



FRW4

Fishing Rod Wrapper

Operator manual · controls, operating modes, settings, troubleshooting

FOC DRIVE

SYNCHRONOUS
TRAVERSE

Edition 1.3 · October 2026 · firmware 4.0

272 × 480 display, knob encoder, pedal with SIDE · BACK buttons, traverse with FRW · REV



Contents

The manual goes from the general to the specific: controls and the screen first, then each operating mode with charts, and at the end settings, faults and a one-page reference to print and keep by the machine.

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How to read this manual

On-screen labels

The machine interface is in English. Display labels are quoted exactly as shown on screen — **ARMED**, **TURNS** — and explained right after.

Keys and gestures

Short press: **SIDE**. Hold: **SIDE 1 s**. Knob: **↻ KNOB** — turn, **PRESS** — press the knob, **HOLD** — hold the knob for 0.7 s.

Mode colours

As on the display: **RPM** amber, **TORQUE** cyan, **INTERP** mint, **DRY** blue. Red means a fault.

1 Purpose and safety

FRW4 is a benchtop machine for wrapping guides and decorative thread work on fishing rods. The blank is clamped in the chuck of a spindle with a brushless FOC drive; the thread is laid by a traverse carriage on a stepper motor, synchronised with the spindle.



- 1 Head unit:** spindle with a three-jaw chuck, FOC drive, control panel with display and knob.
- 2 Guide rail** with the traverse carriage; the blank supports slide along it as well.
- 3 Blank supports** with rollers — set to the length of the rod.
- 4 Pedal encoder** on the floor: smooth input that sets speed, braking or angle depending on the mode.
- 5 Operator position** — facing the panel, spindle on the left, the blank running to the right along the rail.

What the machine does

- **Four spindle modes:** RPM (pedal = speed), TORQUE (pedal = brake while the spindle is turned by hand), INTERP (a set angle per pedal stroke), DRY (timed drying).
- **Synchronous traverse:** the carriage moves at a set number of spindle turns per millimetre (2.50 rot/mm by default); direction is set with the FRW and REV keys.
- **On-the-fly reverse,** brake release, turns counter, spindle detent.
- **Protections:** current and speed limits in every mode, driver and sensor monitoring, watchdog timer. A critical fault cuts power to both motors instantly.

Before you start

Rotating blank and thread. Keep hands, hair and loose clothing away from the spindle and the thread guide while the screen shows **ARMED**. Disarm the drive with **SIDE 1 s** before working on the piece.

Emergency stop: holding **BACK 2 s** on any screen stops the spindle, disarms the drive and disengages the traverse.

Pedal. After power-up the pedal must pass through its home switch once (release it fully). Until then the screen shows **PEDAL NOT HOMED**. The switch is only a zero reference, not a safety device.

1 Machine and connections — continued



- 1 **Display** 272 × 480 — run screen, menu, diagnostics.
- 2 **Knob encoder** with push button (orange disc).
- 3 **Status LEDs** — mirror the mode and warnings.
- 4 **Ventilation grille** of the power stage — do not cover.
- 5 **M12 connector** — traverse connection (carriage stepper motor).
- 6 **Spindle chuck**, three-jaw, with orange clamping ring.



- 7 **Fan** — when it stops, the screen shows **FAN WARNING**.
- 8 **Lower grille** — air intake.
- 9 **Rear bearing cover** of the spindle.
- 10 **Power switch** — mains power of the machine.
- 11 **Mains inlet** IEC C14 with power cord.
- 12 **Pedal connector** — pedal cable.
- 13 **Reset and Boot buttons** — service only: controller restart and firmware-loading mode. Do not press during operation.

Setting up the workplace

1. Place the rail on a level bench, head unit at the left end, power switch facing away from you.
2. Put the blank supports on the rail and fix them to the rod length so the blank rests on the rollers without sagging.
3. Plug the traverse carriage cable into the M12 connector on the front panel.
4. Put the pedal on the floor under the bench, plug its cable into the pedal connector on the rear panel (item 12) and check that the pedal releases freely to its stop.
5. Connect the power cord and switch the machine on. Wait for the self-test to finish (chapter 4).

Clamping the blank

The chuck has three jaws that close towards the centre and self-centre the blank. Turn the orange ring until the grip is firm but not excessive — a carbon blank is easy to crush. Use soft inserts for thin tips. Check run-out by turning the spindle by hand with the drive disarmed.

Ventilation. Keep the front and rear grilles clear: the power stage and the fan cool the spindle driver. Overheating leads to the fault

Motor driver.



Pedal

- 1 **Pedal platform** — working travel 0–100 %; the first 3 % of travel are ignored (dead zone).
- 2 **Encoder axle** — reads the pedal position; the home switch at the fully released end sets zero.
- 3 **BACK button** — short press: release / re-apply the spindle brake; hold 2 s: stop and disarm (chapters 4 and 6).
- 4 **SIDE button** — hold 1 s: arm / disarm the drive; short press: on-the-fly spindle reverse (chapters 4 and 6).

After power-up release the pedal fully once so that **PEDAL NOT HOMED** goes out. Pedal cable — to the connector on the rear panel (item 12).

2 Controls

The display is not a touchscreen. The panel carries only the knob encoder with push button. The **SIDE** and **BACK** buttons are on the pedal, **FRW** / **REV** on the traverse unit. Every button distinguishes a short press from a hold.

CONTROL	SHORT PRESS	HOLD
Knob ↻	Turn: mode setpoint (speed, brake current, stroke, drying speed), menu scrolling, value in settings. Speed step — setting Knob step .	
Knob — press	On the run screen: switches RPM ⇌ TORQUE ; in drying — start / stop the timer. In the menu — open the item; on other screens — next field or confirm.	0.7 s : open the menu (only with the spindle stopped and the pedal released).
SIDE pedal	Reverse the spindle on the fly — with controlled braking through zero. Has no effect in TORQUE.	1 s : arm the drive (ARMED) or disarm it (DISARMED).
BACK pedal	With the drive armed, on the run screen — release / re-apply the spindle brake. On other screens — back.	2 s : stop and disarm from any screen. If the drive is already disarmed — reset the turns counter.
FRW / REV traverse	Traverse direction forward / back. Does not affect the spindle.	—
FRW + REV	Together: engage (lock to the spindle) or disengage the traverse.	—
Pedal	Smooth 0–100 % input. What it sets depends on the mode (see chapters 5–9). The first 3 % of travel are a dead zone.	



FRW traverse ▶	REV ◀ traverse	SIDE drive · reverse	BACK brake · back
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- 1 Portrait 272 × 480 display: top line — status, bottom line — key hints.
- 2 Knob encoder with push button (orange disc): setpoint, navigation, confirm.
- 3 Spindle chuck.
- 4 Traverse M12 connector: carriage stepper motor and the FRW/REV buttons.

SIDE and **BACK** are buttons on the pedal (chapter 1, items 3–4). **FRW** / **REV** sit on the traverse unit and connect together with its motor through the M12 connector. The pedal is an encoder with a home switch.

Key hints are always on screen. The bottom line of the display shows what each key does right now: **Knob** turn the knob, **PRESS** press, **HOLD** hold, **F+R** — FRW and REV together. An unavailable action gives a double low beep and a short hint.

3 Run screen

The run screen opens after the self-test and remains the main screen. Its content changes with the mode, but the structure stays the same.



- 1 Status line.** Left — drive state and mode: **DISARMED** disarmed, **ARMED** armed. Right — an important warning: **PEDAL NOT HOMED**, **PEDAL LOCKED** (the pedal is ignored outside the run screen), **FAN WARNING**, **NO FAULTS**.
- 2 Mode indicator.** With the drive disarmed — tabs **RPM** **TORQUE** **INTERP** **DRY**, the active one highlighted in the mode colour. Below them the setpoint in large digits; turning the knob changes it.
- 3 Main gauge.** With the drive armed — the live value: shaft rpm, brake current, spindle angle or remaining drying time. The pointer on the left is the pedal position. The small line shows the setpoint and the active mode limit.
- 4 Status cards.** **DIRECTION** direction of rotation, **PEDAL** pedal travel in percent, **BRAKE** brake state, **TIMER** drying timer.
- 5 TURNS** — signed spindle turns counter (disabled in drying: **off**). **TRAVERSE** — rot/mm synchronisation and traverse state: **OFF** disengaged, **LOCK** locked to the spindle; the letter **F** / **R** is its direction.
- 6 Carriage bar** — position of the thread guide between 0 and full travel (70 mm by default).
- 7 Key hints** for the current state. With the drive disarmed a green banner appears here: **SIDE Hold 1 s to arm**; messages such as "Brake released, spindle free" are also shown here for a few seconds.

