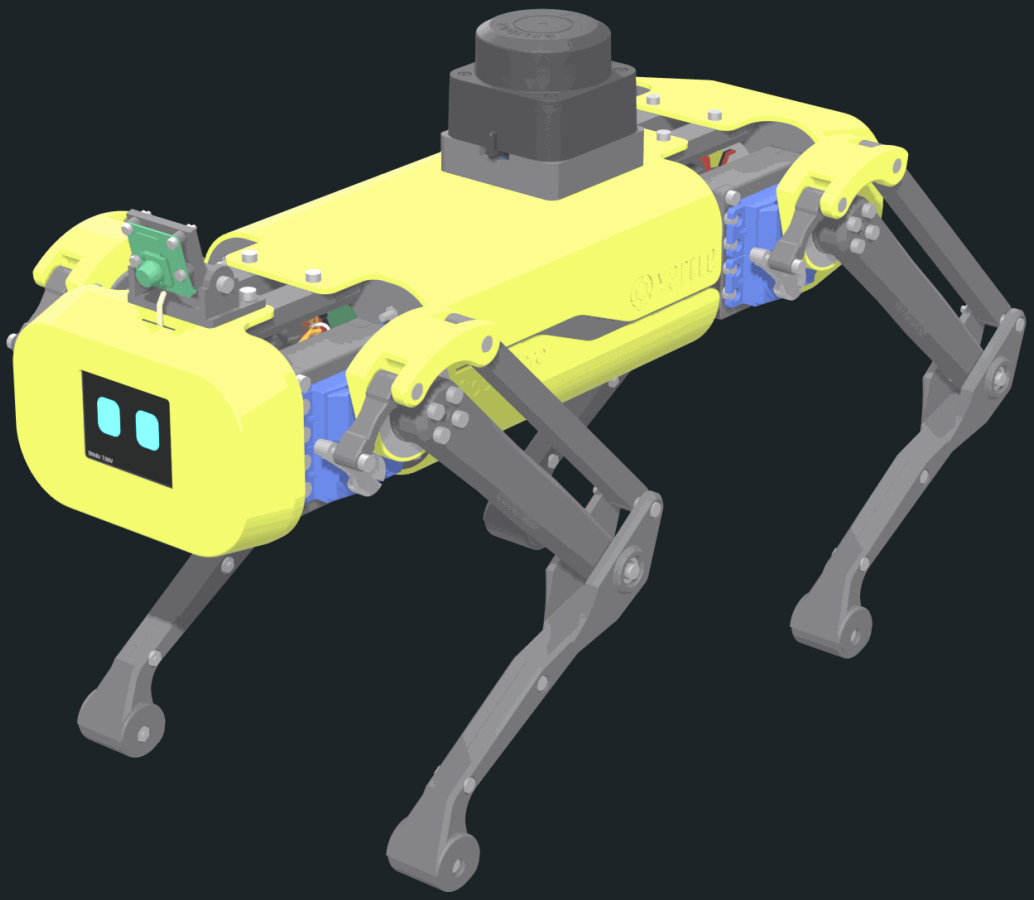
Strido

Catalogue & assembly book — print, buy, build, wire, program



Open 12-DoF quadruped · derived from Yertle by Jerome Graves (MIT) · Strido 0.2.0, generated from the verified CAD assembly.
Every part, bolt and pin on these pages is placed in the CAD model and checked for collisions, fits and clearance.

What you are building

430 × 188 × 264 mm
standing, LiDAR on top

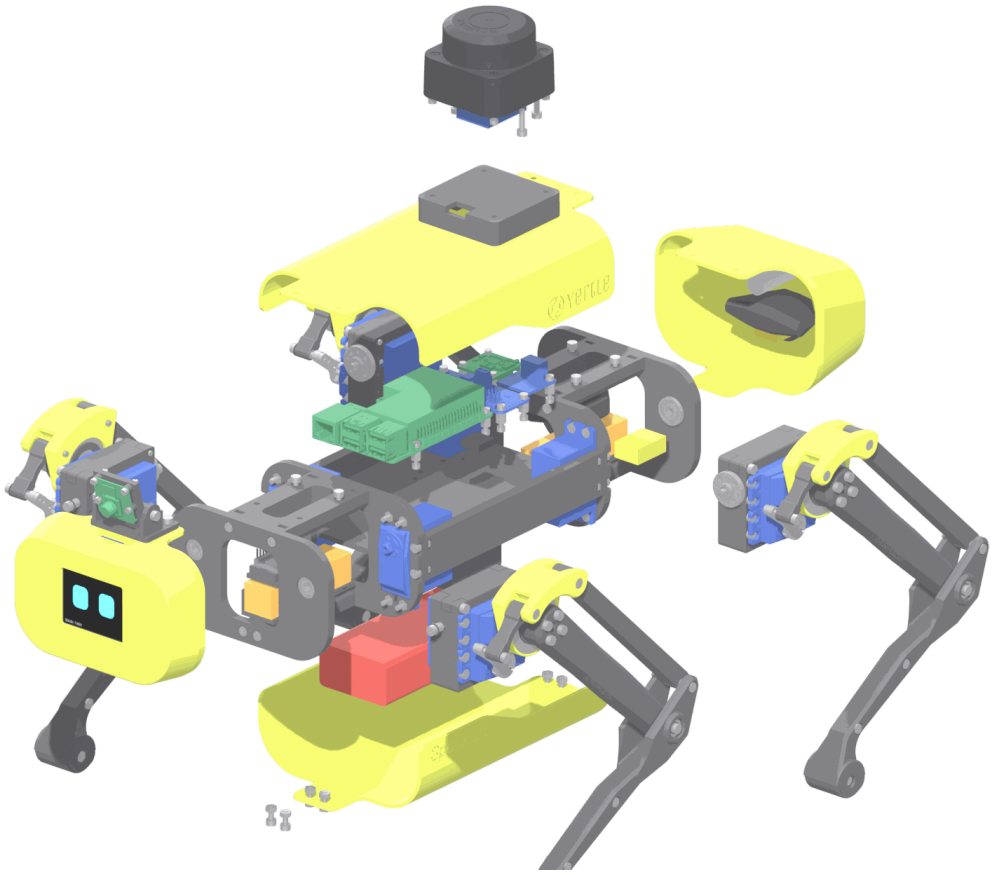
≈ 3.0 kg
CAD mass incl. 2S 5000 mAh battery

12 × SPT5435LV
35 kg·cm at 6 V, linkage-driven knees

67 printed pieces
34 part types, PETG/PLA+

85 purchased parts
boards, servos, bearings, sensors

331 fasteners
M2 / M2.5 / M3, drawn 1:1 in section C



Contents

A · Printed parts 4
B · Purchased parts 6
C · Hardware bags (1:1) 9
D · Shopping plan 10
E · Tools and consumables 13
F · Assembly 14
G · Wiring and pin map 37
H · Software: flash, calibrate, walk, train 41
I · What was verified 42

> **Safety.** LiPo batteries can burn: charge in a LiPo bag with a balance charger, never unattended. The XT60 loop key is the servo kill switch; the push button is not an emergency stop. Keep fingers out of the legs whenever the loop key is in.

A · Printed parts

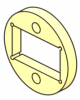
Print every part once per listed quantity. Files: `hardware/print/stl/` (oriented for printing) and ready-to-slice plates in `hardware/print/plates/` (13 plates: plate_graphite_01.3mf, plate_graphite_02.3mf, plate_graphite_03.3mf, plate_graphite_04.3mf, plate_graphite_05.3mf, plate_graphite_06.3mf, plate_graphite_07.3mf, plate_graphite_08.3mf, plate_graphite_09.3mf, plate_graphite_10.3mf, plate_lime_01.3mf, plate_lime_02.3mf, plate_lime_03.3mf). Settings: PETG or PLA+, 0.4 mm nozzle, 0.2 mm layers, 3 walls, 5 top/bottom layers, 30 % gyroid. Lime = shells and shoulders, graphite = everything else.



1× Arming port bezel

26 × 26 × 4 mm · primary (graphite)

`arming_port_bezel.stl`



1× Arming port ring

22 × 22 × 3 mm · primary (graphite)

`arming_port_ring.stl`



1× Back shell button

74 × 114 × 69 mm · secondary (lime)

`back_shell_button.stl`

upstream Back_Shell with the D11.5 hole opened to D12.2

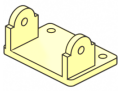


1× Bottom shell

114 × 208 × 42 mm · secondary (lime) · supports

`bottom_shell.stl`

published orientation; resting it on its -Y face lowers overhang to 1 %

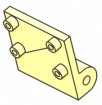


1× Camera mount base

40 × 28 × 20 mm · primary (graphite)

`camera_mount_base.stl`

print standing on its base; the M3 pivot bore prints horizontal (a 3.4 mm drill clears it if tight)



1× Camera tilt plate

27 × 30 × 19 mm · primary (graphite) · supports

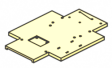
`camera_tilt_plate.stl`



1× Display bracket

40 × 83 × 3 mm · primary (graphite)

`display_bracket.stl`



1× Electronics deck

106 × 150 × 5 mm · primary (graphite) · supports

`electronics_deck.stl`

upstream plate + IMU pocket and stand-off holes for the regulator and INA260; print top face down with supports (the IMU pocket floor is an 18 mm bridge the slicer flags without them)



4× Femur

26 × 151 × 15 mm · primary (graphite) · supports

`femur.stl`

re-oriented from the published STL: more bed contact, less overhang

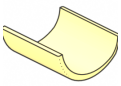


4× Femur servo connector

28 × 28 × 6 mm · primary (graphite) · supports

`femur_servo_connector.stl`

re-oriented from the published STL: more bed contact, less overhang



4× Foot spacer

22 × 24 × 12 mm · primary (graphite) · supports

`foot_spacer.stl`

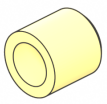


1× Front shell display

74 × 114 × 50 mm · secondary (lime)

`front_shell_display.stl`

upstream Front_Shell + 43x33 display window, 2 display bosses, camera ribbon slot



4× Hip bearing pin

5 × 5 × 5 mm · primary (graphite)

`hip_bearing_pin.stl`

re-oriented from the published STL: more bed contact, less overhang



2× Inner shoulder frame

110 × 70 × 5 mm · primary (graphite)

`inner_shoulder_frame.stl`

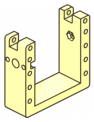


4× Inner tibia

135 × 104 × 14 mm · primary (graphite) · supports

`inner_tibia.stl`

re-oriented from the published STL: more bed contact, less overhang; 1 hole step cut for bridging (hole overhang trick); block supports in the bearing bore so the step bridges

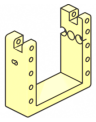


1× Left servo mount

56 × 52 × 19 mm · primary (graphite) · supports

`left_servo_mount.stl`

re-oriented from the published STL: more bed contact, less overhang



1× Left servo mount fl

56 × 52 × 19 mm · primary (graphite) · supports

`left_servo_mount_fl.stl`

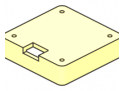
upstream left_servo_mount + Ø2.5 mm hip pivot pilot for the FL leg; re-oriented from the published STL: more bed contact, less overhang



2× Left shoulder

50 × 55 × 26 mm · secondary (lime) · supports

`left_shoulder.stl`

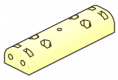


1× Lidar pedestal

56 × 56 × 14 mm · primary (graphite)

`lidar_pedestal.stl`

print upside down (top plate on the bed)

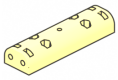


1× Lower shoulder frame front

20 × 70 × 12 mm · primary (graphite)

`lower_shoulder_frame_front.stl`

upstream Lower_Shoulder_Frame + one M3 pilot hole for the servo-bus holder



1× Lower shoulder frame rear

20 × 70 × 12 mm · primary (graphite)

`lower_shoulder_frame_rear.stl`

upstream Lower_Shoulder_Frame + one M3 pilot hole for the servo-bus holder



2× Outer shoulder frame

110 × 70 × 5 mm · primary (graphite)

`outer_shoulder_frame.stl`

2 hole steps cut for bridging (hole overhang trick)

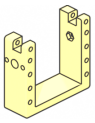


4× Outer tibia

135 × 104 × 14 mm · primary (graphite) · supports

`outer_tibia.stl`

re-oriented from the published STL: more bed contact, less overhang; 1 hole step cut for bridging (hole overhang trick); block supports in the bearing bore so the step bridges

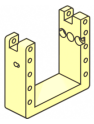


1× Right servo mount

56 × 52 × 19 mm · primary (graphite) · supports

`right_servo_mount.stl`

re-oriented from the published STL: more bed contact, less overhang



1× Right servo mount fr

56 × 52 × 19 mm · primary (graphite) · supports

`right_servo_mount_fr.stl`

upstream right_servo_mount + Ø2.5 mm hip pivot pilot for the FR leg; re-oriented from the published STL: more bed contact, less overhang

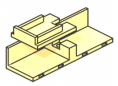


2× Right shoulder

50 × 55 × 26 mm · secondary (lime) · supports

`right_shoulder.stl`

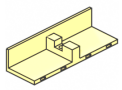
re-oriented from the published STL: more bed contact, less overhang



1× Servo bus holder front

22 × 67 × 28 mm · primary (graphite) · supports

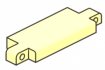
`servo_bus_holder_front.stl`



1× Servo bus holder rear

22 × 67 × 14 mm · primary (graphite) · supports

`servo_bus_holder_rear.stl`

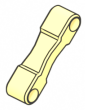


4× Servo mount top bracket

56 × 19 × 6 mm · primary (graphite)

`servo_mount_top_bracket.stl`

re-oriented from the published STL: more bed contact, less overhang

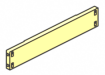


4× Short link

35 × 10 × 7 mm · primary (graphite) · supports

`short_link.stl`

re-oriented from the published STL: more bed contact, less overhang



2× Side body beam

25 × 150 × 6 mm · primary (graphite)

`side_body_beam.stl`

re-oriented from the published STL: more bed contact, less overhang



4× Stiff long link

10 × 141 × 10 mm · primary (graphite)

`stiff_long_link.stl`

upstream long_link, 10 x 10 mm instead of 5 x 8 mm, same pins and eyes: buckling, ADR-010

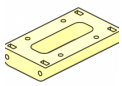


1× Top shell sensor

114 × 208 × 42 mm · secondary (lime) · supports

`top_shell_sensor.stl`

upstream Top_Shell + LiDAR pedestal holes and LiDAR USB cable slot



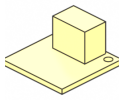
2× Upper shoulder frame

40 × 70 × 12 mm · primary (graphite)

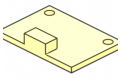
`upper_shoulder_frame.stl`

B · Purchased parts

Modelled in the CAD (sizes are the model envelopes). Price = cheapest observed offer, EUR incl. VAT; the shopping plan (section D) bundles them by shop.



1× INA260 power monitor
23 × 23 × 12 mm
DigiKey.at · Adafruit 4226 · €10.60



1× LSM6DSOX IMU
25 × 18 × 5 mm
DigiKey.at · Adafruit 4438 · €12.73



1× PCA9685 servo driver
62 × 25 × 12 mm
Amazon.de · B06XSFFXQY · €6.95



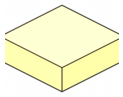
4× Ball bearing 625ZZ
16 × 16 × 5 mm
kugellager-express.de · 625-ZZ · €0.88



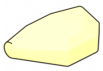
8× Ball bearing 633ZZ
13 × 13 × 5 mm
Amazon.de · B0GGT3GW69 (8-pack) · €10.27 / 8



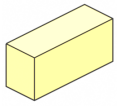
4× Ball bearing 6805-2RS
37 × 37 × 7 mm
kugellager-express.de · 6805/61805-2RS · €1.70



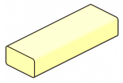
2× Adhesive cable-tie mount 13 × 13 mm
13 × 13 × 4 mm
Reichelt.at · HT 151-02243 (per piece) · €1.06



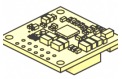
2× ATO fuse holder
52 × 32 × 16 mm
Amazon.de · B07426WCLM (Nilight, 10 holders) · €8.56 / 10



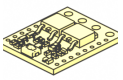
2× Hobbywing UBEC-10A
45 × 20 × 16 mm
Lindinger.at · HW30603003 · €26.99



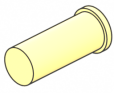
1× LiPo 2S 5000 mAh
138 × 47 × 25 mm
Amazon.de · B0GKP683YF · €22.18



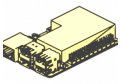
1× Pololu D36V50F5 5 V regulator
25 × 25 × 10 mm
Eckstein (DE) · D36V50F5 · €41.59



1× Pololu #2813 pushbutton switch
25 × 20 × 4 mm
DigiKey.at · Pololu 2813 (Marketplace) · €10.80



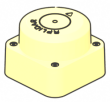
1× 12 mm push button
32 × 14 × 14 mm
Reichelt.at · 318555 · €5.66



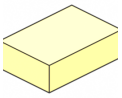
1× Raspberry Pi 5 + Active Cooler
88 × 57 × 19 mm
DigiKey.at · SC1431 (2648-SC1431-ND) · €117.18



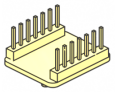
1× Camera Module 3 Wide
25 × 24 × 11 mm
Welectron (DE) · Camera Module 3 Wide · €35.90



1× RPLIDAR C1
56 × 56 × 41 mm
Amazon.de · B0CP8YRY44 (WayPonDEV) · €70.58



1× RPLIDAR USB adapter
32 × 22 × 10 mm
Amazon.de · B0CP8YRY44 (WayPonDEV) · €70.58



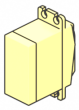
1× Seeed XIAO ESP32-S3
22 × 18 × 13 mm
DigiKey.at · 102010634 · €9.05



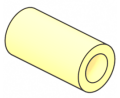
4× 25T aluminium arm horn
27 × 27 × 6 mm
Amazon.de · B0F5QG8HQS (5-pack) · €9.06 / 5



