Build Guide

Everything needed to reproduce a 59-DOF mobile bimanual robot. A fixed core of parts, five decisions you make yourself, and three complete builds.

31 July 2026 · All prices USD · CNY at 1 ¥ = $0.1434 · Every source in this document is a live link

ESSENTIAL BUILD

$8,722.26

Orin Nano Super 8 GB
LD19 lidar, no depth cam

RECOMMENDED BUILD

$9,670.26

Orin NX 16 GB
RPLIDAR C1, MMlove optics

MAXIMUM BUILD

$15,129.30

Jetson Thor 128 GB
D405s, ZED Mini, D435i

How this document works

Sections 1–8 are the core: $8,058.29 of actuators, structure, power and cabling that is identical in every build. Section 8 covers the five choices — compute, wrist cameras, head camera, an optional base depth camera, and the 2D lidar. Those five together range from $663.97 to $7,022.35, a 10.6× spread that accounts for the entire difference between the cheapest and the most expensive way to build this robot.

A note on the Jetson prices in this document

NVIDIA raised the price of every Jetson module and developer kit on 22 July 2026, by between 33% and 101%. The AGX Thor kit went from $3,499 to $5,499 and the Orin Nano Super kit from $249 to $399. This guide uses post-increase pricing throughout. The original MABEL bill of materials totalled $12,969.37 with Thor at $3,500; those same parts today are $14,968.37.

1–8	Bill of Materials	55 line items that never change, with sources
9	Your five choices	Compute, wrist, head, depth camera, lidar
10	Complete builds	Three configurations, priced end to end
A	Machined custom metal parts	Seven cut parts, operations, pricing and quotes
B	Taobao price reference	Verified unit prices, with the order records
12	Cost structure	Where the money goes, build or buy, and what it implies

Bill of Materials

Identical in the Essential, Recommended and Maximum builds. Order all of this first — none of it depends on decisions made later.

Grey text beneath a part name is its specification, and the CNY figure where the item is bought on Taobao. Every entry in the right-hand column is clickable. Filament in section 8 is priced at list — Bambu Lab's standing bulk offer takes 25% off four rolls or more, bringing those seven spools to $120.70 and the core to $8,018.06.

ıtem	Part	Qty	Unit	Extended	Buy from	
1	**Mobile base**					
1.01	REV Swerve Drive Module REV-21-3005	3	$675.00	$2,025.00	revrobotics.com	
1.02	Base sheet metal, lower Custom laser-cut	1	$51.75	$51.75	Custom fabrication	
1.03	Base sheet metal, upper Custom laser-cut	1	$195.36	$195.36	Custom fabrication	
	Mobile base subtotal					**$2,272.11**
2	**Body / torso**					
2.01	FlexiSpot E7 Pro lift column CBR4830MD-E7WS	1	$399.00	$399.00	flexispot.com	
2.02	Lift-to-torso adapter Custom machined	1	$59.26	$59.26	Custom fabrication	
2.03	Torso output plate Custom machined	1	$55.16	$55.16	Custom fabrication	
2.04	Body bottom plate Custom machined	1	$33.55	$33.55	Custom fabrication	
2.05	Arm mounting plate Custom machined	2	$13.17	$26.34	Custom fabrication	
2.06	Neck mounting plate Custom machined	1	$29.05	$29.05	Custom fabrication	
2.07	DAMIAO DM10422P torso actuator Hollow-shaft planetary, dual encoder · ¥1,999.00	1	$286.70	$286.70	Taobao	
	Body / torso subtotal					**$889.06**
3	**Arms — both**					
3.01	DAMIAO DMJ4301 actuator MIT-mode BLDC, dual encoder · ¥599.00	6	$85.91	$515.46	Taobao	
3.02	DAMIAO DMJ4343 actuator DM4340 geared, dual encoder · ¥882.33	4	$126.55	$506.18	Taobao	
3.03	DAMIAO DMJ4341 actuator MIT-mode BLDC module · ¥1,899.00	4	$272.36	$1,089.44	Taobao	
3.04	OpenArm structural set CNC 7075 aluminium + sheet steel · ¥2,699.00	1	$387.10	$387.10	Taobao	