What the lines under the gauge show in each mode

MODE	GAUGE	LINE UNDER THE GAUGE	CARDS
RPM	Shaft rpm, up to Max shaft speed	full pedal 300 rpm · max 1.00 A 0.15 A — speed at full pedal, limit and actual current	DIRECTION · PEDAL
TORQUE	Brake current, A	full pedal 0.50 A · 188 of max 300 rpm — current at full pedal, speed and limit	BRAKE · PEDAL
INTERP	Spindle angle, degrees	0.5 rev per stroke · snap 45° 0.15 A — stroke, detent, current	DIRECTION · PEDAL
DRY	Remaining time m:ss	30 rpm · actual 30 0.18 A — set and actual	TIMER · PEDAL

4 Power-up, arming, stopping



Self-test. Motor driver, current sensors, stepper driver, pedal, watchdog. Takes about 2 s.

Power-up

After power is applied the machine checks its units and reports the result line by line. **OK** — the unit is OK; **not homed** on the pedal — normal until the pedal is released fully for the first time; **FAULT** — jump to the fault screen (chapter 15). After power-up the drive is always disarmed, the traverse disengaged, the mode is **RPM**.

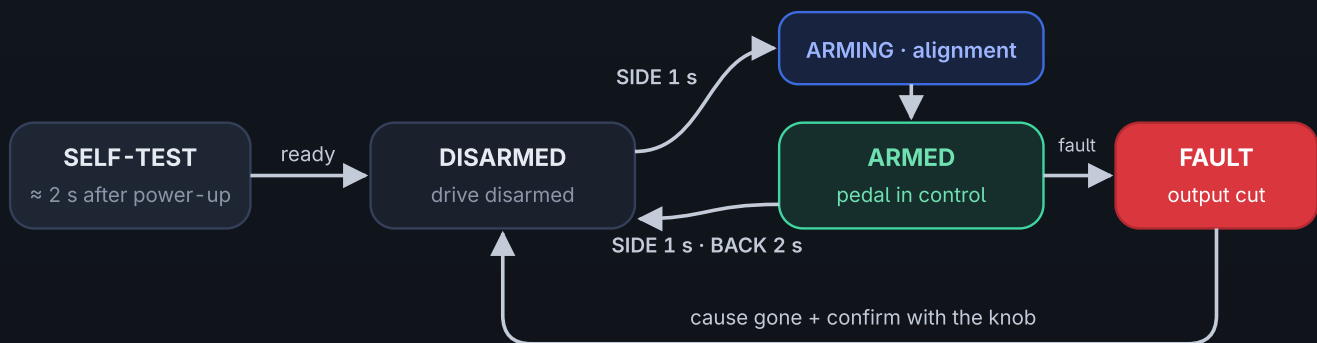
Arming the drive — **SIDE 1 s**

Hold **SIDE** for one second with the pedal released. The drive aligns the rotor (short pause), then a rising chime sounds and the status line shows **ARMED**. From now on the pedal controls the spindle according to the mode. If the pedal is pressed the machine refuses: "Release the pedal to arm".

Disarming and stopping

- **SIDE 1 s** — normal disarm: the spindle stops, the brake holds, the drive is de-energised.
- **BACK 2 s** — stop and disarm **from any screen**, including the menu and settings. Use it as the emergency stop: a button under your foot, hands free.
- Releasing the pedal in RPM stops the spindle, but the drive stays armed — the spindle is held electrically.

Machine states

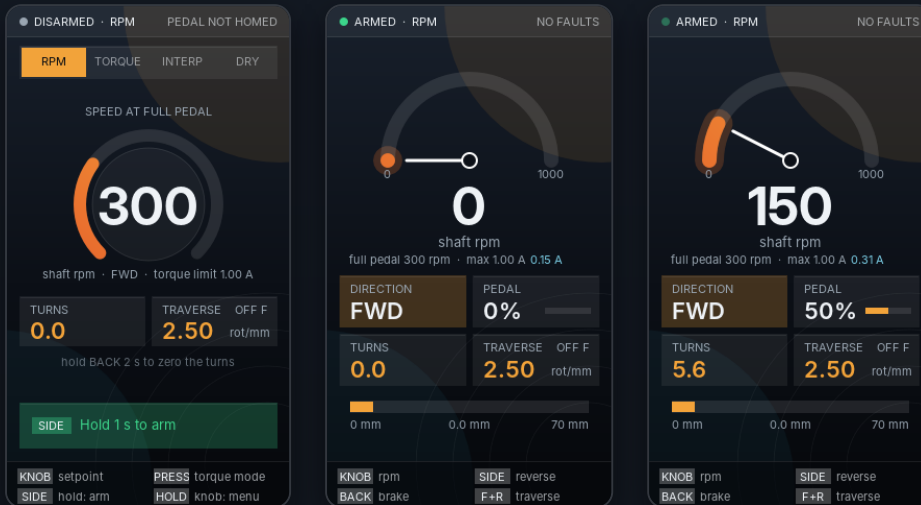


When the menu can be opened. Holding the knob for 0.7 s opens the menu at any time while disarmed; while armed only with the spindle stopped, the pedal released and no drying timer running. Otherwise the warning "Stop before opening the menu" appears.

The pedal is inactive outside the run screen. In the menu, settings, traverse and interpolation screens the pedal is locked (**PEDAL LOCKED**) so an accidental press cannot start the spindle. The drive stays armed meanwhile.

5 RPM mode — the pedal sets speed

The main wrapping mode. The knob sets the speed at full pedal; the pedal ramps the spindle smoothly from zero up to it. Torque is limited by the setting **RPM torque limit**, so a snagged thread or a caught hand does not turn into a jolt.

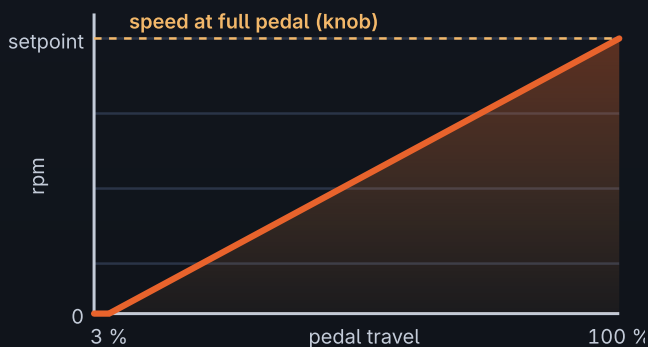


Drive disarmed. Setpoint 300 rpm in large digits; the knob changes it in steps of **Knob step**. The FWD arrow is the selected direction.

Drive armed, pedal released. 0 rpm, the spindle is held. 0.15 A is the holding current.

Pedal at 50 % — 150 rpm with a 300 setpoint. The **TURNS** counter grows with every turn.

Speed versus pedal



The relation is linear; the first 3 % of pedal travel are a dead zone.

What to do

Set the speed

Turn the knob. Range 0 ... **Max shaft speed** (1000 rpm by default), step **Knob step** (5 rpm). Can be changed while running.

Direction

SIDE short: a stopped spindle changes direction; a running one reverses on the fly (chapter 6).

Switch to TORQUE

Press the knob with the spindle stopped and the pedal released.

Torque limit

RPM torque limit (1.00 A): if the spindle jams it stalls at this current and stops.

Stop

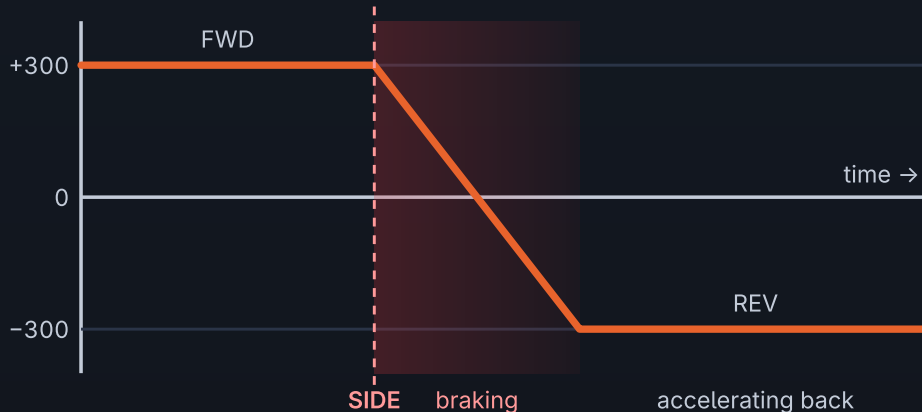
Release the pedal — smooth stop with holding. **SIDE 1 s** or **BACK 2 s** — disarm the drive.

