ROV C-O CHECK

ROV GYRO · CALIBRATION · VERIFICATION

User Manual

ROV gyro C-O on deck
against the vessel's reference gyro

Version 1.0

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1 Introduction

ROV C-O Check works out the C-O of an ROV gyro on deck, against the vessel's calibrated reference gyro. The ROV sits against a measured baseline on deck; the program turns the vessel's heading through the baseline's angle, the ROV's angle to the baseline and the way the ROV faces, giving the heading the ROV gyro should read. The difference at every reading is the C-O.

Open the file logged during the calibration, fill in the deck set-up, and the program gives the C-O, the standard deviation, the readings rejected, the PASS / FAIL checks and a one-page PDF report with a location diagram and a gyro comparison chart. It does the same calculation as the usual ROV gyro verification spreadsheet, without copying data into Excel.

Purpose	How the gyros are set up while logging	The result
Calibration	The reference gyro has its accepted C-O applied. The ROV gyro's C-O is set to 0.	The C-O of the ROV gyro - the new value to enter in the navigation software.
Verification	Both gyros have their known C-Os applied.	A C-O close to 0 if the ROV gyro's C-O is still right; PASS or FAIL against your limit.

2 Getting started

2.1 What you need

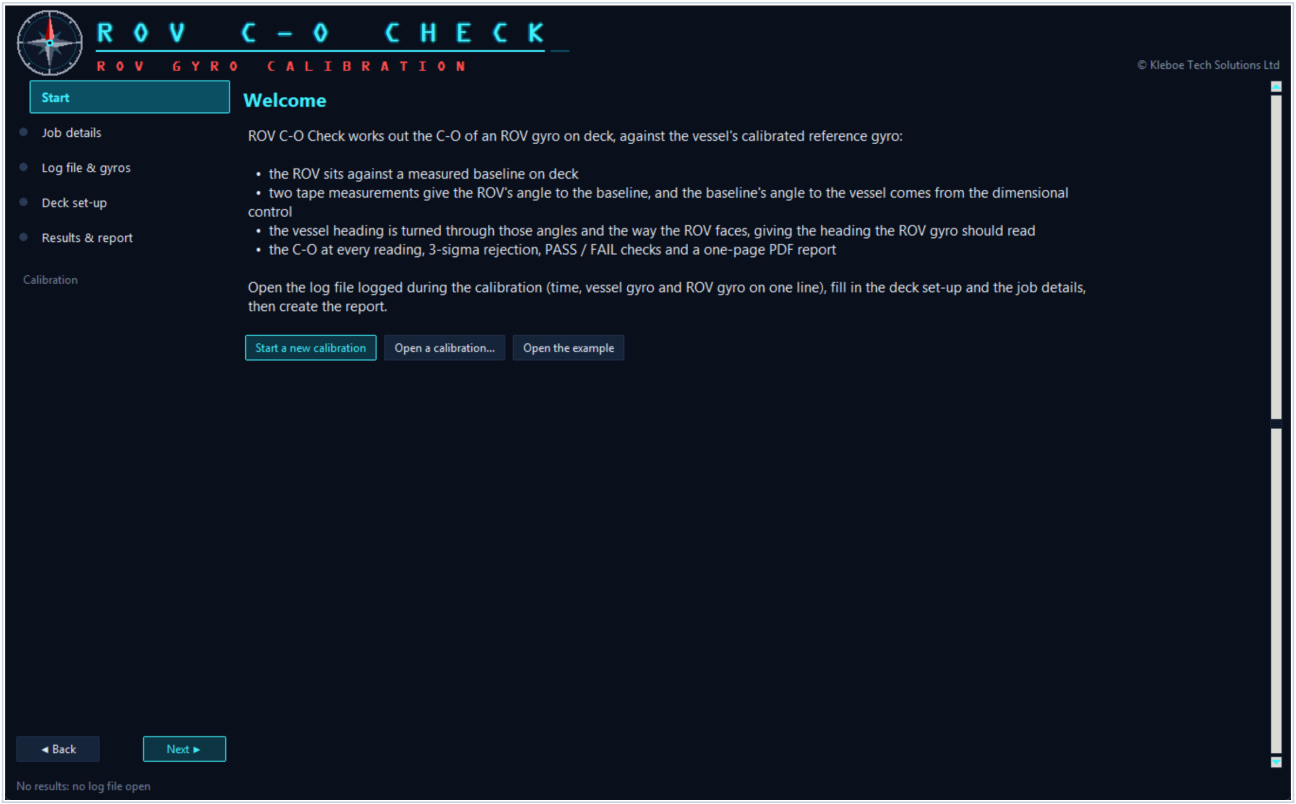
- A Windows PC.
- The program file, **ROV-CO-Check.exe**. Nothing else needs to be installed.
- The file logged during the calibration, with the time, the vessel's reference heading and the ROV gyro heading on each line - for example an .NPD file or a comma separated .txt / .csv file.
- The deck measurements: two tape measurements from the baseline to the ROV and the distance between them, and the baseline's angle to the vessel heading from the dimensional control.