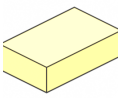
8× 25T aluminium disc horn
20 × 20 × 5 mm
Amazon.de · B07F71J1Q2 (DollaTek, 5-pack) · €5.03 / 5



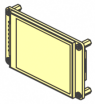
12× Servo SPT5435LV-180W
56 × 44 × 20 mm
AliExpress (DigitalServo Store) · 4000135787995, variant 35kg-180 Waterproof · €13.46



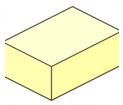
16× Sleeve bearings 3×5×5 (pair)
10 × 5 × 5 mm
Amazon.de · B0G15L264D (50-pack) · €10.27 / 50



8× WAGO 221-415
30 × 19 × 8 mm
Reichelt.at · 149800 · €0.81



1× Waveshare 2" LCD (ST7789)
58 × 35 × 10 mm
Welectron (DE) · 17344 · €10.90



2× XT60H female
24 × 16 × 9 mm
Lindinger.at · Robbe XT60 3 pairs (9750234) · €4.99

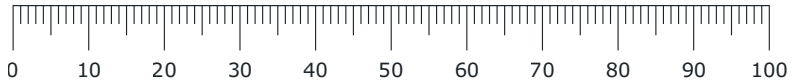
Not modelled in the CAD

Item	Qty	Category	Note
Raspberry Pi Active Cooler	1	Compute and sensors	
microSD 64 GB A2 (SanDisk Extreme)	1	Compute and sensors	
Pi 5 camera cable 22→15 pin, 300 mm	1	Compute and sensors	
STEMMA QT to female sockets cable, 150 mm (Adafruit 4397; IMU to PCA9685 and IMU to INA260)	2	Compute and sensors	
Resistor 2.2 kΩ 0.25 W (PCA9685 OE pull-up)	1	Compute and sensors	
LiPo balance charger, AC input (B6AC class)	1	Power	
LiPo safety bag	1	Power	
LiPo cell checker / low-voltage alarm	1	Power	
ATO blade fuse 25 A (main, 1 + 2 spare)	3	Power	
ATO blade fuse 7.5 A (logic branch, 1 + 1 spare)	2	Power	
Silicone wire 14 AWG / 2.5 mm², red + black, 1 m each	1	Wiring	
Silicone wire 18 AWG / 0.75 mm², red + black (1 m each per unit)	2	Wiring	
Silicone wire 22 AWG (Pi 5 V feed with Dupont crimps, button, jumpers)	1	Wiring	
USB-A to USB-C cable, 20 cm, 90° (Pi → XIAO, Pi → LiDAR adapter)	2	Wiring	
Dupont jumper set 20 cm (F-F, M-M, F-M)	1	Wiring	
Heat-shrink assortment	1	Wiring	
Cable ties 100 x 2.5 mm (100)	1	Wiring	
Spiral wrap, black PE, for bundles 4-10 mm (5-10 m)	1	Wiring	
Dupont 2.54 mm crimp contacts and housings (1-6 pin), for the cut-to-length signal leads	1	Wiring	
Solder wire, lead-free, 0.8 mm, flux core (50-100 g)	1	Wiring	
Hook-and-loop straps (battery strap)	1	Wiring	
Double-sided foam mounting tape, 19 mm	1	Wiring	

Thread locker, medium strength (blue)	1	Fasteners	
Filament PETG, graphite/black, 1 kg	1	Filament	PETG to match the verified slicer profile and the strength check (PLA softens near the warm servos)
Filament PETG, lime/yellow (shells), 1 kg	1	Filament	PETG to match the verified slicer profile and the strength check
Raspberry Pi 27 W USB-C power supply, EU plug (bench power without battery)	1	Bench (recommended)	

C · Hardware bags (1:1)

Drawn in true millimetres — print this page at **100 %** (no "fit to page") and lay a screw on its drawing to identify it. Check: the bar below is exactly 100 mm long. "Buy" includes 10 % (at least 2) spares.





17×
M3 lock nut (nylon insert) (DIN 985)
buy 19



4×
M2 hex nut (ISO 4032)
buy 6



2×
M2.5 hex nut (ISO 4032)
buy 4



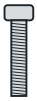
56×
M3 hex nut (ISO 4032)
buy 62



20×
M2.5 × 5 socket head screw (ISO 4762)
buy 22



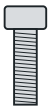
8×
M2.5 × 6 socket head screw (ISO 4762)
buy 10



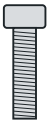
4×
M2 × 10 socket head screw (ISO 4762)
buy 6



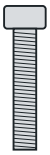
10×
M2 × 5 socket head screw (ISO 4762)
buy 12



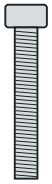
86×
M3 × 10 socket head screw (ISO 4762)
buy 95



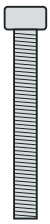
16×
M3 × 12 socket head screw (ISO 4762)
buy 18



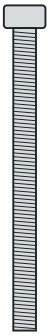
4×
M3 × 16 socket head screw (ISO 4762)
buy 6



28×
M3 × 20 socket head screw (ISO 4762)
buy 31



12×
M3 × 25 socket head screw (ISO 4762)
buy 14



1×
M3 × 40 socket head screw (ISO 4762)
buy 3



34×
M3 × 8 socket head screw (ISO 4762)
buy 38



16×
M3 washer (ISO 7089)
buy 18



10×
M2.5 × 6 stand-off F-F (brass)
buy 12



3×
M2 × 8 stand-off F-F (brass)
buy 5

D · Shopping plan (lowest total)

Cheapest combination of shops including shipping (optimiser over every subset of shops, prices observed 2026-10-30 — re-check before ordering). Total **€978.76** delivered to Austria. Other strategies (fewest shops, EU only, genuine boards): `docs/bom/shopping_list.md`.

Amazon.de — €295.72 + €2.40 shipping

+2.40 Austrian parcel tax per order

Item	SKU	Need	Buy	Cost
microSD 64 GB A2 (SanDisk Extreme)	`B09X7CXWQQ`	1	1	€26.21
PCA9685 16-channel PWM board (Adafruit 815 layout)	`B06XSFFXQY`	1	1	€6.95
Slamtec RPLIDAR C1 (with USB adapter)	`B0CP8YRY44 (WayPonDEV)`	1	1	€70.58
25T aluminium disc horn	`B07F71J1Q2 (DollaTek, 5-pack)`	8	10	€10.06
25T aluminium clamping arm horn	`B0F5QG8HQS (5-pack)`	4	5	€9.06
Ball bearing 6805-2RS (25x37x7)	`B0CL4Z679J (2-pack)`	4	4	€13.48
Ball bearing 633ZZ (3x13x5)	`B0GGT3GW69 (8-pack)`	8	8	€10.27
Sintered bronze sleeve bearing 3x5x5	`B0G15L264D (50-pack)`	32	50	€10.27
LiPo 2S 5000 mAh hardcase, XT60, max 138 x 47 x 25 mm (Gens ace G-Tech)	`B0GKP683YF`	1	1	€22.18
LiPo balance charger, AC input (B6AC class)	`B0F3CYZ6L8 (HTRC B6AC)`	1	1	€46.38
Inline ATO fuse holder, 14 AWG leads (main + logic branch)	`B07426WCLM (Nilight, 10 holders)`	2	10	€8.56
Silicone wire 22 AWG (Pi 5 V feed with Dupont crimps, button, jumpers)	`B0C7T9KYND (6 colours x 4 m)`	1	1	€12.10
USB-A to USB-C cable, 20 cm, 90° (Pi → XIAO, Pi → LiDAR adapter)	`B09ZDV7S44 (aceyoon 20 cm 90°, 3-pack)`	2	3	€7.64
Dupont jumper set 20 cm (F-F, M-M, F-M)	`B0F98KBV61 (160 x F-F)`	1	1	€8.05
Dupont 2.54 mm crimp contacts and housings (1-6 pin), for the cut-to-length signal leads	`B0FP14VDGS (620 pieces)`	1	1	€9.06
M3 socket head screw kit, stainless (6-50 mm, nuts, washers; WZHUIDA 1080 pcs)	`B0D2VST57H`	1	1	€17.14
Stand-off M2 x 8 mm female-female, brass	`B0DR67YGQL`	5	40	€7.73

DigiKey.at — €226.53 + €0.00 shipping

Item	SKU	Need	Buy	Cost
Raspberry Pi 5, 4 GB	`SC1431 (2648-SC1431-ND)`	1	1	€117.18
Raspberry Pi Active Cooler	`SC1148`	1	1	€5.33
Raspberry Pi Camera Module 3 Wide	`SC1224`	1	1	€37.28
Pi 5 camera cable 22→15 pin, 300 mm	`SC1129`	1	1	€2.14
Seeed XIAO ESP32-S3, pre-soldered headers	`102010634`	1	1	€9.05
Adafruit LSM6DSOX 6-DoF IMU (4438)	`Adafruit 4438`	1	1	€12.73
Adafruit INA260 power monitor (4226)	`Adafruit 4226`	1	1	€10.60
STEMMA QT to female sockets cable, 150 mm (Adafruit 4397; IMU to PCA9685 and IMU to INA260)	`Adafruit 4397`	2	2	€2.02

Pololu #2813 Big Pushbutton Power Switch HP	`Pololu 2813 (Marketplace)`	1	1	€10.80
Stand-off M2.5 x 6 mm female-female (Würth 970060151)	`970060151`	12	12	€6.62
Raspberry Pi 27 W USB-C power supply, EU plug (bench power without battery)	`SC1407 (not SC1153 = US plug)`	1	1	€12.78

AliExpress (DigitalServo Store) — €174.98 + €5.90 shipping

servo order > 150 EUR leaves IOSS: split into two orders or expect import VAT/clearance

Item	SKU	Need	Buy	Cost
SPT5435LV-180W servo, 35 kg·cm, 180° (12 + 1 spare)	`4000135787995, variant 35kg-180 Waterproof`	13	13	€174.98

Lindinger.at — €82.38 + €5.99 shipping

Item	SKU	Need	Buy	Cost
Hobbywing UBEC-10A (V2-Car), 6.0 V	`HW30603003`	2	2	€53.98
LiPo safety bag	`Robbe 23x30 cm (9787514)`	1	1	€6.49
LiPo cell checker / low-voltage alarm	`Absima (9771616)`	1	1	€5.95
XT60H connectors, 3 pairs (battery lead, arming port, loop key)	`Robbe XT60 3 pairs (9750234)`	1	1	€4.99
Silicone wire 14 AWG / 2.5 mm², red + black, 1 m each	`20479`	1	1	€4.99
Silicone wire 18 AWG / 0.75 mm², red + black (1 m each per unit)	`44422`	2	2	€5.98

Reichelt.at — €56.28 + €6.95 shipping

Item	SKU	Need	Buy	Cost
Resistor 2.2 kΩ 0.25 W (PCA9685 OE pull-up)	`METALL 2,20K`	1	1	€0.10
12 mm momentary pushbutton, stainless (ONPOW GQ12B-10S)	`318555`	1	1	€5.66
ATO blade fuse 25 A (main, 1 + 2 spare)	`7786`	3	3	€1.08
ATO blade fuse 7.5 A (logic branch, 1 + 1 spare)	`FKS 7.5 A (same series as 7786)`	2	2	€0.72
WAGO 221-415 lever connector	`149800`	8	8	€6.48
Heat-shrink assortment	`152924`	1	1	€5.39
Cable ties 100 x 2.5 mm (100)	`Delock 19186`	1	1	€1.16
Spiral wrap, black PE, for bundles 4-10 mm (5-10 m)	`CIMCO 186220 (10 m, bundles 4–20 mm)`	1	1	€4.84
Adhesive cable-tie mount 13 x 13 mm (HellermannTyton MB2APT-A)	`HT 151-02243 (per piece)`	2	2	€2.12
Solder wire, lead-free, 0.8 mm, flux core (50-100 g)	`Goobay 420259 (50 g, SAC)`	1	1	€13.61
Hook-and-loop straps (battery strap)	`280182`	1	1	€5.14
Double-sided foam mounting tape, 19 mm	`tesa PRO Universal 338987`	1	1	€9.98

Eckstein (DE) — €55.86 + €6.90 shipping

shipping to AT not shown before checkout: 6.90 assumed (UNVERIFIED)

Item	SKU	Need	Buy	Cost
Waveshare 2" LCD module, ST7789, 240x320 (17344)	`Waveshare 2inch LCD`	1	1	€14.27
Pololu D36V50F5 5 V 5.5 A step-down regulator	`D36V50F5`	1	1	€41.59

3DJake.at — €27.37 + €5.49 shipping

Item	SKU	Need	Buy	Cost
Ball bearing 625ZZ (5x16x5)	`625ZZ 10-pack`	4	10	€4.99
Filament PETG, graphite/black, 1 kg	`ELG-50.203.0216 (Elegoo Rapid PETG black)`	1	1	€11.19
Filament PETG, lime/yellow (shells), 1 kg	`ELG-50.203.0221 (Elegoo Rapid PETG yellow)`	1	1	€11.19

Schraubenking.at — €20.11 + €5.90 shipping

Item	SKU	Need	Buy	Cost
M3 x 10 DIN 912 A2	`M3x10 DIN912 A2, 100`	100	100	€2.35
M3 x 20 DIN 912 A2	`M3x20 DIN912 A2, 10`	10	10	€0.97
M3 DIN 985 nylon lock nut	`P000461 (zinc-plated)`	25	100	€1.39
M2.5 x 5 DIN 912 A2	`P004986`	22	30	€2.49
M2.5 x 6 DIN 912 A2	`P005010`	10	10	€0.83
M2 x 5 DIN 912 A2	`P003957`	12	20	€1.72
M2 x 10 DIN 912 A2	`P002803`	6	10	€0.78
M2 hex nut DIN 934 A2	`P002807`	6	100	€1.87
M2.5 hex nut DIN 934 A2	`P004196`	4	100	€2.00
Thread locker, medium strength (blue)	`Förch 10 ml (P002471)`	1	1	€5.71

E · Tools and consumables

Tool	Used for
Hex keys 1.5 / 2.0 / 2.5 mm	M2 / M2.5 / M3 socket heads
Nut drivers 4.0 / 5.0 / 5.5 mm	M2 / M2.5 / M3 nuts
Drills 2.2 / 2.7 / 3.2 mm (hand or pin vice)	chase the holes listed in the fits report
Flush cutters, deburring tool	support and brim removal
Soldering iron, solder, heat-shrink	power harness, XT60, OE pull-up
Dupont crimp tool + housings	signal harness
Multimeter	6.0 V UBEC check, 5 V rail, OE voltage
Medium thread locker	screws into metal horns
Thin CA glue (liquid)	hardening weak printed pilots
LiPo charger (balance) + LiPo bag	battery care
USB-C cable	flashing the XIAO ESP32-S3

Before you start

1. Print everything in section A; remove supports and brims. Test-fit the bearings (625ZZ, 633ZZ, 6805-2RS) and sleeves.
2. Chase the holes listed in `docs/verification/fits.md` ("Holes to chase") with the drill shown.
3. Prepare the 12 servo leads and both UBECs (section G, harness steps).
4. **Centre all 12 servos** before fitting any horn: flash the firmware (section H), then `stride-cli --port <port> center`. A centred servo is the assembly reference: hip vertical, femur 45° backwards, knee crank 35°.
5. Screws into printed pilot holes: turn until snug, never to full torque. Screws into metal horns: one drop of medium thread locker.

F · Assembly

22 steps. Leg steps show the front-left leg — build all four; quantities are per leg. Highlighted parts are new in the step. Every part and fastener of the robot appears in exactly one parts box.