Traverse in RPM: **FRW + REV** locks the carriage to the spindle, **FRW** / **REV** — its direction (chapter 10).

6 On-the-fly reverse and brake release

Reverse — **SIDE** short

In RPM and DRY a short press of **SIDE** changes the spindle direction **without stopping the job**. The direction does not flip abruptly: the speed command passes linearly through zero, the drive brakes actively and then accelerates the spindle the other way up to the same speed. The **DIRECTION** card already shows the new direction during braking.



The command slews at twice **Max shaft speed** per second: at 1000 rpm a reverse from 300 to -300 takes about 0.3 s. The pedal keeps setting the speed magnitude.



Moment of reverse. The card already says **REV**, the speed is passing 87 rpm on the way down. The turns counter will start decreasing.

TORQUE mode has no direction — the operator's hand turns the spindle, the machine only brakes. **SIDE** short there answers with the warning "Torque mode has no direction". In INTERP **SIDE** changes the direction of the following strokes.



Brake released. Card

BRAKE FREE; the spindle can be turned by hand. Another **BACK** or the pedal re-applies the brake.

Brake release — **BACK** short

With the drive armed the spindle is held electrically and cannot be turned by hand. To adjust the blank or take up the thread, press **BACK** short on the run screen: the drive stays armed but torque is removed — **BRAKE FREE**, «Brake released, spindle free».

- Works in **RPM** and **DRY**. In TORQUE the pedal already sets the brake; in INTERP the spindle holds position.
- The brake re-engages **automatically** as soon as the pedal asks for speed (RPM) or the timer is started (DRY), or on another **BACK**.
- The turns counter also counts manual rotation — handy for finishing a turn by hand.

Do not confuse with the hold. **BACK** short — release the brake; **BACK 2 s** — stop and disarm.

7 TORQUE mode — the pedal sets braking

The operator turns the spindle by hand and the machine acts as an adjustable brake: the harder the pedal is pressed, the more current the drive uses to resist rotation. This is convenient for wrapping under tension and controlling every turn. To enter — press the knob on the run screen in RPM mode.

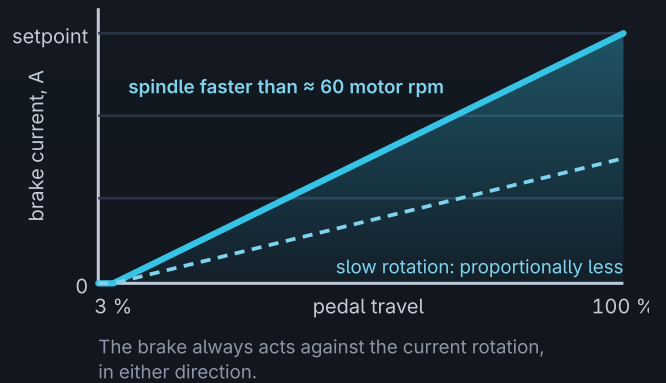


Spindle stopped. Brake current 0.00 A, gauge up to 1.6 A. Setpoint 0.50 A — the current at full pedal.



Spindle spun by hand to 188 rpm with a 300 limit. Brake current appears as the pedal is pressed.

Brake current versus pedal and speed



What to do

Set the force Turn the knob — brake current at full pedal, step 0.02 A, up to 1.6 A. Line under the gauge: **full pedal 0.50 A**.

Work Turn the blank by hand and dose the tension with the pedal. Full force is reached once the spindle turns faster than ≈ 60 motor rpm; at the lowest speeds the brake is softer so the spindle does not “stick”.

Back to RPM Press the knob (spindle stopped, pedal released).

Speed limit **Torque speed limit**. If the spindle is spun by hand above this speed (300 rpm by default), the drive brakes it down to the limit by itself — even with the pedal released. On the gauge this shows as **188 of max 300 rpm**.

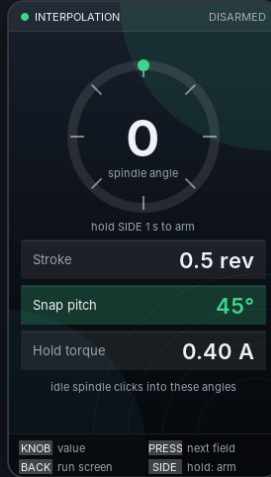
Traverse and counter keep working. With the traverse engaged the carriage follows the manual rotation; the **turns** counter counts signed turns — handy for checking the number of wraps.

8 Interpolation — the spindle follows the pedal

The spindle turns by exactly the set angle per full pedal stroke — half a turn by default. The return stroke gives another half turn **in the same direction**: pump the pedal and the spindle steps along. Between strokes it holds position, and when turned by hand it “snaps” to the nearest detent angle.



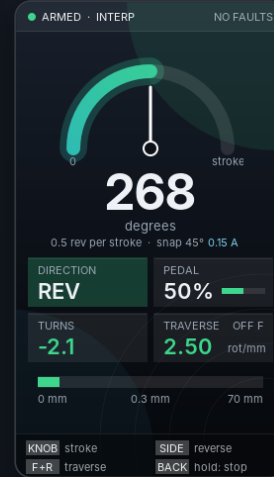
Interpolation screen
(Menu → Interpolation). A dial with detent ticks and three setting fields.



Pressing the knob moves to the next field; turning changes its value.

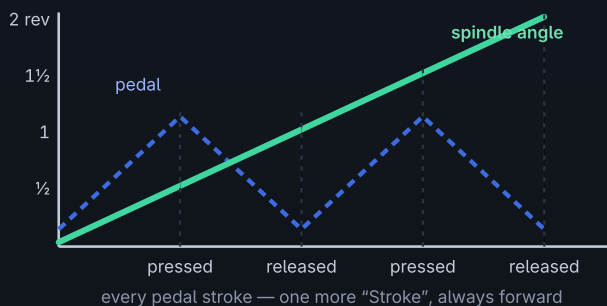


Drive armed, spindle turned by hand — the pointer shows the angle; after a 0.3 s pause it snaps to the nearest 45°.

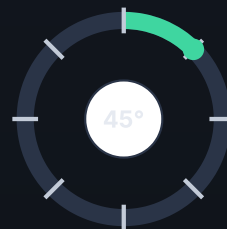


Run screen in INTERP.
Pedal at 50 % — the spindle has done a quarter turn of the current stroke.

Pedal travel and spindle angle



Detent — discrete angles



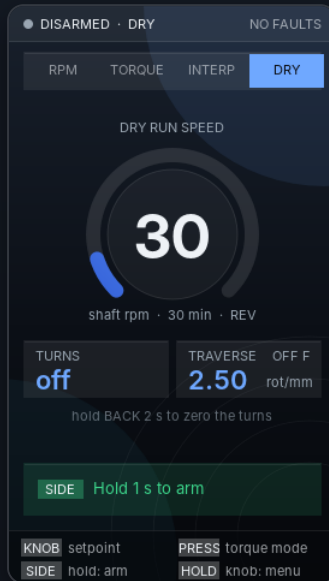
With the drive armed and the pedal still, the spindle can be turned by hand: after 0.3 s at rest it is pulled to the nearest angle of the **Snap pitch** grid and held there with the **Hold torque** current. The next pedal stroke starts from the new angle — the position is not “rewound”. Detent pitch: off, 15°, 30°, 45°, 60°, 90°, 120°, 180°.

Stroke	Spindle turns per full pedal stroke: 0.1 ... 2.0 rev, step 0.1.
Snap pitch	Detent grid pitch in degrees; off — the spindle holds any angle.
Hold torque	Holding current in the detent, 0.05 ... 1.6 A, step 0.05 A. Lower — easier to turn by hand, higher — firmer hold.

