Loadcell to Modbus Remote I/O Module

Compact Modbus RTU remote I/O module for load
cell and strain gauge input with Scale Mode and Force Mode.

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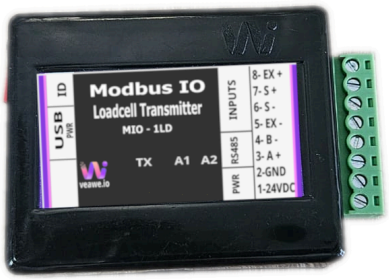
Compact Modbus RTU remote I/O module for loadcell sensor / strain gauge input.



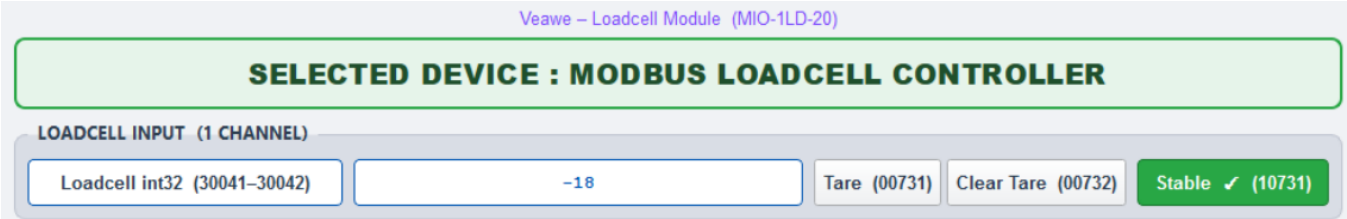
Key Features

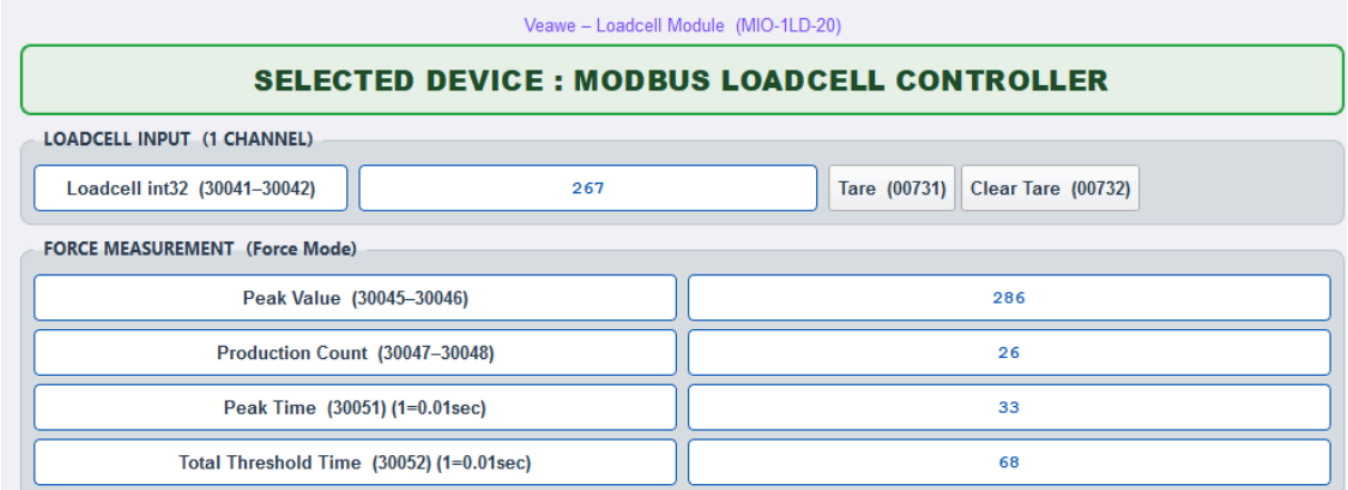
- One Load Cell / Strain Gauge input to Modbus RTU
- Two modes of operation – Scale Mode and Force Mode
- 20-bit resolution analog to digital precision conditioner
- Clean analog front-end designed for industrial environments
- Free software based easy configuration
- Integer and IEEE754 float value support
- Modbus RTU over RS-485
- Write to remote device – Master Mode
- DIP switch for address selection from 1 to 15
- Wide Supported baud rates from 300 to 115200
- DIN Rail mount support
- Dimensions: 60mm x 50mm x 20mm (L x W x H)

ModViz – Modbus Configuration & Visualization Tool

ModViz is a powerful yet simple configuration and visualization tool designed to work seamlessly with **Veawe Modbus I/O modules**. It enables engineers, system integrators, and technicians to quickly configure, monitor, and test field devices through an intuitive graphical interface.

