SCT-4X-AN

Firmware version 01.21.01

Modbus Protocol

RICE LAKE®
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www.ricelake.com

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Introduction

Thank you for purchasing this product.

This manual contains modbus information for the following SCT-1SX digital weight transmitters:

- SCT-1SX-AN

It is recommended that you carefully follow the instructions for programming the weight transmitter; performing actions not indicated in this manual could compromise the functionality of the scale.

Manuals are available from Rice Lake Weighing Systems at www.ricelake.com/manuals
Warranty information is available at www.ricelake.com/warranties

Any problem with the product must be reported to the manufacturer or to the retailer where it was purchased.
Always TURN OFF THE POWER SUPPLY prior to installation or repair action.

Modbus Functions

Function	Description
01 (0x01)	Coil reading
03 (0x03)	Holding data Area registers reading
04 (0x04)	Input Area registers reading
05 (0x05)	Single coil writing
06 (0x06)	Single register writing
15 (0x0F)	Several coils writing
16 (0x10)	Several registers writing

Functions 01, 03, 04 - Coil / Register Reading

Query:	Add	01 / 03 / 04	00	00	00	02	CRC / LRC
	Modbus address	Function	Starting address 00 = 30001 (input) 40001 (holding) 1 (coil)		Number of registers to read		Error control (2 bytes)

Response:	Add	01 / 03 / 04	04	xx	xx	xx	xx	CRC / LRC
	Modbus address	Function	No. of Bytes	Data value				Error control (2 bytes)

Functions 05, 06 - Single Coil / Single Register Writing

Query:	Add	05 / 06	00	00	xx	xx	CRC / LRC
	Modbus address	Function	Register address 00 = 40001 (holding) 1 (coil)		Value to write		Error control (2 bytes)

Response:	Add	05 / 06	04	00	xx	xx	CRC / LRC
	Modbus address	Function	Register address		Written value		Error control (2 bytes)

Functions 15, 16 - Several Coils / Registers Writing

Query:	Add	0F / 10	00	00	00	02	04	xx	xx	xx	xx	CRC / LRC
	Modbus address	Function	Starting address 00 = 30001 (input) 40001 (holding) 1 (coil)		Number of registers / coils to write		No. of bytes to write	Value to write in the first register		Value to write in the second register		Error control (2 bytes)

Response:	Add	0F / 10	00	00	00	02	CRC / LRC
	Modbus address	Function	Starting address		Number of registers / coils modified		Error control (2 bytes)

Error Control

CYCLICAL REDUNDANCY CHECK (CRC)

In RTU transmission mode the messages include an error control field based on a CRC method, calculated as follows:

1. Load the value 0xFFFF into a 16bit register (called CRC).
2. Perform the exclusive OR operation between the first byte of the message and the least significant byte of the CRC register.
3. Shift the CRC register one position to the right, a 0 is entered in place of the MSB. The LSB is extracted and examined.
4. If LSB = 0 ➜ repeat point 3.
   If LSB = 1 ➜ Perform the exclusive OR operation between the CRC register and the value 0xA001.
5. Repeat steps 3 and 4 until 8 shifts have been performed.
6. Repeat steps 2 to 5 for the next byte of the message.
7. The least significant byte must be transmitted first, followed by the most significant byte.

LONGITUDINAL REDUNDANCY CHECK (LRC)

In ASCII transmission mode the messages include an error control field based on a LRC method, calculated as follows:

1. Add together all the bytes of the message, excluding the first character (: or ;) and the final CRLF, within an 8-bit field. In this way the carryovers are discarded.
2. Subtract the value obtained from 0xFF, thus obtaining the complement to 1.
3. Add 1 to obtain the complement to 2.
4. The most significant byte must be transmitted first, followed by the least significant byte.

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By reading 5 registers cyclically (from 40001/30001), the read speed can be increased to about 110 reads/sec.
The standard speed is 20 reads/sec.

Examples

READING OF REGISTER 30005 (INPUT STATUS REGISTER)

Query:	A	04	00	04	00	01	CRC / LRC
	Modbus address	Function	Starting address (30005)		Number of registers to read		Error control (2 bytes)

Response:	01	04	02	xx	xx	CRC / LRC	
	Modbus address	Function	No. of Bytes	Data value		Error control (2 bytes)	

READING OF REGISTERS 30001, 30002 (GROSS WEIGHT)

Query:	A	04	00	00	00	02	CRC / LRC
	Modbus address	Function	Starting address (30001)		Number of registers to read		Error control (2 bytes)

Response:	01	04	04	xx	xx	xx	xx	CRC / LRC
	Modbus address	Function	No. of Bytes	Data value				Error control (2 bytes)

WRITING OF REGISTERS 40001, 40002, 40003 (SEND MANUAL TARE COMMAND WITH VALUE 1000 kg)

Query:	A	10	00	00	00	03	06	00	03	00	00	03	E8	CRC / LRC
	Modbus address	Function	Starting address (40001)		Number of registers / coils to write		No. of bytes to write	Manual tare command		Parameter 1 0x03E8 = 1000				Error control (2 bytes)

Response:	01	10	00	00	00	03	CRC / LRC
	Modbus address	Function	Starting address		Number of registers modified		Error control (2 bytes)

