Din Rail Mountable High Precision Digital Load Cell Transmitter

RW-GT01DE

SMOWO®

Catalog

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Brief Introduction

Din Rail Mountable High Precision Digital Load Cell Transmitter

• Built-in 24 bit high precision AD converter
• Multi-segment Linear calibration function
• Software filtering algorithm
• Automatic zero tracking
• Isolation among power supply, load cell input and communication interface with strong anti-interference capacity
• Standard Modbus RTU communication protocol
• Module address setting conveniently and quickly
• Standard DIN rail mounting mode for space saving

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Technical Data

1. Power supply: 9-26VDC
2. Power consumption: 40mA@24V
3. Output interface: two-wire system RS485
4. Baud rate: 300-115200bps
5. Data format: 1 starting bit, 8 bit data, 1 stop bit, 1 optional parity bit
6. Verification mode: None/odd parity/even parity/SPACE/MARK
7. Communication protocol: Modbus RTU and own protocol
8. Communication address setting: two digit hexadecimal rotating dial switch
9. Load cell sensitivity: 0.8-3.9mV/V, customized for special sensitivity
10. Load cell excitation voltage: 5V
11. Load capacity: 350Ω load cell 6 pcs at most
12. AD converter resolution: 24bit, internal code >1000000
13. Conversion rate: 6.25-400times/second or 7.5-480times/second
14. Enclosure material: ABS
15. Dimension: 115*37*58(length x width x height, mm)
16. Gross weight: around 100g

Dimension(mm)
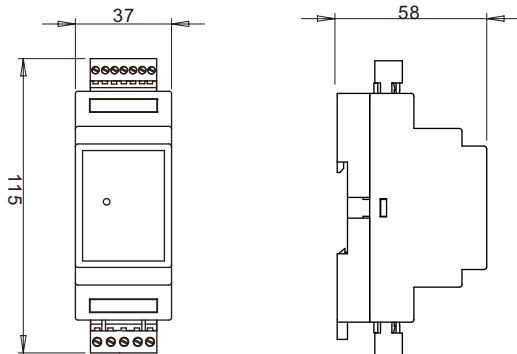
Terminal and Switch
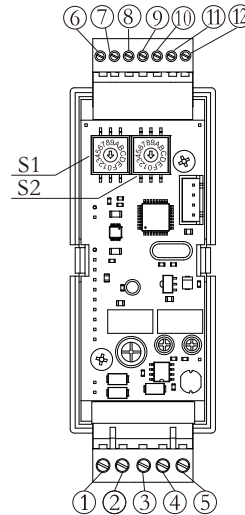
No.	Code	Description
1	24V+	DC24Vpower+
2	0V	DC24Vpower-
3	D+/A	RS485communication+
4	D-/B	RS485communication-
5	COM	communication Common(not connect usually)
6	E+	load cell Excitation voltage+
7	F+	load cell feedback+
8	S+	load cell signal output+
9	S-	load cell signal output-
10	F-	load cell feedback-
11	E-	load cell Excitation voltage-
12	SLD	load cell cable shielded layer & transmitter ground

S1, S2: transmitter communication address (ModBus slave address) setting
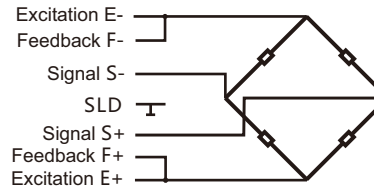
load cell 4 wiring connection
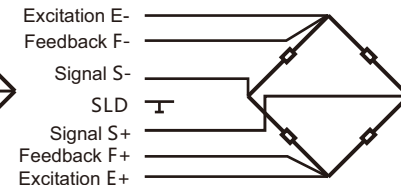
load cell 6-wiring connection

1.Wiring

When wiring, please disconnect power supply of transmitter. Transmitter wiring terminal is plug. To connect easily, please connect cable and terminal plug first, and then plug into socket of transmitter. Please do not plug in a wrong place. It is better to use pin-type cold-pressed terminal to keep reliability of connection. Please use special shielded wire for load cell wiring and do not bind it with AC power supply. Connect load cell cable shielded layer to terminal 12 and

connect it to the ground.