2.2 Installing and starting

Copy **ROV-CO-Check.exe** into a folder of your choice and double-click it. There is no installer. You can also drag a saved calibration (.rovco) onto ROV-CO-Check.exe to open it.

> **Note**
> The first time you start the program, Windows may show a **Windows protected your PC** message. Click **More info**, then **Run anyway**.

2.3 The main window



The Start page. The steps are listed down the left.

- **Steps down the left**: Job details, Log file & gyros, Deck set-up and Results & report. The dot beside each step is green when it is complete, amber when partly done, red when a check fails and grey when it has no data yet. **Back** and **Next** move through them in order.
- **Summary** under the steps: the purpose, the C-O, SD, readings and rejections, the new ROV C-O (calibration) and whether all the checks pass.
- **Guide** at the top of each page: what to enter.
- **Menus**: File (calibrations, the log file and the PDF report), Go to (any step) and Help.

Everything is worked out again as you type, so the results change as soon as there is enough data. The Start page has **Open the example**, a complete calibration with made-up data that shows every step filled in. The pictures in this manual are of the example.

3 A calibration, step by step

3.1 On deck

1. Set the ROV on deck against the baseline, square to it, with one side of the ROV (forward, aft, port or starboard) facing the baseline.
2. In the navigation software, apply the reference gyro's accepted C-O. For a **calibration**, set the ROV gyro's C-O to 0; for a **verification**, leave its known C-O applied.
3. Measure from the baseline to the two corners of the ROV side that faces it (A and B), and the distance between those two points along the ROV.
4. Log the time, the vessel's reference heading and the ROV gyro heading on one line, for as long as your procedure asks (typically an hour).

3.2 In the program

1. **Job details**: the project, vessel, ROV, both heading systems and the purpose (section 4).
2. **Log file & gyros**: open the logged file and choose the reference and ROV gyros (section 5).
3. **Deck set-up**: the way the ROV faces, its side to the baseline, the tape measurements and D (section 6).
4. **Results & report**: check the results, decide whether to accept the new C-O, fill in the initials and create the PDF report (sections 7 and 8).
5. **File > Save calibration** keeps everything, including where the log file is, in a .rovco file.

> **Tip**
> A saved calibration opens with its log file again, as long as the log is still in the same place or in the same folder as the .rovco file.

4 Job details

The Job details page of the example.

Setting	Meaning
Project, project no., vessel, ROV, location, latitude, date / time	Printed at the top of the report.
Observed by, Checked by	The initials of the surveyor and the checker.
Purpose	Calibration or Verification (section 1).
Reference heading system	The model and serial number of the vessel's reference gyro, and the C-O applied to it in the logging (for the record).
ROV heading system	The model and serial number of the ROV gyro, and the C-O applied to it in the logging: 0 for a calibration, the current C-O for a verification. It is added to the measured C-O to give the new C-O.
Limits	The PASS / FAIL limits (section 7.3) and the rejection setting (3 standard deviations, as the spreadsheet).

5 The log file and the gyros

The Log file & gyros page.