1 Prepare the electronics deck



1× Electronics deck (printed)



1× LSM6DSOX IMU



2× M2.5 hex nut (ISO 4032)



10× M2.5 × 5 socket head screw (ISO 4762)



2× M2.5 × 6 socket head screw (ISO 4762)



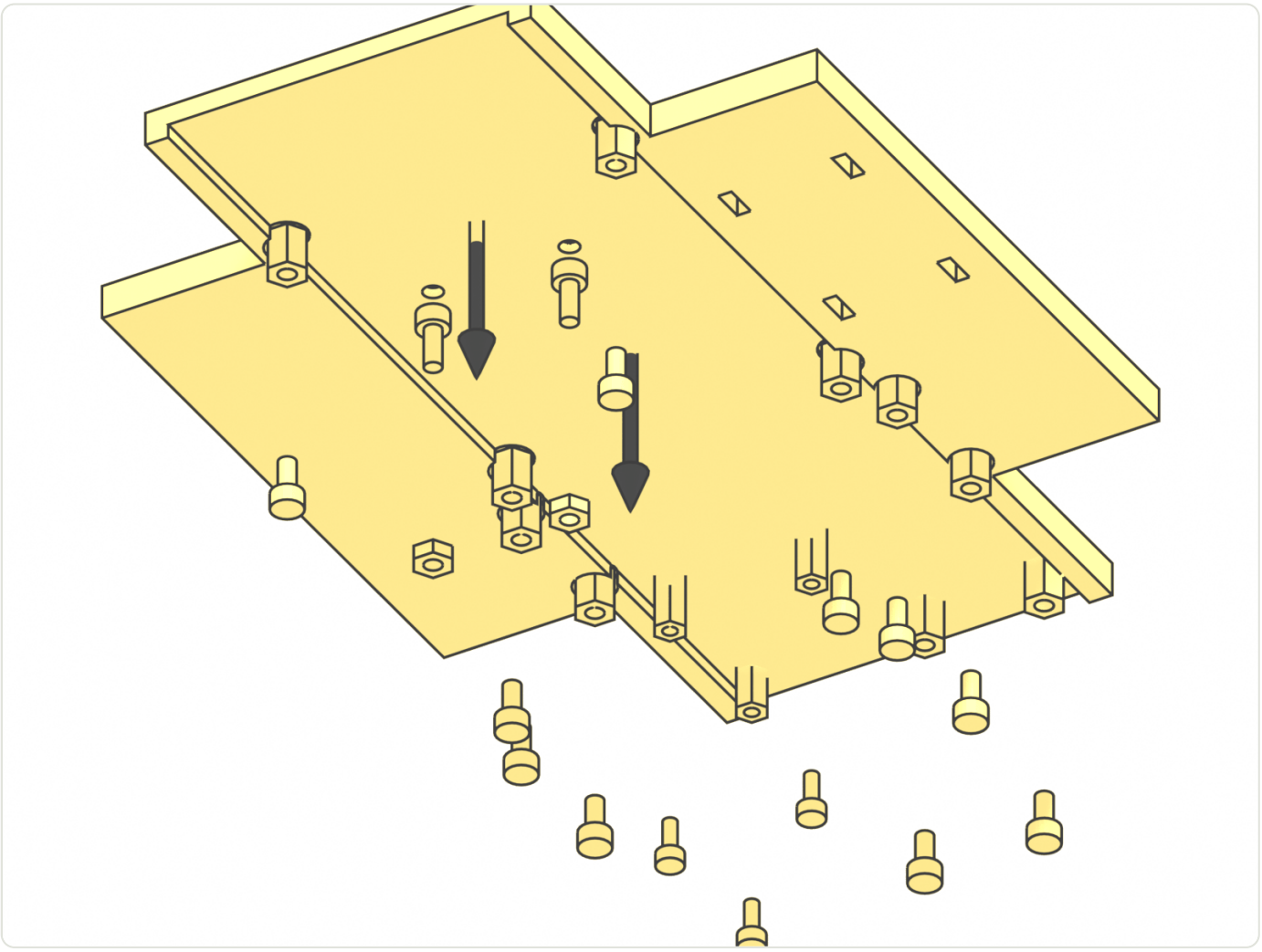
3× M2 × 5 socket head screw (ISO 4762)



10× M2.5 × 6 stand-off F-F (brass)



3× M2 × 8 stand-off F-F (brass)



1. Press the LSM6DSOX IMU into its pocket (chip side up, STEMMA connectors towards the rear) and fix it with two M2.5 × 6 screws from the top and M2.5 nuts underneath.
2. Fix the stand-offs from below with M2.5 × 5 screws: 8 stand-offs M2.5, 6 mm long (Raspberry Pi 5 and PCA9685) and 2 more for the INA260.
3. Fix 3 stand-offs M2, 8 mm long, for the 5 V regulator with M2 × 5 screws from below.
4. The screw heads sit in the counterbores under the deck. Do not over-tighten: the deck is 3 mm thick in the centre.

2 Chassis frame



2× Inner shoulder frame (printed)



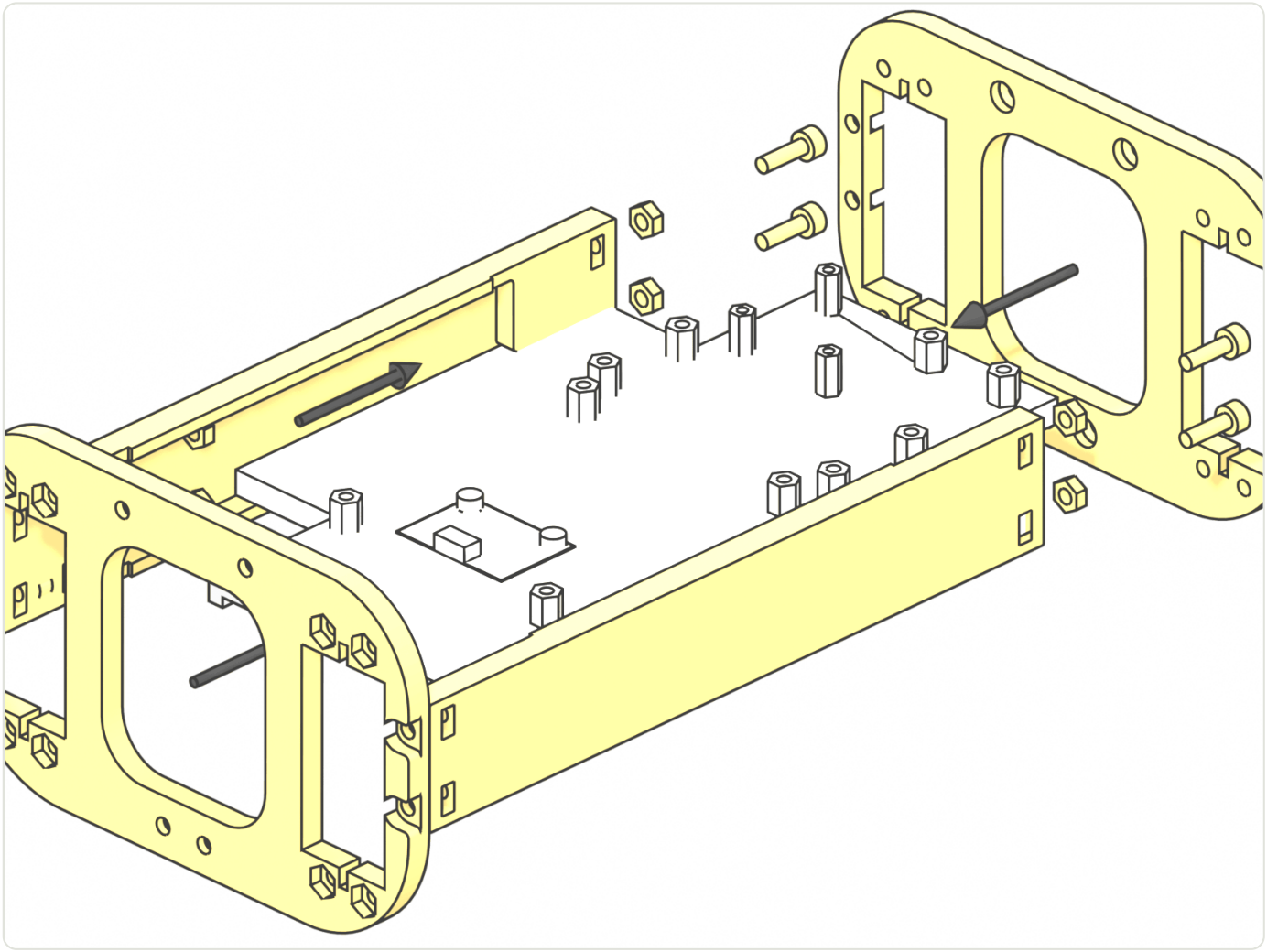
2× Side body beam (printed)



8× M3 hex nut (ISO 4032)



8× M3 × 10 socket head screw (ISO 4762)



1. Slide the prepared deck into the grooves of both side body beams.
2. Close the frame with the two inner shoulder frames: 8 × M3 × 10 screws with hex nuts (nut side inside the bay).
3. Check that the frame sits flat on the table and the deck cannot move.

3 Hip servos



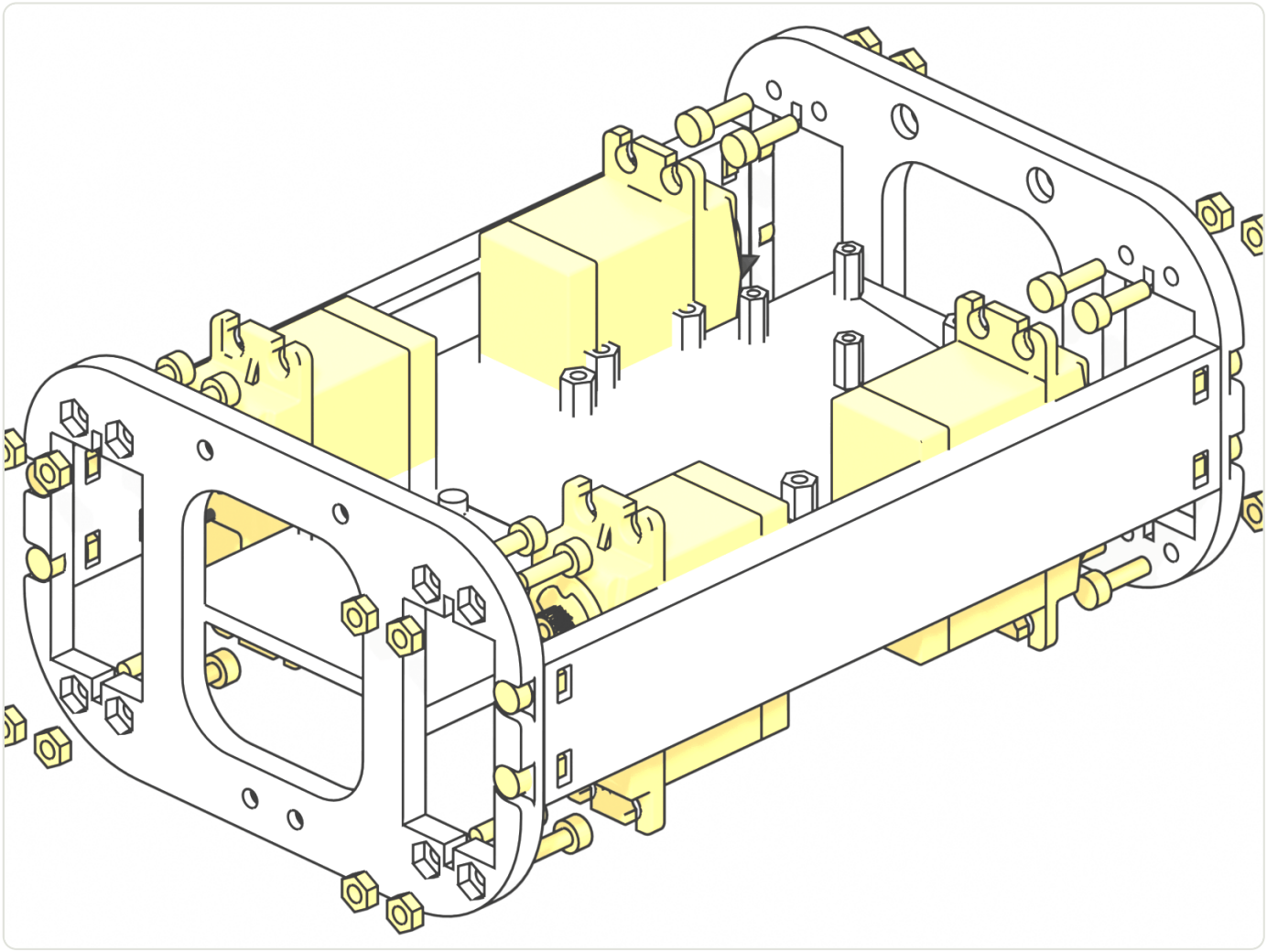
4× Servo SPT5435LV-180W



16× M3 hex nut (ISO 4032)



16× M3 × 10 socket head screw (ISO 4762)



1. Centre all twelve servos before mounting any horn or servo (see Step 0).
2. Insert the four hip servos through the inner shoulder frames from the bay side; output shafts point outwards (front pair to the front, rear pair to the rear).
3. Fix each servo with 4 × M3 × 10 screws and hex nuts through the servo ears (16 in total).
4. Route the servo leads into the bay, they will run to the front and rear cavities later.

4 Hip bearings and shoulder frames


1× Lower shoulder frame front (printed)


1× Lower shoulder frame rear (printed)

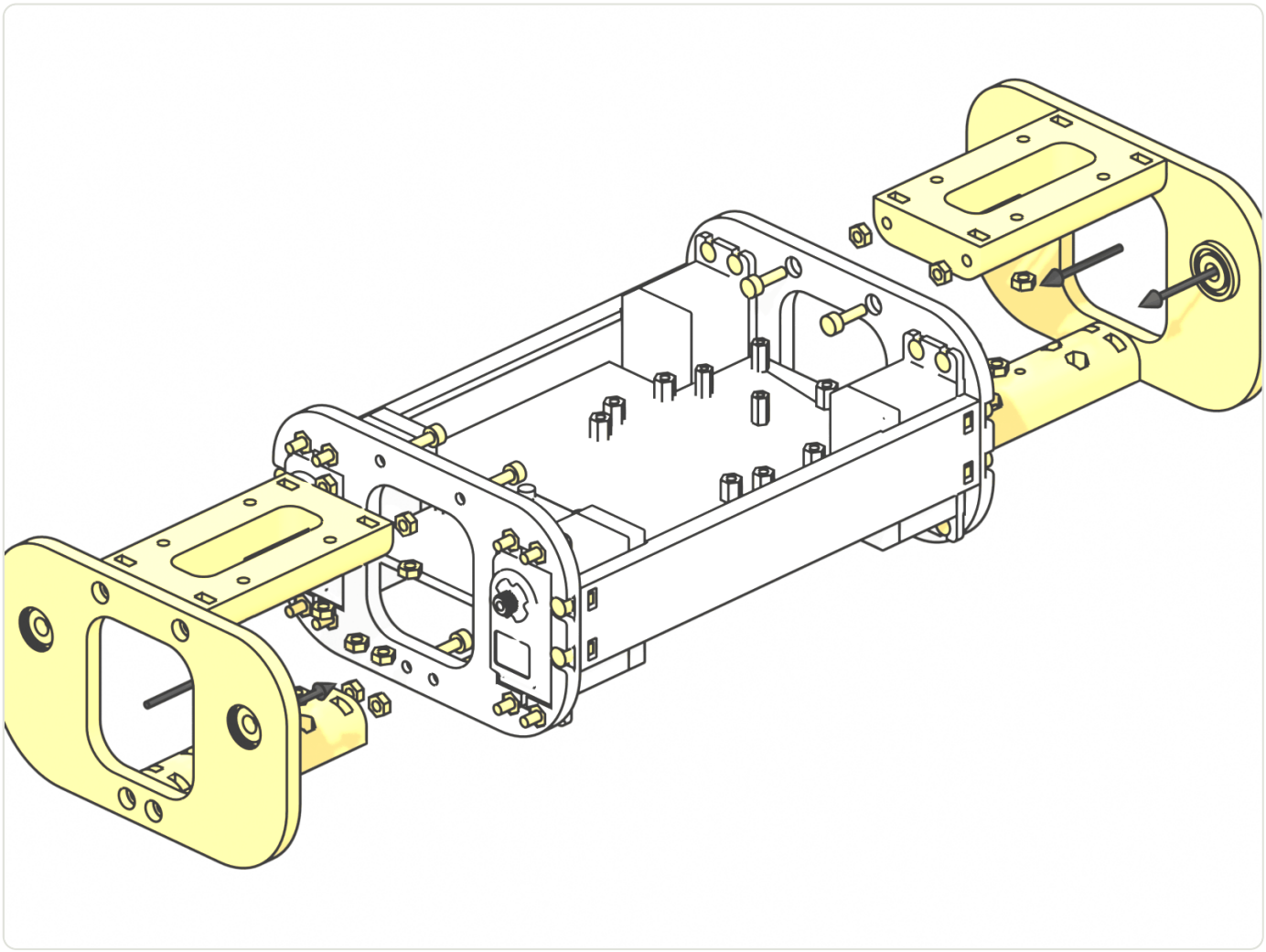

2× Outer shoulder frame (printed)


2× Upper shoulder frame (printed)


4× Ball bearing 625ZZ


32× M3 hex nut (ISO 4032)


16× M3 × 10 socket head screw (ISO 4762)



1. Press two 625ZZ bearings into each outer shoulder frame (4 in total).
2. Assemble outer, upper and lower shoulder frames front and rear with 16 × M3 × 10 screws and hex nuts.
3. Use the Stride lower shoulder frames: `lower_shoulder_frame_front` and `_rear` have the extra pilot hole for the servo-bus holder.
4. Push M3 nuts into the nut pockets now, while they are reachable: 6 on top of the upper shoulder frames and 8 under the lower shoulder frames for the shell screws (Steps 21 and 22), and 2 more on top of the front upper shoulder frame for the camera base (Step 18).