2.Communication Address (Modbus slave address) setting

Communication address of transmitter, that is, Modbus communication protocol slave address, set by software or 2 hex rotating dial switches. Only when S1 and S2 at 0, the address set by software is valid, at the same time, series rate is fixed at 9600 and no parity.

Communication address=S1positionX16+S2position

Attention: the position of S1 or S2 is hex, 0-9-A-F means decimal 0-9-10-15.

Example: S1 position is 5, S2 position is D, that is, 5D in hex, change to decimal system 5X16+13=93. It means transmitter address 93.

If change the position of S1 and S2, it needs to re-up electricity.

3. Communication Interface

Transmitter communication interface is RS485 serial communication standard. RS485 is half-duplex communication, supporting master-slave mode of multiprocessor communication network. Master can be PLC, HMI and controller or PC with RS485 interface. Please follow below diagram to connect all the RS485 interface communication of master-slave device for networking:
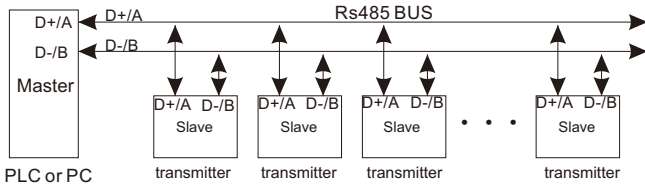
Please check other related notes of RS485 standards for your reference.

ModBus RTU Communication Protocol

All the parameter of transmitter is set and read by standard ModBus RTU communication protocol. Measured value is considered as a parameter. For convenience, all the inter parameters type of transmitter is 32 bit integer, occupying two ModBus holding register, although actual parameter range is needing one register. No 3 function code (read holding register) and No 16 function code (set multi-holding register) access each parameter. Please see below table for corresponding relation between inter parameter of transmitter and Modbus holding register address. Attention: storage order is high 16 in front and low 16 in the back, which is different with some PLC inter storage order. In actual use, please take PLC programming manual for your reference to decide whether needs to make modify.

Table 1 Parameter and Modbus Holding Register Address

No	Parameter	Register Address (Hex)	Access Mode	Value Range	Unit	Description
0	AV	1F40-1F41	RO	32 bit integer		ADC bare value
1	PV	0000-0001	W/R	32 bit integer		measured value. write this parameter to clear or preset measured value[Note1]
2	DE	0002-0003	W/R	1-254		transmitter communication address, that is Modbus slave No.[Note2]
3	ZV	0004-0005	W/R	32 bit integer		offset of measured value
4	CP	0006-0007	W/R	2-9		calibration point quantity
5	AVP1	0008-0009	W/R	32 bit integer		1st calibration point AD value
6	AVP2	000A-000B	W/R	32 bit integer		2nd calibration point AD value
7	AVP3	000C-000D	W/R	32 bit integer		3rd calibration point AD value
8	AVP4	000E-000F	W/R	32 bit integer		4th calibration point AD value
9	AVP5	0010-0011	W/R	32 bit integer		5th calibration point AD value
10	AVP6	0012-0013	W/R	32 bit integer		6th calibration point AD value
11	AVP7	0014-0015	W/R	32 bit integer		7th calibration point AD value
12	AVP8	0016-0017	W/R	32 bit integer		8th calibration point AD value
13	AVP9	0018-0019	W/R	32 bit integer		9th calibration point AD value
14	PVP1	001A-001B	W/R	32 bit integer		1st calibration displayed value
15	PVP2	001C-001D	W/R	32 bit integer		2nd calibration displayed value
16	PVP3	001E-001F	W/R	32 bit integer		3rd calibration displayed value
17	PVP4	0020-0021	W/R	32 bit integer		4th calibration displayed value
18	PVP5	0022-0023	W/R	32 bit integer		5th calibration displayed value
19	PVP6	0024-0025	W/R	32 bit integer		6th calibration displayed value
20	PVP7	0026-0027	W/R	32 bit integer		7th calibration displayed value
21	PVP8	0028-0029	W/R	32 bit integer		8th calibration displayed value
22	PVP9	002A-002B	W/R	32 bit integer		9th calibration displayed value
23	ADSP	0034-0035	W/R	0-6		AD conversion speed and uni-polarity/bipolar option-table 2
24	FLTL	0056-0057	W/R	0-5		software filter parameter control
25	FBND	0058-0059	W/R	0-1000		filter band, difference absolute between measured value of 2 times[Note3]
26	BAUD	005A-005B	W/R	0-10		communication baud rate-table 3
27	ATZT	005C-005D	W/R	0-50	100ms	automatic zero tracking delay[Note4]
28	ATZB	005E-005F	W/R	0-50		automatic zero tracking band[Note4]
29	STBT	0060-0061	W/R	1-50	100ms	stability judging time
30	STBC	0062-0063	W/R	1-100	0.5	stability judging condition
31	RUND	0064-0065	W/R	1-250		division
32	PRTY	0066-0067	W/R	0-4		serial communication parity bit-table 4