5.1 Files it reads

Click **Open log file…**. The program reads comma separated text with one line per reading and a Time column (hh:mm:ss or hh:mm:ss.sss), the same files as C-O Check:

- **.NPD files.** Gyro fields such as *Gyro: Vessel Heading* and *Gyro: ROV Gyro* are found and named automatically.
- **Other text files with a heading line**, such as *Time, Vessel Gyro Heading, ROV Gyro Heading*. The last word of each heading says what it holds (Heading, Hdg or Gyro); the rest is the gyro's name.
- **Files with no headings.** Name the columns in the Columns window.

Under the buttons are the file name, the number of readings, the start and end times, the logging interval and any gaps.

5.2 Choosing the gyros

Choose the **Vessel reference gyro** and the **ROV gyro**. The program picks them for you when it can: a gyro with ROV in its name is taken as the ROV gyro.

5.3 Part of the log, and the date

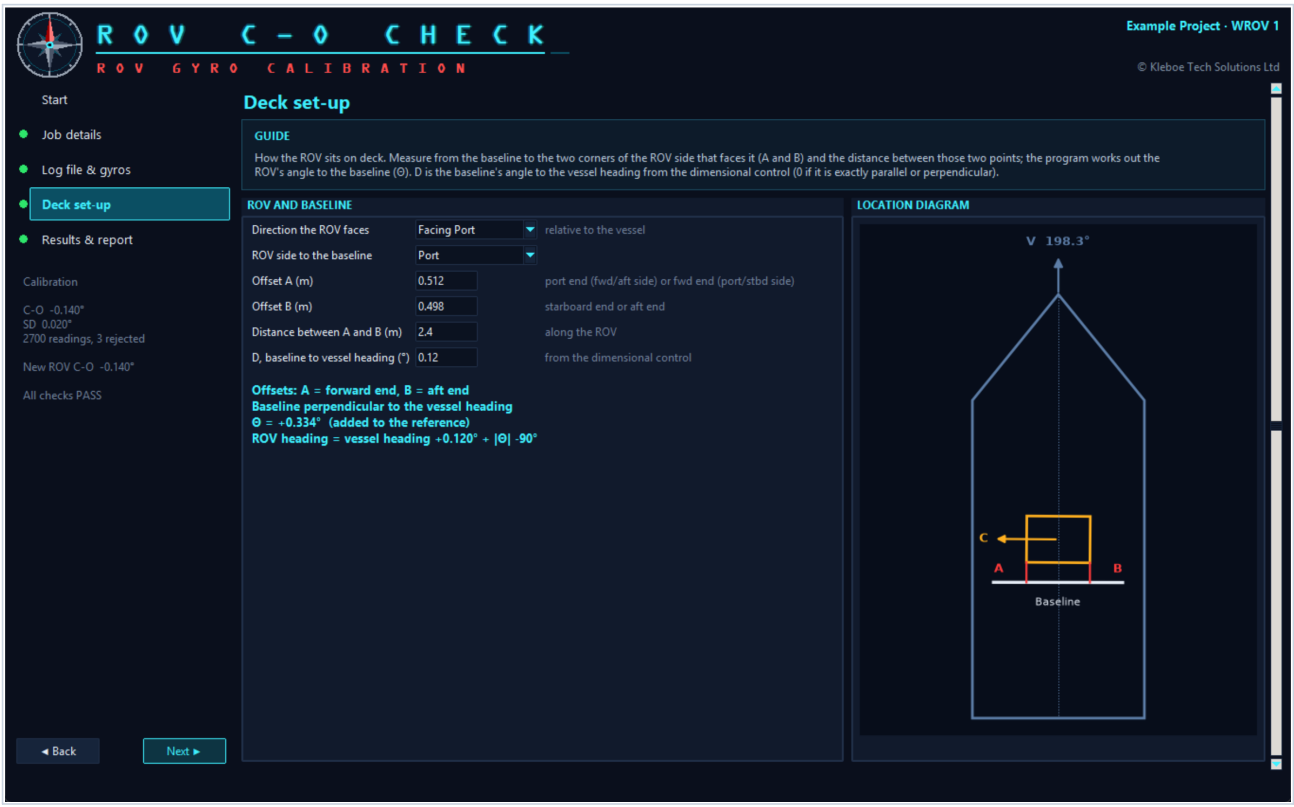
To use only part of the log - for example to leave out the time the ROV was being moved - type a **Start time** and **End time** (hh:mm:ss). Leave them blank to use the whole log. If the file has no date, type it in **Date of the log** so the report shows it.