5 Servo power bus and motion controller

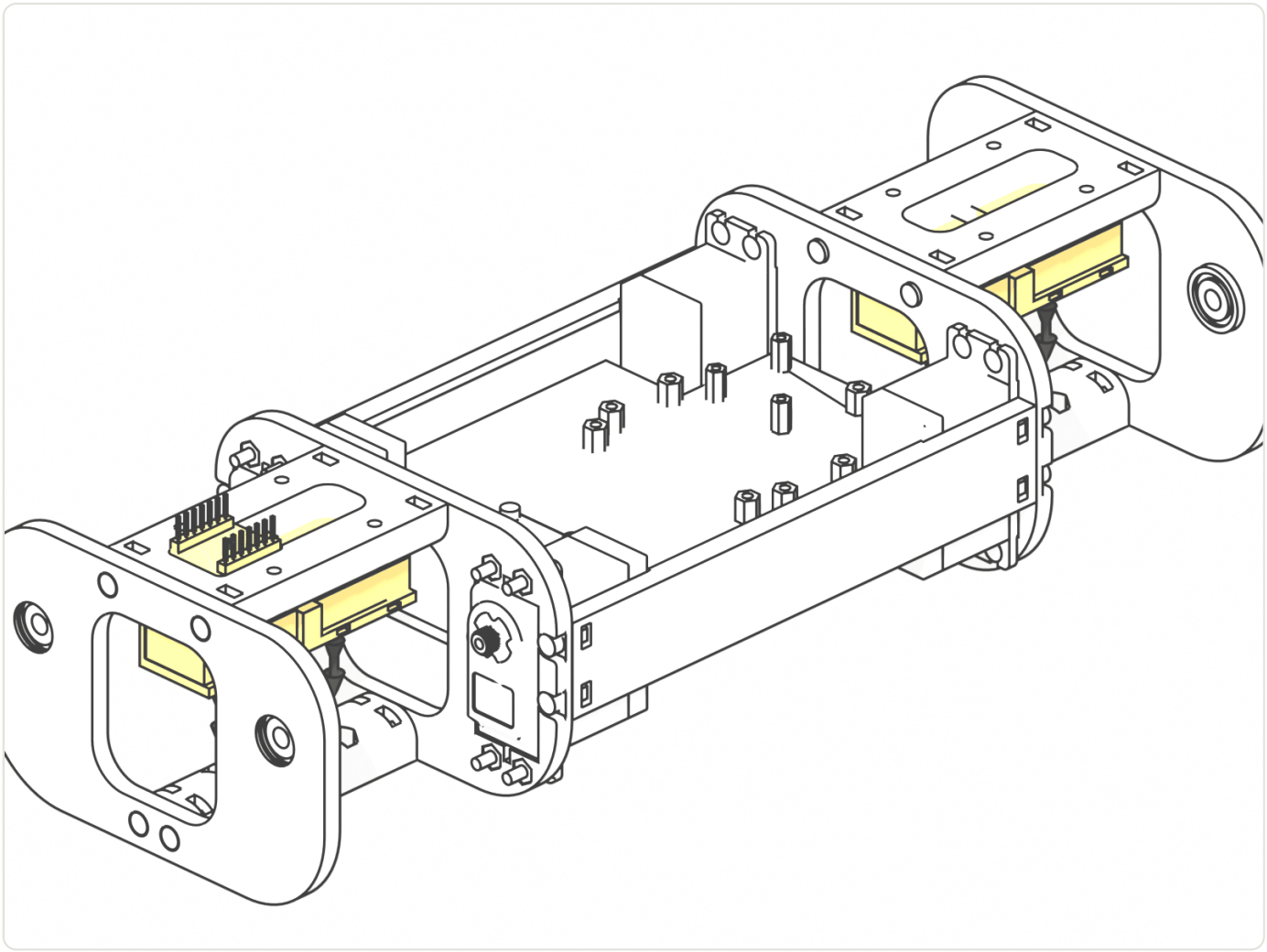

1× Servo bus holder front (printed)


1× Servo bus holder rear (printed)


1× Seeed XIAO ESP32-S3


8× WAGO 221-415


2× M3 × 12 socket head screw (ISO 4762)

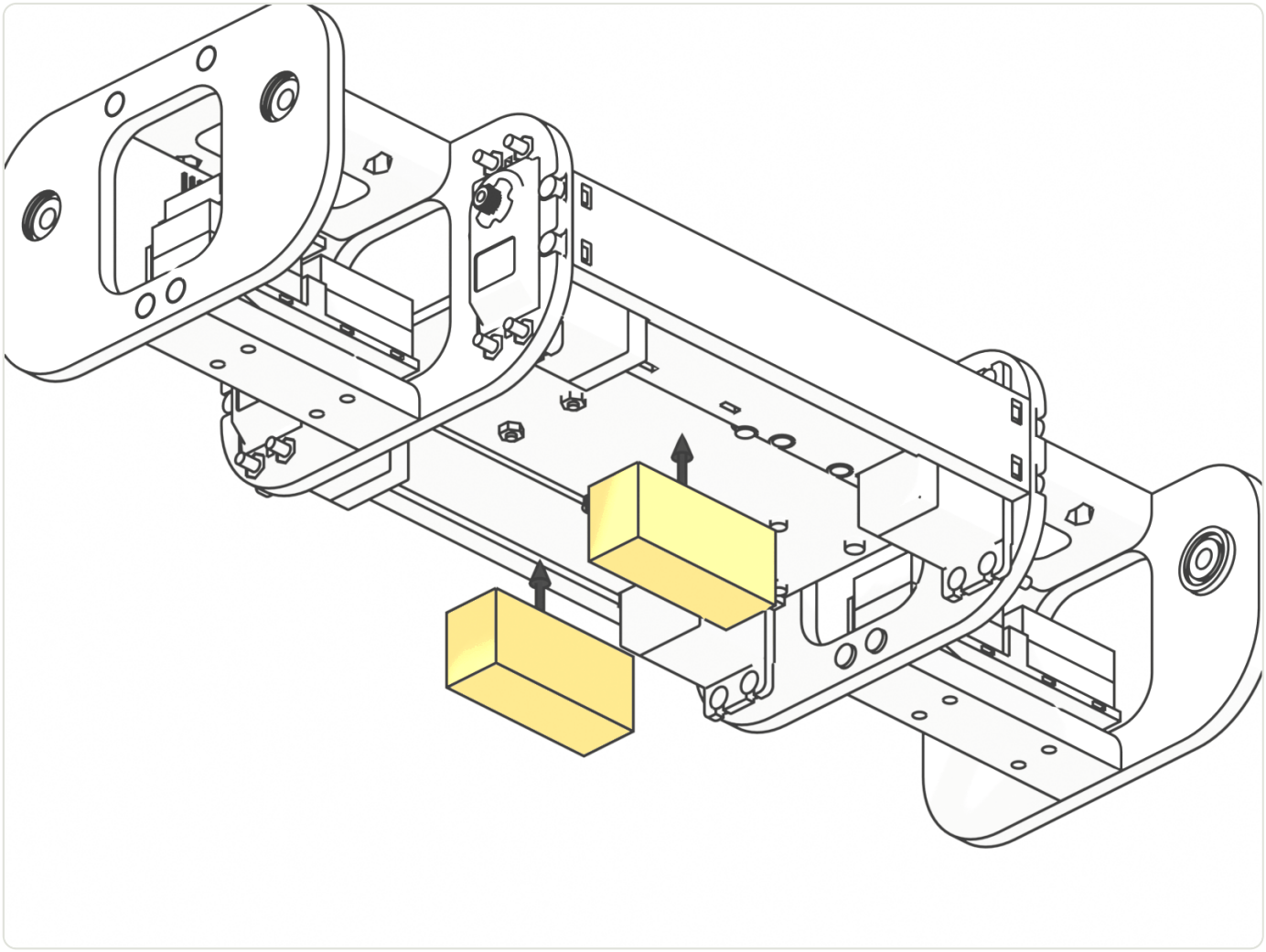


1. Clip four WAGO 221-415 connectors into each servo-bus holder.
2. Screw each holder to its lower shoulder frame with one M3 × 12 screw (self-tapping into the printed pilot hole).
3. Place the XIAO ESP32-S3 in the front cavity, USB-C towards the bay (foam tape).

6 Servo UBECs



2× Hobbywing UBEC-10A



1. Leave both UBEC output jumpers open (6.0 V). Measure 6.0 V before any servo is connected.
2. Foam-tape one UBEC into each side pocket next to the battery bay, standing on its long edge, leads towards the deck.

7 Boards on the deck



1× INA260 power monitor



1× PCA9685 servo driver



1× Pololu D36V50F5 5 V regulator



1× Pololu #2813 pushbutton switch



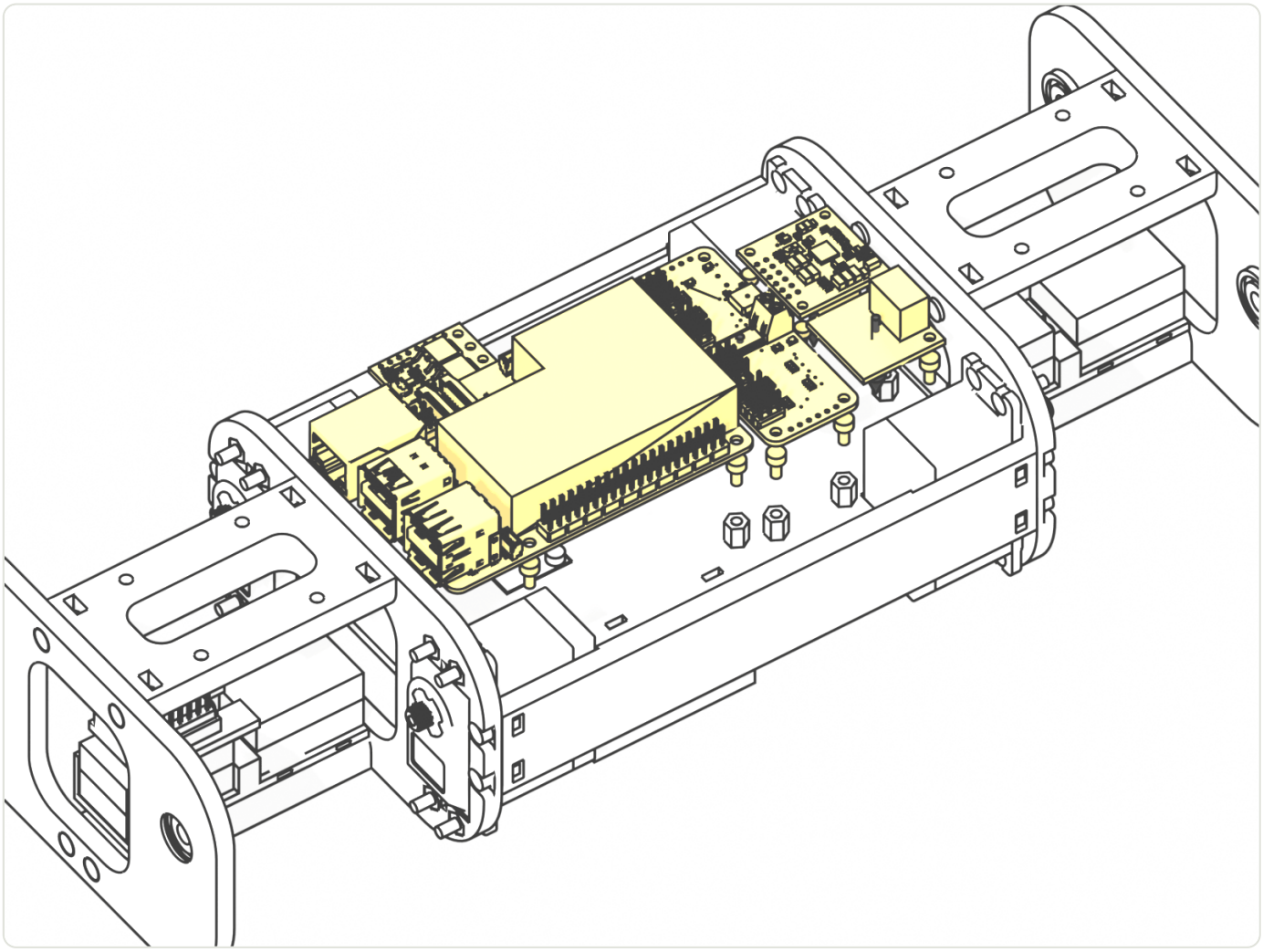
1× Raspberry Pi 5 + Active Cooler



10× M2.5 × 5 socket head screw (ISO 4762)



3× M2 × 5 socket head screw (ISO 4762)



1. Raspberry Pi 5 with Active Cooler: ports to the front, 4 × M2.5 × 5 screws.
2. PCA9685: first solder the 2.2 kΩ OE pull-up (OE to VCC on the header, wiring W20), then mount it with the servo headers towards the right side, 4 × M2.5 × 5 screws. Leave its V+ terminal unconnected.
3. INA260 (bridge A0 first, address 0x41): 2 × M2.5 × 5 screws. Pololu D36V50F5: 3 × M2 × 5 screws.
4. Pololu pushbutton switch on foam tape in the right side strip, its two 5 mm terminal blocks soldered on (VIN/GND and VOUT/GND).

8 Leg servo module

× 4 legs


1× Hip bearing pin (printed)


1× Left servo mount fl (printed) – legs FL only


1× Right servo mount fr (printed) – legs FR only


2× Servo SPT5435LV-180W

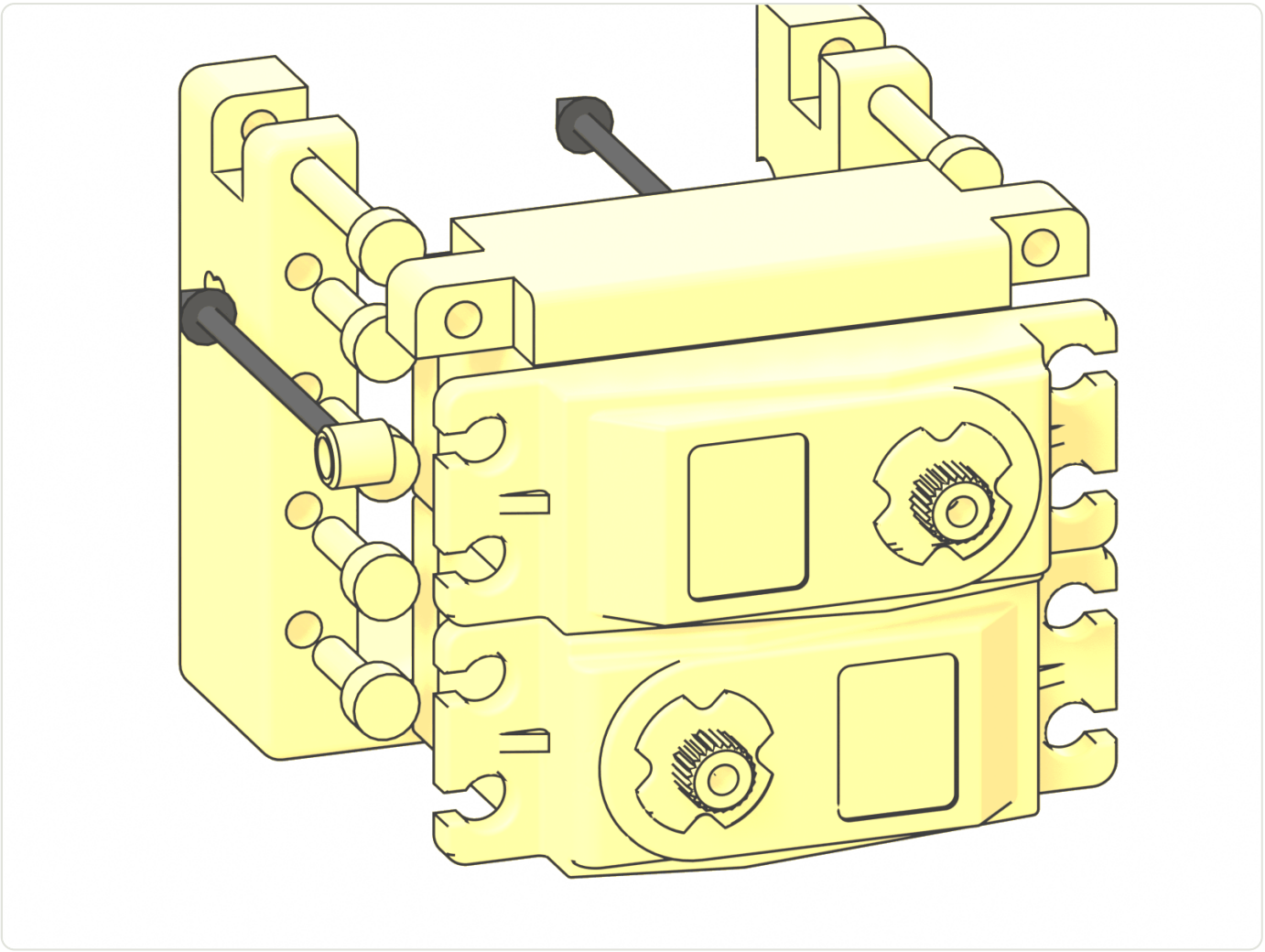

2× M3 × 20 socket head screw (ISO 4762)


1× Left servo mount (printed) – legs RR only


1× Right servo mount (printed) – legs RL only


1× Servo mount top bracket (printed)


8× M3 × 10 socket head screw (ISO 4762)



1. Build one leg at a time; the drawing shows the front-left leg. Front-left and rear-right legs use the *left* servo mount, front-right and rear-left the *right* one. The front legs use the Stride variants `left_servo_mount_fl` / `right_servo_mount_fr` (extra hip-pivot pilot).
2. Mount the thigh servo and the knee servo in the servo mount with 8 × M3 × 10 screws through the servo ears, then close it with the top bracket: 2 × M3 × 20 screws.
3. Press the hip bearing pin into the mount; the hip disc horn is fitted in Step 13.