Item	Part	Qty	Unit	Extended	Buy from	
3.05	Arm harness set Pre-made actuator cabling · ¥865.00	1	$124.06	$124.06	Taobao	
	Arms — both subtotal					**$2,622.24**
4	**Hands — both**					
4.01	Feetech HL3915M servo 14 kg-cm, dual-shaft, steel gear, TTL · ¥235.00	32	$33.70	$1,078.54	Taobao	
4.02	Feetech HL3930M servo 35 kg-cm, metal case, dual-shaft, TTL · ¥359.00	2	$51.49	$102.98	Taobao	
4.03	ST/SC bus servo driver board USB-UART TTL debug board · ¥27.65	2	$3.97	$7.93	Taobao	
4.04	Bus servo power distribution board 5264 terminal splitter · ¥18.00	2	$2.58	$5.16	Taobao	
	Hands — both subtotal					**$1,194.61**
5	**Neck / head**					
5.01	Robotis Dynamixel 2XL430-W250-T Dual-axis smart servo	1	$149.39	$149.39	robotshop.com	
5.02	DAMIAO DMJ4301 neck actuator MIT-mode BLDC, dual encoder · ¥599.00	1	$85.91	$85.91	Taobao	
	Neck / head subtotal					**$235.30**
6	**Structural hardware**					
6.01	Aluminium extrusion, cut lengths 2x2 in: 15x2, 17x2, 4.75x3, 8x2 · 2x4 in: 10x1, 12.5x2	1	$101.46	$101.46	mcmaster.com	
6.02	Extrusion 90 degree corner brackets 1010-series, T-slot	1	$26.90	$26.90	amazon.com	
6.03	Extrusion angled plates BLCCLOY 20-set, 1010-series	1	$20.88	$20.88	amazon.com	
6.04	Metric screw assortment Mixed M3-M6	1	$13.99	$13.99	amazon.com	
6.05	Imperial screw assortment For lift column and extrusion	1	$8.99	$8.99	amazon.com	
6.06	Neodymium magnets Panel retention	1	$11.99	$11.99	amazon.com	
	Structural hardware subtotal					**$184.21**
7	**Electronics, power & cabling**					
7.01	SODOLA 6-port 2.5 GbE switch 4x 2.5G-BaseT, 2x 10G SFP+, managed	1	$49.99	$49.99	amazon.com	
7.02	USB expansion board Powered multi-port hub	1	$74.99	$74.99	amazon.com	
7.03	Battery Main pack	2	$46.81	$93.62	amazon.com	

Item	Part	Qty	Unit	Extended	Buy from	
7.04	Ethernet twinax cable SFP+ direct-attach	1	$45.99	$45.99	amazon.com	
7.05	Wi-Fi antenna cable Pigtail extension	2	$17.99	$35.98	amazon.com	
7.06	Power cable, 6XT Main DC run	1	$24.99	$24.99	amazon.com	
7.07	Buck converter, 24 V to 12 V Step-down regulator	1	$18.99	$18.99	amazon.com	
7.08	Speaker + USB sound card 8 ohm 5 W, Jetson/Pi	1	$19.50	$19.50	amazon.com	
7.09	Power cord extension AC mains	1	$16.95	$16.95	amazon.com	
7.10	Fuse box Blade-fuse distribution	1	$15.99	$15.99	amazon.com	
7.11	Raspberry Pi Pico Auxiliary MCU	1	$15.95	$15.95	amazon.com	
7.12	Motor driver Auxiliary DC drive	1	$9.99	$9.99	amazon.com	
7.13	USB-C to USB-A cable Head cam, hands x2, base cam	4	$6.99	$27.96	amazon.com	
7.14	Ethernet patch cable Upper body + mobile base	2	$6.99	$13.98	amazon.com	
7.15	Protective sleeving, 1/2 in Harness loom	2	$8.99	$17.98	amazon.com	
7.16	Protective sleeving, 1/4 in Harness loom	1	$8.99	$8.99	amazon.com	
7.17	Flashlight Inspection / work light	1	$7.99	$7.99	amazon.com	
7.18	Custom PCBs Not yet priced - budget $100-300	1	TBD	TBD	JLCPCB	
7.19	Custom PCB components Not yet priced	1	TBD	TBD	-	
	Electronics, power & cabling subtotal					**$499.83**
8	**3D printed material**					
8.01	Bambu Lab PLA Basic, Jade White 1.75 mm, 1 kg with spool - covers, sensor mounts, trim	4	$22.99	$91.96	bambulab.com	
8.02	Bambu Lab PLA Basic, Black 1.75 mm, 1 kg with spool - ORCA hand structure	2	$22.99	$45.98	bambulab.com	
8.03	Bambu Lab PLA Basic, Light Gray 1.75 mm, 1 kg with spool - accent parts	1	$22.99	$22.99	bambulab.com	
	3D printed material subtotal					**$160.93**
	Core subtotal					**$8,058.29**

Decide these five things

Everything below sits on top of the core. Pick one option from each of the five groups and add them to the core subtotal.