5.4 The Columns window

Click **Columns…** to see how each column has been read and to change it. For each column, choose what it **Holds** (Time, Date or Heading) and type the gyro's name. **Detect again** puts back what the program found.

The Columns window for the example log.

6 The deck set-up



The Deck set-up page, with the location diagram.

6.1 The settings

Setting	Meaning
Direction the ROV faces	Facing Forward, Aft, Port or Starboard, relative to the vessel.
ROV side to the baseline	Which side of the ROV is against the baseline: Forward, Aft, Port or Starboard (the ROV's own sides).

Setting	Meaning
Offset A, Offset B	The tape measurements from the baseline to the two corners of that side. When the ROV's forward or aft side faces the baseline, A is at its port end and B at its starboard end; when its port or starboard side does, A is at its forward end and B at its aft end.
Distance between A and B	Between the two measured points, along the ROV.
D, baseline to vessel heading	The baseline's angle to the vessel heading from the dimensional control. 0 if the baseline is exactly parallel or perpendicular to the centreline.

Below the settings the page shows which end A and B are, whether the baseline is parallel or perpendicular to the vessel heading, Θ (the ROV's angle to the baseline) and whether it is added or taken away, and the sum that gives the ROV heading. The **location diagram** draws the vessel (bow up, with the mean vessel heading), the baseline, the ROV with its heading arrow C, and the A and B measurements.

> **Note**
> The diagram is a sketch to check the set-up has been entered the right way round: the ROV is drawn larger than it really is, and Θ is too small to see.

6.2 Parallel or perpendicular

The program works out whether the baseline is parallel or perpendicular to the vessel heading from the way the ROV faces and its side to the baseline: an ROV facing forward or aft with its forward or aft side to the baseline, or facing port or starboard with its port or starboard side to it, is against a **perpendicular** (athwartships) baseline; otherwise the baseline is **parallel** to the centreline.

7 Results

The Results & report page of the example.

7.1 The result tiles

Tile	Meaning
C-O (accepted mean)	The mean C-O of the readings that weren't rejected.
SD	The standard deviation of the accepted C-Os.
Min / Max	The smallest and largest accepted C-O.
Readings	The number of readings, the number rejected and the percentage.
Time	The start and end of the readings used.
New ROV C-O	Calibration only: the C-O applied while logging plus the measured C-O.
Checks	PASS when every check passes.

7.2 The gyro comparison chart

The chart shows the corrected reference heading and the ROV gyro heading against time (left scale), and the C-O (right scale) with its mean as a dashed line. Rejected readings are marked with red dots. Look for jumps, drift or a change part way through - if the ROV was disturbed, use the start and end times on the Log page to leave that part out.

