CLB

Crane Load Measurement and Control Unit

USER MANUAL

Document no	COTO-CLB-UM-EN
Revision	1.3 - 03.11.2026 (Working draft)
Language	English
Web	www.coto.com.tr

WORKING DRAFT - INSTALLATION AND INSPECTION ADDENDA

The v10 content has been retained, and initial commissioning, troubleshooting, periodic inspection and a record form have been added. Technical information that is contradictory or requires device / software evidence is listed in Section 12; this version is awaiting technical approval.

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1. General Information and Safety

CLB combines load measurement, relay control, analog output and communication functions in a single device for crane applications. The load cell signal is measured by a 24-bit A/D converter; the load value is shown on a 2-inch colour TFT display and passed on to external systems through four relay outputs, a 0-10 V analog output and Modbus, CANbus and Bluetooth interfaces.

1.1 Safety warnings

WARNING Mounting, electrical connection and commissioning of the device must be carried out only by authorised and trained personnel.

WARNING Before making connections or working on the terminals, isolate the supply and relay circuits. The supply voltage range is 24-250 VAC/DC; apply a suitable voltage to the L / N terminals marked on the label.

CAUTION CLB is a measuring and control device; on its own it does not replace a safety function. Use separate protective devices complying with the relevant standards for overload and emergency-stop safety of the lifting system.

CAUTION Do not load the relay outputs beyond the specified contact ratings. Use shielded cable for the load cell wiring and route it separately from power cables.

1.2 Symbols and abbreviations used

Term	Meaning
SET	Confirm / enter key (shown as ENTER on the screen)
BACK	Key with the curved arrow symbol (BACK on the screen)
A1 / A2	First and second load cell input channels
DARA (tare)	Accepting the load value in the unloaded state as zero
HYSTERESIS	Threshold margin that prevents frequent switching of the relay output (kg)

2. Technical Specifications

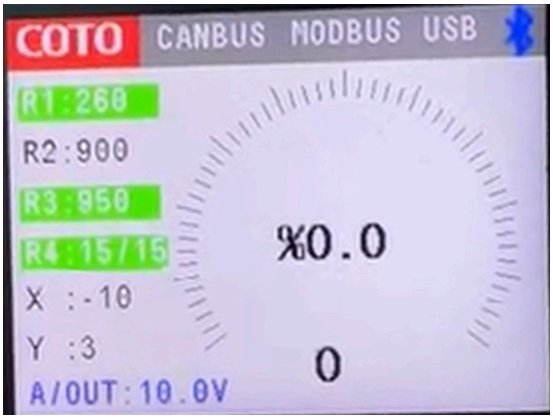
Feature	Value
Supply / power	24-250 VAC/DC / 6 VA
Housing / mounting	106 × 106 × 43 mm; DIN rail mounting
Display / keypad	2-inch colour TFT / 5 keys
Load cell inputs	2 independent inputs; 2 × 350 Ω / 10 VDC
A/D / linearity	24 bit / less than 0.01% of full scale
Relay / digital input	4 relays / 2 opto-isolated digital inputs
Analog hardware	2 selectable analog inputs + 2 selectable analog outputs
Analog output	0-10 V, 12-bit DAC
Serial communication	RS485 / RS232; depending on hardware variant
Wireless	Bluetooth (BLE)
Operating temperature	-20…+55 °C
Storage temperature	-30…+60 °C

3. Front Panel and Operating Screen

3.1 Keypad

Key	Function
SET - long press (3 s)	Enters the main settings menu from the normal operating screen.
SET - short press	Opens the selected menu; confirms the edited value / option.
UP / DOWN	Moves through the menu; changes the value of the selected digit.
RIGHT	Selects the digit to be edited on the numeric screen.
BACK	Returns to the previous menu; cancels on selection and numeric screens. From the main settings menu, exits to the operating screen.

3.2 Normal operating screen



Normal operating screen

Field	Description
Top bar	COTO logo and communication headers (CANBUS, MODBUS, USB); Bluetooth icon on the right.
R1 ... R3	Relay threshold (kg). The box turns green while the relay is energised.
R4	Angle relay; shows the X / Y tolerance values (e.g. 15/15). Green while energised.
X / Y	Current tilt angles (degrees).
Dial	Load percentage; full scale 10,000 kg.
Large number	Measured load value (kg), rounded according to the ROUND setting.
A/OUT	Instantaneous value of the 0-10 V analog output (V).

