1: OFL	
00003	0002	0: non-zero; 1: zero	
00004	0003	0: +; 1: -	
00005	0004	Reserved	
00006	0005	Reserved	
The following item are available to read and write (read code: 0x01, writing code: 0x05)			
00007	0006	Automatically zeroing when power on (0: OFF; 1: ON)	
00008	0007	Reserved	
00009	0008	Reserved	
00010	0009	Reset all	
00011	0010	Reset calibration	
00012	0011	Reset paramaters	
00013	0012	Reset I/O	

00014	0013	Reserved	
00015	0014	Reserved	
00016	0015	I/O testing switch	
00017	0016	Set point 1 status	Only read: 0:invalid, 1:valid
00018	0017	Set point 2 status	
00019	0018	Set point 3 status	
00020	0019	Set point 4 status	
00021~ 00032	0020~ 0031	Reserved	

7 Password Input and Setting, Reset

7.1 Password Input

- (1) Indicator calibration and working paraters setting default password: **000000**.
- (2) User can set password in parameters when **F4.1** is“**ON**”.
- (3) When display is “PASS”, need to input correct password to enter parameters.

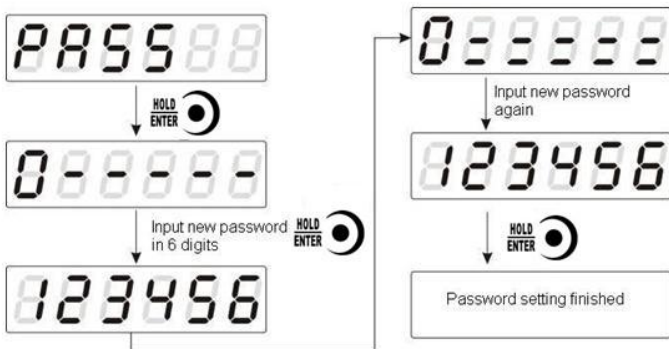
Note:

- (1) When input password, if first time wrong, it will go to the second chance for password input(display from **0 - - - -** turn to **0 - - - -**).
- (2) If second input wrong, it will enter into interface for inputting password the third time
(Display change from **0 - - - -** to **0 - - - -**).
- (3) If Input wrong for three times, main display show “Error4” and self-lock, but user can operate when power on again.

7.2 Password Setting

- (1) User can set password in parameters when **F4.1** is“**ON**”.

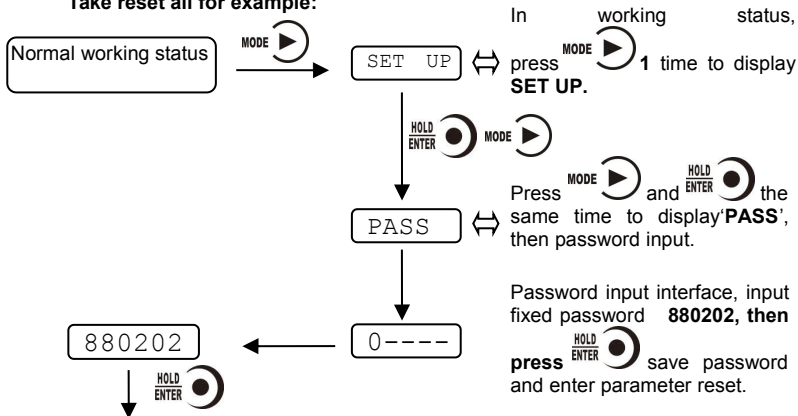
- (2) User must input same new password twice in setting password, If not same, main display show "**Error**" one second and return to **PASS** again.

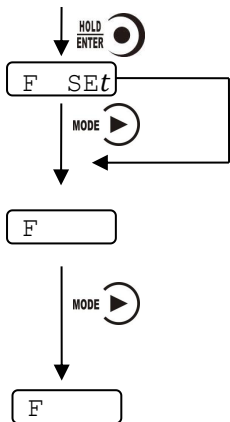


7.3 Factory Reset

Note: Factory reset is only for special technicians, which will reset all of parameters and will maybe cause not working.

Take reset all for example:





⇔ 1) In **F Set** interface, press **HOLD ENTER** to reset working parameters, enter into reset calibration parameters interface.

2) In **F Set** interface, press **MODE**, not to make working parameter reset, enter into calibration para. Reset interface.

⇔ 1) In **F CAL** interface, press **HOLD ENTER** to reset calibration para., enter into reset all interface.

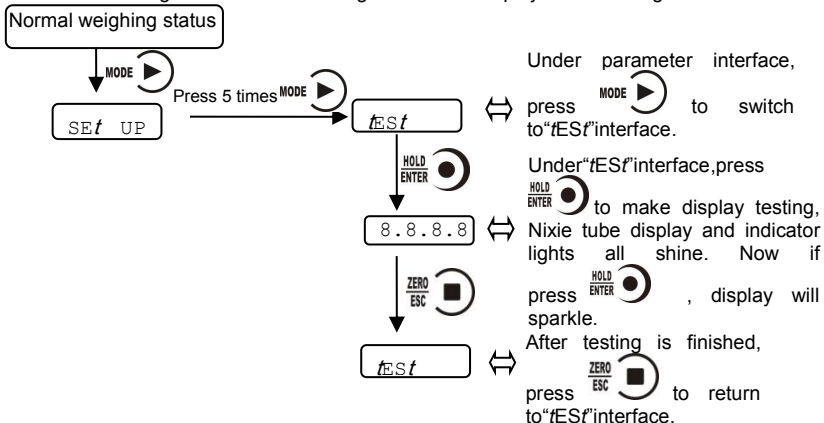
2) In **F CAL** interface, press **MODE**, not to make calibration para. reset, enter into reset all interface.

⇔ 1) In **F ALL** interface, press **HOLD ENTER** to make reset all of the parameters (including working para., calibration para., I/O etc..)

Note: In all reset interfaces, press **ZERO ESC** to exit and return to weighing interface.

8 Display Testing

The following flow chart is to test lights on main-display and status lights.



9 Errors and Alarm Messages

Error ① Input error.

② wrong data beyond parameter range.

Error 2 The present weight value is out of zeroing range.

Error 3 Scale platform is not stable when zeroing.

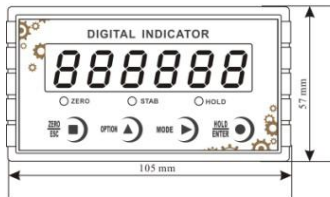
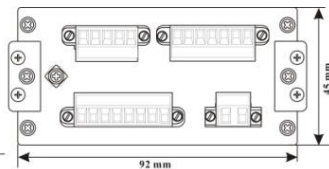
Error 4 Input wrong password more than 3 times.

OFL Weighing value is positive overflow.

-OFL Weighing value is negative overflow.

10 Dimension of Indicator

Dimension of rear panel: **92×45(mm)**



Dimension of front panel: **105×57(mm)**

Panel cutout dimension: **93×46(mm)**