The software can be downloaded from https://veawe.io/modviz/





Ordering Information

Product Code	Description
MIO-1LD	**LOADCELL TRANSMITTER**

Applications

- **Industrial Automation** – Integrate load cell and strain gauge sensors into PLC and SCADA systems via Modbus RTU
- **Process Monitoring** – Continuous weight measurement for tanks, hoppers, and platform scales in Scale Mode
- **Quality & Force Testing** – Capture peak force events for press monitoring, tension testing, and crimp verification in Force Mode
- **Material Handling & Logistics** – Check-weighing, batching, and fill-level control on production lines
- **Remote Monitoring** – Ideal for distributed weighing or force-measurement points reporting scaled engineering values over Modbus RTU

Specifications

Parameter	Value
Mounting	DIN rail
Dimensions	60 mm x 50 mm x 20 mm (L x W x H)

Electrical Specifications

Parameter	Value
Supply Voltage	9–24V DC or USB 5V
Excitation Voltage	5V DC
Communication Port	RS-485

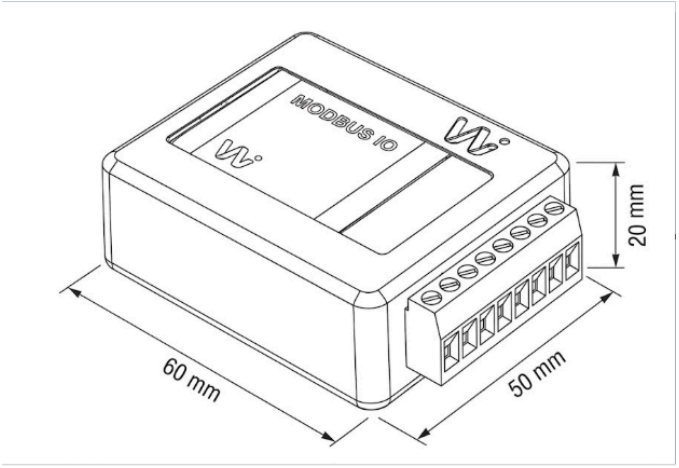
Input/Output Specifications

Parameter	Value
Channel Count	1
Sensor Type	Strain gauge / Wheatstone bridge load cell
ADC Resolution	20-bit
Excitation Voltage	5V DC
Signal Range	±20mV (differential)
Conversion Rate	Configurable sample speed

Isolation & Protection Specifications

Parameter	Value	Notes / Description
Supply Reverse Polarity Protection	Integrated	Series protection diode (continuous protection, zero reverse leakage)
Supply Isolation	Non-Isolated	Common ground between input power, internal circuitry, analog inputs
Transient Voltage Clamping	Up to 600W	Clamps overvoltage spikes (10/100 µs peak pulse rating)
EMC & Immunity Standards	Class-Compliant	Meets IEC 61000-4-2 (ESD), IEC 61000-4-4 (EFT), & IEC 61000-4-5 (Surge)
RS-485 Bus ESD Protection	15kV HBM/Air	IEC61000-4-2 Integrated high-ESD protected transceiver on A/B lines