3.3 Quick operation

Operation	Key sequence / result
Entering the menu	Hold SET pressed for 3 seconds on the operating screen.
Numeric setting	RIGHT: select digit → UP / DOWN: value → SET: confirm.
Saving all values	Main settings menu → KAYDET (save) → SET → KAYDEDİLDİ! (saved) → main settings menu.
Returning to the operating screen	BACK key (curved arrow symbol) in the main settings menu.

The menu is entered by holding the SET key pressed for 3 seconds; this duration has been confirmed by the user. The 1 s hold on numeric confirmation and the behaviour when exiting without saving will be checked under T1.

4. Mounting and Electrical Connection

The device is mounted on a DIN rail. The terminal labels are listed from left to right when looking straight at the front panel of the device.

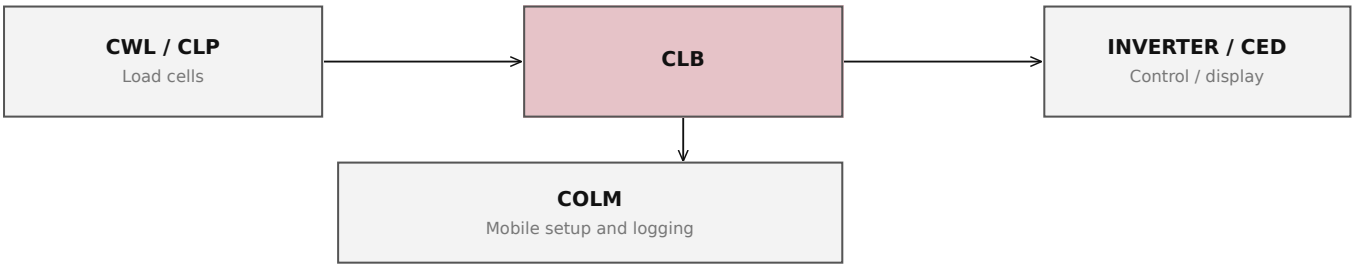
4.1 Upper terminal row

Label	Connection
SIG - / SIG + / SIG + / SIG -	Two load cell signal pairs
EXC + / EXC -	Load cell excitation supply
Earthing	Protective earth
0-10V OUTPUT - / +	0-10 V analog output
CAN H / L	CANbus line
MODBUS A / B	Modbus (RS485) line

4.2 Lower terminal row - complete

Label	Connection
DIGITAL INPUT + / -	Opto-isolated digital input; electrical limits pending confirmation.
ANALOG INPUT + / -	Analog input; signal type and range pending confirmation.
RELAY 4 / 3 / 2 / 1	Relay outputs.
COM	Label of the common terminal of the relay group.
Earth symbol	Earthing connection on the label.
L / N	Supply label; product variant / polarity to be verified.