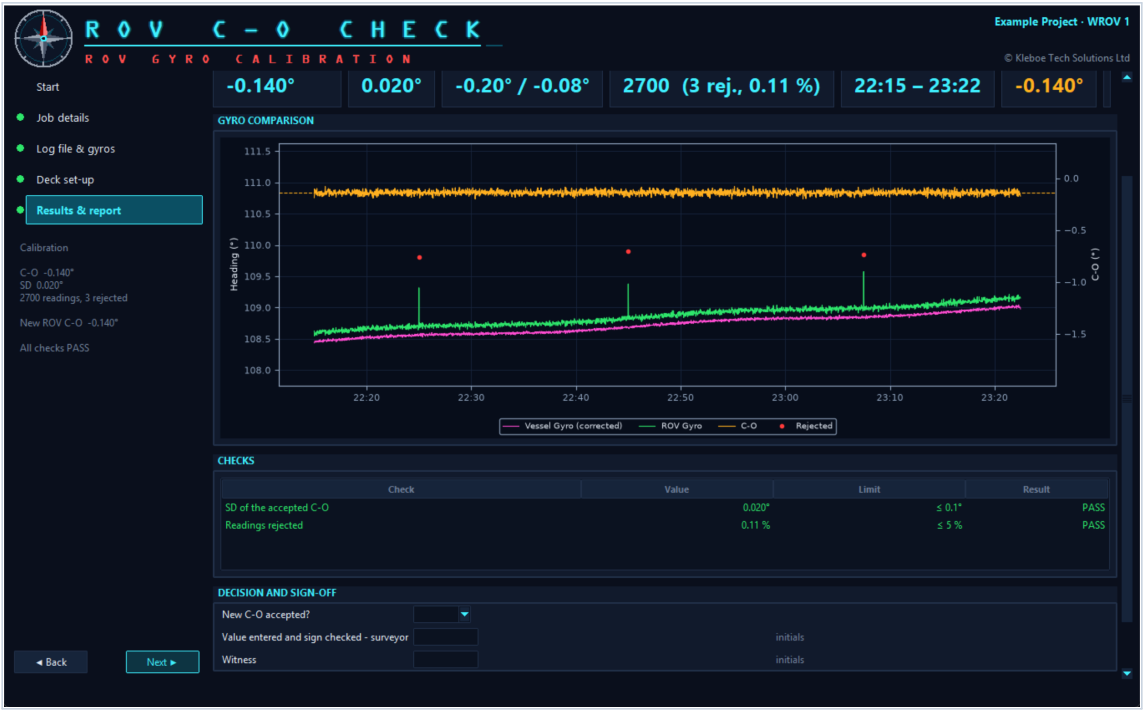
7.3 The checks

Check	Default limit	Used for
SD of the accepted C-O	≤ 0.1°	Calibration and verification
Readings rejected	≤ 5 %	Calibration and verification
C-O with the applied values	within ±0.5°	Verification only

The limits can be changed on the Job details page and are saved with the calibration. Leave a limit blank to leave that check out.

A verification: the C-O is checked against the ±0.5° limit.

7.4 Decision and sign-off



Lower on the Results page: the checks and the decision.

Choose whether the **New C-O accepted?** - Yes or No - and type the surveyor's and witness's initials for entering the value and checking its sign. If the new C-O is not accepted (for example in a verification), the report says the previous value was kept. Anything typed in **Notes** is printed on the report.

8 The PDF report

Click **Create PDF report…** on the Results page (or File > Create PDF report, Ctrl+R), choose where to save it, and open it. The report is one A4 page:

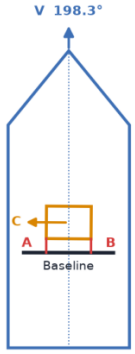
- the job details and both heading systems;
- the location diagram and the set-up table, including Θ, D and the C-Os applied;
- the gyro comparison chart;
- the results table: start and end time, min, max, C-O, SD, readings, rejections and % rejected;
- the checks with PASS / FAIL, and the new ROV C-O for a calibration;
- the decision and the initials.

ROV GYRO CALIBRATION

Example Project · WROV 1

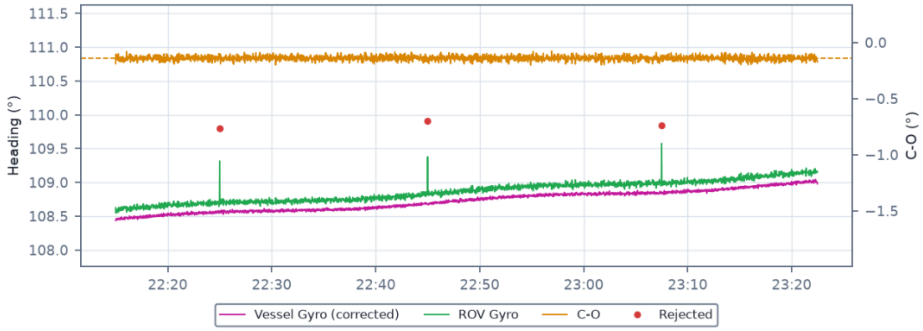
Project	Example Project	**Vessel**	MV Example	**Reference gyro**	Vessel INS REF-001
Project no.	EX-001	**ROV**	WROV 1	**ROV gyro**	ROV INS ROV-001
Date / time	21/10/2026 22:15	**Location**	Alongside (example)	**Purpose**	Calibration
Observed by	AB	**Checked by**	CD	**Latitude**	14.7° N