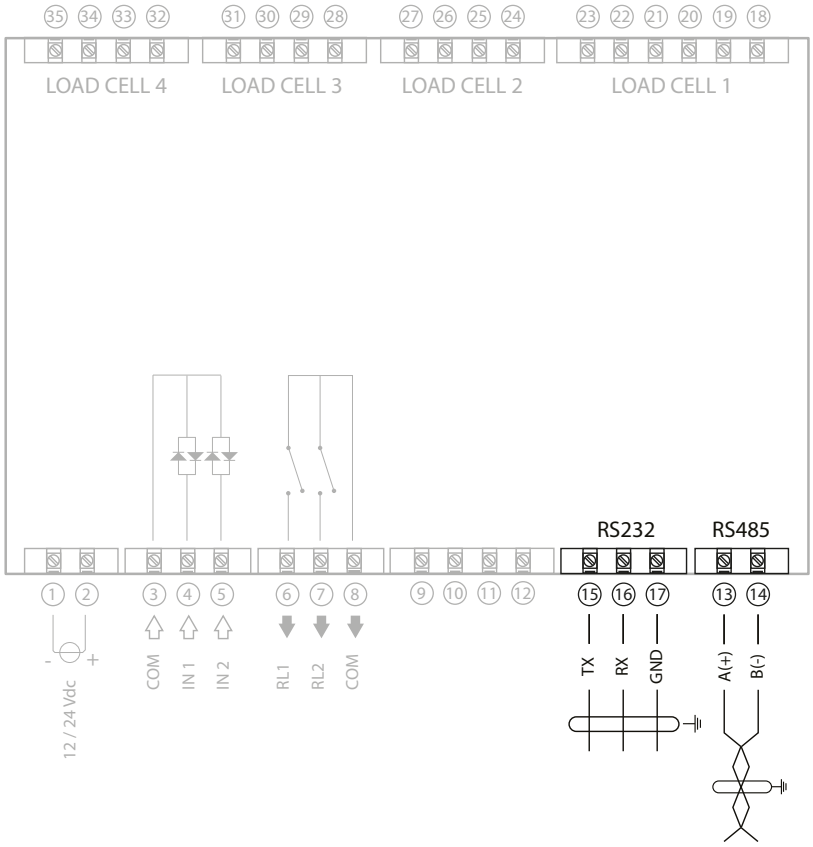
WRITING OF REGISTER 40001 (SEND ZERO COMMAND)

Query:	Add	06	00	00	00	01	CRC / LRC
	Modbus address	Function	Register address (40001)		Zero command (01)		Error control (2 bytes)

Response:	Add	06	00	00	00	01	CRC / LRC
	Modbus address	Function	Register address		Value written		Error control (2 bytes)

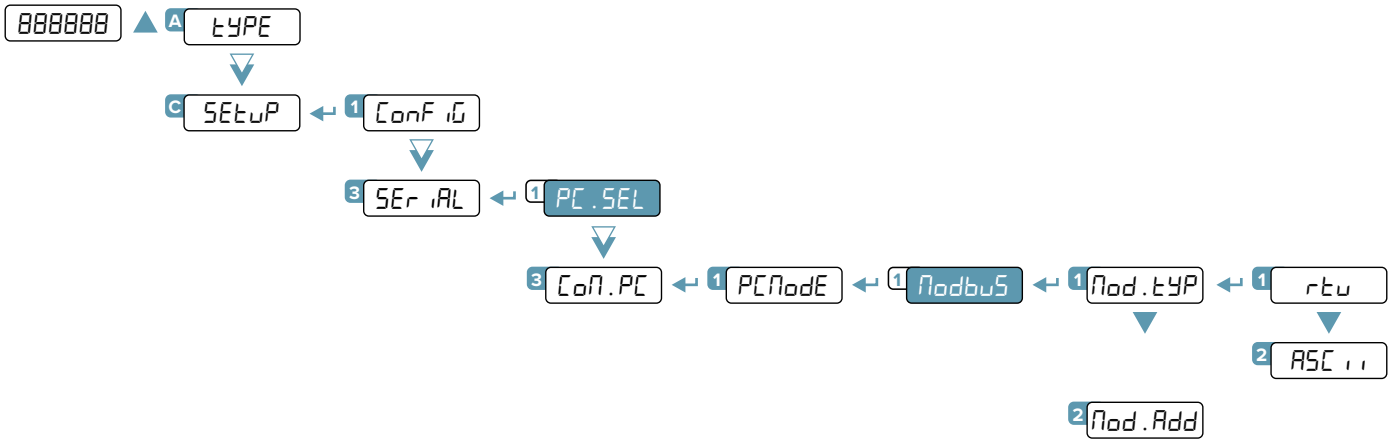
Connection

SCT-4X-AN



The connection is made via the **RS485 or RS232** port on the instrument.

Selection of Modbus Protocol



1. Select the serial port in the parameter *PC.SEL*.

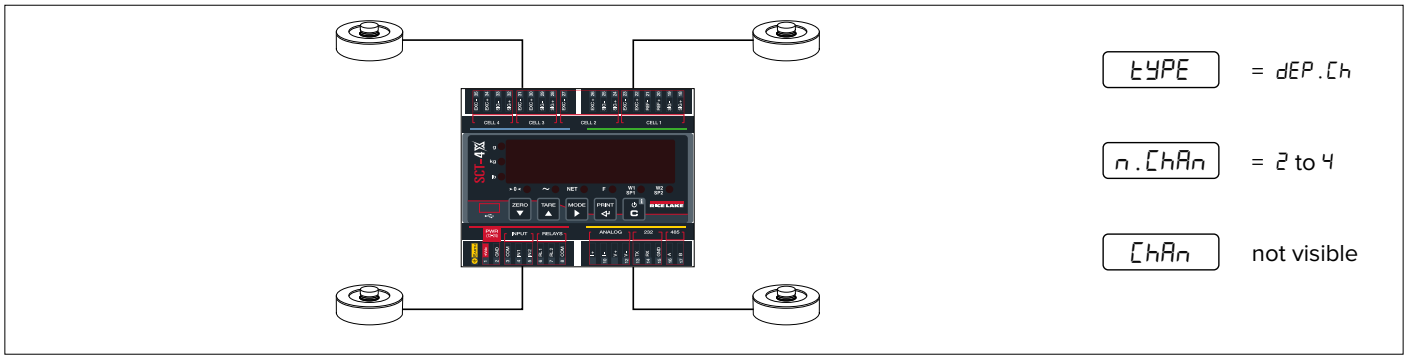
2. Select the *ModbuS* transmission mode in the parameter *PC.ModE*.