4.3 Position within the system

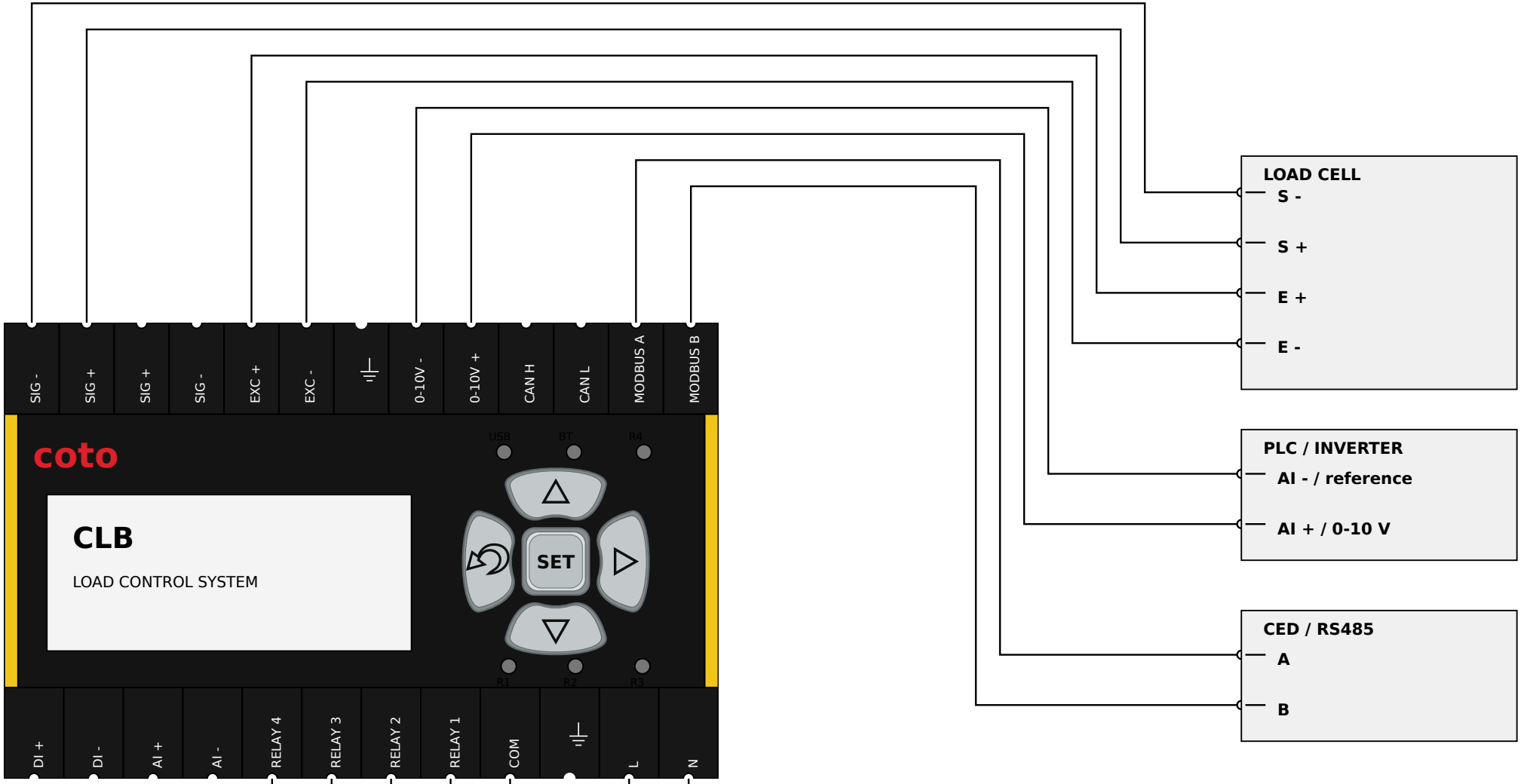


NOTE	The diagram above shows the block relationship; it is not an electrical wiring drawing. Make the connections according to the product label.

This page shows the terminal labels and the block relationship. An approved electrical drawing is required for the loadcell A1/A2 assignment, relay NO/NC scheme, contact limits and supply connection. Missing information is listed in T4.

4.4 CLB - SAMPLE WIRING DIAGRAM

Load cell / 0-10 V analog output / CED communication / CLB AC supply



RELAY CONTACTS

R4 / R3 / R2 / R1

Normally open (NO)

- R1-R4: normally open (NO) contact.
- Supply the CED according to its own label.
- A1/A2 and receiver inputs to be confirmed.
- Earth / shield connection not shown.

AC supply: according to the product label.

5. Settings Menu

Entering the main settings menu: hold SET pressed for 3 seconds on the operating screen. Use up / down to move between menu items. Menu items are given as they appear on the device screen.

Page	Menu items
1/3	DARA (tare), KALIBRASYON (calibration), HALAT (rope), ROLE1, ROLE2, ROLE3
2/3	SENSOR, RELSET, GYRO, MODBUS, CANBUS, ANALOG
3/3	BLUETOOTH, SIFIRLA (reset), KAYDET (save), DIL (language)

5.1 Value entry and saving

On the numeric screen, RIGHT selects the digit, UP / DOWN changes the value and SET confirms. In a selection list, BACK cancels. To save all changes, select KAYDET in the main menu and press SET; after the KAYDEDİLDİ! message the display returns to the main settings menu. The protective behaviour on numeric cancel and power loss will be confirmed in T1.