	Choice	Options	Price range	Recommended	Price
9.1	Onboard compute	5	$399.00 – $5,499.00	Orin NX 16 GB	**$1,249.00**
9.2	Wrist cameras (×2)	3	$97.98 – $576.00	MMlove 1200P	**$165.98**
9.3	Head camera	3	$97.99 – $399.00	MMlove stereo	**$97.99**
9.4	Base depth camera	2	$0.00 – $319.72	Omit	**$0.00**
9.5	2D lidar	4	$69.00 – $228.63	RPLIDAR C1	**$99.00**
	Recommended total				**$1,611.97**

9.1 Onboard compute — quantity 1

Option	Unit	Total	vs. rec.	Buy from
NVIDIA Jetson Orin Nano Super Dev Kit ESSENTIAL 8 GB · 67 TOPS · carrier also accepts Orin NX modules	$399.00	$399.00	−$850.00	amazon.com
NVIDIA Jetson Orin NX 8 GB + carrier 8 GB · 117 TOPS · module $649 + ~$250 carrier, est.	$899.00	$899.00	−$350.00	nvidia.com
NVIDIA Jetson Orin NX 16 GB + carrier RECOMMENDED 16 GB · 157 TOPS · module $999 + ~$250 carrier, est.	$1,249.00	$1,249.00	—	nvidia.com
NVIDIA Jetson AGX Orin 64 GB Dev Kit 64 GB · 275 TOPS · emulates every Orin module · 60 W	$3,499.00	$3,499.00	+$2,250.00	amazon.com
NVIDIA Jetson AGX Thor Developer Kit MAXIMUM 128 GB · 2070 TFLOPS · was $3,499 before 22 July 2026	$5,499.00	$5,499.00	+$4,250.00	nvidia.com

Memory, not TOPS, is the binding constraint: the policy, cuVSLAM, Nav2 and every camera stream must be resident at once, and the module is soldered. The Orin Nano Super carrier accepts Orin NX modules, so the $399 kit is also a route to 16 GB later — buy the kit now, swap the module when the policy outgrows it.

Cameras

9.2 Wrist cameras — quantity 2

Option	Unit	Pair	vs. rec.	Buy from
MMlove AR0144 GS-720P-60fps ESSENTIAL 1280x720 @ 60 · global shutter · 170 deg fisheye · no depth	$48.99	$97.98	−$68.00	amazon.com
MMlove AR0144 GS-1200P-90fps RECOMMENDED 1600x1200 @ 90 · global shutter · same board, higher rate	$82.99	$165.98	—	amazon.com
Intel RealSense D405 MAXIMUM 1280x720 @ 90 · global shutter · metric depth 7-50 cm	$288.00	$576.00	+$410.02	digikey.com

The $68 step from 720P to 1200P across the pair is the highest-value spend in this guide. Wrist views carry the fine detail a manipulation policy learns from. Dropping the D405s loses metric depth at the wrist, which most RGB-conditioned policies in the UMI lineage never use.

9.3 Head camera — quantity 1

Option	Unit	Total	vs. rec.	Buy from
MMlove 1200P stereo, 112 deg HFOV RECOMMENDED 3200x1200 @ 60 · global shutter · synced pair · host-side matching	$97.99	$97.99	—	amazon.com
Intel RealSense D435i 1280x720 @ 90 · rolling shutter · depth + IMU	$319.72	$319.72	+$221.73	pcnation.com
Stereolabs ZED Mini MAXIMUM 1280x720 @ 60 · rolling shutter · on-board depth engine + VIO	$399.00	$399.00	+$301.01	stereolabs.com

The ZED Mini gives on-board depth and visual-inertial odometry; the MMlove pair gives raw synchronised stereo and moves matching onto the host, which costs memory on a smaller Jetson. Choosing MMlove for both wrist and head also removes $48.66 of camera-specific cabling — the Micro-B pair and the ZED USB-C run are not needed.

9.4 Base depth camera — optional

Option	Unit	Total	vs. rec.	Buy from
Omit — rely on the 2D lidar RECOMMENDED Nav2 maps and plans from the lidar scan alone	$0.00	$0.00	—	-
Intel RealSense D435i MAXIMUM Adds 3D obstacle detection at the base: overhangs, table edges, low clutter	$319.72	$319.72	+$319.72	pcnation.com

A 2D lidar sees one horizontal plane. It will not see a table edge at torso height, a low pallet, or an overhanging shelf. If MABEL only ever drives across open floor, the lidar alone is enough and this line is $0. If it works around furniture, add the D435i or expect to hand-annotate keep-out zones in the costmap.

2D lidar

9.5 2D lidar — quantity 1

Option	Unit	Total	vs. rec.	Buy from
youyeetoo FHL-LD19 ESSENTIAL DTOF · 12 m · 10 Hz · 4.5 kHz · 30 klux · 50 g · ROS 2 SDK · est.	$69.00	$69.00	−$30.00	amazon.com
Slamtec RPLIDAR C1 RECOMMENDED DTOF · 12 m · 8-12 Hz · 5 kHz · 40 klux · 110 g · est.	$99.00	$99.00	—	amazon.com
youyeetoo FHL-LD19 Plus DTOF · 25 m · 60 klux · IP5X · drop-in LD19 replacement · est.	$99.00	$99.00	—	amazon.com
Slamtec RPLIDAR A2M12 MAXIMUM Triangulation · 12 m · 5-15 Hz · 16 kHz · 190 g · original spec	$228.63	$228.63	+$129.63	amazon.com

All four publish a standard LaserScan and work with slam_toolbox and Nav2 unmodified. The LD19 is a third of the price of the A2M12 and, being direct time-of-flight rather than triangulation, holds its accuracy at range better; the A2M12 wins on sample rate (16 kHz against 4.5 kHz), which matters for fast rotation, not for a robot that drives at walking pace. Prices marked est. are street prices — verify before ordering.