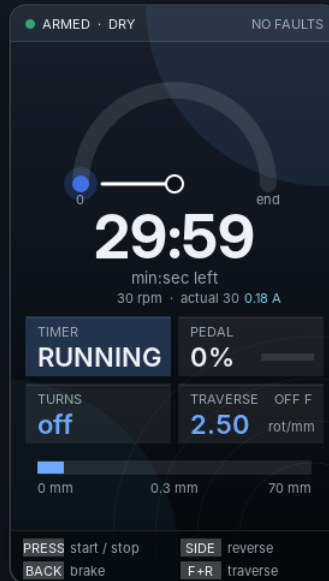
Direction and exit. **SIDE** short changes the direction of the following strokes (card **DIRECTION**). **BACK** short on the interpolation screen returns to the run screen; the mode stays INTERP. Pressing the knob on the run screen switches to RPM.

9 Drying — timed rotation

After applying finish the blank must turn slowly until the coating sets. In DRY mode the spindle turns at a set low speed for a set time, the pedal is not involved, and at the end the machine gives three long beeps and stops.



DRY selected, drive disarmed. Setpoint 30 rpm, time 30 min from settings. The counter **TURNS off**.

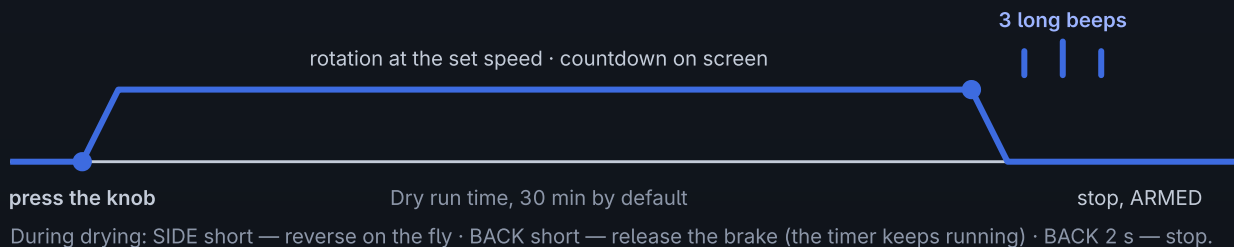


Timer running. Countdown m:ss, card **TIMER RUNNING**, actual speed under the gauge.

Procedure

1. Open the menu (hold the knob 0.7 s) and choose **Dry run**. The item caption already shows the parameters: 30 rpm for 30 min, then a beep.
2. Set the drying speed with the knob: 1 ... 300 rpm, step 1. The time is set in settings — **Dry run time**, 1 ... 240 min.
3. Arm the drive — **SIDE 1 s**. Hint: "Armed: press the knob to start".
4. **Press the knob** — the timer runs. Pressing again stops it early.
5. When the time is up — three long beeps with vibration, the spindle stops, the drive stays armed. Disarm it with **SIDE 1 s**.

Timeline



No pedal needed

In DRY the pedal does not control speed. The **PEDAL** card shows its travel for information only.

Counter disabled

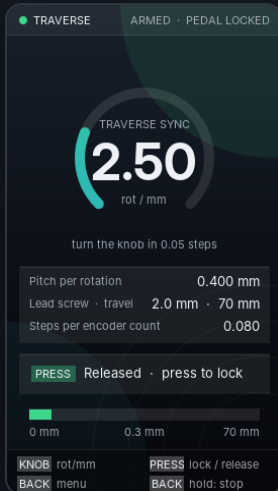
Drying turns are not counted: **TURNS off**. Your wrap count is kept and continues after leaving DRY.

Menu during drying

While the timer runs, the menu and mode changes are unavailable. Stop the timer by pressing the knob or wait for the beeps.

10 Traverse — the thread-guide carriage

The carriage with the thread guide runs on a lead screw driven by a stepper motor. When the traverse is locked (**LOCK**), the stepper is rigidly tied to the spindle encoder: however the spindle turns — by pedal, by hand or in reverse — the carriage travels exactly the right distance.



Traverse screen (Menu → Traverse sync). Synchronisation 2.50 rot/mm, computed carriage pitch 0.400 mm per spindle turn.

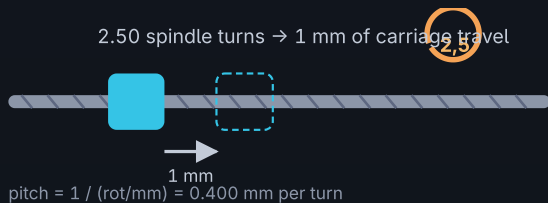


Locked. Pressing the knob engages or disengages the traverse; so does **FRW + REV** on any screen.



On the run screen: card **TRAVERSE LOCK F**, the carriage bar at the bottom moves.

Synchronisation in rot/mm



Set Turn the knob on the traverse screen, step 0.05 rot/mm, range 0.05 ... 20. The screen recomputes the pitch per turn and the motor steps per encoder count.

Lock Press the knob on the traverse screen or **FRW + REV** anywhere. The carriage is zeroed at the current point — put the thread guide at the start of the wrap beforehand.

Direction **FRW** / **REV** — buttons on the traverse unit. Can be changed on the fly: re-synchronisation starts from the current position, without a jerk of the carriage.

End of travel

The bar at the bottom of the run screen shows the carriage travel from 0 to **Carriage travel** (70 mm). When the computed position leaves this range the traverse **disengages by itself** with the warning “Traverse end reached”; the spindle keeps running. Bring the carriage back with the direction key and lock again — on the traverse screen this is the item **At travel end · press to re-lock**.

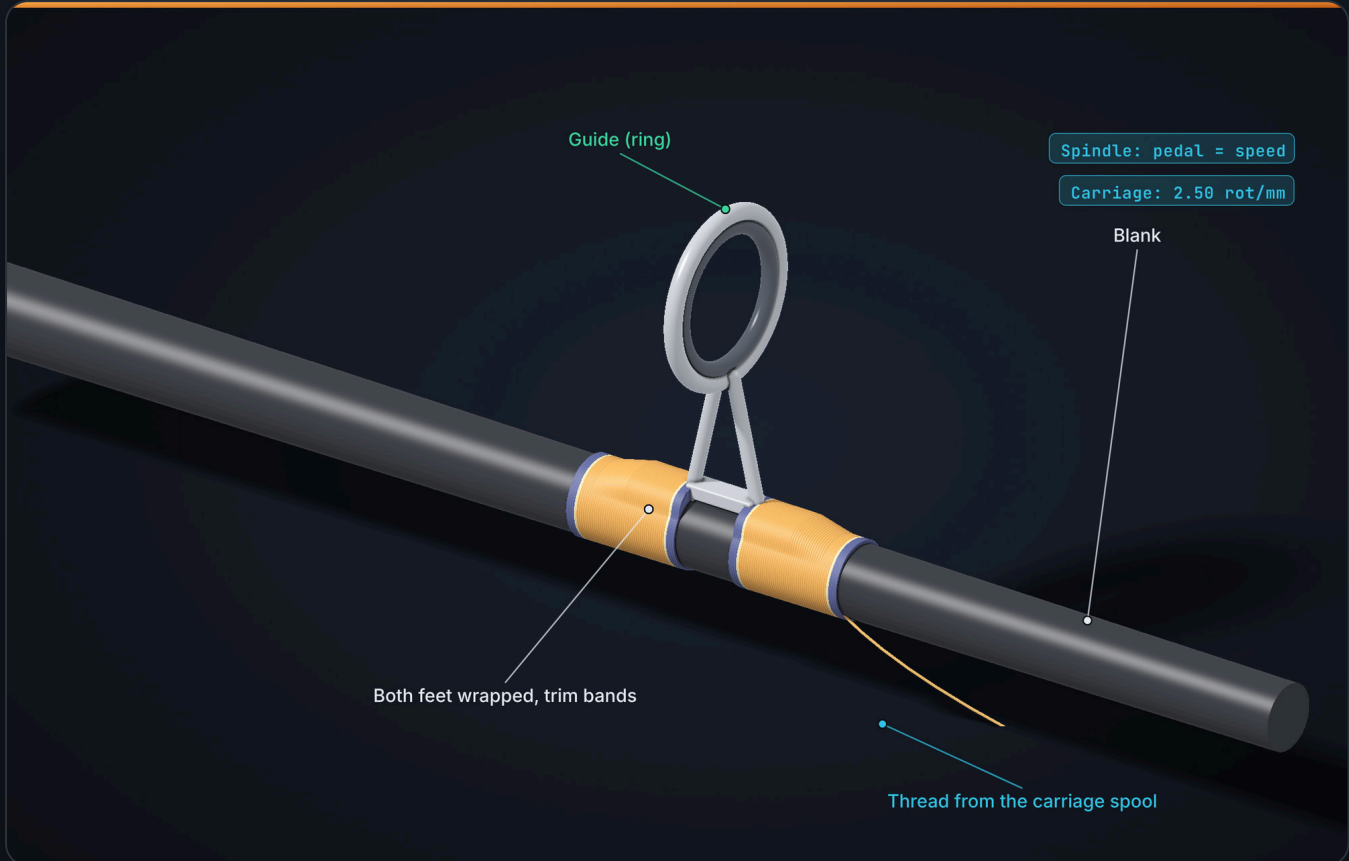
The carriage pitch also depends on the screw lead **Lead screw lead** (2.0 mm): for 2.50 rot/mm this is 0.080 motor steps per encoder count — the value is shown on the traverse screen.