5.2 Load functions

Item	Range / default	Description
DARA	—	SET → “DARA ALINIYOR...” → “TAMAM!”. Apply with the load cell unloaded; saved as the zero measurement reference.
KALIBRASYON	1-1000000 kg / 100	A known reference load is applied and its kg value is entered. SET → “KALIBRASYON...” → “TAMAM!”. The BACK key cancels the operation.
HALAT	1-20 / 5	Enter 2 for 2/1 reeving, 4 for 4/1 and 6 for 6/1.

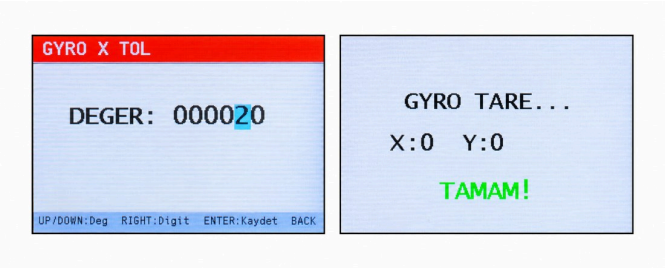
5.3 Relays and RELSET

Item	Range / default	Description
ROLE1 / ROLE2 / ROLE3	0-999999 kg / 500, 1000, 2000	Relay threshold (kg).
RELSET → DELAY	0-10 s / 1	Time waited after the threshold condition occurs before the relay changes state. Common to all relays.
RELSET → HYSTER	0-100 kg / 10	Hysteresis margin.

Relay operating logic. ROLE1 and ROLE3: the relay energises when the load falls below the threshold by the hysteresis amount and releases when it rises above the threshold by the hysteresis amount. ROLE2: energises when the load rises above the threshold by the hysteresis amount and releases when it falls below the threshold by the hysteresis amount. Example: with a threshold of 500 kg and a hysteresis of 10 kg, ROLE1 / ROLE3 energise below 490 kg and release above 510 kg; ROLE2 energises above 510 kg and releases below 490 kg. An energised relay is indicated by a green LED on the screen; the LED colour does not define the NO/NC configuration of the contacts.

> The range / default values and the ROLE1-3 operating logic on this page are carried over from v10. The hysteresis transitions and the relay scope of DELAY must be confirmed on the target device according to T3.

5.4 GYRO and ROLE4 (angle relay)



GYRO X tolerance and tare screens

ROLE4 is not a threshold relay but an angle relay. The relay stays energised as long as the current X and Y angles deviate from the tare value by no more than GYRO X and GYRO Y; it releases when either angle exceeds its tolerance. If the tolerance is 0, the relay does not energise. The delay time is a multiple of 0.1 s of the RELSET → DELAY value.

Item	Range / default	Description
X	0-90° / 0	X-axis angle tolerance.
Y	0-90° / 0	Y-axis angle tolerance.
TARE	—	Saves the current X and Y angles as the zero reference (“GYRO TARE...” → “TAMAM!”).
GERI	—	Returns to the main menu.

5.5 SENSOR

Item	Range / default	Description
GAIN	64 / 128 — 64	Measurement gain.
SPEED	10 / 80 — 80	Measurement rate (samples/s).
INPUT	IN:A1 / IN:A2 / IN:A1A2 — A1	Measurement input: sensor 1, sensor 2 or the sum of both sensors.
HASSAS	0-100 — 95	Outlier filter: samples below this percentage of the block average are discarded.
FILTER	10-255 — 150	Moving-average window length. A larger value gives a more stable but slower reading.
REFRES	1-100 — 20	Number of measurement samples in one averaging block.
LSB	1-50 — 10	LSB setting.
RESOL	1-999999 — 5637	Raw count scale factor.
TARE2	—	A2 / sensor 2 tare operation.
CAL2	1-999999 kg — 1	A2 reference load (kg).
NEG	OFF / ON — OFF	When enabled, intended to stop the lowering movement through the relay output under negative load. Relay assignment is within the scope of technical confirmation T3.
ROUND	OFF / 1 / 5 / 10 / 20 / 50 — AUTO	Display rounding step (kg). Rounds to the nearest step; the rounded value is used by the relays, analog output and communication.
RESET	—	Returns only the SENSOR parameters to factory values (“RESET OK!”). No confirmation is requested.