9 Thigh

× 4 legs

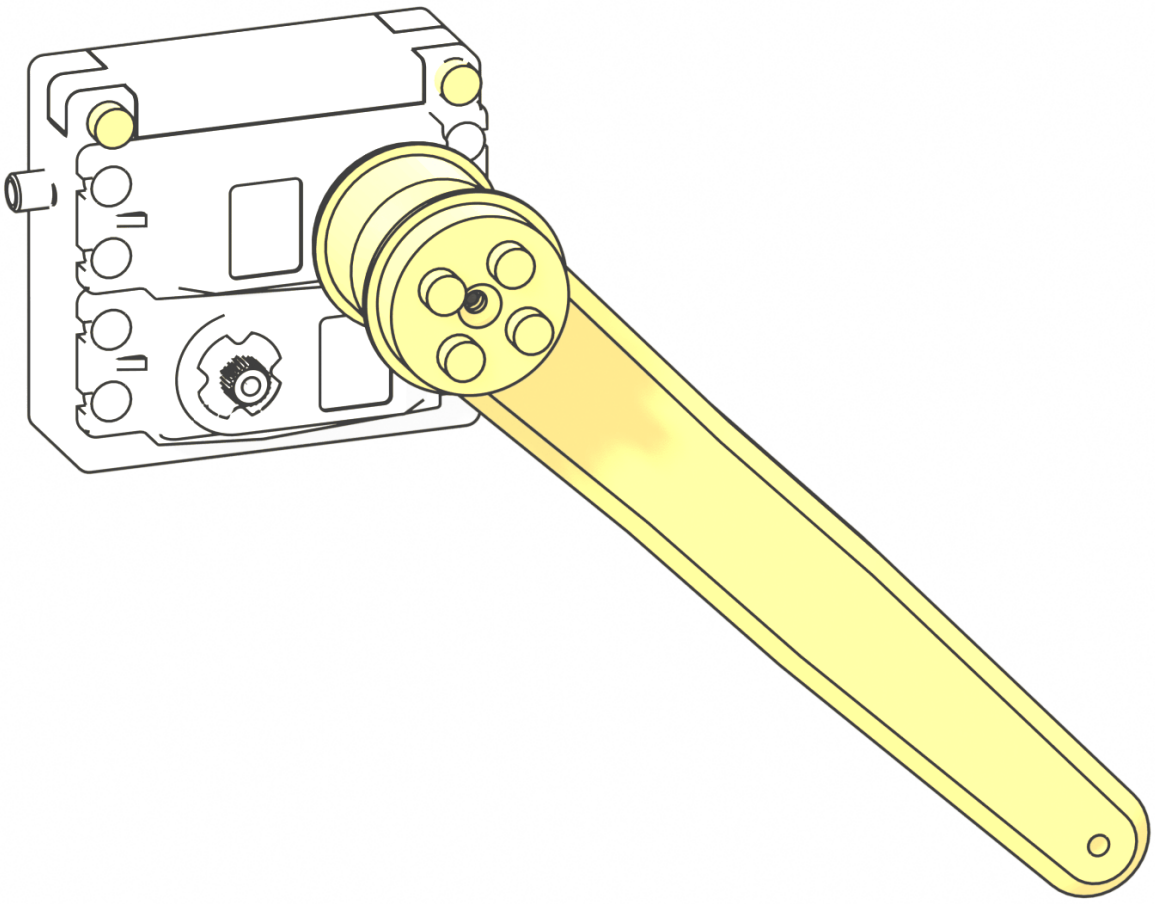

1× Femur (printed)


1× Femur servo connector (printed)


1× 25T aluminium disc horn


4× M3 × 20 socket head screw (ISO 4762)


1× M3 × 8 socket head screw (ISO 4762)



1. Fix the femur and the femur servo connector to a 25T aluminium disc horn with 4 × M3 × 20 screws.
2. With the thigh servo centred, push the horn on the spline with the femur pointing 45° backwards (assembly reference) and fix it with the M3 × 8 centre screw.

10 Knee drive crank

× 4 legs

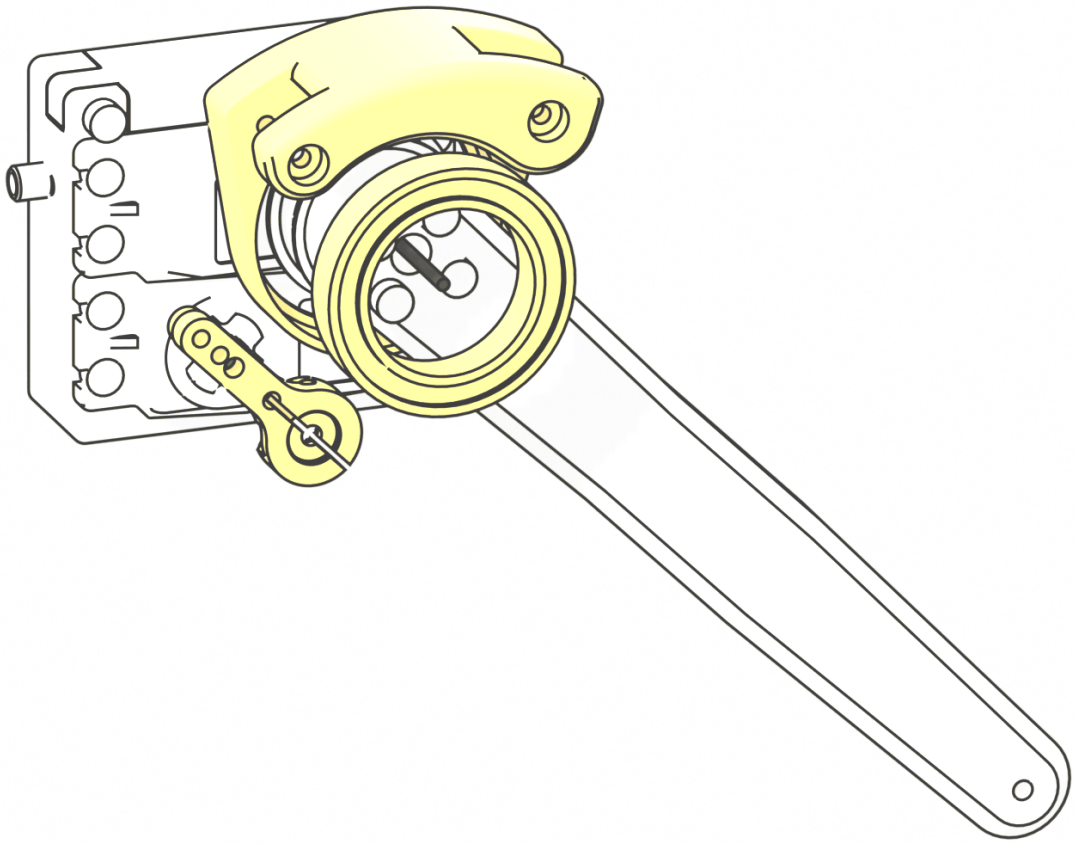

1× Left shoulder (printed) – legs FL, RL only


1× Right shoulder (printed) – legs FR, RR only


1× Ball bearing 6805-2RS


1× 25T aluminium arm horn


1× M3 × 8 socket head screw (ISO 4762)



1. Press the 6805-2RS bearing into the shoulder crank (left or right version per leg) and fit it over the femur servo connector: it turns freely about the thigh axis.
2. With the knee servo centred, push the 25T aluminium arm horn on its spline at 35° (assembly reference) and fix it with the M3 × 8 centre screw.

11 Lower leg

× 4 legs


1× Foot spacer (printed)


1× Inner tibia (printed)


1× Outer tibia (printed)


2× Ball bearing 633ZZ

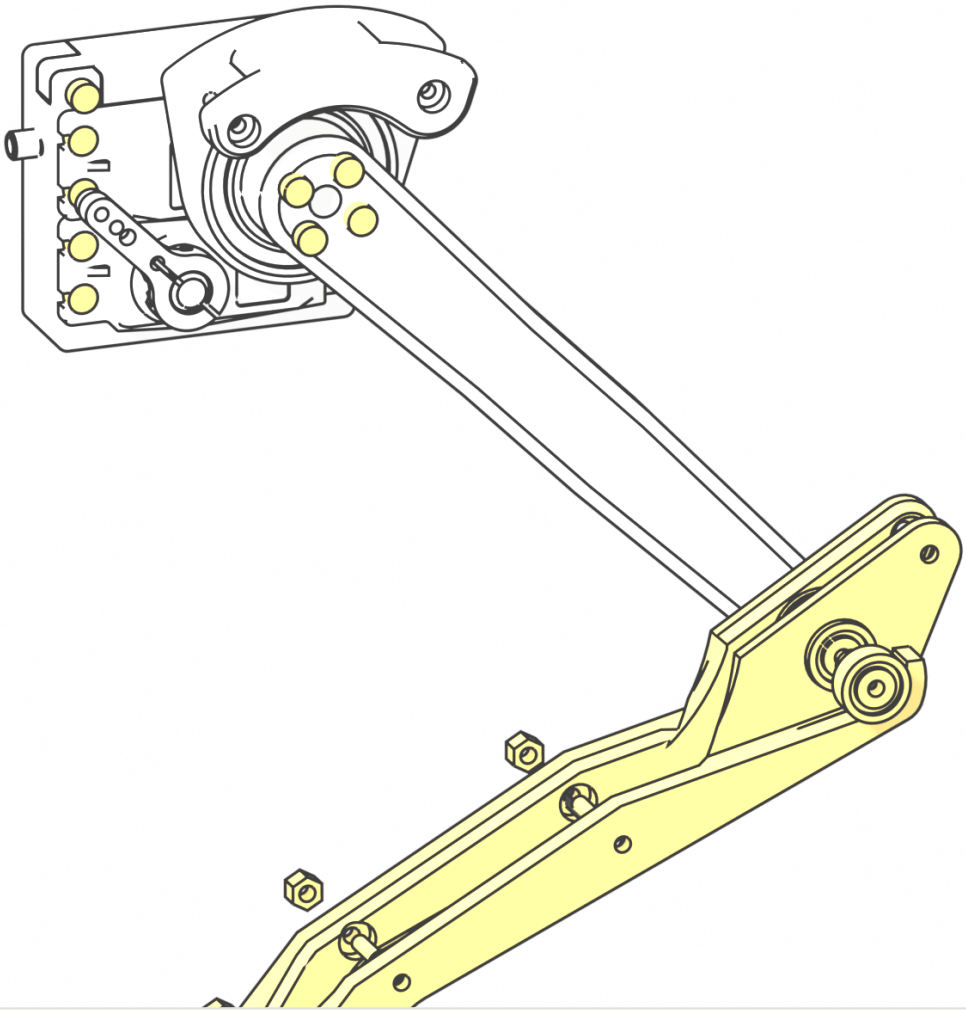

3× M3 lock nut (nylon insert) (DIN 985)


2× M3 × 10 socket head screw (ISO 4762)


2× M3 × 12 socket head screw (ISO 4762)


1× M3 × 20 socket head screw (ISO 4762)


2× M3 washer (ISO 7089)



1. Press two 633ZZ bearings into the tibia halves.
2. Join inner and outer tibia with 2 × M3 × 12 screws and lock nuts; clamp the foot spacer with the M3 × 20 screw and lock nut.
3. Fit the knee axle: 2 × M3 × 10 screws with washers from both sides through the femur.

12 Knee linkage

× 4 legs


1× Short link (printed)


1× Stiff long link (printed)

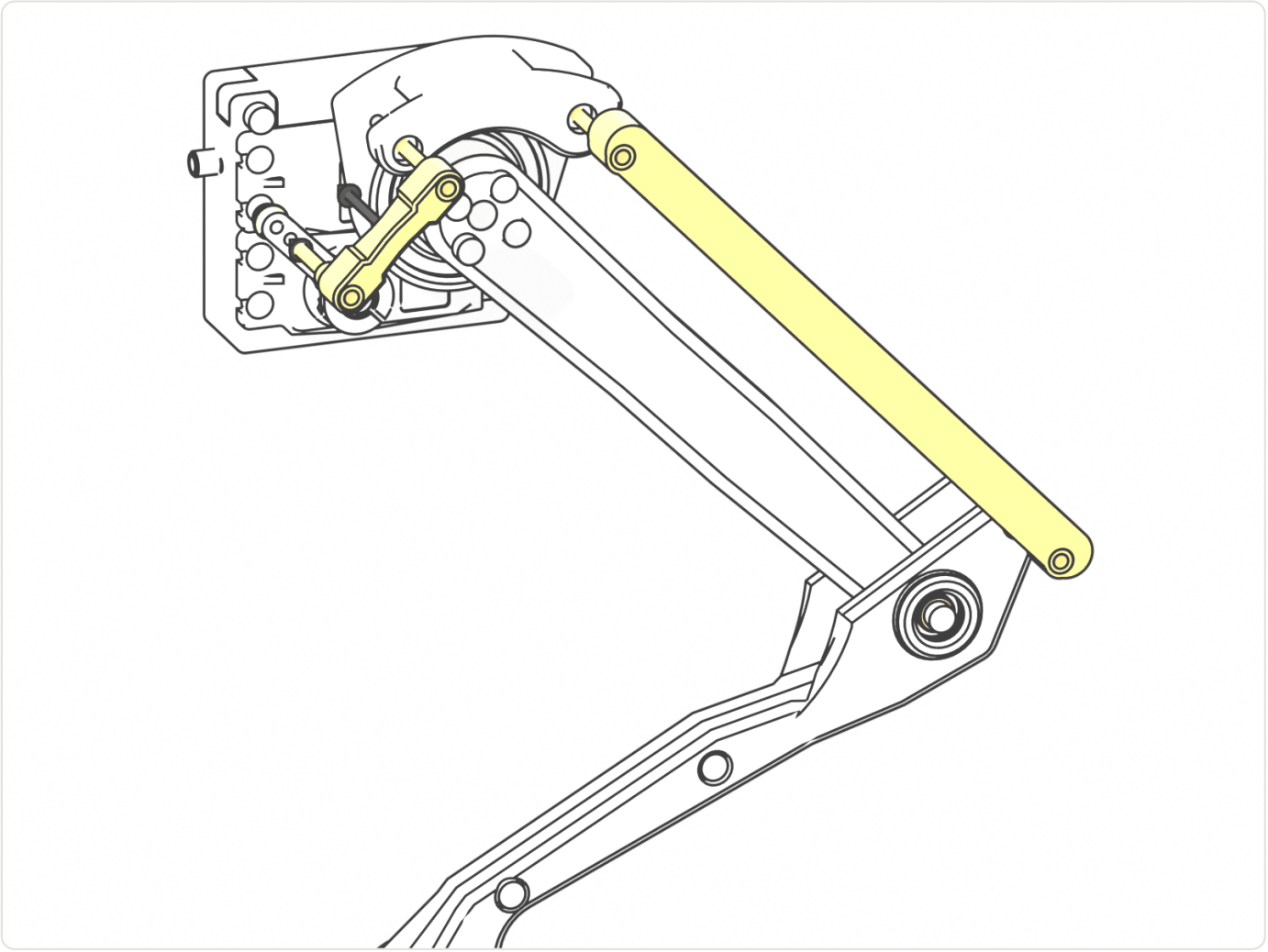

4× Sleeve bearings 3×5×5 (pair)


1× M3 lock nut (nylon insert) (DIN 985)


1× M3 × 16 socket head screw (ISO 4762)


3× M3 × 25 socket head screw (ISO 4762)


1× M3 washer (ISO 7089)



1. Press two 3 × 5 × 5 sleeve bearings into every link eye (8 per leg).
2. Connect the links as drawn: 2 × M3 × 25 crank pins through the shoulder crank, the M3 × 16 screw with washer at the arm horn, and 1 × M3 × 25 with a lock nut at the tibia.
3. Tighten the lock nuts only until the joint is free of play: the links must swing under their own weight.

13 Mount the legs



4× 25T aluminium disc horn



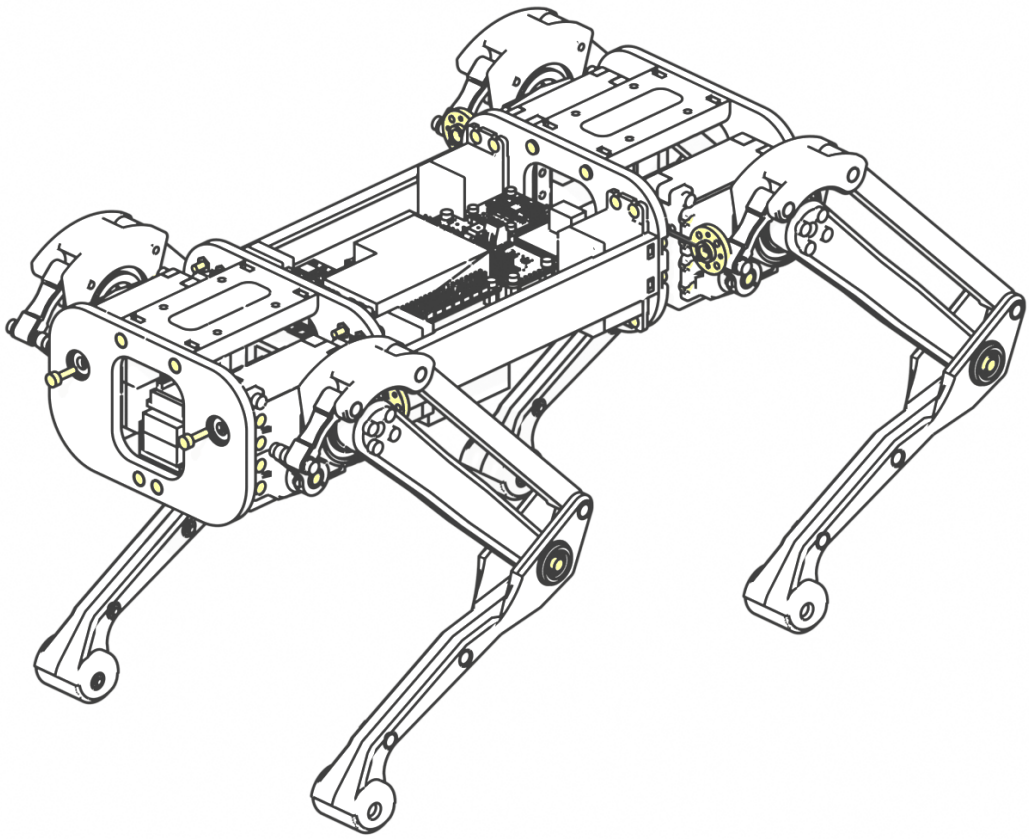
4× M3 × 10 socket head screw (ISO 4762)



12× M3 × 8 socket head screw (ISO 4762)



4× M3 washer (ISO 7089)



1. Fix a disc horn to each leg module with 2 × M3 × 8 screws.
2. With the hip servo centred, push the leg on the hip servo spline (leg vertical) and fix it with the M3 × 8 centre screw.
3. Insert the hip pivot screw (M3 × 10 with washer) through the 625 bearing into the hip bearing pin.