Mechanical Dimensions

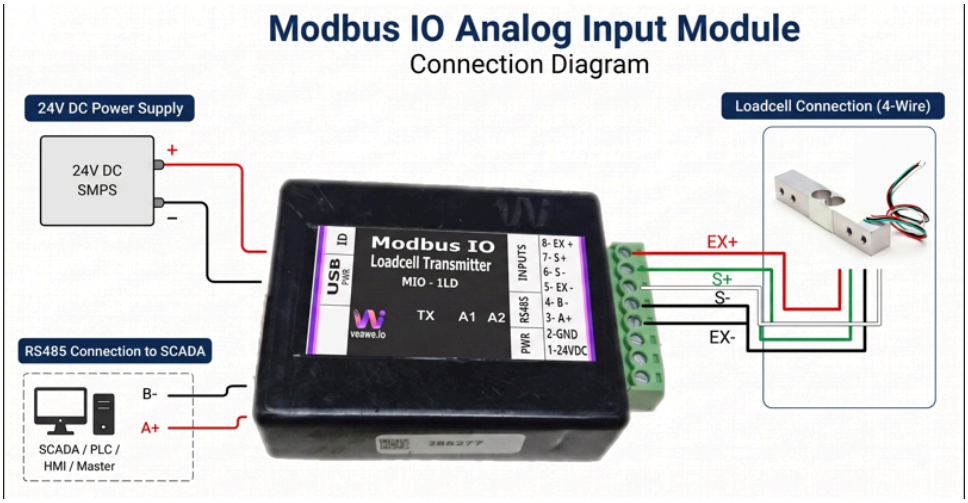


Terminal Details

Pin	1	2	3	4	5	6	7	8
Signal	24V+	24V-	A+	B-	EX-	S-	S+	EX+

Wiring Diagrams

Note: All images and connection diagrams shown are for illustrative purposes only and may differ from the actual product.



Communication Interface

Protocol	Physical Layer	Default Baud Rate	Default Format
Modbus RTU	RS-485	19200	8N1

Basic Process Registers

Signal	Address	Type	Description
Weight (int16 / float)	30001 / 30021–30022	int16 / float	Scaled weight value / Engineering float value
Raw ADC Counts	30043–30044	int32	Raw uncalibrated ADC counts
Tare Command	00731	Bit	Set current weight to zero (Tare)

Supported Modbus Function Codes

Read	Write
01 – Read Coils	05 – Write Single Coil
02 – Read Discrete Inputs	06 – Write Single Register
03 – Read Holding Registers	15 – Write Multiple Coils
04 – Read Input Registers	16 – Write Multiple Registers

Register Map Overview

Function	Address Range	Type	Description
Discrete Inputs	10601	Bit	Loadcell alarm active indication
Discrete Inputs	10621	Bit	Loadcell sensor open indication
Discrete Inputs	10641	Bit	Loadcell latched alarm status
Discrete Inputs	10731	Bit	Stable flag (Scale Mode)
Discrete Inputs	10733	Bit	Peak captured flag (Force Mode)
Coils	00601	Bit	Reset alarm counters
Coils	00731–00732	Bit	Tare now / Clear tare
Coils	00733	Bit	Reset captured peak measurement
Coils	00734	Bit	Reset production counter
Input Registers	30001	int16	Loadcell scaled value
Input Registers	30021–30022	float	Loadcell scaled engineering value
Input Registers	30041–30042	int32	Live scaled value (32-bit)
Input Registers	30043–30044	int32	Raw ADC counts
Input Registers	30045–30046	int32	Peak value (Force Mode)
Input Registers	30047–30048	uint32	Production count
Input Registers	30051–30052	uint16	Peak time / time above threshold
Input Registers	30601–30602	int16	Loadcell alarm counters
Holding Registers	40101	int16	Modbus slave address
Holding Registers	40621–40622	float	Loadcell gain calibration
Holding Registers	40661–40701	int16	Alarm mode / minimum / maximum
Holding Registers	40731	int16	Operating mode: 0 = Scale, 1 = Force
Holding Registers	40732–40737	int16	Sample speed, filter strength, stable window/time, decimal point, unit
Holding Registers	40741–40744	int32/ int16	Peak threshold, peak drop, peak reset mode

Detailed Register Tables

Discrete Inputs (1xxxx)

Stable Flag

Address	Description
10731	Stable Flag becomes 1 when the measured value remains within the configured Stable Window for the configured Stable Time.
10732	Reserved

In **Scale Mode** – this flag indicates the load value is now stable as per the configured condition.

Peak Captured

Address	Description
10733	Peak Captured becomes 1 after Peak Threshold is exceeded and the measured value subsequently drops by the configured Peak Drop percentage.