In the ROUND row the options are OFF / 1 / 5 / 10 / 20 / 50, while the default is given as AUTO. See T2 and T6 for the menu equivalent of AUTO, the LSB function and the scope of RESET.

6. Analog Output (ANALOG)

ANALOG menu: 0-10V, 4-20mA, FILTER, GERI. The 0-10V submenu has two pages.



0-10V submenu (1/2 and 2/2)



Numeric setting screens

0-10 V output function. In normal operation the output is fixed at 10 V. When the measured load reaches the ASIRI ESIK value, the output drops to the DAC ASIRI KOD level (approx. 3 V). If the load remains stable within STABIL BANT for STABIL SURE, the output rises linearly back to 10 V over RAMPA SURE. A new alarm is not started until the load falls below ASIRI ESIK.

Item	Default	Description
ASIRI ESIK	300 kg	Overload threshold that lowers the output.
MAX AGIRLIK	10000 kg	Upper load limit (kg).
STABIL BANT	50 kg	Fluctuation allowed for the load to be considered stable.
STABIL SURE	2000 ms	Time the load must remain within the band.
RAMPA SURE	3000 ms	Ramp time for the return to 10 V.
DAC MAX KOD	4055	12-bit DAC code corresponding to a 10.0 V output.
DAC ASIRI KOD	1228	DAC code in the overload condition (≈ 3.0 V).
4-20mA (ANALOG MAX)	4095	Upper code value of the analog output.
FILTER (ANALOG FILTER)	5 (1-10)	Analog output filter. Independent of SENSOR FILTER.

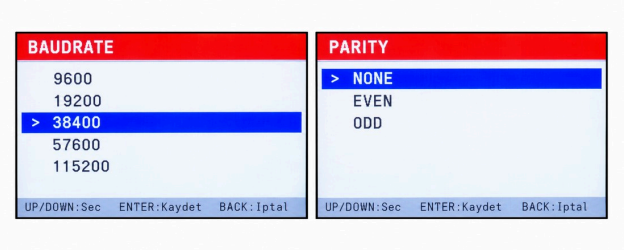
6.1 Output check during commissioning

Check	Record / evaluation
Initial state	Record the displayed A/OUT value and the measured physical output.
Threshold and stability	Check the threshold, band and time behaviour in the approved application test plan.
Ramp	Record the start / end output and the elapsed time in the approved scenario.
Connected device	Check that the inverter / PLC analog input scaling matches the approved CLB output function.

v10 defines the function as 10 V normally → low level at the threshold → ramp after stability. Earlier notes described MAX AGIRLIK as the load corresponding to 10 V. The relationship between these two descriptions will be finalised in T5; no scaling formula has been assumed in this version.

7. Communication

7.1 MODBUS and CANBUS



BAUDRATE and PARITY selection



CAN BAUD and CAN MODE selection

Item	Options	Default
MODBUS → ID	1-247	1
MODBUS → BAUDRATE	9600 / 19200 / 38400 / 57600 / 115200	38400
MODBUS → PARITY	NONE / EVEN / ODD	NONE
CANBUS → ID	0-127	1
CANBUS → BAUDRATE	10K / 20K / 50K / 100K / 125K / 250K	125K
CANBUS → MODE	NORMAL / LOOPBACK / SILENT	NORMAL

7.1.1 Communication check sequence

Step	Check
1. Physical line	With power off, check the A/B or H/L labels and the project cabling. Verify termination / shield connection against the approved drawing.
2. Settings	Compare the line speed on CLB and the connected device; for Modbus, also the parity, address and data map used.
3. Saving	Confirm with SET; perform the KAYDET operation in the main menu.
4. Data verification	Compare the load on the CLB screen with the value read by the other device; record the address, data format and unit.