How the lidar and the depth camera divide the work

The lidar does localisation and mapping — it is the sensor slam_toolbox consumes, and no depth camera substitutes for it well. The depth camera does 3D obstacle avoidance in the local costmap. They are not interchangeable, but the depth camera is optional in a way the lidar is not. Every build in this guide includes a lidar; only the Maximum build includes the D435i.

If you are on the smallest compute

On an 8 GB Orin Nano, run the lidar for SLAM and skip the base depth camera. A D435i point cloud into Nav2's voxel layer competes for exactly the memory the policy needs, and it is the first thing you would have to turn off anyway.

Three ways to build MABEL

Each starts from the same $8,058.29 core. The rows below are the five choices.

	Essential	Recommended	Maximum
Core parts, sections 1–8	$8,058.29	$8,058.29	$8,058.29
9.1 Compute	$399.00	$1,249.00	$5,499.00
9.2 Wrist cameras ×2	$97.98	$165.98	$576.00
9.3 Head camera	$97.99	$97.99	$399.00
9.4 Base depth camera	$0.00	$0.00	$319.72
9.5 2D lidar	$69.00	$99.00	$228.63
Camera-specific cabling	$0.00	$0.00	$48.66
Total	**$8,722.26**	**$9,670.26**	**$15,129.30**

ESSENTIAL SAVES

$6,407.04

42% below Maximum
Same mechanism throughout

RECOMMENDED SAVES

$5,459.04

36% below Maximum
16 GB of memory retained

FIXED CORE

$8,058.29

83% of the recommended build
Not reducible by sourcing

Two further configurations

Configuration	When it makes sense	Total
Performance AGX Orin 64 GB, D405 ×2, ZED Mini, D435i, A2M12	For onboard training or large VLA inference	**$13,129.30**
Original MABEL bill of materials As first costed, before the Jetson price rise	Historical reference — Thor was $3,500, and filament was not costed	**$12,969.37**

Not included in any total

Shipping, duties and sales tax; 3D-printed parts and filament; the custom PCBs and their components (budget $100–300 at JLCPCB); labour. Item 3.05, the arm harness, is listed in the original sheet as 865 with no currency — treated here as CNY on the basis of its Taobao link. If it is USD, every total rises by $740.93.

Machined custom metal parts list

The only parts not bought off a shelf. Upload each DXF or STEP to an online sheet-metal service and select the operations below. Quotes are 5052 H32 aluminium, 0.080 in (2.0 mm).

Hardware insertion means PEM nuts or standoffs pressed in at the fabricator; tapping means threaded holes cut there rather than on your bench; dimple forming raises a shallow boss for fastener clearance.

Item	Part and operations	Qty	Unit	Extended
1.02	**Base sheet metal, lower** Laser cutting only — no secondary operations	1	$51.75	**$51.75**
1.03	**Base sheet metal, upper** 4 bends · dimple forming · hardware insertion · tapping	1	$195.36	**$195.36**
2.02	**Lift-to-torso adapter** 2 bends · dimple forming · hardware insertion · tapping	1	$59.26	**$59.26**
2.03	**Torso output plate** 1 bend · hardware insertion · tapping	1	$55.16	**$55.16**
2.04	**Body bottom plate** 2 bends · hardware insertion · tapping	1	$33.55	**$33.55**
2.06	**Neck mounting plate** 2 bends only	1	$29.05	**$29.05**
2.05	**Arm mounting plate** Hardware insertion · tapping	2	$13.17	**$26.34**
	One complete set			**$450.47**

Volume pricing — the case for a group buy

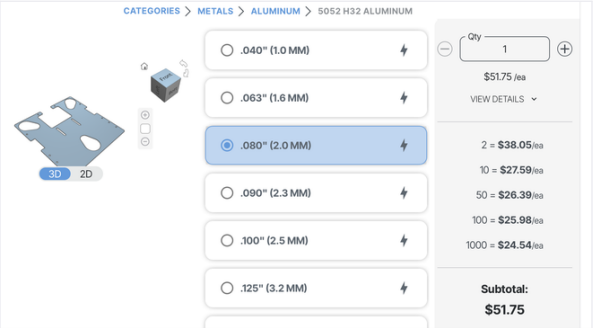
Part	×1	×2	×10	×50	×100	×1000
Base sheet metal, lower	$51.75	$38.05	$27.59	$26.39	$25.98	$24.54
Base sheet metal, upper	$195.36	$156.42	$112.94	$97.49	$88.30	$85.82
Lift-to-torso adapter	$59.26	$40.69	$28.93	$25.15	$22.42	$17.99
Torso output plate	$55.16	$36.62	$25.70	$22.77	$21.87	$19.29
Body bottom plate	$33.55	$22.29	$15.73	$12.81	$11.44	$8.97
Neck mounting plate	$29.05	$19.21	$13.86	$10.93	$9.74	$7.60
Arm mounting plate	$13.17	$13.17	$9.42	$7.56	$6.64	$5.26
Full set per robot	**$450.47**	**$339.62**	**$243.59**	**$210.66**	**$193.03**	**$174.73**