3. Select the type of transmission *ASC ii* / *rtu* in the parameter *Mod.tYP*.

4. Set the modbus address (0 - 98) of the transmitter in the parameter *Mod.Add*.

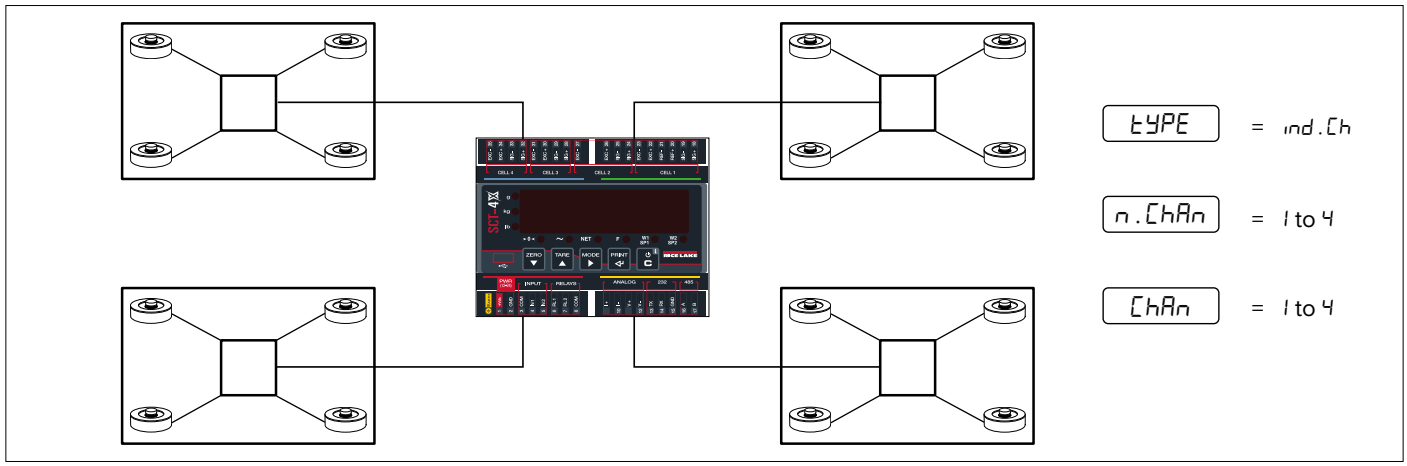
MODE 1 “DEP.CH”

Allows you to connect the load cells directly, equalize them (if necessary) and transmit the data of each cell and the total weight via Modbus.



MODE 2 “IND.CH”

Allows you to manage up to 4 independent scales and transmit all the data of each scale via Modbus.



Data Reading (Input Area)

- The available data is divided into registers.
- Each register consists of 2 Bytes.

Register	Name
30001	Gross weight.
30002	
30003	Net weight.
30004	
30005	Input register (see Table 1 on page 12).
30006	Command register (see Table 3 on page 14).
30007	Output register (see Table 2 on page 13).
30101	Firmware release.
30102	
30103	ADC points channel 1.
30104	
30105	ADC points channel 2.
30106	
30107	ADC points channel 3.
30108	
30109	ADC points channel 4.
30110	
30111	µV channel 1.
30112	µV channel 2.
30113	µV channel 3.
30114	µV channel 4.
30115	Analog output current value (DAC).
30116	Calibration (see page 33)
30117	Analog output current value (V, 1 decimal).
30118	Analog output current value (mA, 1 decimal).
30120	Number of channels.
30122	Serial number.
30123	
30124	Weight distribution - channel 1 (in %)
30125	Weight distribution - channel 2 (in %)
30126	Weight distribution - channel 3 (in %)
30127	Weight distribution - channel 4 (in %)
30128	Pre-calibration status (0 = not pre-calibrated / 1 = pre-calibrated).
30129	Setup size (in bytes)
30130	Legal HW ID (MSB) / Legal ID (LSB)
30131	Selected scale for calibration / parameters sending
30132	Firmware name (2 characters for each register).
...	
30135	

Register	Name
30136	Current value of zero scale 1.
30137	
30138	Current value of zero scale 2.
30139	
30140	Current value of zero scale 3.
30141	
30142	Current value of zero scale 4.
30143	

Table 1 - **Input Register**

Bit	Description	Bit meaning	
		0	1
0	Net weight polarity.	+	-
1	Gross weight polarity.	+	-
2	Weight stability.	No	Yes
3	Underload condition.	No	Yes
4	Overload condition.	No	Yes
5	Tare condition entered.	No	Yes
6	Manual Tare condition.	No	Yes
7	Gross weight = 0.	No	Yes
8	Input 1.	Deactivated	Activated
9	Input 2.	Deactivated	Activated
10	Not used.		
11			
12	Endian.	Big Endian	Little Endian
13	Multi-scale.	No	Yes
14	Channel displayed (low bit).	00 = channel 1	01 = channel 2
15	Channel displayed (high bit).	10 = channel 3	11 = channel 4

Table 2.1 - **Output Register** (Multi-Scale)

Bit	Description	Bit meaning	
		0	1
0	Relay 1.	Not energized	Energized
1	Relay 2.	Not energized	Energized
2	Not used.		
3			
4			
5			
6			
7			
8	Error channel 1.	No	Yes
9	Error channel 2.	No	Yes
10	Error channel 3.	No	Yes
11	Error channel 4.	No	Yes
12	Channels global error / Unbalancing	No	Yes
13	Selected scale for calibration / parameters sending	00 = scale 1	01 = scale 2
14		10 = scale 3	11 = scale 4
15	Not used		

Table 2.2 - **Output Register** (Single Scale)

Bit	Description	Bit meaning	
		0	1
0	Relay 1.	Not energized	Energized
1	Relay 2.	Not energized	Energized
2	Not used.		
3			
4			
5			
6	Unit of measure.	00 = g	01 = kg
7		10 = t	11 = lb
8	Error channel 1.	No	Yes
9	Error channel 2.	No	Yes
10	Error channel 3.	No	Yes
11	Error channel 4.	No	Yes
12	Channels global error / Unbalancing	No	Yes
13	Decimals.	00 = 0	01 = 1
14		10 = 2	11 = 3
15	Not used.		