Note1: this parameter is measured value or display value of transmitter. In the process of communication, data is transferred by the way of integer, so there is no decimal point. If needing decimal point, please set on the host. For example: For one load cell with range 10kg, if resolution of measured value reach to 1g, it needs to calibrate transmitter PVP2 to 10000 display code. (supposing apply two points calibration here); if needing resolution 0.1g, it needs to calibrate PVP2 to display code 100000. After host read measured value, user needs to handle decimal point to show actual weight correctly, according to resolution. The former have no decimal point, so it show g directly; the later needs to add one decimal point, divide measured value by 10 and then show g. If write this parameter 0, please make measured value "clear". If write a nonzero value, user needs to modify current value to this value, that is, preset measured value.

Note2: Transmitter support hardware address and software address. Hardware is set by 2 rotary switches, while software is set by parameter DE. Only when hardware address is 0, software address is valid. Attention: now transmitter communication address is fixed: baud rate 9600, no parity. 0 is always treated as broadcast address. Therefore, when not clear for current baud rate, parity check and other communication parameters, it can reset after setting hardware address 0. Restore default of transmitter communication parameter: baud rate 9600, no parity, and then it can use host to modify parameter of transmitter. Finally, revise hardware address to whatever you need.

Note3: Parameter FILTER value is higher, measured value is more stable, but measured delay is bigger. If the difference absolute value of two successive measured results is higher than parameter FBND, filter direct connection can quicken response speed. If amplitude of measured value is bigger, please increase FBND appropriately.

Note4: If absolute value of measure value less than ATZB and keep stable within the time set by ATZT, measured value return to zero automatically. In the application of filling and feeding, please note that weight rate of increase and decrease higher than ATZB/ATZT, or the added weight will be cleared automatically.

Table2 -AD Conversion Speed and Input Signal Polarity Selection

ADSP value	ADC speed	Interference Suppression	Input Signal Polarity	Input Signal Range	ADSP value	ADC speed	Interference Suppression	Input Signal Polarity	Input Signal Range
0	7.5SPS	60Hz	bipolar	$\pm2mV/V$	128	7.5SPS	60Hz	unipolar	0-2mV/V
1	15SPS	60Hz	bipolar	$\pm2mV/V$	129	15SPS	60Hz	unipolar	0-2mV/V
2	30SPS	60Hz	bipolar	$\pm2mV/V$	130	30SPS	60Hz	unipolar	0-2mV/V
3	60SPS	60Hz	bipolar	$\pm2mV/V$	131	60SPS	60Hz	unipolar	0-2mV/V
4	120SPS	60Hz	bipolar	$\pm2mV/V$	132	120SPS	60Hz	unipolar	0-2mV/V
5	240SPS	60Hz	bipolar	$\pm2mV/V$	133	240SPS	60Hz	unipolar	0-2mV/V
6	480SPS	60Hz	bipolar	$\pm2mV/V$	134	480SPS	60Hz	unipolar	0-2mV/V
7	6.25SPS	50Hz	bipolar	$\pm2mV/V$	135	6.25SPS	50Hz	unipolar	0-2mV/V
8	12.5SPS	50Hz	bipolar	$\pm2mV/V$	136	12.5SPS	50Hz	unipolar	0-2mV/V
9	25SPS	50Hz	bipolar	$\pm2mV/V$	137	25SPS	50Hz	unipolar	0-2mV/V
10	50SPS	50Hz	bipolar	$\pm2mV/V$	138	50SPS	50Hz	unipolar	0-2mV/V
11	100SPS	50Hz	bipolar	$\pm2mV/V$	139	100SPS	50Hz	unipolar	0-2mV/V
12	200SPS	50Hz	bipolar	$\pm2mV/V$	140	200SPS	50Hz	unipolar	0-2mV/V
13	400SPS	50Hz	bipolar	$\pm2mV/V$	141	400SPS	50Hz	unipolar	0-2mV/V