In **Force Mode** – this flag indicates the peak force value is captured and available as per the configured condition.

Peak Capture Graph in ModViz

Analog Input Live Alarm Status

Address	Description
10601	Loadcell alarm active indication

If a loadcell sensor value is out of the range set in Alarm Configuration:

- The corresponding alarm LED is ON.
- The alarm indication status bit is set.

Analog Sensor Open Status

Address	Description
10621	Loadcell sensor open indication

If the analog sensor device is faulty, open, or out of voltage range:

- The corresponding sensor open status bit is set.

Analog Input Latched Alarm Status

Address	Description
10641	Loadcell latched alarm status; auto clears on read

Latched alarm status stays high even after the alarm is cleared, and auto-clears only after the master reads this bit.

Coils (0xxxx)

Loadcell Tare Now

Address	Description
00731	Tare now
00732	Clear tare – clears the tare counts

Tares the loadcell's current value. This bit auto-clears. All scaled loadcell values become zero.

Loadcell Peak Reset

Address	Description
00733	Resets the captured peak measurement

In Force Mode, resets the captured peak measurement. This command clears:

- Peak Value
- Peak Time
- Time Above Threshold
- Peak Captured Flag

This bit automatically clears after execution.

Counter Reset

Address	Description
00734	Reset production counter
00601	Reset alarm counters for loadcell

Writing 1 to the coil resets the corresponding retentive counter value. This bit is self-clearing.

Input Registers (3xxxx)

Loadcell Live Values

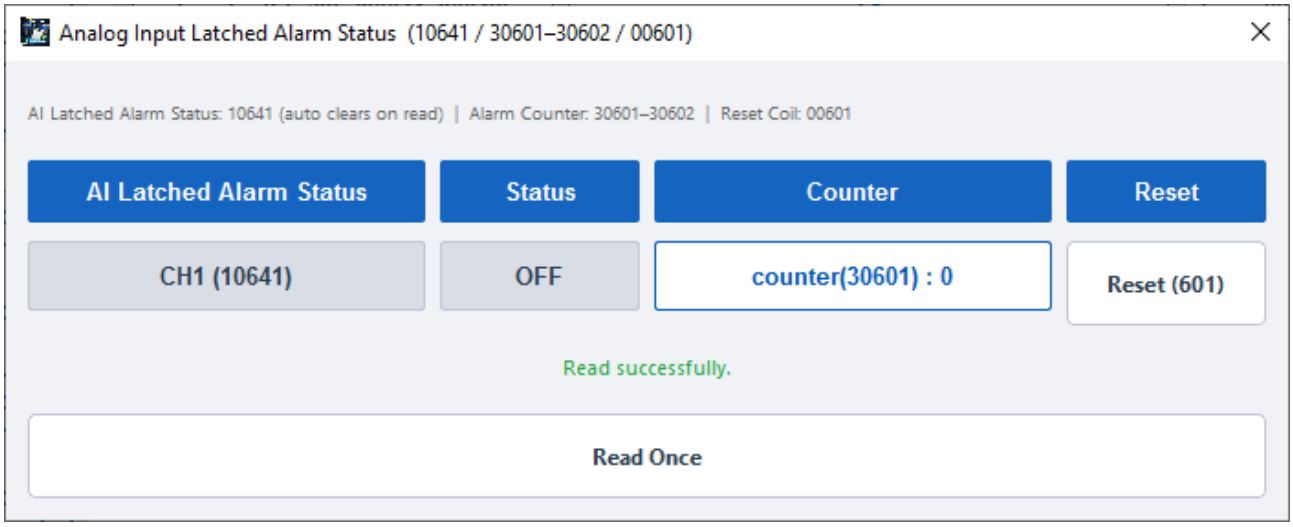
Address	Type	Description
30001	int16	Loadcell scaled value
30021–30022	float	Loadcell scaled engineering value (float)
30041–30042	int32	Loadcell scaled engineering value (32-bit integer)
30043–30044	int32	Loadcell raw ADC count value (32-bit integer)