Table 3 - **Command Register**

Bit	Description	Bit meaning
0	Processed command count.	Value in module 16.
1		
2		
3		
4	Result of last command received:	0 = Command correct and executed. 1 = Incorrect command. 2 = Incorrect command data. 3 = Command not allowed. 4 = Command non-existent.
5		
6		
7		
8	Last command received.	
9		
10		
11		
12		
13		
14		
15		

Table 4 - **Alibi Register**

Bit	Description	Bit meaning	
		0	1
0	Number of rewrites.	From 0 to 255 rewrites.	
1			
2			
3			
4			
5			
6			
7			
8	Scale number.	From 1 to 4.	
9			
10			
11	Type of tare.	Semi-automatic	Manual
12	Not used.		
13			
14			
15			

Table 5 - **Channel Register**

Bit	Description	Bit meaning	
		0	1
0	Gross weight polarity.	+	-
1	Weight stability.	No	Yes
2	Underload condition.	No	Yes
3	Overload condition.	No	Yes
4	Gross weight = 0.	No	Yes
5	Net weight polarity.	+	-
6	Tare condition entered.	No	Yes
7	Manual tare condition.	No	Yes
8	Unit of measure.	00 = g	01 = kg
9		10 = t	11 = lb
10	Decimals.	00 = 0	01 = 1
11		10 = 2	11 = 3
12	Scale active.	No	Yes
13	Not used.		
14			
15			

Table 6 **- Output Functions**

0 = No function.
1 = Setpoint on gross weight.
2 = Setpoint on net weight.
4 = Gross weight on zero.
5 = Net weight on zero.
6 = Weight in motion.
23 = PRINT key pressed.
25 = MODE key pressed.
26 = Key C pressed.
27 = ZERO key pressed.
28 = TARE key pressed.
29 = Error.
30 = Setpoint on net weight if a tare is set.
31 = Unblancing error.

Coil Data Area

Read and write data area, consisting of 6 coils of 1 bit each.

Register	Name	Bit meaning	
		0	1
1	Digital output 1.	Output not active.	Output active.
2	Digital output 2.	Output not active.	Output active.
3	Digital output 3.	Output not active.	Output active.
4	Digital output 4.	Output not active.	Output active.
5	Digital output 5.	Output not active.	Output active.
6	Digital output 6.	Output not active.	Output active.

Reading and Writing Data (Holding Data Area)

Reading

Register	Name
40001	Gross weight.
40002	
40003	Net weight.
40004	
40005	Input Register (see Table 1 on page 12).
40006	Command Register (see Table 3 on page 14).
40007	Output register (see Table 2 on page 13).

Weights and Setpoints

Register	Name
40101	Gross weight.
40102	
40103	Net weight.
40104	
40105	Tare.
40106	
40107	Input Register (see Table 1 on page 12).
40108	Output Register (see Table 2 on page 13).
40109	Setpoint 1 ON temporary.
40110	
40111	Setpoint 2 ON temporary.
40112	
40121	Setpoint 1 OFF temporary.
40122	
40123	Setpoint 2 OFF temporary.
40124	

...

40133	Setpoint 1 ON permanent.
40134	
40135	Setpoint 2 ON permanent.
40136	
40145	Setpoint 1 OFF permanent.
40146	
40147	Setpoint 2 OFF permanent.
40148	

Multi-Scale

Register	Name
40201	Number of channels configured.
40202	Status Register channel 1 (see Table 5 on page 15).
40203	Gross weight channel 1.
40204	
40205	Status Register channel 2 (see Table 5 on page 15).
40206	Gross weight channel 2.
40207	
40208	Status Register channel 3 (see Table 5 on page 15).
40209	Gross weight channel 3.
40210	
40211	Status Register channel 4 (see Table 5 on page 15).
40212	Gross weight channel 4.
40213	
40214	Net weight channel 1.
40215	
40216	Net weight channel 2.
40217	
40218	Net weight channel 3.
40219	
40220	Net weight channel 4.
40221	
40222	Tare channel 1.
40223	
40224	Tare channel 2.
40225	
40226	Tare channel 3.
40227	
40228	Tare channel 4.
40229	

Commands

Register	Name
40231	Command Register (see Table 3 on page 14).
40232	Command (see list of commands page 30).
40233	Parameter 1.
40234	
40235	Parameter 2.
40236	

Alibi

Register	Name
40251	Gross weight.
40252	
40253	Tare weight.
40254	
40255	ID.
40256	
40257	Alibi Register (see Table 4 on page 14).

Setup

Register	Name
40301	Word 1.
...	
40812	Word 512.

Calibration

Register	Name
40901	Number of calibration points.
40902	Calibration weight 1.
40903	
40904	Calibration weight 2.
40905	
40906	Calibration weight 3.
40907	
40908	ADC value at zero.
40909	
40910	ADC value of calibration point 1.
40911	
40912	ADC value of calibration point 2.
40913	
40914	ADC value of calibration point 3.
40915	

Metrological Data

Register	Name	
40951	Unit of measure.	0 = g
		1 = kg
		2 = t
		3 = lb
40952	Division 1.	
40953	Division 2.	
40954	Decimals.	
40955	Range 1.	
40956		
40957	Range 2.	
40958		

Filter

Register	Name	
40959	Filter Index (see example on page 36).	
40960	Custom filter rate.	Active only if Custom filter is selected.
40961	Win custom filter.	
40962	Avg custom filter.	
40963	Pit custom filter.	

Metric Parameters

Register	Name
40964	Auto zero.
40965	Auto zero percentage.
40966	Zero key percentage.
40967	Zero tracking divisions.
40968	Stability divisions.
40969	Calibration zone G.
40970	Zone of use G.
40974	Zero tracking speed (100 - 5000 ms)
40975	Stability detection time (10 - 10000 ms)
40976	Stability filter time (0 - 2000 ms, 0 = disabled)
40977	Stability filter divisions (1 - 100 divisions)

Operative Mode

Register	Name	
40971	Operative mode.	1 = MODE 1 “DEP.CH”.
		2 = MODE 2 “IND.CH”.
40972	Number of channels.	1 = 1 channel.
		2 = 2 channels.
		3 = 3 channels.
		4 = 4 channels.