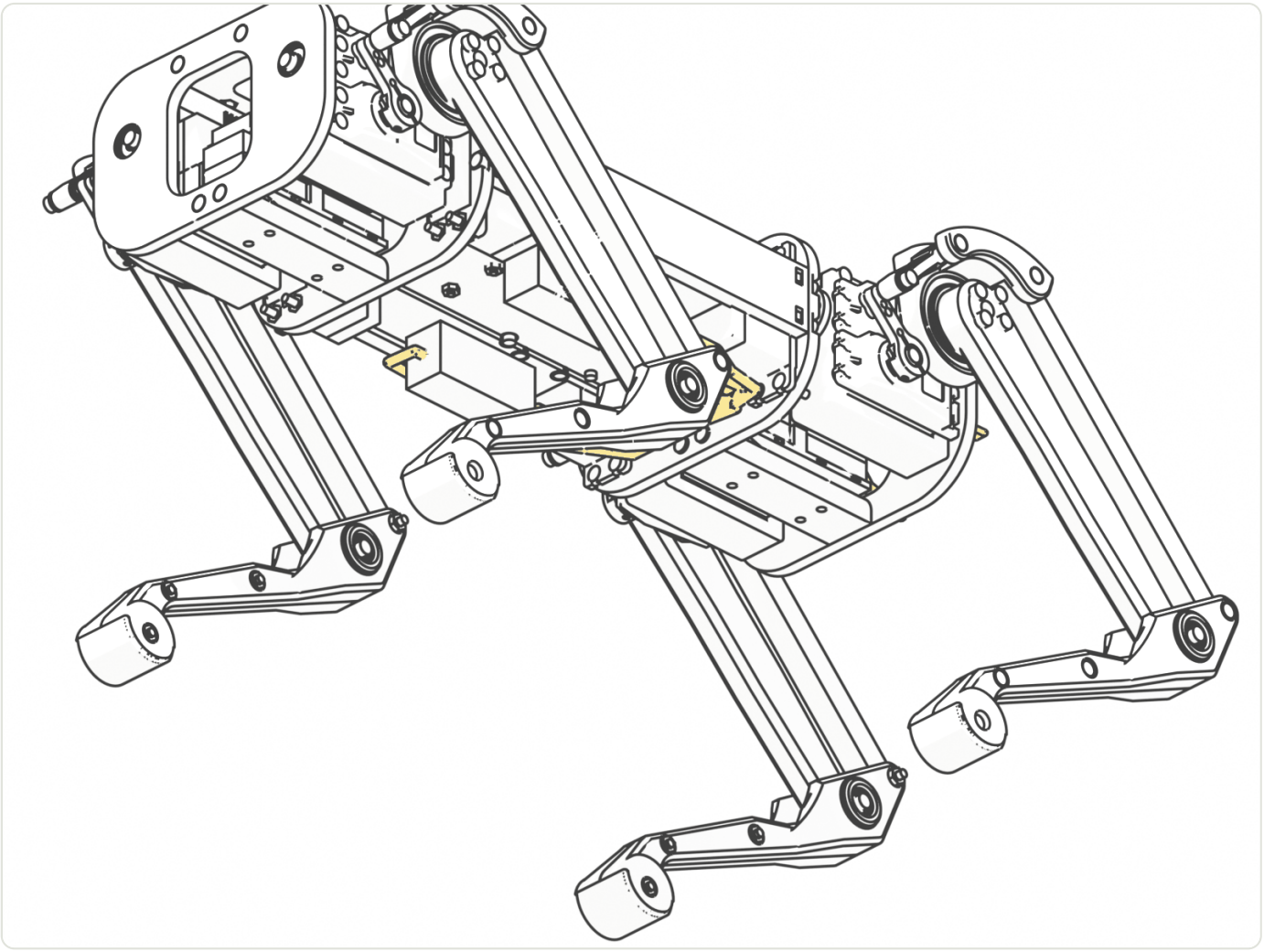
14 Power entry



1× ATO fuse holder

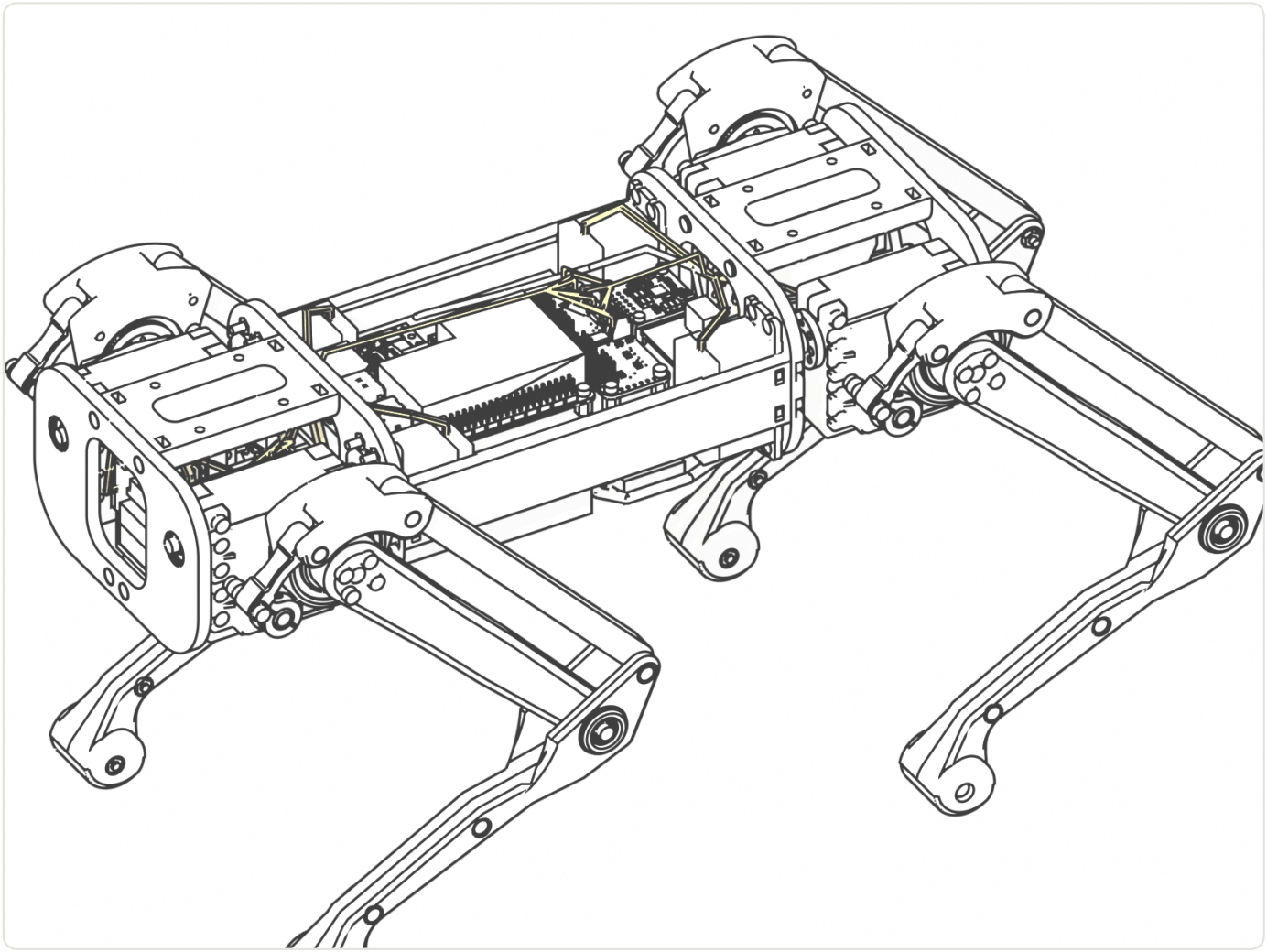


1× XT60H female



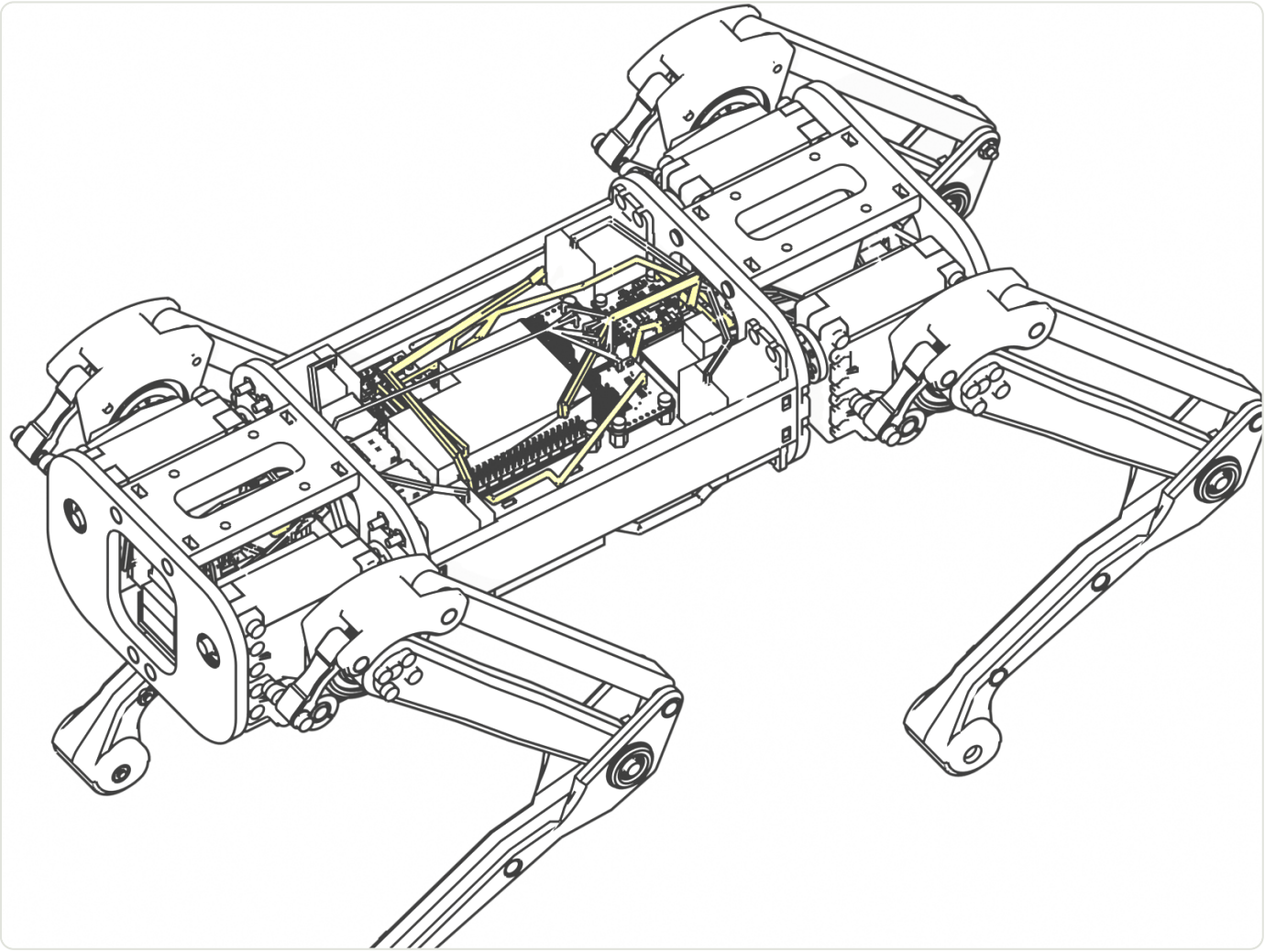
1. Cut every wire to its length in the cut list ([wiring check](../verification/wiring.md#cut-list)); strip, tin and heat-shrink every solder joint.
2. Battery input: solder W01 (14 AWG red) and W04 (14 AWG black) to an XT60H with sockets (check the contact rule in [electronics](../electronics.md#xt60-contact-rule-the-loop-key-must-never-fit-the-battery)) and lay it in the pocket beside the battery under the deck, hood towards the rear. Slide spiral wrap over W01 (it is unfused).
3. Ground star beside it: splice W04 to the black inputs of both UBECs (14 AWG) and to the logic ground (18 AWG black, on to the switch GND).
4. Main fuse: trim both leads of a 25 A in-line holder to 20 mm, splice W01 to one and W02 to the other, lay the holder on the rear WAGO bus with its leads out through the inner and outer frame openings and tie it to the upper shoulder frame. No fuse yet.
5. W02 and W03 (to both UBEC red inputs, spliced under the deck) end behind the rear outer frame: they are soldered to the arming jack in Step 19. W09 (18 AWG red, logic feed) runs from there through the rear cavity and over the deck to the switch VIN; its other end waits for the logic fuse holder (Step 19).

15 Servo leads and servo bus



1. Thigh and knee servo leads: tie each to its servo mount plate at the marked point (close to the hip axis), leave the free loop (front: 30 mm thigh, 32 mm knee; rear: 22 mm; it takes up the hip motion) and tie it again at the shoulder frame (thigh) or the bus holder (knee).
2. Unclip each WAGO pair from its holder before clamping (the XIAO platform blocks the levers in bay 0). At the tie peel the red and brown wires off the lead, cut them to the cut-list length, strip 11 mm and clamp them into the leg's WAGO pair: red into the upper (V+) connector, brown into the lower (GND), ports hip 1, thigh 2, knee 3; refit the pair. Hip servo leads split at the inner frame opening.
3. Cut the orange signal wire to its cut-list length (measured from the tie), crimp a female Dupont contact, push it into a 1-pin housing and plug it onto the PWM pin of its PCA9685 channel (channel map in [electronics](../electronics.md#pin-maps)).
4. UBEC outputs (W05 front, W06 rear): extend with 18 AWG into port 0 of bay 0. Jumpers W07/W08: 18 AWG from port 4 of bay 0 to port 0 of bay 1, V+ and GND separately along the WAGO faces.

16 Logic and signal wiring



1. 18 AWG: switch VOUT to INA260 VIN+ (W10, red), INA260 VIN- to the regulator VIN (W11, red), switch GND to the regulator GND (W24, black; the INA260 terminal block takes only VIN+ and VIN-).
2. W12: four 22 AWG wires from the regulator VOUT/GND, Dupont crimps at the Pi end. Leave them unplugged: they go onto the Pi header only after the supply check in Step 20.
3. I²C: W17 (3V3, GND, SDA, SCL) and W20 (D3 to OE) are 22 AWG wires soldered to the XIAO pins and crimped (Dupont) for the PCA9685 left header. STEMMA QT cables: PCA9685 right header to the IMU (W18), IMU to the INA260 header (W19).
4. USB: Pi lower port to the XIAO (W14, fold the spare length and tie it in the front cavity). Optional W22: Pi GPIO 26 to the switch OFF pad (22 AWG, Dupont crimp at the Pi, soldered at the switch).

17 Front display



1× Display bracket (printed)



1× Front shell display (printed)



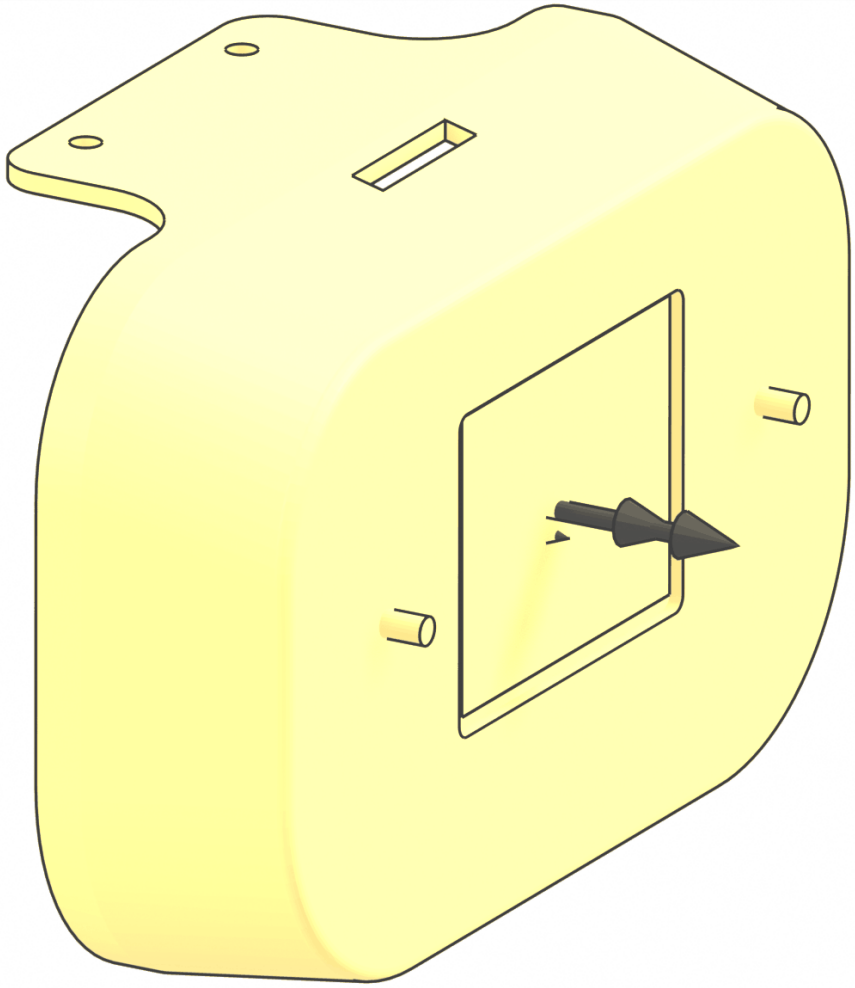
1× Waveshare 2" LCD (ST7789)



4× M2 × 5 socket head screw (ISO 4762)



2× M3 × 10 socket head screw (ISO 4762)



1. Put the 2-inch LCD into the front shell window from the inside, screen outwards, header pins down.
2. Fix the bracket to the LCD hex studs with 4 × M2 × 5 screws, then to the shell bosses with 2 × M3 × 10 (self-tapping).
3. Plug the display cable (W21, supplied with the LCD) into the display, run it through the outer shoulder frame opening and solder its 8 wires to the XIAO pins (no room for Dupont housings under the upper shoulder frame); fold the spare length (cut list) and tie it at the opening.