Location diagram and set-up



Set-up	
ROV facing	Facing Port
ROV side to baseline	Port
Baseline to vessel heading	Perpendicular
A - Forward offset	0.512 m
B - Aft offset	0.498 m
Distance between A and B	2.400 m
Θ, ROV to baseline	+0.334°
D, baseline to vessel heading	+0.120°
Reference C-O applied	+0.000°
ROV C-O applied	+0.000°
Mean vessel heading	198.27°

Gyro comparison



Results

Calibrated heading	Start	End	Min	Max	C-O	SD	Readings	Rejected	% rejected
ROV Gyro	22:15:00	23:22:28	-0.202°	-0.077°	-0.140°	0.020°	2700	3	0.11 %

Check	Value	Limit	Result
SD of the accepted C-O	0.020°	≤ 0.1°	PASS
Readings rejected	0.11 %	≤ 5 %	PASS

New ROV gyro C-O (applied +0.000° + measured -0.140°) = -0.140°

Decision

New C-O accepted?	—		
If not accepted	Previous value kept, entered and sign checked	Surveyor:	Witness:

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The example's report.

> **Tip**
> If the report can't be saved, it is probably open in a PDF viewer. Close it and try again, or save it with another name.

9 How the results are worked out

9.1 The ROV's angle to the baseline

$\Theta = \text{atan}((A - B) / \text{distance between A and B})$

9.2 The corrected reference heading

For every reading, the vessel's reference heading V is turned to the heading the ROV gyro should read:

$\text{corrected} = V + D \pm |\Theta| + \text{facing turn}$

Part	Value
D	The baseline's angle to the vessel heading.
± |Θ|	Added when A is larger than B and the ROV's port or aft side is to the baseline, or when A is not larger than B and its starboard or forward side is; otherwise taken away.
Facing turn	Facing Forward 0°, Facing Aft 180°, Facing Port −90°, Facing Starboard +90°.

9.3 C-O and rejection

$\text{C-O} = \text{corrected reference} - \text{ROV gyro (wrapped into } -180° \text{ to } +180°)$

$\text{standardised C-O} = |\text{C-O} - \text{mean}_{all}| / \text{SD}_{all}$

A reading with a standardised C-O above 3 is rejected. The reported C-O is the mean of the accepted C-Os, and the SD their sample standard deviation. The minimum and maximum are of the accepted C-Os.

9.4 The new C-O

$\text{new ROV C-O} = \text{ROV C-O applied while logging} + \text{measured C-O}$

A C-O is added to the gyro's reading to correct it to the reference. These are the same formulas as the ROV gyro verification spreadsheet, and give the same answers.

10 Trial and licence

The program runs as a free 48-hour trial with everything working. A bar under the title shows how long is left. After that it needs a Survey Software Utilities licence key: click **Enter licence key…**, paste the key from the email and click **Activate**. One key unlocks every Survey Software Utilities program on the PC, on up to 4 PCs. With a licence the bar goes, and the window title shows **Licensed until** and the date. The licence is checked online now and then and works for up to 30 days at a time without internet.

11 Troubleshooting

Problem	What to check
“Choose the vessel reference gyro and the ROV gyro”	Pick both on the Log file & gyros page. If a gyro is missing from the list, set its column to Heading in the Columns window.
“The reference and the ROV gyro are the same column”	Choose a different gyro for one of them.
The C-O is about 90° or 180° out	Check the Direction the ROV faces and its side to the baseline.
The C-O is a few tenths of a degree out	Check the A and B measurements are the right way round, the distance between them, and D.
“No readings inside the time window”	Check the start and end times (hh:mm:ss) against the times shown on the Log page.
Many readings rejected, or a large SD	Look at the chart for jumps or a change part way through, and use the start and end times to leave out the disturbed part.
The saved calibration opens without its log	Open the log again on the Log page: it was moved or renamed.
The report won't save	Close it in the PDF viewer, or save it with another name.

Keyboard shortcuts

Keys	Command
Ctrl+N / Ctrl+O / Ctrl+S	New, open and save a calibration
Ctrl+L	Open a log file
Ctrl+R	Create the PDF report