A single set costs $450.47. Ten sets cost $243.59 each — a 46% reduction, because setup and tooling dominate at quantity one — the easiest saving in the whole build for a lab making more than one. It is also why the upper base plate costs nearly four times the lower one at similar size: four bends, dimpling, insertion and tapping against a plain laser cut.

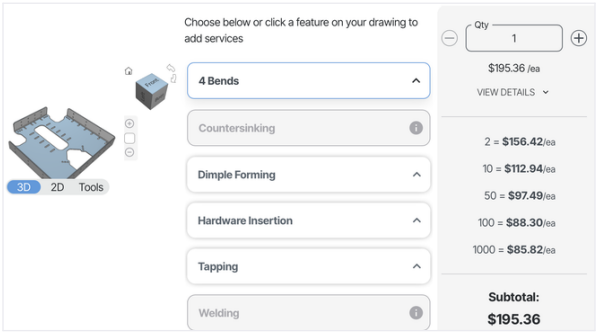
Fabrication quotes

The quote behind every line on the previous page: part geometry, the operations selected, and the price at quantity one alongside the volume breaks.

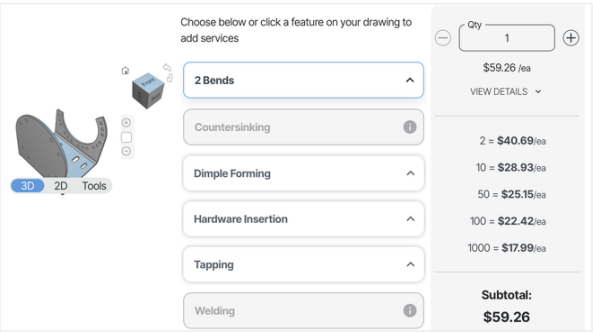
1.02 Base sheet metal, lower — $51.75



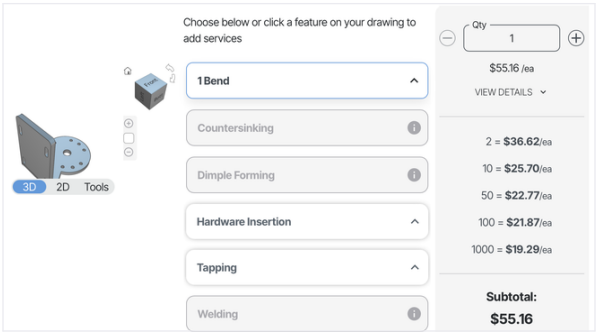
1.03 Base sheet metal, upper — $195.36



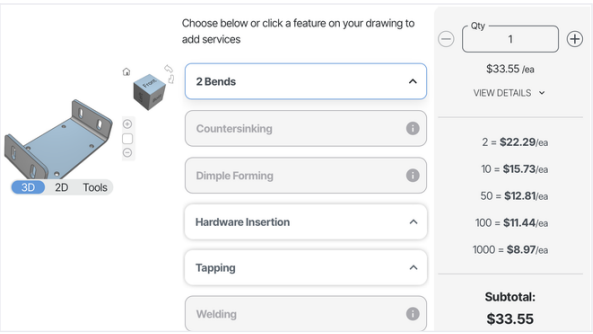
2.02 Lift-to-torso adapter — $59.26



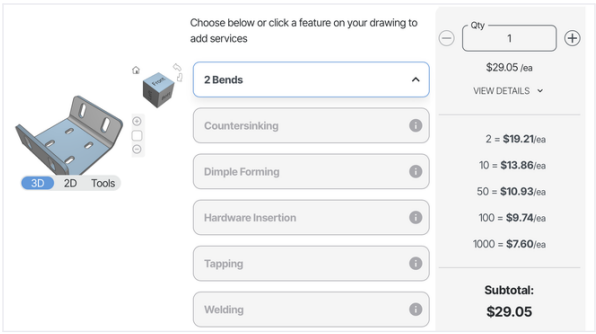
2.03 Torso output plate — $55.16



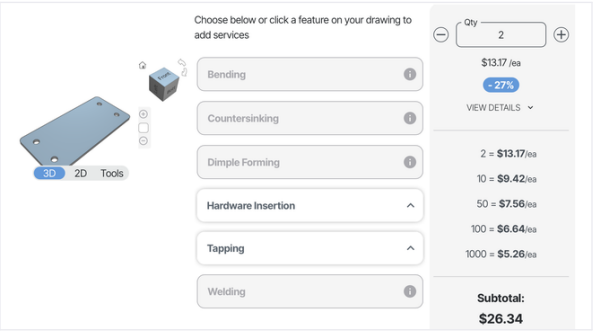
2.04 Body bottom plate — $33.55



2.06 Neck mounting plate — $29.05



2.05 Arm mounting plate x2 — $13.17



Verified unit prices

Every Taobao line in the parts list, with the price actually paid. Model numbers are the strings to search on — listing URLs expire, model numbers do not.

Unit prices only — quantities for a build are in Sections 2–5 of the parts list.

Item	List	Paid	USD	Parts list
DAMIAO FOCGM43 joint module MIT驱动无刷伺服机械臂机器人达妙科技关节模组电机FOCGM43减速双编 Motor with integrated driver · v1.1 (V3)	¥650.00	**¥599.00**	$85.91	3.01, 5.02
DAMIAO DM4340 joint motor MIT驱动无刷伺服机械臂机器人达妙科技关节电机DM4340减速双编码器 Motor with integrated driver · 9 N·m rated	¥899.00	**¥882.33**	$126.55	3.02
DAMIAO DM8009P joint module DM8009P 无刷MIT驱动伺服机械臂机器人达妙科技关节模组电机双编 Motor with integrated driver · V4	¥2,529.00	**¥1,899.00**	$272.36	3.03
DAMIAO DM10422P torso actuator DM10422P 双电感编码器高精度中空行星减速关节电机模组 Motor with built-in dual inductive encoder	—	**¥1,999.00**	$286.70	2.07
OpenArm structural set 现货openarm机械臂结构件 定做cnc零件钣金不锈钢 7075铝合金加工 Dual-arm structural set · CNC 7075 + stainless	—	**¥2,699.00**	$387.10	3.04