Send in a single frame

Application Configuration

Register	Name	
40981	Tare configuration.	0 = Disabled.
		1 = Locked.
		2 = Unlocked.
40982	ID Modbus	0 to 98.
40983	Excluded channel in dependent channels mode	1 to 4.
40984	Mode of operation	
40985	Restore zero	
40986	Restore tare	
40987	Unit 2 decimal c	0 to 4.
40988	Unit 2	0 = default
		1 = custom
40989	Unit 2 divisions	(1, 2, 5, 10, 20, 50)
40990	Unit 2 conversion factor	(in integer fixed-point 5 decimal places)
40991		

Metric Parameters

Register	Name
41001	Filter 1 ID.
41002	Filter 1 value.
41003	Filter 2 ID.
41004	Filter 2 value.
41005	Filter 3 ID.
41006	Filter 3 value.

ID	Filter	Value
1	Coarse	Frequency, 1 decimal (the value 30 stands for 3,0 Hz)
4	Selective	Frequency, 1 decimal (the value 500 stands for 50,0 Hz)
5	Fine	Percentage, 2 decimals (the value 1000 stands for 10%)

Anti-Peak Filter

Register	Name
41021	Lock divisions (PA.LA.dU).
41022	Unlocked to locked switch time (PA.LA.tM, 0,01 s).
41023	Unlock divisions (PA.d iU).
41024	Locked band divisions (PA.bn.dU).
41025	Locked peak time (PA.t iME, 0,01 s).

Weights and Setpoints on 1 Word

Register	Name
41101	Gross weight.
41102	Net weight.
41103	Tare.
41104	Input Register (see Table 1 on page 12).
41105	Output Register (see Table 2 on page 13).
41106	Setpoint 1 ON temporary.
41107	Setpoint 2 ON temporary.
41112	Setpoint 1 OFF temporary.
41113	Setpoint 2 OFF temporary.
41118	Setpoint 1 ON permanent.
41119	Setpoint 2 ON permanent.
41124	Setpoint 1 OFF permanent.
41125	Setpoint 2 OFF permanent.

Unbalancing

Register	Name
41042	Max unbalancing percentage.
41043	Max unbalancing percentage at zero.
41044	Unbalancing error delay.
41045	Stored percentage channel 1.
41046	Stored percentage channel 2.
41047	Stored percentage channel 3.
41048	Stored percentage channel 4.

Multi-Scale on 1 Word

Register	Name	
41201	Number of channels configured.	
41202	Status Register Channel 1 (see Table 5 on page 15).	
41203	Gross weight channel 1.	
41204	Status Register Channel 2 (see Table 5 on page 15).	
41205	Gross weight channel 2.	
41206	Status Register Channel 3 (see Table 5 on page 15).	
41207	Gross weight channel 3.	
41208	Status Register Channel 4 (see Table 5 on page 15).	
41209	Gross weight channel 4.	
41210	Net weight channel 1.	
41211	Net weight channel 2.	
41212	Net weight channel 3.	
41213	Net weight channel 4.	
41214	Tare channel 1.	
41215	Tare channel 2.	
41216	Tare channel 3.	
41217	Tare channel 4.	
41218	Weight distribution - channel 1 (in %)	
41219	Weight distribution - channel 2 (in %)	
41220	Weight distribution - channel 3 (in %)	
41221	Weight distribution - channel 4 (in %)	
41222	Error status channel 1.	0 = Channel not used. 1 = Channel OK. 2 = Channel in error. 3 = Unbalancing error. 4 = Excluded channel.
41223	Error status channel 2.	
41224	Error status channel 3.	
41225	Error status channel 4.	

Condensed Channels (Multi-Scale)

Register	Name
41401	Status Register Channel 1 (see Table 5 on page 15).
41402	Net weight channel 1.
41403	
41404	Tare channel 1.
41405	
41406	ADC points channel 1.
41407	
41408	Status Register Channel 2 (see Table 5 on page 15).
41409	Net weight channel 2.
41410	
41411	Tare channel 2.
41412	
41413	ADC points channel 2.
41414	
41415	Status Register Channel 3 (see Table 5 on page 15).
41416	Net weight channel 3.
41417	
41418	Tare channel 3.
41419	
41420	ADC points channel 3.
41421	
41422	Status Register Channel 4 (see Table 5 on page 15).
41423	Net weight channel 4.
41424	
41425	Tare channel 4.
41426	
41427	ADC points channel 4.
41428	
41429	Input Status Register (see Table 1 on page 12).
41430	Output Status Register (see Table 2 on page 13).

Register	Name
41431	Analog output.
41432	Alibi gross weight.
41433	
41434	Alibi tare.
41435	
41436	Alibi ID.
41437	
41438	Alibi status register (see Table 4 on page 13).

Multi-Scale Channels on 1 Word (Net Weights and Tare)

Register	Name
41501	Status Register Channel 1 (see Table 5 on page 15).
41502	Net weight channel 1 (low word).
41503	Tare channel 1 (low word).
41504	Status Register Channel 2 (see Table 5 on page 15).
41505	Net weight channel 2 (low word).
41506	Tare channel 2 (low word).
41507	Status Register Channel 3 (see Table 5 on page 15).
41508	Net weight channel 3 (low word).
41509	Tare channel 3 (low word).
41510	Status Register Channel 4 (see Table 5 on page 15).
41511	Net weight channel 4 (low word).
41512	Tare channel 4 (low word).

Configuration of Inputs, Outputs

Register	Name	
41601	Input 1 function.	0 = No function. 1 = ZERO key pressed. 2 = TARE key pressed. 3 = MODE key pressed. 4 = PRINT key pressed. 5 = C key pressed. 6 = Off. 7 = Disabling keypad.
41602	Input 2 function.	
41603	Not used	
41604		
41605	Output 1: Function.	See Table 6 on page 15.
41606	Output 1: Type of contact (NO/NC).	
41607	Output 1: Switching condition (direct / stability).	
41608	Output 1: Hysteresis (disabled / enabled).	
41609	Output 1: Sign (positive / negative).	
41610	Output 1: Switching delay.	
41611	Output 1: Activation time.	
41612	Output 2: Function.	See page 13.
41613	Output 2: Type of contact (NO/NC).	
41614	Output 2: Switching condition (direct / stability).	
41615	Output 2: Hysteresis (disabled / enabled).	
41616	Output 2: Sign (positive / negative).	
41617	Output 2: Switching delay.	
41618	Output 2: Activation time.	