18 Front camera


1× Camera mount base (printed)


1× Camera tilt plate (printed)


1× Camera Module 3 Wide

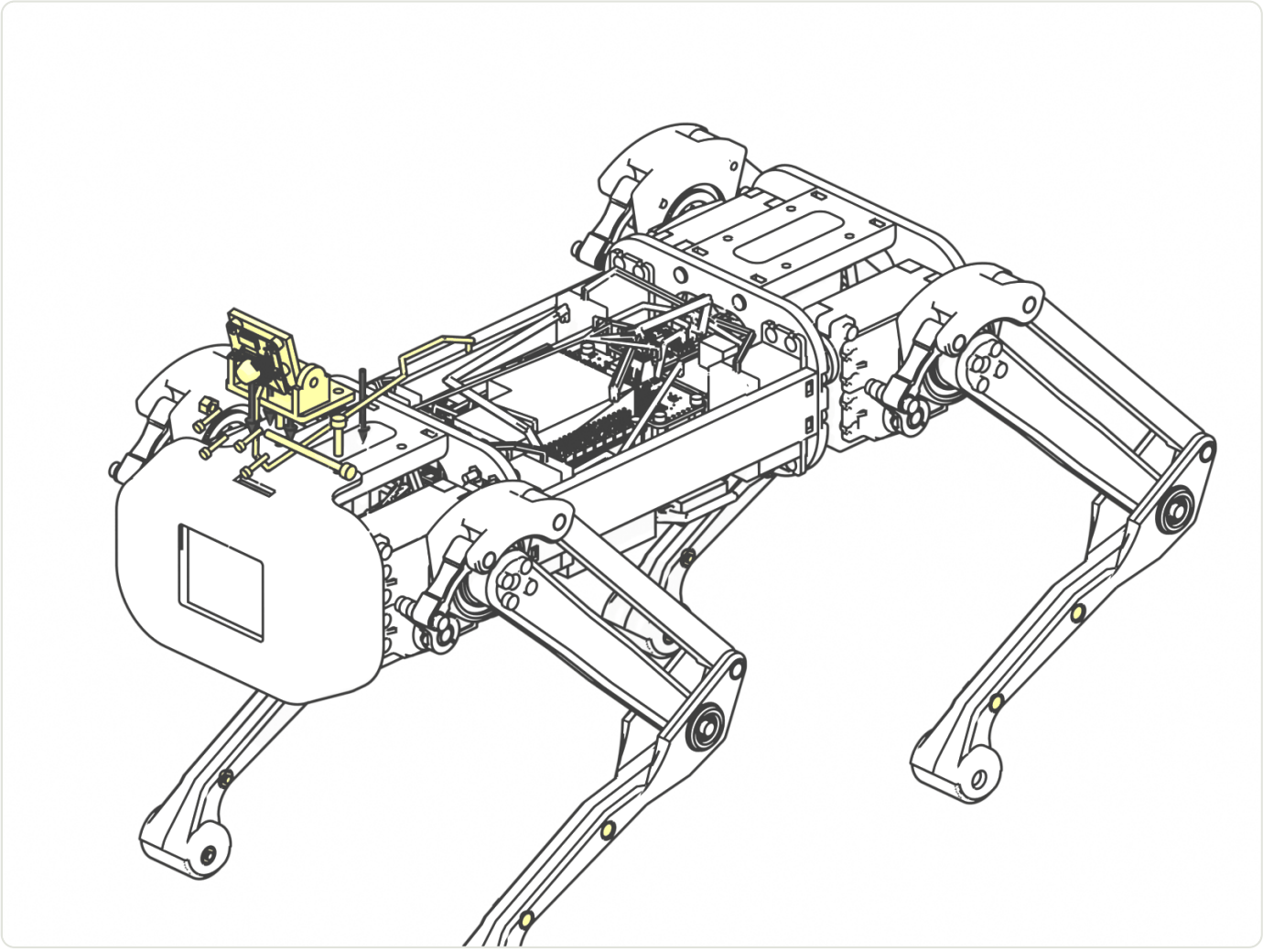

1× M3 lock nut (nylon insert) (DIN 985)


4× M2 hex nut (ISO 4032)


4× M2 × 10 socket head screw (ISO 4762)


2× M3 × 12 socket head screw (ISO 4762)


1× M3 × 40 socket head screw (ISO 4762)



1. Fix the Camera Module 3 Wide to the tilt plate: 4 × M2 × 10 screws, M2 nuts behind the plate.
2. Hang the tilt plate between the base cheeks with the M3 × 40 pivot screw and a lock nut; tighten until the camera holds its angle (15° down is the reference).
3. Plug the 300 mm camera ribbon (W16) into CAM/DISP 0 of the Pi, run it through both shoulder frame openings and up through the front-shell slot to the camera; fold the spare length flat (no creases). Then put the front shell on and screw the camera base and shell to the upper shoulder frame with 2 × M3 × 12.

19 Rear panel



1× Arming port bezel (printed)



1× Arming port ring (printed)



1× Back shell button (printed)



1× ATO fuse holder



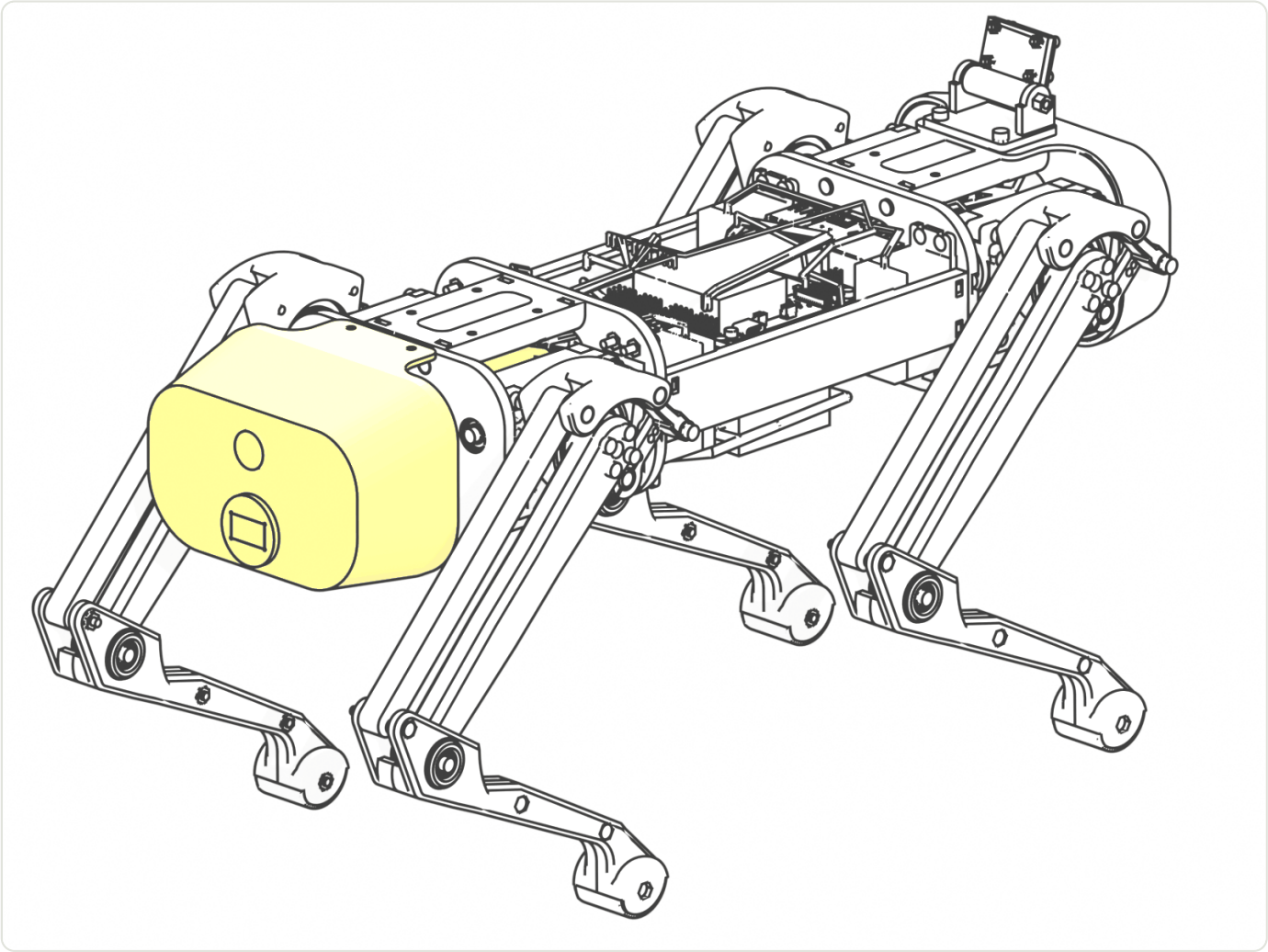
1× 12 mm push button



1× XT60H female



2× M2.5 × 6 socket head screw (ISO 4762)

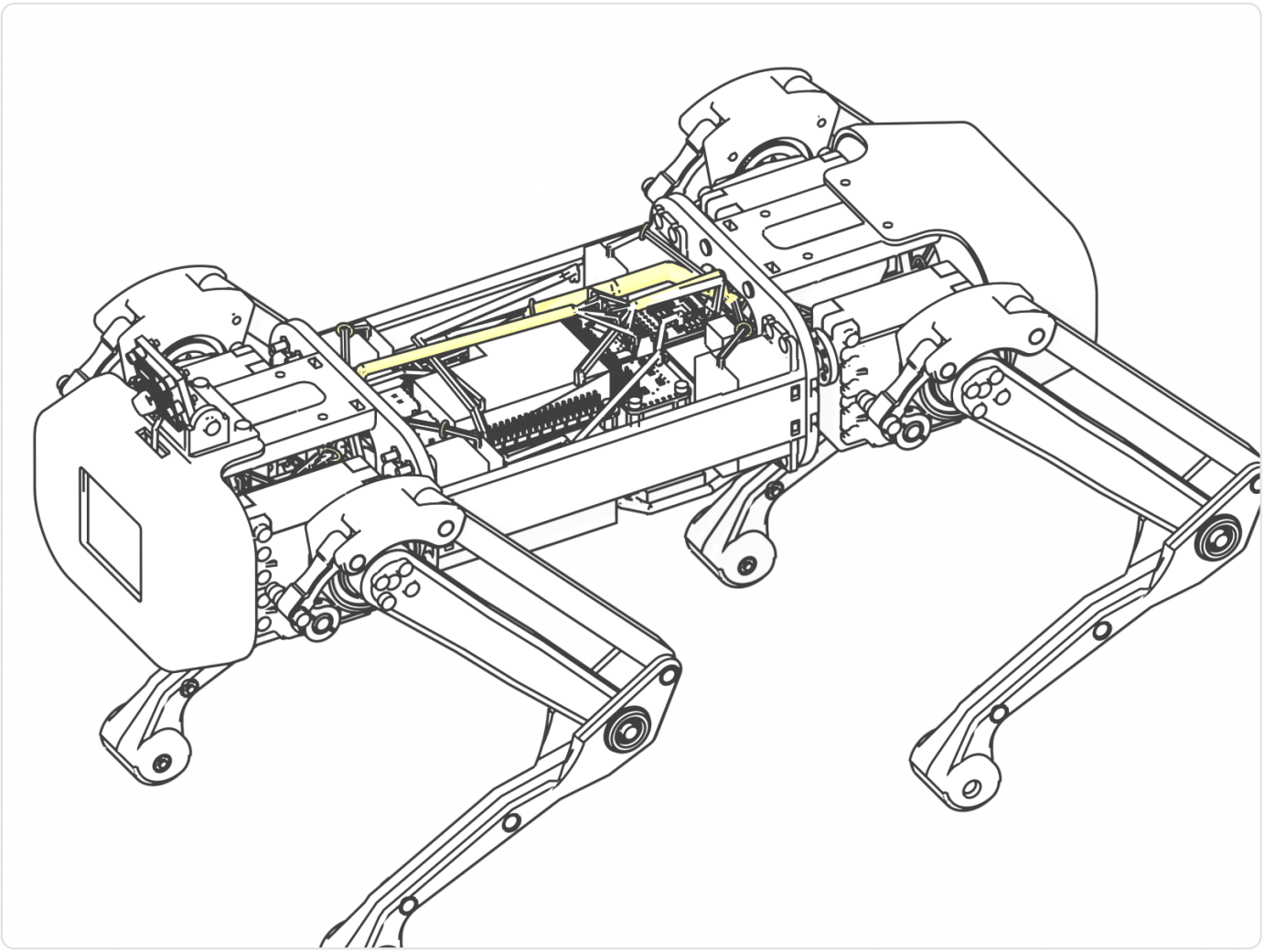


1. Mount the 12 mm power button in the small hole of the back shell and solder W13 (22 AWG pair, routed to the switch A/B pads).
2. Insert the XT60 arming port into the printed bezel from outside, clamp it with the ring from inside: 2 × M2.5 × 6.
3. Solder W02 and W03 to the two contacts of the arming jack. Logic fuse: trim the input lead of a second in-line holder to its cut length and splice it to W02 (heat-shrink); trim its output lead to 20 mm and splice W09 to it. Lay the holder in the shell between the jack and the button. No fuse yet.
4. Put the back shell on. The loop key stays out until first power-up (final step).

20 Dress the harness and check the logic supply



2× Adhesive cable-tie mount 13 × 13 mm



1. Supply check before the Pi is connected: plug a charged pack into the battery input (W00) for a moment, insert both fuses, loop key out, press the button and measure 4.8–5.2 V at the W12 Dupont ends (D36V50F5: 5 V ± 4 %). Press again, pull the fuses, unplug the pack. Then plug W12 onto Pi pins 2/4 (5 V) and 6/14 (GND).
2. Spiral-wrap every bundle of three or more cables and W01 where the drawing shows a sleeve; it protects the leads where they pass frames and moving parts.
3. Tie at every marked point (2.5 × 100 mm ties, cut flush); two adhesive tie mounts on the deck carry the bundles in the side strips.
4. Move every leg through its full range by hand: no cable may be pulled tight, pinched or touch a horn or link ([wiring check](../verification/wiring.md)).

21 Top shell and LiDAR



1× Lidar pedestal (printed)



1× Top shell sensor (printed)



1× RPLIDAR C1



1× RPLIDAR USB adapter



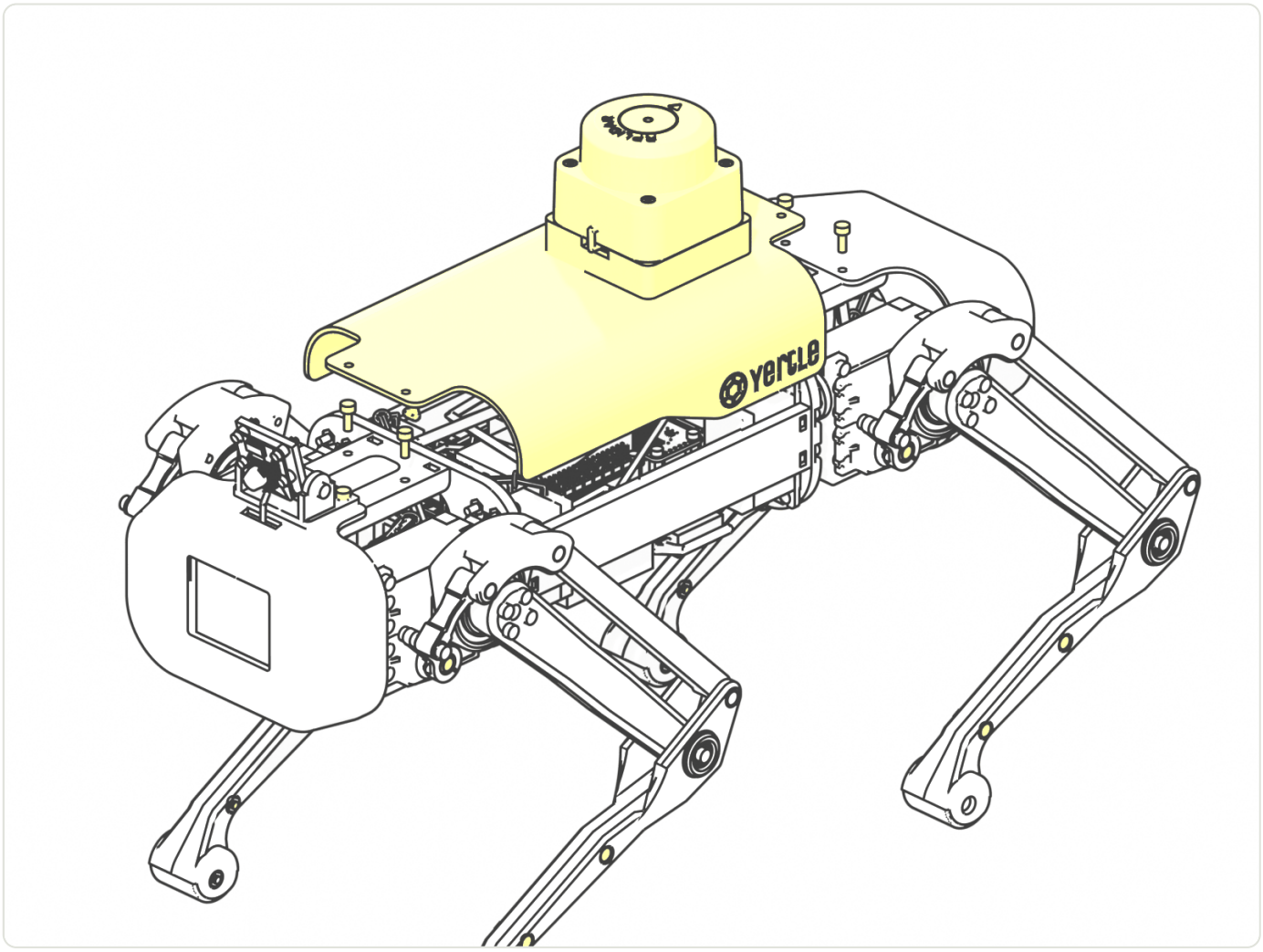
4× M2.5 × 6 socket head screw (ISO 4762)



4× M3 × 12 socket head screw (ISO 4762)



6× M3 × 8 socket head screw (ISO 4762)



1. Screw the LiDAR pedestal to the top shell from below: 4 × M3 × 12 (self-tapping).
2. Put the LiDAR USB adapter into the pedestal, behind the cable slot, USB end towards the slot (foam tape). Lead the LiDAR's own cable (W23) through the notch at the pedestal front into the adapter, then fix the RPLIDAR C1 with 4 × M2.5 × 6 (max. 4 mm into the LiDAR).
3. Plug the second USB cable (W15, from the Pi's upper USB port, routed over the Pi beside the cooler fan) into the adapter through the top-shell slot, then close the top shell over the front and back shells: 6 × M3 × 8 into the nuts inserted in Step 4.

