

QS-100 sensor housing

Prepared by: Daniel Z Schneider · Oct 12, 2026

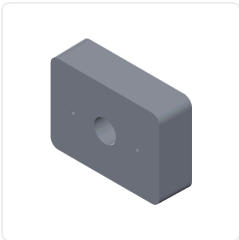
Material: Aluminum 6061-T6

Process: CNC 3-Axis Milling

Region: United States

Annual volume: 500

Grade: B



Cost position

SHOULD-COST / UNIT (EX-WORKS)

18.96 USD

Grade B · Worked out from the part's CAD by the physics engine.

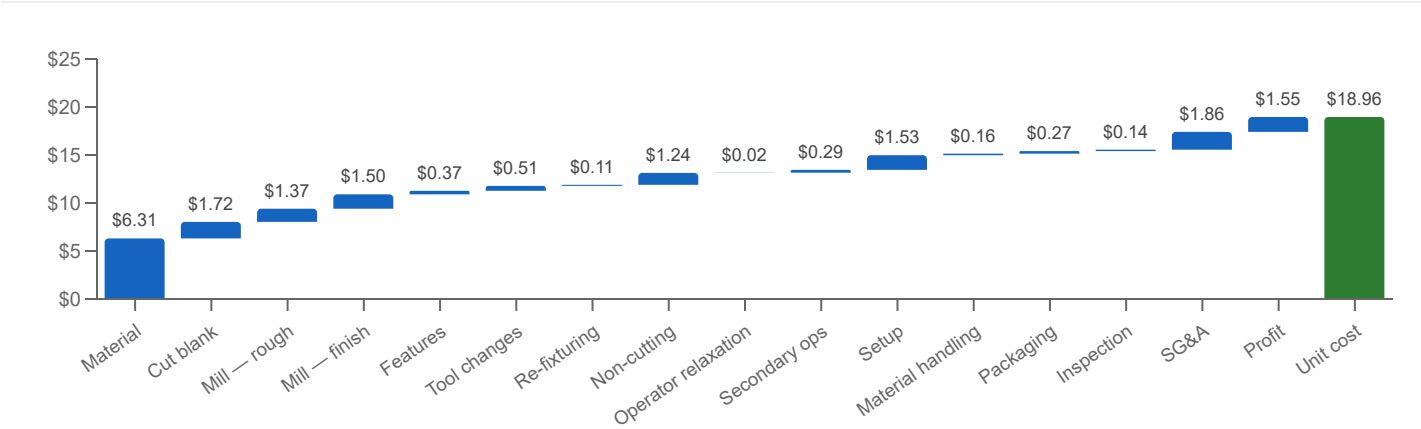
From an efficient to a struggling shop: 18.61 USD to 20.34 USD

Lowest achievable, best practice throughout: 18.16 USD

Manufacturing summary — how it's made

MACHINE Haas VF-2		CYCLE TIME 13.9 min	OUTPUT 4 pc/hr
SETUPS / FIXTURES 2	LOAD/UNLOADS (PER PART) 2		

Cost build-up



Cost bucket	Amount (USD)	% total
Material	6.31	33.3
Processing & labour	8.83	46.6
Quality & packaging	0.41	2.2
Commercials (SG&A + profit)	3.41	18.0
Fully-burdened should-cost	18.96	100.0

Region comparison (same part, same process)

Made in	Ex-works (USD)	Freight + duty	Landed	Landed vs source
United States	18.96	0.46	19.42	source
China	6.80	6.88	13.68	-29.5%
Mexico	8.67	8.74	17.40	-10.4%
Southeast US	18.19	0.67	18.86	-2.9%
Germany	19.96	15.53	35.49	82.8%

Ex-works is the price at the factory gate, the same basis as the should-cost above. Landed adds the freight to the ship-to and any import duty, so countries compare like for like.