Analog Output Configuration (DAC Values)

Register	Name
41647	Analog output function.
41648	Analog output slot.
41649	Not used.
41650	Channel 1: value weight 1.
41651	
41652	Channel 1: DAC value weight 1.
41653	Value weight 2.
41654	
41655	Channel 1: DAC value weight 2.
41656	Value weight 3.
41657	
41658	Channel 1: DAC value weight 3.
41659	Not used.
41660	
41661	Channel 2 (as channel 1).
...	
41679	
41680	Not used.
41681	
41672	Channel 3 (as channel 1).
...	
41680	
41681	Not used.
41682	
41683	Channel 4 (as channel 1).
...	
41691	

Analog Output Configuration (V Values)

Register	Name
41694	Channel 1: value weight 1.
41695	
41696	Channel 1: V value weight 1.
41697	Value weight 2.
41698	
41699	Channel 1: V value weight 2.
41700	Value weight 3.
41701	
41702	Channel 1: V value weight 3.
41703	Not used.
41705	Channel 2 (as channel 1).
...	
41713	
41716	Channel 3 (as channel 1).
...	
41724	
41727	Channel 4 (as channel 1).
...	
41735	

Analog Output Calibration (V)

Register	Name
41801	DAC value at 0 V.
41802	DAC value at 10 V.

Analog Output Configuration (mA Values)

Register	Name
41738	Channel 1: value weight 1.
41739	
41740	Channel 1: mA value weight 1.
41741	Value weight 2.
41742	
41743	Channel 1: mA value weight 2.
41744	Value weight 3.
41745	
41746	Channel 1: mA value weight 3.
41747	Not used.
41749	Channel 2 (as channel 1).
...	
41757	
41760	Channel 3 (as channel 1).
...	
41768	
41771	Channel 4 (as channel 1).
...	
41779	

Analog Output Calibration (mA)

Register	Name
41803	DAC value at 0 mA.
41804	DAC value at 20 mA.

Commands

COMMAND	DESCRIPTION	PARAMETER 1	PARAMETER 2
0 (0x00)	No command.	-	-
1 (0x01)	Zero.	Only for MODE 2 “IND.CH”: specify the scale on which zeroing is to be performed.	0 (0x00) = check stability. 1 (0x01) = immediate zero.
2 (0x02)	Tare.	Only for MODE 2 “IND.CH”: specify the scale on which tare is to be performed.	0 (0x00) = check stability. 1 (0x01) = immediate tare.
3 (0x03)	Manual tare.	Tare value. (*)	Only for MODE 2 “IND.CH”: specify the scale on which tare is to be performed.
10 (0x0A)	Writing setpoint 1.	Output activation “threshold” weight. (*)	Output deactivation “threshold” weight. (*)
11 (0x0B)	Writing setpoint 2.	Output activation “threshold” weight. (*)	Output deactivation “threshold” weight. (*)
25 (0x19)	Sets the relay status.	Status bitmask of the relays to be enabled *(bit 0 = relay 1,* *bit 1 = relay 2).*	Always 0 (0x00).
28 (0x1C)	Save setup.	-	-
30 (0x1E)	Read Alibi memory.	Rewrite number.	Weighing operation alibi ID.
31 (0x1F)	Saving a weighing operation in the Alibi memory.	-	-
34 (0x22)	Restart instrument.	-	-
35 (0x23)	Data reading.	MODE 1 “DEP.CH” = 0 (0x00). MODE 2 “IND.CH”: 0 (0x00) = Scale 1 1 (0x01) = Scale 2 2 (0x02) = Scale 3 3 (0x03) = Scale 4.	-
36 (0x24)	Write and save data.	Parameter 1 = 0 (0x00) for saving data.	-
37 (0x25)	Calibration point acquisition.	0 (0x00) = Zero point 1 (0x01) = First point 2 (0x02) = Second point 3 (0x03) = Third point.	-
38 (0x26)	Cancel current calibration.	-	-
39 (0x27)	Zero calibration.	Only for MODE 2 “IND.CH”: specify the scale on which tare is to be performed.	
40 (0x28)	Enabling / Disabling keypad.	0 (0x00) = disabled. 1 (0x01) = enabled.	
45 (0x2D)	Zero channel 1 (IND.CH).	0 (0x00) = check stability. 1 (0x01) = immediate zero.	
46 (0x2E)	Zero channel 2 (IND.CH).	0 (0x00) = check stability. 1 (0x01) = immediate zero.	
47 (0x2F)	Zero channel 3 (IND.CH).	0 (0x00) = check stability. 1 (0x01) = immediate zero.	
48 (0x30)	Zero channel 4 (IND.CH).	0 (0x00) = check stability. 1 (0x01) = immediate zero.	

COMMAND	DESCRIPTION	PARAMETER 1	PARAMETER 2
49 (0x31)	Tare scale 1 (only for MODE 2 “IND.CH”).	0 (0x00) = check stability. 1 (0x01) = immediate tare.	-
50 (0x32)	Tare scale 2 (only for MODE 2 “IND.CH”).	0 (0x00) = check stability. 1 (0x01) = immediate tare.	-
51 (0x33)	Tare scale 3 (only for MODE 2 “IND.CH”).	0 (0x00) = check stability. 1 (0x01) = immediate tare.	-
52 (0x34)	Tare scale 4 (only for MODE 2 “IND.CH”).	0 (0x00) = check stability. 1 (0x01) = immediate tare.	-
53 (0x35)	Multi-scale zeroing (only for MODE 2 “IND.CH”).	Bitmask indicating which scales to zero *(bit 0 = scale 1,* *bit 1 = scale 2,* *bit 2 = scale 3,* *bit 3 = scale 4).*	0 (0x00) = check stability. 1 (0x01) = immediate zero.
54 (0x36)	Multi-scale tare (only for MODE 2 “IND.CH”).	Bitmask indicating on which scales to execute tare *(bit 0 = scale 1,* *bit 1 = scale 2,* *bit 2 = scale 3,* *bit 3 = scale 4).*	0 (0x00) = check stability. 1 (0x01) = immediate tare.
55 (0x37)	Disabling a peripheral.	0 (0x00) = disables the digital outputs (parameter 2) 1 (0x01) = disables the analog output.	Bit 0 = 1 disables relay 1. Bit 1 = 1 disables relay 2.
60 (0x3C)	Modbus ID setting.	Instrument serial number	Bit 0 to 3 = ID. Bit 4 to 7 = 1 to save data.
64 (0x40)	Unbalancing acquisition.	-	-
65 (0x41)	Serial baud rate setting.	Baud rate index: 0 = 1200 1 = 2400 2 = 4800 3 = 9600 4 = 19200 5 = 38400 6 = 57600 7 = 115200	-
66 (0x42)	Theoretical calibration for MODE 1 "DEP.CH". Theoretical calibration scale 1.	See par. "Theoretical calibration" on page 34	
67 (0x43)	Theoretical calibration scale 2.	See par. "Theoretical calibration" on page 34	
68 (0x44)	Theoretical calibration scale 3.	See par. "Theoretical calibration" on page 34	
69 (0x45)	Theoretical calibration scale 4.	See par. "Theoretical calibration" on page 34	
77 (0x4D)	Start equalisation (zero acquisition)	-	
78 (0x4E)	Next channel equalisation	-	