Traverse and faults. Any critical fault de-energises the stepper and clears the lock. After clearing the fault the traverse has to be engaged again.

The traverse also works with the drive disarmed. If you lock it while disarmed and turn the spindle by hand, the carriage follows — a handy way to check the synchronisation before wrapping.

11 Wrapping a guide — step by step

A typical job on the machine, from placing the guide to the finish. The blank is held in the three-jaw chuck and turns at the speed set by the pedal (RPM mode); the locked traverse feeds the thread one thread width per turn. The six steps on the following pages are shown on a double-foot guide.



Machine set-up

Mode **RPM** — the pedal sets speed. 60–150 rpm is comfortable for wrapping; lower **Max shaft speed** in the settings if you like (chapter 13).

Traverse $\text{rot/mm} = 1 / \text{thread diameter}$: 0.40 mm thread → 2.50 rot/mm. Put the thread guide at the start of the wrap and lock with **FRW + REV** (chapter 10).

Direction **FRW** — the carriage moves away from the chuck, **REV** — towards it. Always wrap towards the guide: the first foot in one direction, the second in the opposite one.

Tension Tensioner on the carriage: the thread lies tight but does not cut into the neighbouring turns. Test on a scrap of blank.

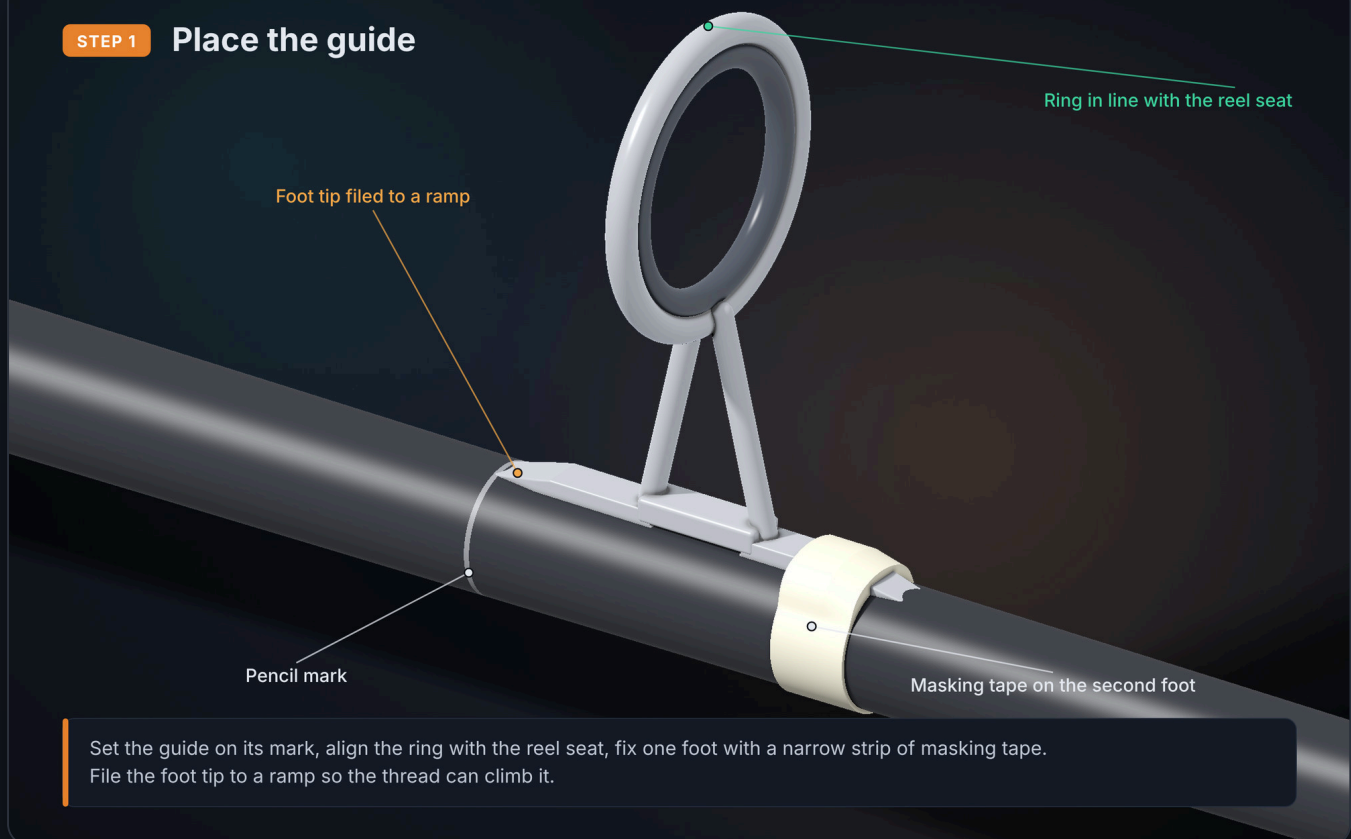
What you need

- Wrapping thread — 0.40 mm in the pictures, trim bands in a dark thread.
- Masking tape and a pencil for marking.
- A needle file — to ramp the foot tips.
- A pull-through loop of strong thread or line, ≈ 150 mm.
- A blade or scalpel; a smooth tool for burnishing the turns.

Hands only guide the thread. The pedal sets the speed, the traverse sets the pitch. Do not pull the thread against the carriage and do not hold the blank. To stop, release the pedal; emergency stop — **BACK 2 s**.

11 Wrapping a guide — continued

STEP 1 Place the guide



STEP 2 Start the wrap



11 Wrapping a guide — continued

STEP 3 Wrap onto the foot

Carriage feed → 2.50 rot/mm

Thread climbs the ramp

Wrap front: keep turns closed

One thread width per turn

Keep the pedal steady. The carriage advances by itself, one thread width per turn (set rot/mm = 1 / thread diameter). Guide the thread with a finger only to keep the turns closed; the machine keeps the pitch.