Force Measurement Values

Address	Type	Description
30041–30042	int32	Live value – current loadcell scaled value
30043–30044	int32	Loadcell raw ADC count value (32-bit integer)
30045–30046	int32	Peak value – maximum pressing value
30047–30048	uint32	Production count – number of successfully completed peak capture events
30051	uint16	Peak time – time from Peak Threshold crossing until Peak Value is detected
30052	uint16	Time above threshold – dwell time under load

Analog Input Alarm Counter Values

Address	Type	Description
30601–30602	int16	Loadcell alarm counters



Holding Registers (4xxxx)

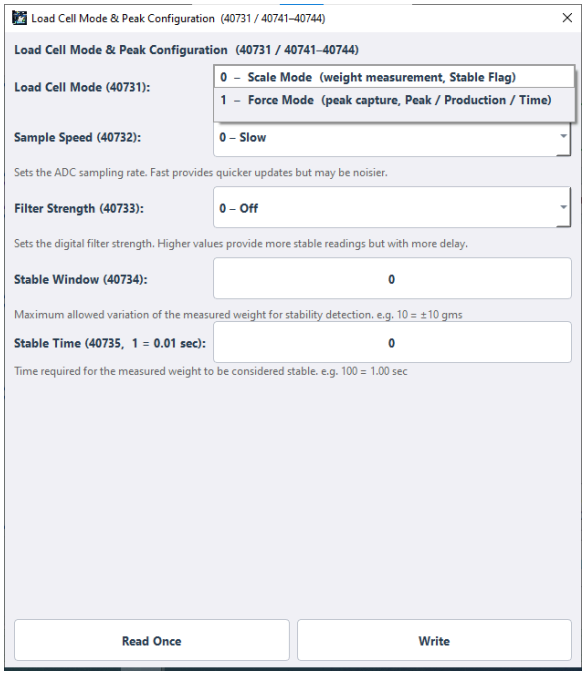
Loadcell Operating Mode

Address	Type	Description
40731	int16	0 = Scale, 1 = Force

The loadcell module operates in one of two modes based on this register:

Scale Mode – Measures weight, updates the filtered value, and asserts the Stable Flag when the configured stability conditions are met. Suitable for slow, accurate measurement.

Force Mode – Acquires high-speed samples, detects threshold and peak values, and measures time taken. Designed to capture short-duration peak forces accurately.



Loadcell Sample Speed

Address	Type	Description
40732	int16	0 = Slow, 1 = Fast

Applies to both modes. Scale Mode may need this set to Slow; Force Mode may need this set to Fast.

Loadcell Filter Strength

Address	Type	Description
40733	int16	0 = Off, 1 = Fast, 2 = Normal, 3 = Stable, 4 = Very Stable, 5 = Slow

Applies to both modes – sets the filter value of the loadcell input.

Suggested settings by application:

Scale Mode - Platform scales – Stable / Very Stable - Check weighing – Fast / Normal - Tank weighing – Very Stable / Slow

Force Mode - Presses, tension testing, and similar applications – Fast or Normal

Stable Window

Address	Type	Description
40734	int16	Maximum allowed variation of the measured weight for stability detection

Scale Mode – e.g. 5 for ±5 grams variation. **Force Mode** – Not applicable.

Stable Time

Address	Type	Description
40735	int16	Time the measured weight must remain within the Stable Window before the Stable Flag is asserted

Scale Mode – Expressed in units of 10ms. Actual Stable Time = Register Value × 10ms (e.g. set to 100 for 1 second). **Force Mode** – Not applicable.

Decimal Point & Unit

Address	Type	Description
40736	int16	Configured decimal point
40737	int16	Configured unit

Defined unit values are not used internally – provided for the remote device's reference:

Value	0	1	2	3	4	5	6	7	8	9	10
Unit	ADC Counts	Cus-tom	g	kg	ton	N	kN	kgf	tonf	lbf	oz

Peak Threshold

Address	Type	Description
40741–40742	int32	The minimum value to start the peak measurement

Scale Mode – Not applicable. **Force Mode** – Example: Unit = N, Peak Threshold = 500 → capture begins above 500N. Unit = kg, Peak Threshold = 20 → capture begins above 20kg.

Peak Drop

Address	Type	Description
40743	int16	Peak is considered captured when the measured value falls below the recorded peak by the configured percentage

Scale Mode – Not applicable. **Force Mode** – Example: 100 for 10.0% peak-value drop.