1. Give the command **35** (0x23) **"DATA READING"** with parameter 1 equal to the channel to be calibrated. In the case of dependent channels, parameter 1 can only have the value 0.

2. If necessary, modify the metrological data registers (40951 - 40970).

3. Set the number of calibration points and the weight value of the calibration points in registers 40901 - 40907.

4. Check the correct progress of calibration in register 30116.

0	CALIBRATION NOT STARTED
1	ACQUISITION IN PROGRESS
2	ACQUISITION OK
3	ACQUISITION ERROR
4	CALIBRATION OK
5	CALIBRATION ERROR
6	ZERO CALIBRATION IN PROGRESS
8	THEORETICAL CALIBRATION
9	ZERO EQUALISATION IN PROGRESS
10	X-POINT EQUALISATION IN PROGRESS

5. Unload the scale and use command **37** (0x25) **"CALIBRATION POINT ACQUISITION"** with parameter 1 equal to 0 to acquire the calibration zero point. In register 30116, the calibration status changes to **ACQUISITION IN PROGRESS** and, if it then changes to **ACQUISITION OK**, it is possible to proceed (if instead it changes to **ACQUISITION ERROR** the point has not been acquired, send command **38** (0x26) **"CANCEL CALIBRATION"** and try to acquire the point again. Check that the weight is stable).

6. Load the scale with the first sample weight and use command **37** (0x25) **"CALIBRATION POINT ACQUISITION**" with parameter 1 equal to 1 to acquire the first calibration point. In register 30116, the calibration status changes to **ACQUISITION IN PROGRESS** and, if it then changes to **ACQUISITION OK**, it is possible to proceed (if instead it changes to **ACQUISITION ERROR** the point has not been acquired, send command **38** (0x26) **"CANCEL CALIBRATION**" and start again from step 5. Check if the weight is stable, and check that the µV are greater than the zero point).

Repeat step 6 for each calibration point (the number of calibration points has been set in register 40901).

After all points have been acquired, in register 30116, the calibration status changes to **CALIBRATION OK** (if it changes to **CALIBRATION ERROR**, send command **38** (0x26) **"CANCEL CALIBRATION"** and repeat the procedure from step 5).

7. Use command **36** (0x24) **"WRITE AND SAVE DATA"** with parameter 1 equal to 0 to save the calibration.

Theoretical Calibration

1. Write parameters registers:

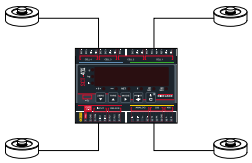
Registers 40233-40234 (PARAMETER 1): total load cells capacity.
Registers 40235-40236 (PARAMETER 2): load cells sensitivity (*).
Registers 40237-40238 (PARAMETER 3): mechanical tare value (if not known, insert the value 0).

2. Send the command **66** (0x42) "**THEORETICAL CALIBRATION SCALE 1**" (same procedure for the other scales)

3. Save the parameters by sending the command **28** (0x1C) **"SAVE SETUP"**..

*

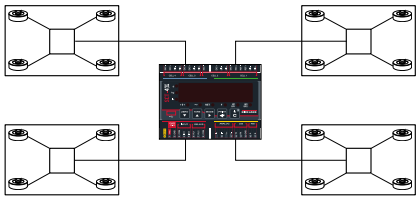
MODE 1 “DEP.CH”



Insert in CEL.SEn parameter, the load cells sensitivity sum value:

(mV/V cell1) + (mV/V cell2) + (mV/V cell3) + (mV/V cell4)

MODE 2 “IND.CH”



For each scale to calibrate, insert in CEL.SEn parameter the average sensitivity value of the load cells:

$$\frac{(\text{mV/V cell1}) + (\text{mV/V cell2}) + \ldots + (\text{mV/V cell}n)}{n}$$

Zeroing the Scale

MODE 1 “DEP.CH”

Send the command **1** (0x01) **“ZERO”**.

MODE 2 “IND.CH”

To zero a single scale give the commands:
45 (0x2D) **“ZERO SCALE 1”**
46 (0x2E) **“ZERO SCALE 2”**
47 (0x2F) **“ZERO SCALE 3”**
48 (0x30) **“ZERO SCALE 4”**

alternatively, give the command **53** (0x35) **“MULTI-SCALE ZEROING”** entering in PARAMETER 1 the bitmask indicating which scales to zero *(bit 0 = scale 1, bit 1 = scale 2, bit 2 = scale 3, bit 3 = scale 4).*

Note: This command does not affect calibration. When the instrument is switched off the zeroing is lost.

Quick Zero Calibration - Mechanical Tare Zeroing

MODE 1 “DEP.CH”

- Send the command **35** (0x23) **“DATA READING”**.
- Send the command **39** (0x27) **“ZERO CALIBRATION”**.
- Check that the value in register 30116 changes from 6 (0x06) “Zero calibration in progress” to 4 (0x04) “Calibration ok”.
- Give the command **36** (0x24) **“WRITE AND SAVE DATA”** entering the value 0 in PARAMETER 1 (0x00).