OpenArm harness set openarm线束、openarm 结构件可开票 线束优化 Harness + hub + e-stop + power adapter board + PSU	—	**¥865.00**	$124.06	3.05
Feetech HL3915M servo 飞特HL3915M力控全金属钢齿14KG双轴灵巧手机械臂TTL总线串口舵机 HL-3915-C001 · 12 V · 14 kg-cm · dual-shaft	—	**¥235.00**	$33.70	4.01
Feetech HL3930M servo 飞特HL3930M恒力金属外壳35KG大扭矩双轴机械臂机器人TTL串口舵机 HL-3930-C001 · 12 V · 35 kg-cm · dual-shaft	—	**¥359.00**	$51.49	4.02
ST/SC bus servo TTL driver board 灵影ST/SC系列飞特总线舵机TTL驱动板USB调试UART接口控制调试板 Bundle 1: TTL Adopter (A)	¥28.00	**¥27.65**	$3.97	4.03
ST/SC 5264 splitter board 灵影ST/SC系列5264端子分线器分组供电飞特总线舵机TTL分线板 TTL-5264 8P Hub (A)	—	**¥18.00**	$2.58	4.04

Three lines were bought below list. The DM8009P is the one worth knowing about: ¥1,899 against a ¥2,529 list price, a 25% discount that is worth $90.38 per motor and $361.52 across the four the arms need. The DM4340 came in at ¥882.33 against ¥899 and the TTL board at ¥27.65 against ¥28.00. DAMIAO pricing moves, so treat these as what was achievable rather than guaranteed.

USD figures use 1 ¥ = $0.1434, the rate implied by the parts list's own line reading 599 ¥ = $85.91. If the rate has moved, rescale all ten lines above together — the Amazon, DigiKey, McMaster and Stereolabs lines are unaffected.

Price provenance

The order records behind every figure on the previous page, as captured. Prices are shown as paid, with the struck-through list price where one applied.

Cropped to the listing title, specification and price. The purchase quantity visible in each record is order history, not the quantity a MABEL build needs.

3.01 / 5.02 **DAMIAO FOCGM43 joint module** — **¥599.00**



MIT驱动无刷伺服械臂机器人达妙科技关节模组电机FOCGM43减速双编 [交易快照] — ¥599.00 ~~¥650.00~~ x4
电机（含驱动）;v1.1（V3）
极速退款 7天无理由退货

3.02 **DAMIAO DM4340 joint motor** — **¥882.33**



MIT驱动无刷伺服械臂机器人达妙科技关节电机DM4340减速双编码器 [交易快照] — ¥882.33 ~~¥899.00~~ x6
电机（含驱动）
7天无理由退货

3.03 **DAMIAO DM8009P joint module** — **¥1,899.00**



DM8009P 无刷MIT驱动伺服械臂机器人达妙科技关节模组电机双编 [交易快照] — ¥1899.00 ~~¥2529.00~~ x4
电机（含驱动）;V4
极速退款 7天无理由退货