Peak Reset Mode

Address	Type	Description
40744	int16	0 = Auto rearm, 1 = Hold until reset (ignore new values until reset)

Scale Mode – Not applicable. **Force Mode** – Resets all peak values.

Analog Input Calibration

Address	Type	Description
40621–40622	float	Loadcell gain calibration

Calibration register for weight or force measurement. Use a standard, accurate known weight to set the gain.

Formula:

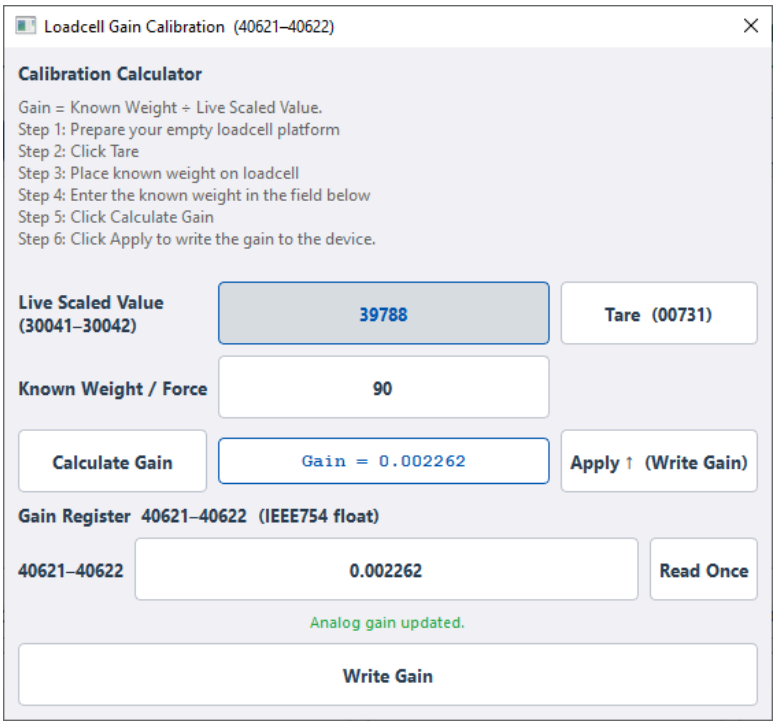
$$\text{Gain} = \frac{\text{Known Weight}}{\text{Net ADC Counts}}$$

Where:

- **Gain** = 32-bit float value written to holding registers 40621–40622
- **Known Weight** = Calibration test weight in desired engineering units (e.g. kg, g, N)
- **Net ADC Counts** = Value read from registers 30041–30042 with calibration weight applied (after taring)

Calibration Procedure:

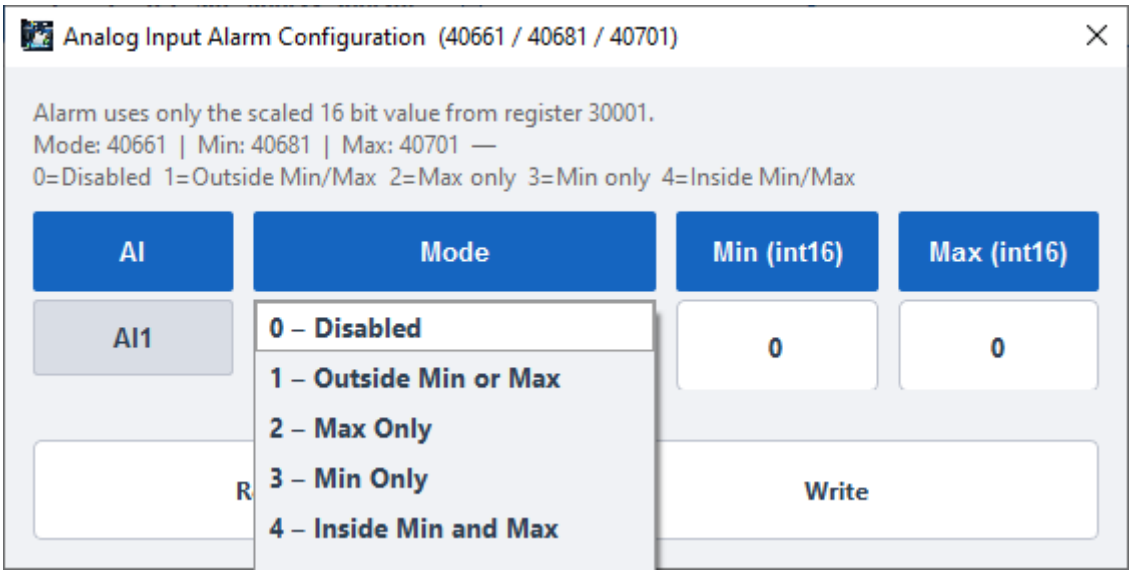
1. **Tare empty scale** – Ensure the platform is empty and trigger Tare (write 1 to coil 00731).
2. **Apply known weight** – Place the test weight on the loadcell.
3. **Read counts** – Read the Net ADC Counts from input registers 30041–30042.
4. **Calculate gain** – `Gain = Known Weight ÷ Net ADC Counts`
5. **Write gain** – Write the calculated float value to holding registers 40621–40622.