Since this manual does not give a Modbus register map, function codes or CAN message IDs, no communication packet example has been produced. Integration requires the information in T7.

7.2 BLUETOOTH



POWER and DELAY (SPEED) screens

The device communicates with the COLM mobile application over Bluetooth (BLE) for setup and monitoring. When NAME is confirmed, the module name is updated to “COTO-<number>” and the module restarts; this takes a few seconds.

Item	Range / default	Description
NAME	0-9999 / 435	Device ID number (BLE name).
POWER	4 / 3 / 0 / -4 / -8 / -12 dBm — 3 dBm	BLE transmitter power.
DELAY	0-4095 ms / 1	Interval for sending data to the phone (screen title SPEED).

7.3 Bluetooth data and commands

Data (device → phone)	Format
Load (kg)	KG=<n>W
X / Y angles	X=<n>W, Y=<n>W
Command acknowledgement	OK:<command>

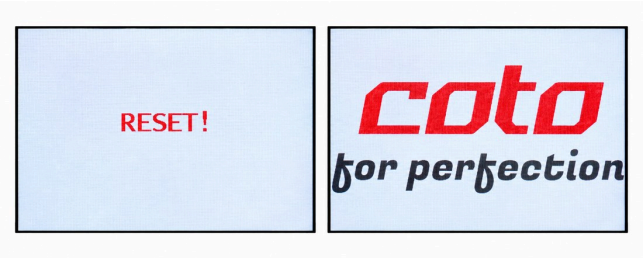
Command	Function	Command	Function
TARE / DEFTARE	Tare / tare and save	SGA, SSP, SCH	GAIN, SPEED, INPUT
KAL=<kg>	Calibration	SFL, SHS, RFR	FILTER, HASSAS, REFRES
ROL1= … ROL3=	Relay thresholds	LSB, RSL, SYV, SNG	LSB, RESOL, ROUND, NEG
ROL4=, X=, Y=	Angle tolerances	RDL=, HYS=	DELAY, HYSTER
ROPE=	Number of rope falls	AMN, AMX, AFL	ASIRI ESIK, RAMPA SURE, STABIL BANT
GYXT	Gyro tare	BLN, BLP, BLS	BLE NAME, POWER, DELAY
STATUS, SENSOR, RELAY, GYROSCOPE, DIGER	Read settings	RESTART	Restart the device

7.4 COLM connection check

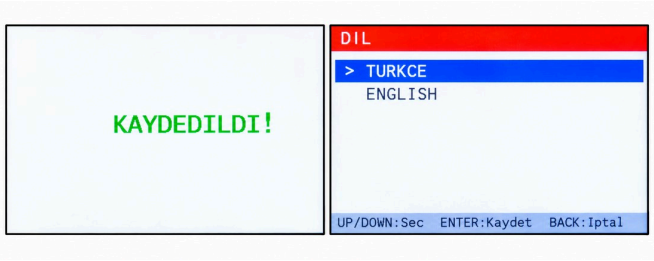
Record the device ID number and the device name shown in the application. Once the connection is established, compare the load / X / Y values in the application with the CLB screen. Complete setting changes with SET and with KAYDET in the main menu.

> The command table is a developer reference carried over from v10. Until the full command syntax, terminator, units, response to invalid commands and authorisation are described, it is not to be regarded as a complete protocol for third-party control software. See T7.

8. System Functions



SIFIRLA: RESET! and start-up logo



KAYDET and DIL screens

Item	Function
SIFIRLA	Returns all settings to factory values. After the “RESET!” message the device restarts and the COTO start-up logo is displayed. No confirmation is requested.
KAYDET	Writes all values to non-volatile memory; returns to the main menu after the green “KAYDEDİLDİ!” message.
DIL	TURKCE / ENGLISH. The selection is valid until restart; the device starts in Turkish at power-up.
BACK (in the main menu)	Exits to the normal operating screen.