3.04 **OpenArm structural set** — **¥2,699.00**



现货openarm机械臂结构件 定做cnc零件钣金不锈钢 7075铝合金加工 [交易快照] — ¥2699.00 x1
双臂结构件（现货）
退货宝 7天无理由退货

3.05 **OpenArm harness set** — **¥865.00**



openarm线束、openarm 结构件可开票 线束优化 [交易快照] — ¥865.00 x1
线束+集线器+急停开关+电源转接板+电源适配器
不支持7天无理由

4.01 **Feetech HL3915M servo** — **¥235.00**



飞特HL3915M力控全金属钢齿14KG双轴灵巧手机械臂TTL总线串口舵机 [交易快照] — ¥235.00 x18
HL-3915-C001(12V14KG);HL3915M
退货宝 极速退款 7天无理由退货

4.02 **Feetech HL3930M servo** — **¥359.00**



飞特HL3930M恒力金属外壳35KG大扭矩双轴机械臂机器人TTL串口舵机 [交易快照] — ¥359.00 x1
HL-3930-C001(12V35KG);HL3930
退货宝 极速退款 7天无理由退货

4.03 **ST/SC bus servo TTL driver** — **¥27.65**



灵影ST/SC系列飞特总线舵机TTL驱动板USB调试UART接口控制调试板 [交易快照] — ¥27.65 ~~¥28.00~~ x2
套餐1：TTL Adopter(A)
极速退款 7天无理由退货

4.04 **ST/SC 5264 splitter board** — **¥18.00**



灵影ST/SC系列5264端子分线器分组供电飞特总线舵机TTL分线板 [交易快照] — ¥18.00 x7
TTL-5264 8P Hub(A)
极速退款 7天无理由退货

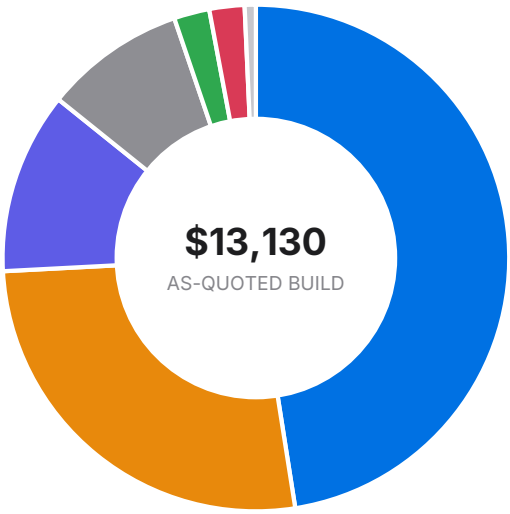
2.07 **DAMIAO DM10422P torso actuator** — **¥1,999.00**



DM10422P 双电感编码器高精度中空行星减速关节电机模组具身智能 [交易快照] — ¥1999.00 x1
电机（内置电感双编）
极速退款 7天无理由退货

Where the money goes

The as-quoted build, regrouped by what each part does rather than where it bolts on. Actuation covers every joint motor, hand servo and swerve drive module; structure includes the filament.



Actuation	$6,238.60	**47.5%**
Compute	$3,500.00	**26.7%**
Perception	$1,523.35	**11.6%**
Structure	$1,182.71	**9.0%**
Data & connectivity	$297.55	**2.3%**
Power & wiring	$294.60	**2.2%**
Control & misc	$93.49	**0.7%**

The ten most expensive line items

Part	Qty	Extended	Share
Jetson AGX Thor Developer Kit	×1	**$3,500.00**	26.7%
REV Swerve Drive Module	×3	**$2,025.00**	15.4%
DAMIAO DMJ4341 actuator	×4	**$1,089.44**	8.3%
Feetech HL3915M servo	×32	**$1,078.54**	8.2%
Intel RealSense D405	×2	**$576.00**	4.4%
DAMIAO DMJ4301 actuator	×6	**$515.46**	3.9%
DAMIAO DMJ4343 actuator	×4	**$506.18**	3.9%
FlexiSpot E7 Pro lift column	×1	**$399.00**	3.0%
Stereolabs ZED Mini	×1	**$399.00**	3.0%
OpenArm structural set	×1	**$387.10**	2.9%

These ten lines carry $10,475.72 — 79.8% of the as-quoted build. The other 48 items total $2,654.58.

Build or buy

Actuators are the most expensive thing in this robot. Buying them at source rather than inside a finished product is the decision that makes MABEL affordable.