Analog Input Alarm Configuration

Address	Type	Description
40661	int16	AI1 alarm mode
40681	int16	AI1 alarm minimum
40701	int16	AI1 alarm maximum

Alarms work with 16-bit scaled values only.



Alarm mode values:

- 0 = Disabled
- 1 = Outside minimum or maximum
- 2 = Maximum only
- 3 = Minimum only
- 4 = Inside minimum and maximum window

Communication Settings

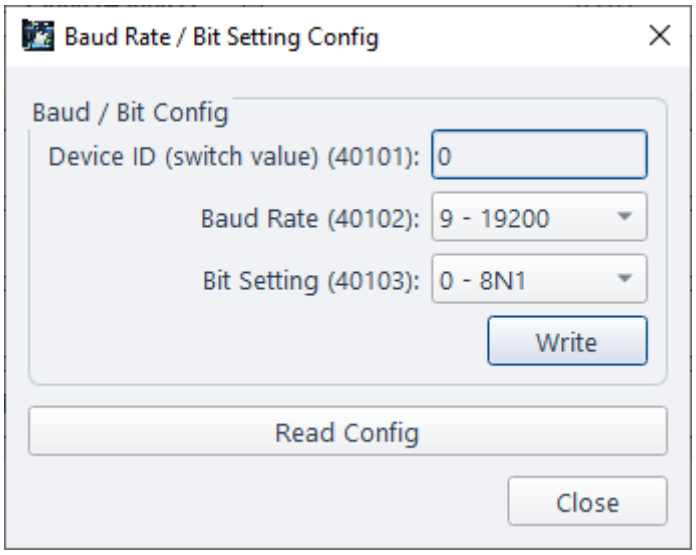
Address	Type	Description
40101	int16	Modbus slave address (switch value)
40102	int16	Baud rate selection
40103	int16	Serial format selection

Modbus Address (40101)

This is set using the rotary or DIP switches.

Baud Rate Register (40102) and Serial Format Register (40103)

Value	Baud Rate	Value	Baud Rate	Value	Format
0	300	7	9600	0	8N1
1	600	8	14400	1	8E1
2	1200	9	19200	2	8O1
3	1800	10	38400	3	8N2
4	2400	11	57600	4	8E2
5	4800	12	62500	5	8O2
6	7200	13	115200		



Default: 19200 baud, 8N1.

Default Settings

Setting	Default
Slave Address	As per switch position
Baud Rate	19200
Serial Format	8N1