STEP 4 Lay the finishing loop

Pedal released, spindle holds

Finishing loop, opening towards the guide

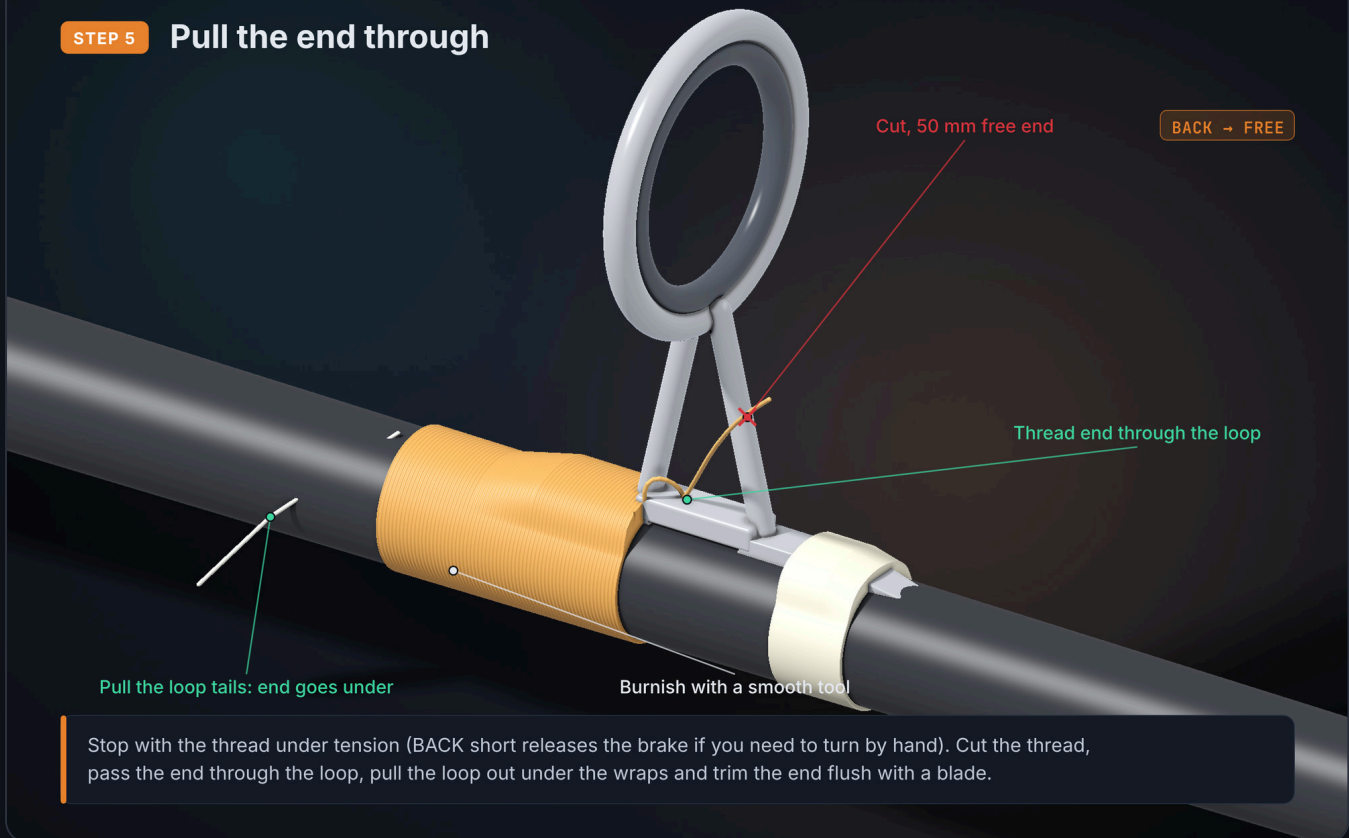
≈ 8 turns remain

Wrap continues over the loop

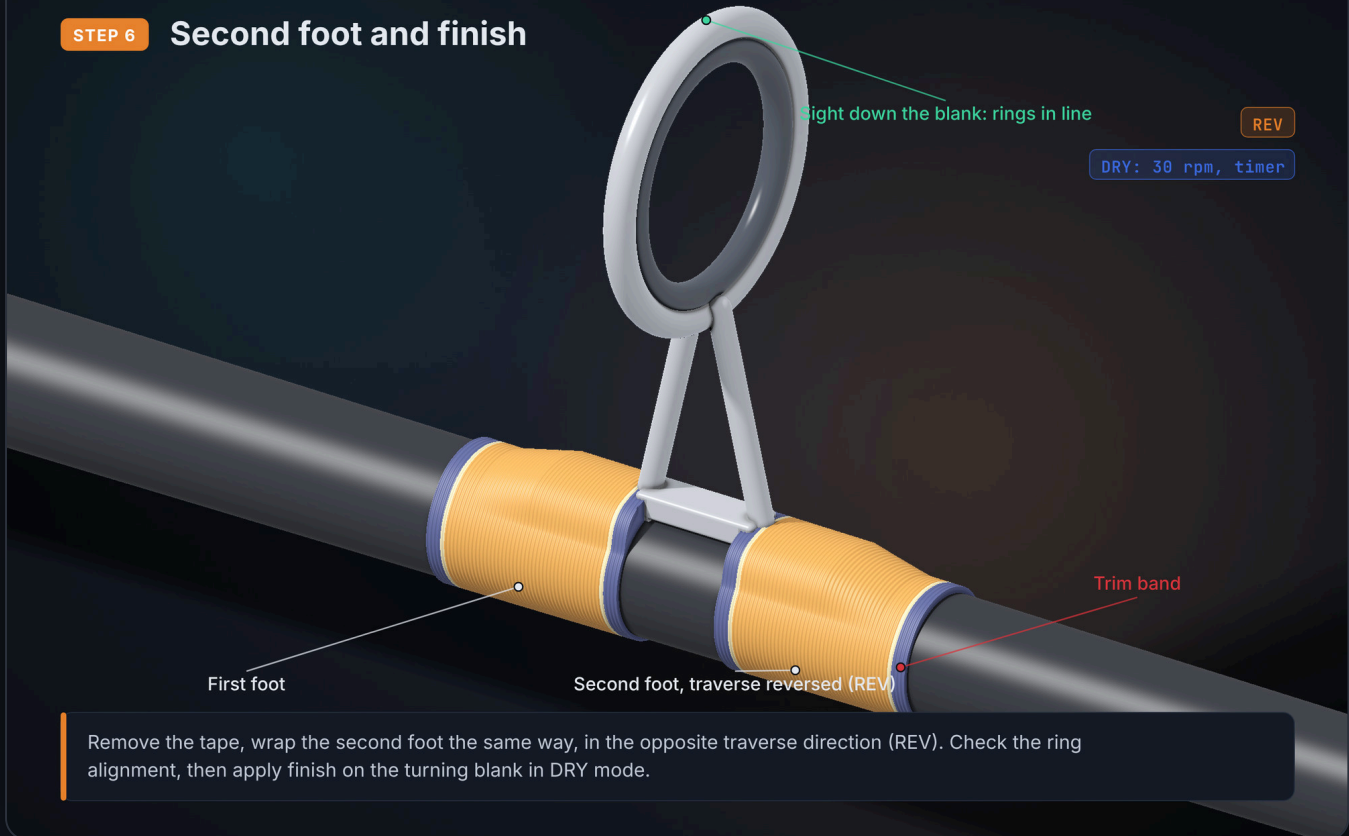
About 8 turns before the end, release the pedal, lay a loop of thread on the blank with its opening towards the guide, then continue wrapping over it.

11 Wrapping a guide — continued

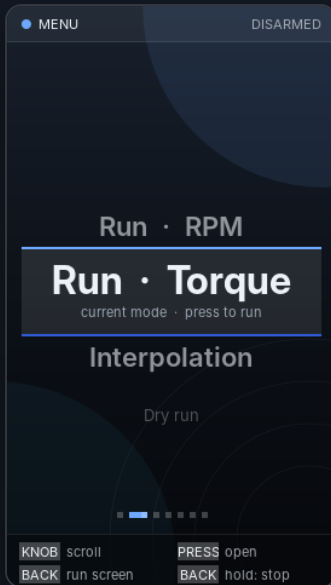
STEP 5 Pull the end through



STEP 6 Second foot and finish

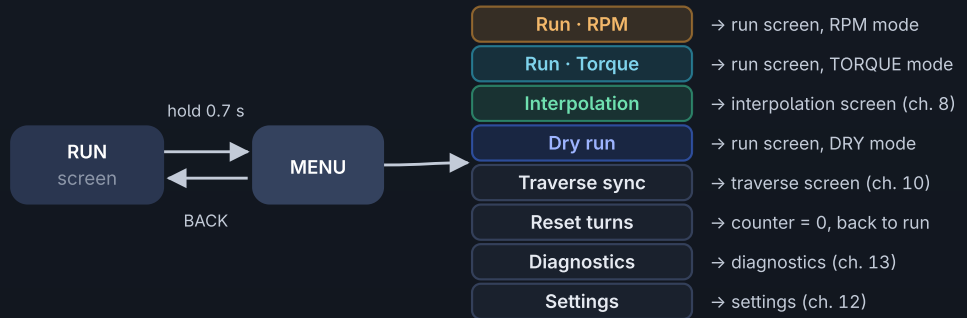


12 Menu and turns counter



Menu — hold the knob 0.7 s

The menu opens on the item of the current mode. Turn the knob to scroll, press to open, **BACK** — back to the run screen. With the drive armed the menu is available only with the spindle stopped; the pedal is locked in the menu.



Menu. The selected item is shown large with a hint; the dots at the bottom show the position in the list of eight items.

Turns counter **TURN**

Counts signed spindle turns in every mode except drying: forward adds, backward subtracts, manual rotation counts too. Resolution — a tenth of a turn. Handy for keeping track of the number of wraps and matching symmetrical guides.

Reset With the drive disarmed on the run screen — **BACK 2 s** (on-screen hint: **hold BACK 2 s to zero the turns**). Or the menu item **Reset turns**, which shows the current value before resetting.

Kept Across mode changes, arming and disarming, and after clearing a fault. Reset at power-off.

Why not BACK 2 s while armed? Holding **BACK** while armed always means “stop and disarm” — it is a safety gesture and must not depend on context. That is why resetting is available only after disarming or through the menu.