● Please select ADC speed according to your power network to get the best anti-interference result. The higher of ADC speed, the quicker of response time of measured value, the lower of measured value.

● In the application of weighing and one-way load, please select single polarity input to get max measurement resolution.

Table3-Baud Rate Setting

BAUD value	Baud Rate	BAUD value	Baud Rate
0	300bps	6	19200bps
1	600bps	7	28800bps
2	1200bps	8	38400bps
3	2400bps	9	57600bps
4	4800bps	10	115200bp
5	9600bps		

Table4-Parity Bit Setting

PRTY value	Checkout Mode
0	no parity
1	odd parity
2	even parity
3	1 parity
4	0 parity

Communication Example

1. Read measured value with slave No 1 transmitter by function code 03 to read holding register. Register No. of measured value is 0000-0001(Register No. 40001-40002 in PLC), length is 4 byte signed long integer, high 16 bytes in front Dimension is related with calibration. For example, if load cell range is 800kg, and calibration is 800000, which means the data read is actual measured value, and unit is g. If calibration is 80000, the value unit read is 0.01kg. This transmitter does not support decimal point.

Query message from Host:
01 03 00 00 00 02 C4 0B (slave address: 01, function 03, read 2 consecutive holding register from 0000, the last is CRC calibration code)
Responsive message from transmitter:
01 03 04 00 01 05 E2 28 EA (slave address: 01, function: 03, responsive 4 byte data: 00 01 05 E2, which means decimal 67042, that is, measured value is 67042, the last is CRC calibration code)
2. Setting transmitter device address (slave address): use function code 10 to write many holding register. For example: the original device address is 01, need to revise to 10.

Query message from Host:
 01 10 00 02 00 02 04 00 00 00 0A F2 71 (slave address is 01, function:10, write 2 consecutive holing register from 0002, total data bytes:4, new address 10 is changed to 32-byte hex 00 00 00 0A, the last is CRC calibration code)
Responsive message from transmitter:
01 10 00 02 00 02 E0 08 (slave address: 01, function: 10, write 2 consecutive holding register from 0002, the last is CRC calibration code)
3. Clear: write measured value register 0 directly. Other needed value can be written into preset display value. However, please note that this operation could not save zero value in the inner part of transmitter, when power up next time, it will return to original set value.

Query Message from Host:
01 10 00 00 00 02 04 00 00 00 00 F3 AF (slave address:01, function: 10, write 2 consecutive holding register from 0000, total data bytes: 4, set displayed value 0, the last is CRC calibration code)

Responsive Message from transmitter:
01 10 00 00 00 02 41 C8 (slave address: 01, function 10, write 2 consecutive holding register from 0000, the last is CRC calibration code).

4. Zero setting:
First read present displayed value, and then write it into transmitter zero point register. Please note that do not make clear before this operation. Writing zero tracing value 0 is used for factory testing. So we suggest using clear function, so as not to shorten service life of inner part of transmitter,

5. MODBUS Command Calibration
We suggest using transmitter as AD module, and make calibration calculation on host. Please check below methods to make transmitter calibration through MODBUS command.

- Weighing nothing, read AD code 32 times (register 1F40-1F41), get average value, write it into AVP1 and write 0 for PVP1

- For standard loading, read AD code 32 times (register 1F40-1F41), get average value, write it into AVP2, write standard load value for PVP2. Please note that this value decides (affect) resolution of transmitter. For example, if standard load is 10kg and need resolution to show 1g, 10000 must be wrote.

- If write calibration point 2, calibration is finished.

- If need to make multi-calibration, make standard load incremented repeatedly, read AD code, write into corresponding register and revise register value of calibration point.