MODE 2 “IND.CH”

- Give the command **35** (0x23) **“DATA READING”** specifying in PARAMETER 1 the scale on which to perform zero calibration.
- Send the command **39** (0x27) **“ZERO CALIBRATION”**.
- Check that, on page **5001** (0x1389) of the Input Area, the value in register 30116 changes from 6 (0x06) “Zero calibration in progress” to 4 (0x04) “Calibration ok”.
- Give the command **36** (0x24) **“WRITE AND SAVE DATA”** entering the value 0 in PARAMETER 1 (0x00).

Note: Unlike the ZERO command, the ZERO CALIBRATION command acts on the calibration of the scale and makes the change of the zero point definitive.

The filters available are the following and can be set by modifying the register 40959, entering the index of the filter to be set. Before reading the value in the register, give the command **35** (0x23) **"DATA READING"** (register 40232).

CONTENTS	FILTER	DESCRIPTION
0	F 1	Filter at 5 Hz
1	F 2	Filter at 10 Hz
2	F 3	Filter at 20 Hz
3	F 4	Filter at 40 Hz
4	F 5	Filter at 80 Hz
5	F 6	Filter at 160 Hz
6	F 7	Filter at 325 Hz
7	F 8	Filter at 650 Hz (*)
8	F 9	Filter at 1300 Hz (*)
9	F 10	Filter at 2600 Hz (*)

(*) Available only for single channel.

Then give the command **36** (0x24) **"WRITE AND SAVE DATA"** to save the change (register 40232).

Backup and Restoring the Setup

It is possible to make a **complete backup** of the system by copying the content of the registers 40301 to 40812.

To **restore** the setup:
Write the data previously copied in registers 40301 - 40812.
Then give the command **28** (0x1C) **"SAVE SETUP"** (register 40232)

Examples

Saving or Reading a weighing operation in the Alibi memory

To save a weighing operation in the Alibi memory give the command **31** (0x1F) **"SAVE IN ALIBI MEMORY"**.

To read a weighing operation saved in the Alibi memory give the command, with parameter 1 equal to the rewrite number and parameter 2 equal to the ID number.

E.g. Reading of the weighing operation with ID = 131071 and rewrite number 00255.

Register	Value	Description
40232	31	Command READ ALIBI MEMORY.
40233	0	Rewrite number = 255.
40234	255	
40235	1	ID number = 131071 (0x1FFFF).
40236	65535	

MODBUS Calibration

Calibration of a scale with 4 cells with a capacity of 50 kg, division 2 g (0.002 kg), only one calibration point (besides zero) with a weight of 20 kg.

1. Use the command **35** (0x23) **"DATA READING"** with parameter 1 equal to 0 (dependent channels).

Register	Value	Description
40232	35	DATA READING command.
40233	00	Parameter 1 = 0 because the system has dependent channels.
40234	00	

2. Set the correct values in the registers for the metrological data.

Register	Value	Description
40901	1	Number of calibration points.
40951	1	Unit of measure (kg = 1).
40952	2	Division 1.
40953	0	Division 2.
40954	3	Decimals.
40955	0	Range 1 (value to be entered without considering the decimal point).
40956	50000	
40957	0	Range 2.
40958	0	
...		...

3. Unload the scale and give the command **37** (0x25) **"CALIBRATION POINT ACQUISITION"** with parameter 1 equal to 0 to acquire the calibration zero.

Register	Value	Description
40232	37	Command CALIBRATION POINT ACQUISITION.
40233	0	Parameter 1 = 0 to acquire the zero point.
40234	0	

30116	X	Check that the value is 2 before proceeding (see calibration procedure on page 31).

4. Load the scale with the sample weight and give command **37** (0x25) **"CALIBRATION POINT ACQUISITION"** with parameter 1 equal to 1 to acquire the first calibration point.

Register	Value	Description
40232	37	Command CALIBRATION POINT ACQUISITION.
40233	0	Parameter 1 = 1 to acquire the first calibration point.
40234	1	

30116	X	Check that the value is 2 before proceeding (see calibration procedure on page 31).

5. Give command **36** (0x24) **"WRITE AND SAVE DATA"** with parameter 1 equal to 0 to save the changed parameters and the calibration.

Output Setting

Example of setting output 1 with setpoint on gross weight, contact normally open, direct switching condition, no hysteresis, positive sign, no switching delay and enabled for 10 s.

Register	Value	Description
41605	1	1 = Setpoint on gross.
41606	0	NO.
41607	0	Direct switching condition.
41608	0	Hysteresis disabled.
41609	0	Positive sign.
41610	0	No communication delay.
41611	100	Activation time in tenths of a second.

Input setting

Example of setting input 1 to disable the keypad and input 2 to carry out tare.

Register	Value	Description
41601	7	7 = Disabling keypad.
41602	2	2 = Simulation of the tare key.

Analog Output Setting

Example of analog output configuration for operation on gross weight at 4 - 20 mA.
Using 3 calibration points at 0 kg, 50 kg, 100 kg. *(the values used are indicative)*

1. SELECTING THE OPERATING MODE:

Register	Value	Description
41647	1	0: analog output disabled. 1: analog output on gross weight. 2: analog output on net weight.
41648	0	Slot 1.

2. CALIBRATING THE ANALOG OUTPUT (V / mA)

Register	Value	Description
41801	0	DAC value at 0 V.
41802	63300	DAC value at 10 V.

41803	0	DAC value at 0 mA.
41804	58200	DAC value at 20 mA.

3. ASSOCIATING AN OUTPUT VALUE (OR ADC POINTS) WITH THE WEIGHT:

	Value	Description
mA		
41737	0	Output for underload (0 mA).
41738	0	Weight 1 (0 kg).
41739		
41740	40	Output for weight 1 (4.0 mA).
41741	50	Weight 2 (50 kg).
41742		
41743	120	Output for weight 2. (12.0 mA).
41744	100	Weight 3 (100 kg).
41745		
41746	200	Output for weight 3. (20.0 mA)
41747	200	Output for overload. (20.0 mA)

Notes

Notes

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