13 Settings

Menu → **Settings**. Turning the knob selects a row; the caption at the bottom explains it. **Pressing the knob** puts the row into edit mode (it pulses), turning changes the value, pressing again confirms and applies it immediately. **BACK** in edit mode cancels the change; outside editing it returns to the menu.

Settings are not yet kept across power cycles.

After power-up the machine starts with the default values from the table. Write your working values in the cheat sheet (chapter 18) and check them before work. Non-volatile storage is planned for the next firmware version.

Backlight changes immediately as the knob is turned; **BACK** restores the previous value, pressing the knob keeps the new one.



Settings list. The first row is selected.



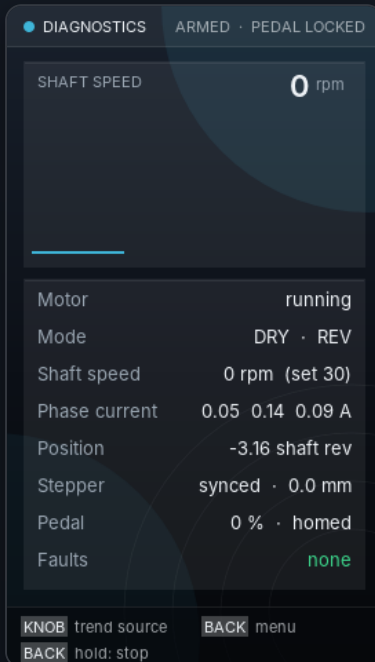
Scrolled to the mode limits. Below are drying time, sound, vibration and backlight.

ROW ON SCREEN	WHAT IT SETS	DEFAULT	RANGE · STEP
Lead screw lead	Lead of the traverse lead screw. Affects the conversion of rot/mm into motor steps.	2.0 mm	0,5 ... 10 · 0,5
Carriage travel	Full carriage travel; the traverse disengages when it is reached.	70 mm	5 ... 300 · 1
Pedal full travel	How many pedal encoder counts correspond to 100 %. Increase it if the pedal reaches 100 % too early.	200	20 ... 2000 · 10
Max shaft speed	Upper limit of the RPM speed setpoint and the reverse speed. Also sets the ramp rate (2 × value per second).	1000 rpm	50 ... 1000 · 50
Knob step	How many rpm one knob click changes the speed by in RPM.	5 rpm	1 ... 50
RPM torque limit	Current (torque) limit in RPM, DRY and INTERP modes. Protects the piece and your hands if the spindle jams.	1.00 A	0,1 ... 1,6 · 0,05
Torque speed limit	Speed limit in TORQUE mode: above it the drive brakes by itself.	300 rpm	10 ... 1000 · 10
Dry run time	Duration of timed drying.	30 min	1 ... 240 · 1
Buzzer	Sound signals on / off (the fault alarm always sounds).	on	on / off
Vibration	Vibration motor in the knob: confirmations, warnings, fault.	on	on / off
Backlight	Display backlight brightness.	75 %	10 ... 100 · 5

Interpolation parameters (Stroke, Snap pitch, Hold torque) and traverse synchronisation (rot/mm) are set on their own screens — chapters 8 and 10. When **Max shaft speed** is reduced, speed setpoints above the new limit are trimmed automatically.

14 Diagnostics

Menu → **Diagnostics**. A screen for checking the machine and talking to service: a live chart and a status table of every unit. The drive can stay armed — the pedal is locked on this screen.



Diagnostics in DRY mode. At the top — a chart of the selected quantity over the last seconds.

Chart

Turning the knob switches the source: **SHAFT SPEED** shaft rpm, **PHASE CURRENT** phase current amplitude, **CARRIAGE** carriage position in mm. The trace runs right to left; the scale adjusts automatically.

Status rows

Motor	idle disarmed, aligning aligning at arming, running armed, fault fault.
Mode	Mode and direction, e.g. DRY · REV .
Shaft speed	Actual shaft rpm with the setpoint in brackets: 0 rpm (set 30) .
Phase current	Three phase currents in amperes. On a stopped spindle — holding current; under a symmetrical load the values are close.
Position	Spindle position in shaft turns from the last reference point (the sign is the direction).
Stepper	idle disengaged / synced locked to the spindle, and the carriage position in mm.
Pedal	Pedal travel in percent and homed / not homed — whether the pedal has passed its home mark.
Faults	none or the code and name of the first active fault, e.g. 0x001 Motor driver .

Quick check before a shift

1 · Pedal

Release and press the pedal fully. The **Pedal** row must go 0 → 100 % and show **homed**. If 100 % comes too early or is never reached — adjust **Pedal full travel**.

2 · Spindle

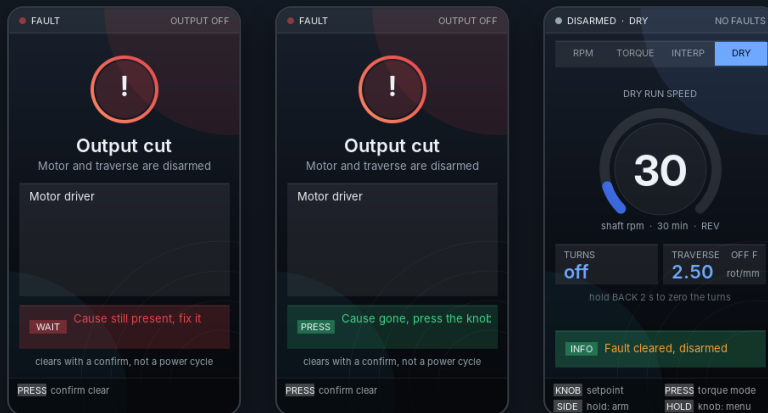
Arm the drive and give a little speed in RPM. Phase currents should be even under steady rotation, without jumps; **Shaft speed** stays at the setpoint.

3 · Traverse

Lock the traverse and turn the spindle 10 turns. **Stepper** must show 4.0 mm at 2.50 rot/mm. If it differs — check the synchronisation and the screw lead.

15 Faults and how to clear them

A critical fault instantly cuts power to both motors, sounds an intermittent low alarm and opens the red **FAULT** screen. Only one control works there — pressing the knob to confirm the reset. The machine does not need to be switched off.



Cause still present: red banner **WAIT**, the reset will be refused.

Cause gone: green banner **PRESS** — confirm with the knob.

After the reset: "Fault cleared, disarmed". The drive is disarmed, the traverse disengaged.

Reset procedure

1. Read the list of causes on the screen (there may be several) and remove them: free the snagged thread, let the driver cool down, check the connectors.
2. Wait for the green banner **PRESS**: the machine itself watches whether the cause has gone.
3. Press the knob. If the cause comes back — **CLEAR REFUSED**, «Refused, check the cause, press again».
4. After the reset arm the drive again with **SIDE 1 s** and, if needed, lock the traverse with **FRW + REV**. The turns counter is kept.

ON SCREEN	WHAT IT IS	LIKELY CAUSES AND ACTIONS
Motor driver	The spindle driver reported an error	Overload or overheating of the power stage, a short in the winding or cable. Let it cool, check the cable; if it repeats under load — lower RPM torque limit .
Stepper driver	Traverse driver	Stepper overheating or overload: the carriage is binding or has hit the end. Check the carriage travel by hand with the machine off.
Driver SPI	No communication with the driver	Poor contact of the driver ribbon cable or interference. Check the connectors; if it repeats — service.
Motion timeout	The spindle does not move on command	The spindle is jammed or the encoder is not counting: wound-up thread, disconnected encoder plug.
Overcurrent	Overcurrent	Impact, jam, current setpoint too high. Free the spindle, lower the setpoint.
Current sensing	Current sensors	Current measurement failure; operation is not possible. Contact service.
Task watchdog	Watchdog	Internal software fault. Reset; if it repeats, restart the machine and inform service.
Emergency stop	Stop on command	External stop signal. Make sure its cause has been removed, then confirm the reset.
Fan	Warning, not a fault	The fan is not turning; the status line shows FAN WARNING . The machine keeps working; clean the fan, otherwise the driver will overheat.

16 Troubleshooting

Most “faults” are a protection doing its job. First look at the status line at the top of the screen and the hint at the bottom: the machine has usually already written what it is waiting for.