8.1 Factory settings reported in v10 - pending technical confirmation

Group	Values
Load	KALIBRASYON weight 100 kg; HALAT 5
Relays	ROLE1 500, ROLE2 1000, ROLE3 2000 kg; DELAY 1 s; HYSTER 10 kg; GYRO X/Y 0
SENSOR	GAIN 64; SPEED 80; INPUT A1; HASSAS 95; FILTER 150; REFRES 20; LSB 10; RESOL 5637; CAL2 1; NEG OFF; ROUND AUTO
MODBUS / CANBUS	ID 1 / 38400 / NONE; ID 1 / 125K / NORMAL
ANALOG	ASIRI ESIK 300; MAX AGIRLIK 10000; STABIL BANT 50; STABIL SURE 2000; RAMPA SURE 3000; DAC MAX 4055; DAC ASIRI 1228; 4-20mA 4095; FILTER 5
BLUETOOTH	NAME 435; POWER 3 dBm; DELAY 1 ms

NOTE	The numbers in the screenshots are example setting values; they are not factory settings.

The factory values in the table are those reported in v10. They must be kept separate from the settings visible in the photographs. Verification against the target model and software version falls under T8. The scope of RESET / SIFIRLA and the persistence of DIL will be checked under T6.

9. Initial Commissioning and Verification

This sequence organises the use of the menu and the verification of the measurement. The electrical connection must have been completed according to the approved drawing. Tests must be carried out by authorised personnel following an application-specific plan, with the load / movement area kept under control.

Step	Application / check
1. Identify the device	Record the model, serial number, software version and supply variant in Section 11. Note the current settings.
2. Check the connection	With power off, compare the loadcell, supply, relay, analog and communication cables with the approved drawing. Do not proceed with an uncertain terminal assignment.
3. Select the measurement input	Set SENSOR → INPUT to A1, A2 or A1A2 according to the connected sensors. Record which physical sensor each channel belongs to.
4. Enter the rope reeving	Enter the HALAT value according to the actual reeving: 2/1 → 2; 4/1 → 4; 6/1 → 6. Confirm with SET.
5. Create the tare reference	Record the fixed hook / fixture condition to be accepted as the measurement reference. Apply the tare operation of the relevant channel. TARE2 is used for A2; the channel scope of the main DARA is confirmed with T2.
6. Calibrate with a reference load	Apply the known load selected in the authorised test plan. Enter the actual kg value in the relevant calibration screen. CAL2 is used for A2. Record the success message and the return screen.
7. Compare the result	Compare the reference load with the CLB reading. Record the difference, unit and stability. Take the acceptance limit from the project / manufacturer criteria; no limit has been set in this version.
8. Make the control settings	Enter the approved relay thresholds of the application, delay / hysteresis, angle tolerances if required, and interface settings. Do not test with protective functions disabled.
9. Save	Main settings menu → KAYDET → SET. Check for the KAYDEDİLDİ! message and return to the operating screen with BACK.
10. Verify the function	Check the relay, angle, negative load, analog and communication results in approved test scenarios. Record the actual response of the connected system alongside the LED.

SIFIRLA and SENSOR RESET are not to be used routinely for troubleshooting; their scope, which may lead to loss of settings / calibration, must be verified first.

10. Troubleshooting and Periodic Inspection

The table below is a general check sequence; it is not a CLB-specific error code list. Electrical measurements and work on the terminals are carried out by authorised personnel.

Symptom	Preliminary check / next step
Display does not turn on	Compare the device label and the supply variant. Have authorised personnel check the supply circuit / protective devices.
Load is not at zero	Check the fixed fixture and the tare condition. Record the selected INPUT channel and the mechanical load condition; do not apply tare directly to hide the load.
Measurement wrong by a ratio	Compare the HALAT and INPUT selections, the kg value of the reference load and the calibration record.
Unstable reading	Examine mechanical movement of the load and the proximity of the cable to power circuits. Record the current filter settings; verify the effect of a change on response time.
Relay does not respond as expected	Record the threshold, hysteresis, delay and any angle condition. Have the actual contact / connected system response checked separately from the LED status.
Angle reference not suitable	Check the mounting position of the device and the recorded tare reference. Do not apply GYRO TARE before the reference position has been verified.
Analog output mismatch	Compare the A/OUT display, the authorised measurement result and the input setting of the other device. Verify the ASIRI ESIK / ramp function according to T5.
No communication / mobile connection	Compare the line / device selection, ID, speed and parity settings. Record the device ID in the application and the connection status shown.
Settings are not retained	Check that the KAYDEDİLDİ! message was shown. Record the model / software version and the parameter that changes at restart; evaluate according to T1 / T6.