22 Battery and bottom shell



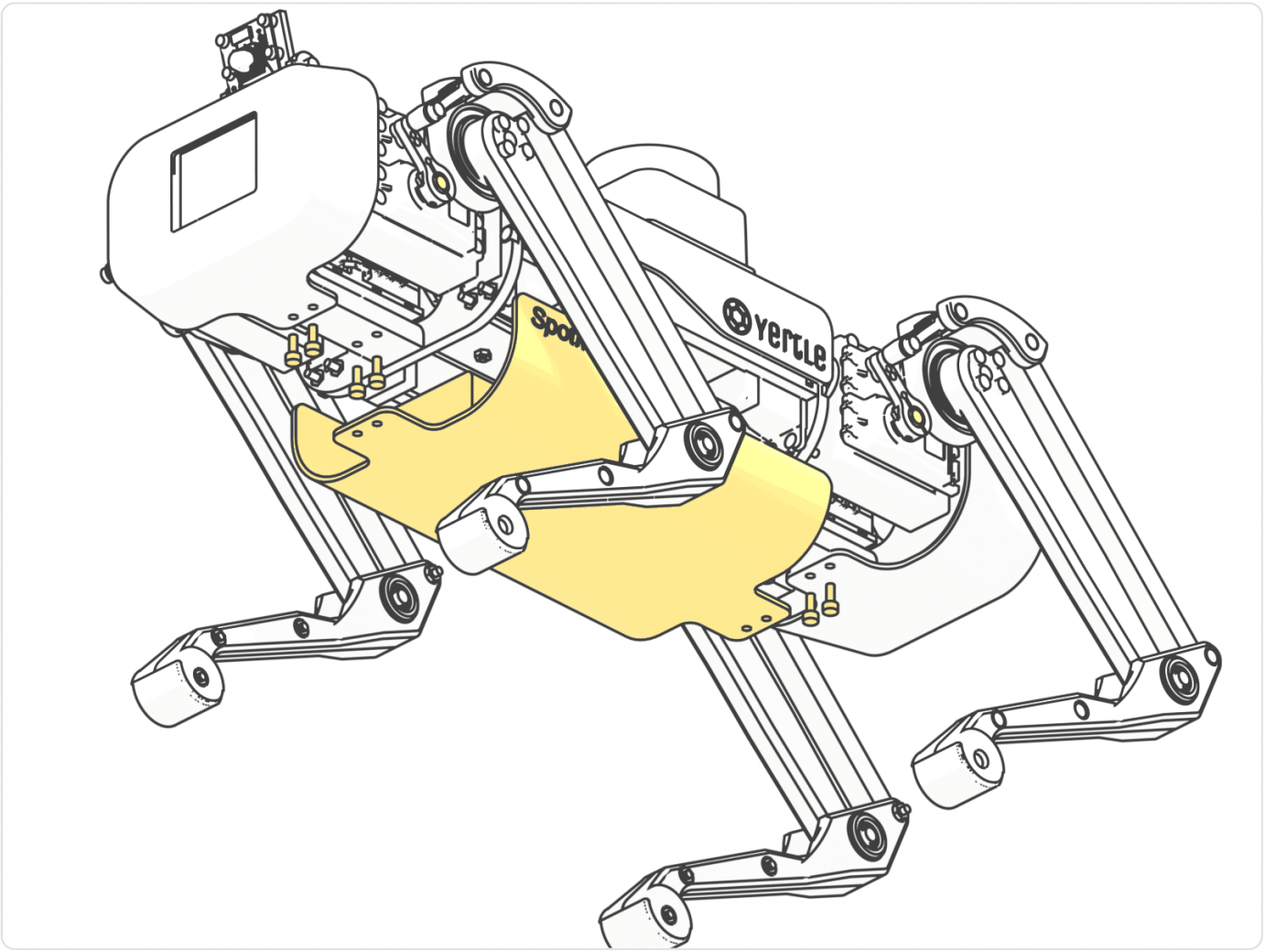
1× Bottom shell (printed)



1× LiPo 2S 5000 mAh



8× M3 × 8 socket head screw (ISO 4762)



1. Strap the 2S LiPo under the deck (hook-and-loop strap), lead end to the rear.
2. Plug the pack's own lead (W00) into the battery input XT60H in the pocket beside the battery (the lead turns forward along the left side under the rear hip servo). Keep the loop key out.
3. Close the bottom shell: 8 × M3 × 8 screws into the nuts inserted in Step 4.

G · Wiring and pin map

XIAO ESP32-S3 pins

Pad	GPIO	Function	Connects to	Note
D0	1	lcd_cs	LCD CS	
D1	2	lcd_rst	LCD RST	
D2	3	lcd_backlight	LCD BL	strapping pin: driven only after boot
D3	4	servo_oe_n	PCA9685 OE	active low; 2.2 kΩ pull-up to VCC keeps outputs off in reset
D4	5	i2c_sda	I²C SDA	
D5	6	i2c_scl	I²C SCL	
D8	7	lcd_sck	LCD CLK	
D9	8	lcd_dc	LCD DC	
D10	9	lcd_mosi	LCD DIN	

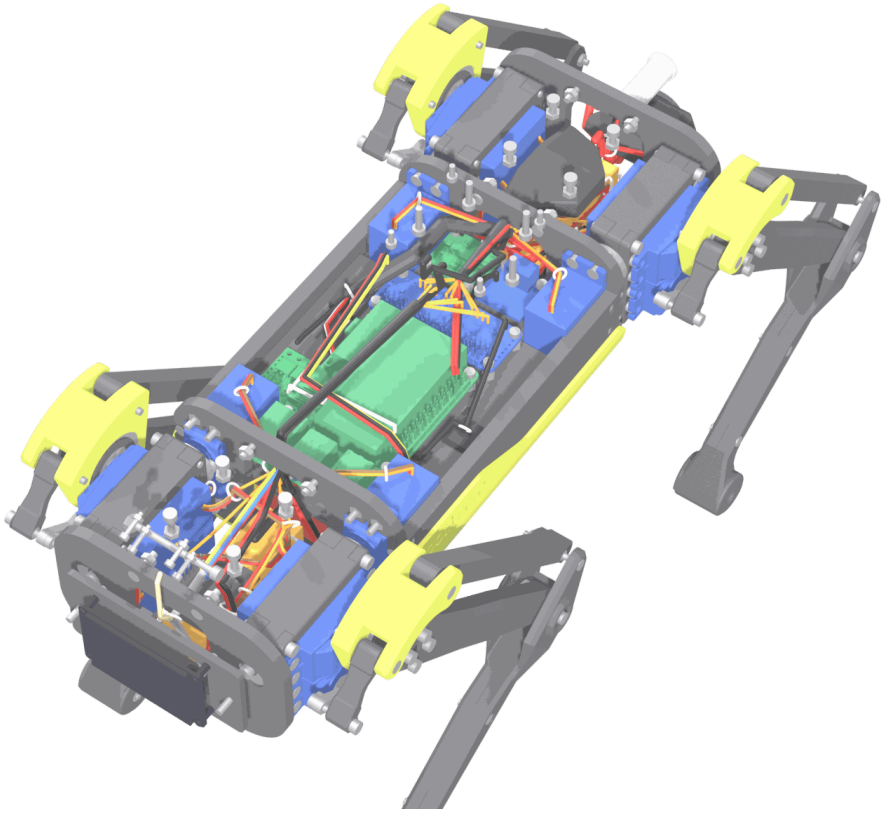
I²C bus (400 kHz)

Address	Device	Note
0x40	PCA9685 servo driver	0x70 = all-call
0x6A	LSM6DSOX IMU	
0x41	INA260 power monitor	bridge the A0 jumper (default 0x40 collides with the PCA9685)

PCA9685 servo channels (200 Hz)

Leg	hip	thigh	calf (knee crank)
FL	15	11	7
FR	14	10	6
RL	13	9	5
RR	12	8	4

Wiring harness



Cut list

Every cable is routed through the CAD (`hardware/wiring.yaml`) and checked for reach, hip-loop slack and clearance in every pose (`docs/verification/wiring.md`). Cut length = route + strip/solder allowance + slack; servo-lead branches are measured from the tie where the lead splits.

Run	Cable	From	To	Cut
W00/red	battery_core_red	battery.lead_red	xt60_battery.pack_red	ready-made
W00/black	battery_core_black	battery.lead_black	xt60_battery.pack_black	ready-made
W01	wire_14awg_red	xt60_battery.robot_red	fuse_main.in	151 mm
W02	wire_14awg_red	fuse_main.out	back.splice	62 mm
W02/arming	wire_14awg_red	back.splice	xt60_arming.cups	26 mm
W02/logic	fuse_holder_lead	back.splice	fuse_logic.in	ready-made
W03	wire_14awg_red	xt60_arming.cups	mid.ubec_split	182 mm
W03/front	wire_14awg_red	mid.ubec_split	ubec_front.in	84 mm
W03/rear	wire_14awg_red	mid.ubec_split	ubec_rear.in	212 mm
W04	wire_14awg_black	xt60_battery.robot_black	mid.ground_star	66 mm
W04/front	wire_14awg_black	mid.ground_star	ubec_front.in	75 mm
W04/rear	wire_14awg_black	mid.ground_star	ubec_rear.in	219 mm
W04/logic	wire_18awg_black	mid.ground_star	switch.vin	226 mm
W05	wire_18awg_pair	ubec_front.out	wago:front.0.p0	234 mm
W06	wire_18awg_pair	ubec_rear.out	wago:rear.0.p0	180 mm

W07/vplus	wire_18awg_red	wago:front.0.p4.V+	wago:front.1.p0.V+	47 mm
W07/gnd	wire_18awg_black	wago:front.0.p4.GND	wago:front.1.p0.GND	49 mm
W08/vplus	wire_18awg_red	wago:rear.0.p4.V+	wago:rear.1.p0.V+	47 mm
W08/gnd	wire_18awg_black	wago:rear.0.p4.GND	wago:rear.1.p0.GND	49 mm
W09	wire_18awg_red	fuse_logic.out	switch.vin	290 mm
W10	wire_18awg_red	switch.vout	ina.vin	157 mm
W11	wire_18awg_red	ina.vin	reg.vin	67 mm
W24	wire_18awg_black	switch.vout	reg.vin	148 mm
W12	wire_22awg_quad	reg.vout	pi.gpio_power	123 mm
W13	wire_22awg_pair	button.terminals	switch.ab	280 mm
W14	usb_a_c	pi.usb_low	xiao.usb	ready-made
W15	usb_a_c	pi.usb_high	lidar_adapter.usb	ready-made
W16	camera_ffc	pi.cam0	camera.ffc	ready-made
W17	wire_22awg_i2c	xiao.pins	pca.header_left	312 mm
W18	stemma_qt	pca.header_right	imu.qt_right	ready-made
W19	stemma_qt	imu.qt_left	ina.header	ready-made
W20	wire_22awg_green	xiao.pins	pca.header_left	312 mm
W21	lcd_cable	lcd.connector	xiao.pins	ready-made
W22	wire_22awg_white	pi.gpio_poweroff	switch.ab	219 mm
W23	lidar_cable	lidar.cable	lidar_adapter.sensor	ready-made
S-FL-hip	servo_lead	servo:FL.hip	front.opening	ready-made
S-FL-hip/power	servo_power	front.opening	wago:front.0.p1	114 mm
S-FL-hip/signal	servo_signal	front.opening	pca:15	147 mm
S-FL-thigh	servo_lead	servo:FL.thigh	front.thigh_base.L	ready-made
S-FL-thigh/power	servo_power	front.thigh_base.L	wago:front.0.p2	80 mm
S-FL-thigh/signal	servo_signal	front.thigh_base.L	pca:11	162 mm
S-FL-calf	servo_lead	servo:FL.calf	front.calf_base.L	ready-made
S-FL-calf/power	servo_power	front.calf_base.L	wago:front.0.p3	50 mm
S-FL-calf/signal	servo_signal	front.calf_base.L	pca:7	188 mm
S-FR-hip	servo_lead	servo:FR.hip	front.opening	ready-made
S-FR-hip/power	servo_power	front.opening	wago:front.1.p1	79 mm
S-FR-hip/signal	servo_signal	front.opening	pca:14	145 mm
S-FR-thigh	servo_lead	servo:FR.thigh	front.thigh_base.R	ready-made
S-FR-thigh/power	servo_power	front.thigh_base.R	wago:front.1.p2	81 mm
S-FR-thigh/signal	servo_signal	front.thigh_base.R	pca:10	154 mm
S-FR-calf	servo_lead	servo:FR.calf	front.calf_base.R	ready-made
S-FR-calf/power	servo_power	front.calf_base.R	wago:front.1.p3	86 mm
S-FR-calf/signal	servo_signal	front.calf_base.R	pca:6	186 mm
S-RL-hip	servo_lead	servo:RL.hip	rear.opening	ready-made
S-RL-hip/power	servo_power	rear.opening	wago:rear.0.p1	71 mm
S-RL-hip/signal	servo_signal	rear.opening	pca:13	90 mm

S-RL-thigh	servo_lead	servo:RL.thigh	rear.thigh_base.L	ready-made
S-RL-thigh/power	servo_power	rear.thigh_base.L	wago:rear.0.p2	78 mm
S-RL-thigh/signal	servo_signal	rear.thigh_base.L	pca:9	152 mm
S-RL-calf	servo_lead	servo:RL.calf	rear.calf_base.L	ready-made
S-RL-calf/power	servo_power	rear.calf_base.L	wago:rear.0.p3	43 mm
S-RL-calf/signal	servo_signal	rear.calf_base.L	pca:5	117 mm
S-RR-hip	servo_lead	servo:RR.hip	rear.opening	ready-made
S-RR-hip/power	servo_power	rear.opening	wago:rear.1.p1	103 mm
S-RR-hip/signal	servo_signal	rear.opening	pca:12	88 mm
S-RR-thigh	servo_lead	servo:RR.thigh	rear.thigh_base.R	ready-made
S-RR-thigh/power	servo_power	rear.thigh_base.R	wago:rear.1.p2	67 mm
S-RR-thigh/signal	servo_signal	rear.thigh_base.R	pca:8	153 mm
S-RR-calf	servo_lead	servo:RR.calf	rear.calf_base.R	ready-made
S-RR-calf/power	servo_power	rear.calf_base.R	wago:rear.1.p3	81 mm
S-RR-calf/signal	servo_signal	rear.calf_base.R	pca:4	117 mm

Wiring list, build order, the XT60 loop-key contact rule and the Raspberry Pi power settings: `docs/electronics.md`. Fuses: main 25.0 A, logic 7.5 A. Servo UBECs at 6.0 V (jumper open) — never 7.4 V.

H · Software: flash, calibrate, walk, train

1 · Flash the motion controller (any computer)

`pipx install platformio` · `cd firmware/strido_esp32s3 && pio run -e xiao_esp32s3 -t upload` (XIAO on USB-C; hold BOOT while plugging in if no port appears).

2 · Bench tools

`uv sync --locked` then `uv run strido-cli --port <port> center` (assembly reference), `… calibrate` (per-joint trim, stored in flash), `… monitor` (battery, IMU, flags).

3 · Raspberry Pi 5

Ubuntu 24.04 or Raspberry Pi OS with Docker. Set `PSU_MAX_CURRENT=5000` (rpi-eeprom-config) and install the udev rules (`ros2/strido_bringup/config/99-strido.rules`). Then `docker compose -f docker/compose.yaml build ros` and `docker compose -f docker/compose.yaml run --rm robot` (MCU bridge, gait, LiDAR).

4 · First stand and walk

Robot on its belly with legs folded → loop key in (servos stay limp) → start the launch (rest pose, 3 s stand-up) → `ros2 run teleop_twist_keyboard teleop_twist_keyboard` . Stop: `/strido/estop` true, or pull the loop key.

5 · Simulate and train

`make sim-walk` (MuJoCo), `make sim-gazebo` (ROS 2 + Gazebo in Docker), `make rl-smoke` / `make rl-train` (PPO), `make ntx-smoke` (NT-X harness). The released policy: `models/policies/ppo-v1/policy.npz` .

> Not yet measured on a built robot: servo response, current draw, runtime. Treat the learned policy as experimental until it is retrained with measured servo dynamics.

I · What was verified

Check	Result
Interference (every solid, 4 poses)	**0 unexplained overlaps**
Screw fits (223 screws) and 32 bearing seats	**86 ok, 137 with a finishing action, 0 fail**
Moving-part clearance (13 operating poses)	**0 fail, 4 tight (< 1 mm), 80 rotational interfaces**
Printability (34 parts, 13 plates sliced in PrusaSlicer)	**0 fail, 4 thin-wall warnings; 1.0 kg, 100 h**
Sensors (5 poses)	**0 LiDAR rays blocked, camera sees 0.0 % robot**
Electronics vs firmware (pins, I²C, servo channels, fuses, wires)	**81 of 81 checks pass**
Wiring harness (reach, stock, hip loops, ports, clearance in every pose)	**173 of 174 checks pass, 1 warn**
Purchasing: every CAD part and fastener in the BOM	**all covered**
Joint limits (method)	range-of-motion sweep with the mirrored partner leg and 0.3 mm clearance (`hardware/joint_limits.yaml`)

CAD, simulation and native firmware tests are not hardware evidence. The verification ledger (`docs/verification.md`) records what ran and its limits.