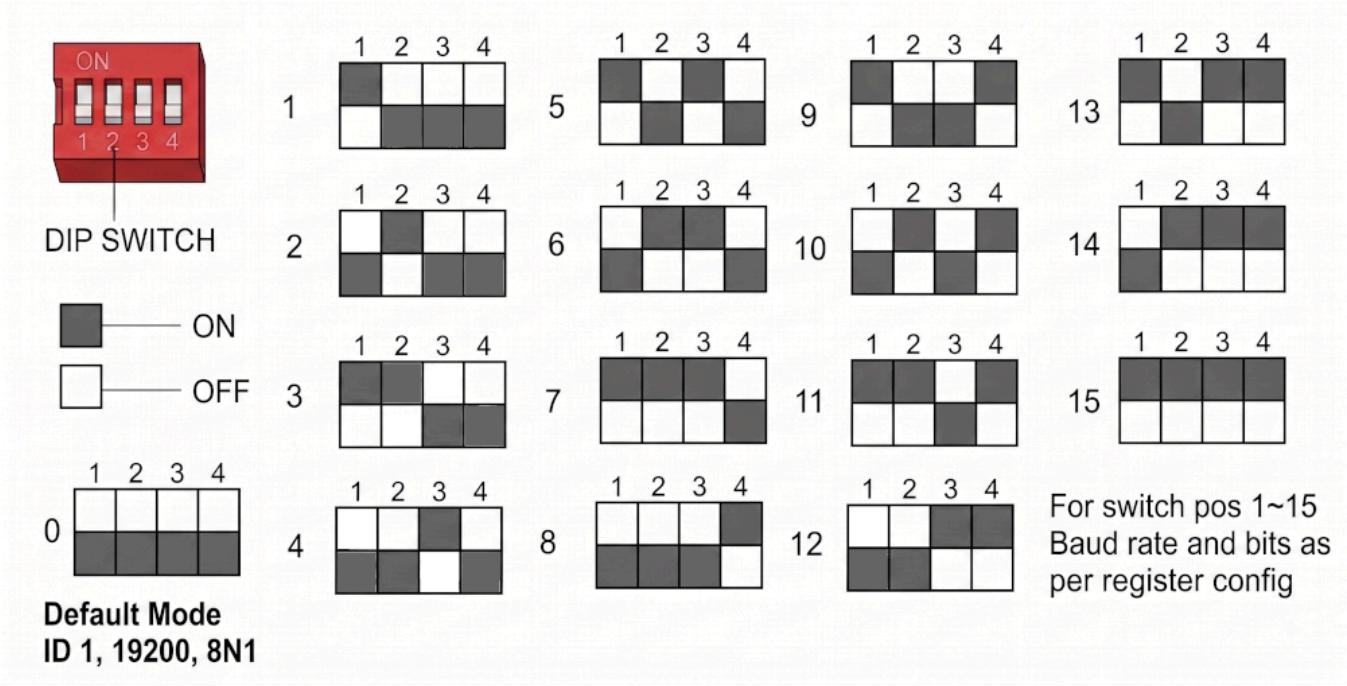
Configuration Settings

Default Mode

Default mode is useful when communication settings are unknown.

When the rotary address switch is set to 00:

- Slave address = 1
- Baud rate = 19200
- Serial format = 8N1



Changing to default mode does not overwrite stored settings. Stored settings remain unchanged until written through Modbus.

LED Indications and Diagnostics

LED	Description
Tx	RS-485 transmit status and run blink every 2 sec when idle
A1	activity status LED1. On when above threshold
A2	activity status LED2. Scale Mode: ON when stable flag Force Mode: ON when peak flag

Calibration and Engineering Values

The module internally measures loadcell milli volt input as a raw integer value using a 20 bit high precision ADC after an industrial grade analog front end.

Example:

- 0mV = 0
- 20mV = 5,24,287
- −20mV = −5,24,288

Raw values represents ADC counts and not the milli Volt equivalents

Engineering value registers allow the raw loadcell value to be converted into user units such as:

● g ● Kg ● ton ● N ● kN ● kgf ● tonf ● lbf ● oz

Engineering values are available in float format using IEEE754 registers and integer 32

Formula:

Engineering Value = Net Raw Value × Gain

Where:

- Net Raw Value = measured ADC counts after Tare (Raw ADC Counts − Tare Offset)
- Gain = engineering unit multiplier when the known load is applied

Net Raw Counts = 353000

Gain = 0.0025
Engineering Value = 353000 × 0.0025 = 882.5

(Also Raw ADC Counts = 365420, Tare Offset = 12420)

Revision History

Revision	Date	Changes
Rev 1.0	2026-08-10	Initial datasheet, HW Version = 3, FW Version = 2

Get the latest version of this datasheet : **click here..**

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