SYMPTOM	CAUSE	WHAT TO DO
Pedal pressed, spindle still, top line shows DISARMED	The drive is not armed.	Release the pedal, hold SIDE for 1 s until the chime and ARMED .
Top line shows PEDAL NOT HOMED , pedal reads 0 %	After power-up the pedal has not yet passed its home mark.	Release the pedal fully (until the switch clicks). The message disappears and diagnostics shows homed .
Top line shows PEDAL LOCKED , the pedal does nothing	A screen other than the run screen is open (menu, settings, traverse, interpolation).	Return to the run screen: BACK short.
When holding SIDE two low beeps, “Release the pedal to arm”	The pedal is pressed or not at zero.	Release the pedal fully and try again. If the pedal “hangs” at 4–5 % — increase Pedal full travel or check the pedal mechanics.
«Arming failed, try again»	The drive did not reach holding within 3 s: driver not ready, power dip.	Try again after a couple of seconds. If it repeats — check the power-stage supply, see Diagnostics .
Holding the knob does not open the menu, “Stop before opening the menu”	The spindle is turning, the pedal is pressed or drying is running.	Stop the spindle (release the pedal, stop the timer with the knob) and try again. Or disarm the drive.
Pressing the knob does not switch RPM ⇌ TORQUE, “Stop before changing mode”	Changing mode while running is not allowed.	Release the pedal, wait for the stop, press again.
SIDE short does not reverse	TORQUE mode has no direction; in INTERP SIDE changes the direction of the following strokes.	This is normal. On-the-fly reverse works in RPM and DRY.

16 Troubleshooting — continued

Traverse, interpolation, counter, sound, faults and settings.

SYMPTOM	CAUSE	WHAT TO DO
Spindle slower than the setpoint under load, current at the limit	The torque limit RPM torque limit .	Remove the load (tight thread, stiff blank) or raise the limit in settings. The limit is a protection; do not raise it without need.
In TORQUE the spindle brakes by itself when spun fast by hand	The Torque speed limit .	This is normal. Raise the limit if you need higher speeds when turning by hand.
The carriage does not move, the run screen shows TRAVERSE OFF	The traverse is not locked.	Press FRW + REV together (or the knob on the traverse screen). A double beep sounds and the card shows LOCK .
The carriage stopped, "Traverse end reached"	The computed position went beyond Carriage travel .	Change direction with FRW / REV and lock again. If the real travel is more than 70 mm — increase Carriage travel .
The carriage moves the wrong way	The opposite traverse direction is selected.	Press FRW or REV — re-synchronisation without a jerk; the letter in the TRAVERSE .
The wrap pitch does not match the expected one	Wrong rot/mm synchronisation or screw lead.	Set the required rot/mm on the traverse screen (pitch = 1 / rot/mm). Check Lead screw lead and the "10 turns = 4 mm" test from chapter 14.
In INTERP the spindle "drifts" after turning by hand	The detent is off (Snap pitch off) or the holding current is low.	Set the detent pitch and raise Hold torque on the interpolation screen.
The TURN s counter shows off	DRY mode is selected — turns are not counted during drying.	Normal. The counter value is kept and comes back after leaving DRY.
No sound on key presses	Buzzer is off in settings.	Switch it on. The fault alarm sounds regardless of this setting.
Fault reset is refused, CLEAR REFUSED	The cause is still present or comes back when the driver is powered.	Remove the cause using the table in chapter 15, wait for the green banner, then press the knob.
After power-up all settings are back to defaults	The current firmware version does not store settings.	Restore your values from the cheat sheet (chapter 18). Storage will come in the next version.

17 Sound and vibration signals

The machine answers every action with a short sound and, where it matters, with a vibration of the knob — so you need not look away from the blank. Seven signals are easy to tell apart by ear.

Click

CLICK



Any accepted press or turn of the knob. A very short high tone.

Confirm

CONFIRM



Two tones up: mode change, direction, traverse locked, counter reset, setting saved.

Drive armed

ARM · with vibration



Rising three-tone chime, the knob vibrates twice. Now shows **ARMED**.

Drive disarmed

DISARM



Two tones down: SIDE 1 s or BACK 2 s, and also an external stop.

Warning

WARN · with vibration



Two low tones: action unavailable. The reason is in the hint line at the bottom of the screen.

Drying timer

TIMER · with vibration



Three long high beeps (0.5 s each): drying time is up, the spindle has stopped.

Fault

FAULT · with vibration



bar height — pitch, width — duration

Three long low beeps, the knob vibrates. The red **FAULT** screen is open, output cut.

A higher-priority signal overrides a lower one. If a fault happens during a click or a confirm, the fault alarm sounds; the other way round, a warning does not interrupt the arming chime. An important signal cannot be “silenced” by an accidental press.

Muting. The settings **Buzzer** and **Vibration** switch off the interface signals. The fault alarm always sounds.

18 Operator cheat sheet

One page for the wall next to the machine. Gestures, modes and the things most often forgotten.

KEYS

SIDE 1 s	arm / disarm the drive
SIDE	reverse on the fly (RPM, DRY) · direction (INTERP)
BACK 2 s	STOP and disarm — from any screen
BACK	release / apply the brake · back
BACK 2 s (disarmed)	reset the turns counter
FRW / REV	traverse direction
FRW + REV	lock / release the traverse
Knob ↻	setpoint · scroll · value
Knob press	RPM ⇄ TORQUE · start/stop drying · open · confirm
Knob 0.7 s	menu (spindle stopped)

MODES

RPM	pedal = speed, knob = speed at full pedal. Current limit RPM torque limit.
TORQUE	hand turns the spindle, pedal = brake, knob = current at full pedal. Speed limit Torque speed limit.
INTERP	pedal stroke = Stroke turns, return stroke — the same again forward. Detent Snap pitch, hold Hold torque.
DRY	press the knob — timer, 3 long beeps at the end. Pedal and counter inactive.

START OF SHIFT

- 1 Switch on, wait for "Ready", release the pedal to zero (no PEDAL NOT HOMED).
- 2 Check the settings — they are at defaults after power-up.
- 3 Thread guide to the start of the wrap → FRW + REV → direction FRW/REV.
- 4 SIDE 1 s → ARMED → pedal.

IF SOMETHING IS WRONG

two low beeps	action unavailable — read the hint at the bottom of the screen
PEDAL LOCKED	you are not on the run screen — BACK
menu does not open	stop the spindle, release the pedal
carriage not moving	TRAVERSE OFF → FRW + REV; "end reached" → change direction and lock
red screen	remove the cause → green PRESS banner → press the knob → SIDE 1 s

MY WORKING VALUES

Traverse, rot/mm	
RPM speed	
TORQUE brake, A	
Stroke / Snap / Hold	
Drying, rpm · min	
Pedal full travel	
Lead · Travel	

Fill in with a pencil: settings do not yet survive a power cycle.

19 Appendix: simulator on a PC

The machine interface can be run on a computer without any hardware — for operator training and for checking scenarios. The simulator window reproduces the display, the keyboard replaces the controls; a model of the drive and the pedal is built in.

Controls

KEY	ACTION
+ / -	turn the knob one click (also k / j)
Space, Enter	press the knob
` (tilde)	hold the knob — menu
f / r	FRW / REV short
g	FRW + REV together
s / S	SIDE short / SIDE 1 s
b / B	BACK short / BACK 2 s
q	close the simulator

Machine model

KEY	ACTION
p / o	pedal 10 % deeper / higher
h	pedal passed its home mark (homed)
a / z	turn the spindle by hand 15°; in TORQUE — spin up / slow down by 150 rpm
x / c	raise / clear a motor - driver fault
u	emergency - stop signal

Training route: wait for the self - test to end → **h** → **s** (drive armed) → several times **p** (spindle turning) → **s** (reverse) → **o** down to zero → **`** (menu) → **+** / **-**, space → **b** back → **x**, **c**, space (fault and its reset).

About this document

Version

Edition 1.3, October 2026.
Matches FRW4 firmware 4.0 with the operator interface (RPM / TORQUE / INTERP / DRY modes, mode limits, interpolation detent).

Screenshots

All display images were taken from the simulator running the same firmware as the machine and match the real 272 × 480 screen.

Printing

A4, colour, printed without scaling ("actual size"). Page 25 is handy to laminate and hang by the machine.



FRW4 · Fishing Rod Wrapper

Operator manual, edition 1.3, October 2026. Matches firmware 4.0 with RPM / TORQUE / INTERP / DRY modes, mode limits and interpolation detent. Screenshots were taken from the simulator running the same firmware.

Keep your hands away from the rotating blank. To stop: hold BACK on the pedal for 2 s.