10.1 Periodic inspection and service record

Determine the inspection interval according to the manufacturer / facility maintenance plan. With power off, inspect the mounting, terminal connections and the condition of the cables and shields. Repeat the measurement comparison with a reference load and the approved relay / interface tests according to the maintenance plan. If the problem persists, contact technical service with the serial number, software, settings list, screenshot and test record.

11. Settings and Commissioning Record Form

Identification	Record
Facility / equipment / date	
CLB model / serial number	
Software / hardware revision	
Sensor type / capacity / A1-A2 assignment	
INPUT / HALAT / tare reference	
Reference load / displayed load / difference	
ROLE1 / ROLE2 / ROLE3	
HYSTER / DELAY / GYRO X-Y / tare	
Analog function / scale / band-time-ramp	
Modbus / CANbus / Bluetooth settings	

Function verification record

Check	Result / observation
Measurement and calibration comparison	
Relays and actual response of the connected system	
Angle / negative load functions (if applicable)	
Analog / communication comparison	
KAYDEDİLDİ! message / return to operating screen	
Acceptance criterion / open nonconformities	
Tested by / checked by	

This form is for recording results. It does not mean that the test or technical approval was performed by the assistant. Measurement tolerance and function acceptance conditions are determined by the authorised person.

12. Items Pending Technical Confirmation

The information below requires a device test, the target software or an approved manufacturer drawing. The technical values reported in v10 have been retained; points that conflict with earlier descriptions or are missing have not been changed silently.

No / topic	Required information / point to be finalised
T1 - Keys and saving	Is a 1 s hold required for numeric saving? Does BACK cancel the numeric value? Is SET alone persistent; what happens if power is lost before KAYDET?
T2 - Measurement / sensor	Channel scope of the main DARA and KALIBRASYON; CAL2 result / return; actual function of LSB; ranges and units of filter / scale parameters. Equivalent of the AUTO default, which is not among the ROUND options, and its effect on the outputs.
T3 - Relay / protection	Energise / release direction and hysteresis transitions of ROLE1-3. Use of a 0.1 s multiple in GYRO while RELSET DELAY is in seconds. ROLE4 being an angle relay, its zero-tolerance behaviour and which relay NEG affects.
T4 - Electrical / mounting	A1-A2 SIG assignment; load cell / shield connection; use of EXC; relay NO/NC / COM and contact ratings; DI / AI limits; analog output load limit; AC/DC polarity / earth and protective devices; dimensioned mounting drawing.
T5 - Analog function	Relationship between the fixed 10 V / drop at threshold / stability / ramp scenario and the MAX AGIRLIK scaling. Output equivalent of the DAC codes; 4-20mA hardware function; filter and time units; equality condition in the threshold comparison.
T6 - System behaviour	Which parameters does SENSOR RESET reset? Does SIFIRLA require additional confirmation? Does DIL return to Turkish at start-up? Is the full scale of the operating dial fixed at 10,000 kg or adjustable?
T7 - Communication	Modbus register / data type / unit / byte order; CAN ID and message structure; line termination. Full syntax of the Bluetooth commands, terminator, response / error format, access conditions and COLM pairing steps.
T8 - Version and factory values	Target model / software version; source of all minimum-maximum / default values and device test. In particular, the meaning of HALAT 5, ROUND AUTO and CAN ID 0, and the Bluetooth defaults.
T9 - Error / service	Actual error messages / codes; state of the outputs on sensor disconnection and communication loss; maintenance interval / methods and valid service contact information.

Completed in this revision

Headings and tables were rearranged; the table of contents and page numbers were updated. A quick key / saving sequence, initial commissioning, general troubleshooting, maintenance inspection and a settings / test record form were added. The technical confirmation items were collected on this page.