Arms — 14 DOF, both sides

Option	Both arms	Per arm	vs. MABEL
MABEL, built from source motors 7 DOF/arm · 6.0 kg peak · DAMIAO 8009P, 4340, 4310	**$2,622.24**	$1,311.12	—
OpenArm 2.0 assembled, delivered US Same arm, same motors · $6,000 kit + $480 air freight	**$6,480.00**	$3,240.00	+147%
OpenArm 2.0 online + ZED top camera Card checkout price, camera package included	**$7,300.00**	$3,650.00	+178%
AgileX PiPER ×2 6 DOF/arm · 1.5 kg payload · $2,499 each	**$4,998.00**	$2,499.00	+91%

MABEL's arms are an OpenArm, built from the same DAMIAO motors the official product uses — 8009P at the shoulder, 4340 through the upper arm and elbow, 4310 at the wrist. The licensed manufacturer sells the finished bimanual system for $6,000 plus $480 US air freight. Sourcing the identical motors and CNC set directly costs $2,622.24, 59.5% less. The premium buys factory assembly, a moulded industrial harness, a flight case, a two-finger gripper with RGB camera, CE and UKCA paperwork and a one-year warranty — not more capability.

Against commercial arms in the same class the gap is starker. Two AgileX PiPER arms cost $4,998 for 6 DOF and 1.5 kg payload each. MABEL's pair costs 47.5% less, carries one more DOF per arm, and lifts four times the load.

Hands — both sides

Option	Both hands	Per hand	vs. MABEL
MABEL, Feetech bus servos 34 servos + driver boards · actuators and electronics only	**$1,194.61**	$597.30	—
ORCA hand, self-built to the ETH BOM 17 DOF/hand · full material cost, under CHF 2,000 each	**$4,915.00**	$2,457.50	+311%
orcahand, ORCA Dexterity 17 DOF/hand · assembled · $3,500 each	**$7,000.00**	$3,500.00	+486%
orcahand touch, ORCA Dexterity 17 DOF/hand · tactile on all five digits · from $6,100 each	**$12,200.00**	$6,100.00	+921%
Allegro Hand 16 DOF/hand · direct-drive · about CHF 15,000 each	**$36,861.00**	$18,430.50	+2,986%

These are not like-for-like and should not be quoted as though they are. MABEL's $1,194.61 is actuators and driver boards; ORCA's CHF 2,000 is a complete material cost including printed structure, tendons, bearings, fasteners and tactile sensors. Adding MABEL's printed parts and hardware would plausibly land near $800–1,000 per hand — still under half the ORCA material cost and a fifth of the assembled price, but the defensible comparison is actuators to actuators.

What this means for the build

Actuation dominates, and that is structural

Actuation — every joint motor, hand servo and swerve drive module — is $6,238.60, or 47.5% of the as-quoted build, the largest category by a wide margin. Cost scales with degrees of freedom and no sourcing decision changes it, which puts a floor near $6,000 under any version of this robot whatever you do to compute and cameras. Within that, the 14 arm actuators average $150.79 each and the 34 hand servos $34.75. The hands carry most of MABEL's degrees of freedom for 9.0% of its cost — worth saying plainly in the paper, because dexterity is not what makes this robot expensive.

Compute is the only line that moves by an order of magnitude

One item at $3,500 as quoted, $5,499 today, is 27% of the build — more than every actuator in both arms and both hands combined ($3,292.60). It is also the only category that can fall tenfold without touching the mechanism — and the only one that is a single soldered decision, made once, with no way back.

Sensing is the most flexible money in the build

$1,523.35 as specced against $362.97 in the Recommended build and $264.97 in the Essential — reductions of 76% and 83%. Sensing is the only category made of four independent decisions rather than one, and each can be taken on its own: dropping the base depth camera saves $319.72, the head camera $301.01 against a synchronised MMlove stereo pair, the wrist pair up to $478.02, and the lidar $159.63. None of it is soldered. Every sensor here is a USB or serial part on an external mount, so a lab can start at the Essential tier and upgrade one position at a time without touching the structure, the loom or any software interface.

Everything else is noise

Batteries are $93.62. Power and wiring, data and connectivity, and control and miscellany together are 5.2% of the build, and there is no saving to find there. The real power question is headroom rather than cost: AGX Orin at 60 W, and Thor well above it, would force a battery redesign that appears nowhere in this guide.

Where to start

The Recommended build at $9,670.26 keeps the 16 GB of memory that decides what policies run onboard and spends nothing on sensing you are unlikely to use. The Essential build at $8,722.26 is a genuine working robot rather than a stripped one — the mechanism is identical, and every difference is a sensor or a compute tier that can be upgraded later without touching the structure.

Sources for the comparison figures

OpenArm pricing, specification and shipping table from the licensed manufacturer's product page, July 2026. PiPER at $2,499 from AgileX press coverage. ORCA material cost from the IROS 2025 paper (arXiv 2504.04259), which states under CHF 2,000; commercial orcahand pricing from ORCA Dexterity's March 2026 launch. The Allegro comparison is taken from the ORCA paper's own related-work discussion. CHF converted at 1 CHF = $1.2287, the rate on 29 July 2026.