Cost breakdown (detailed)

Cost line	With overhead (USD)	% total	Time / qty	Note
Material	6.31	33.3	0.924 kg	1
Cut blank	1.72	9.1	—	2
Mill — rough	1.37	7.2	3.8 min	3
Mill — finish	1.50	7.9	4.2 min	4
Features (drill / tap / mill)	0.37	1.9	0.944 min	5
Tool changes	0.51	2.7	1.4 min	6
Re-fixturing	0.11	0.6	0.333 min	7
Non-cutting (rapids / approach)	1.24	6.6	3.5 min	8
Operator relaxation (ILO)	0.02	0.1	0.021 min	9
Secondary ops	0.29	1.5	0.33 min	10
Setup	1.53	8.1	1.8 hr/batch	11
Material handling (load / unload)	0.16	0.8	0.1 min/part	12
Packaging	0.27	1.4	0.269 USD/part	13
Inspection	0.14	0.8	0.144 USD/part	14
SG&A	1.86	9.8	—	
Profit	1.55	8.2	—	
Unit cost	18.96			

Each line includes its share of factory overhead and scrap, so it is larger than the same step's direct cost in the routing table below. The **Note** column points to how each line was worked out, in the Calculation appendix at the back.

Cycle time (13.9 min)

Step	Time	% of cycle
■ Mill — rough	3.8 min	27.5
■ Mill — finish	4.2 min	30.0
■ Features (drill / tap / mill)	56.6 s	6.8
■ Finish-bore pass (machined)	5.16 s	0.6
■ Tool changes	85.5 s	10.2
■ Non-cutting (rapids / approach)	3.5 min	24.9
Cycle per shot	13.9 min	100.0
Operator relaxation (ILO) (off the machine clock)	1.25 s	—

Per-part cycle; 4 pc/hr. The cycle is the machine's own time on the part: cutting, moving between cuts and changing tools. In all, the machine is tied up for 14.3 min per part, because it also waits while the part is loaded, flipped and unloaded (the Machine Burden lines below). The machine cost is priced on those 14.3 min.

Manufacturing routing (selected)

#	Operation	Stage	Time / part	Direct cost (USD)
1	35 mm plate, 85x115 mm sawn	Stock	—	6.31
2	Cut blank	Prep	—	1.05
3	Mill — rough	Primary	3.8 min	0.84
4	Mill — finish	Primary	4.2 min	0.92
5	Features (drill / tap / mill)	Primary	61.8 s	0.23
6	Tool changes	Machine	85.5 s	0.31
7	Re-fixturing	Machine	—	0.07
8	Non-cutting (rapids / approach)	Machine	3.5 min	0.76
9	Operator relaxation (ILO)	Allowance	1.25 s	0.01
10	Secondary ops	Primary	—	0.18
11	Setup	Setup	—	0.93
12	Material handling (load / unload)	Handling	—	0.10
13	Packaging (\$0.27/part)	Packaging	—	0.27
14	Inspection (20/100 sampled)	Inspection	per lot	0.14
15	Freight → United States	Logistics	—	in freight line
16	Finish-machined (1 feature)	Added	—	0.01
17	Aqueous wash	Clean	—	0.01
Routing steps subtotal (time on and off the machine)			13.9 min	12.13
Overhead, SG&A, profit & other part-level costs — see Cost build-up				6.83
Fully-burdened should-cost				18.96

Each row is that step's own direct cost: the stock row is the material, the operations their machine, labour and setup. Time is shown per part; the subtotal includes steps off the machine (such as sawing the blank), so it is longer than the machine cycle above. Stock, per-lot inspection and packaging aren't timed per part and stay out of it. Overhead, SG&A and profit are part-level, itemised in the Cost build-up above, so the table foots to the same fully-burdened should-cost.

Manufacturing detail

Machine(s)	Haas VF-2
Setups / fixtures	2
Cutting tools	end mill (roughing), drill, tap
Load/unloads (per part)	2
Stock form	35 mm plate, 85x115 mm sawn

Process expansion (sub-step build-up)

Operation / step	Time / qty	Amount (USD)	% of element	Note
Material	0.924 kg	6.31	100.0	
Net material	0.924 kg	6.16	97.6	15
Inbound freight (2%)	2 %	0.15	2.4	16
Direct Labor	0.62 min	0.55	100.0	
Roughing (drawn toolpath)	3.82 min	0.07	12.9	17
Finishing (drawn toolpath)	4.17 min	0.08	14.1	18
Feature processing	0.944 min	0.02	3.2	19
Tool changes (19×)	1.43 min	0.03	4.8	20
Load/unload (2× setup)	—	0.00	0.0	21
Finish-bore pass (machined)	0.086 min	0.00	0.3	22
Non-cutting (rapid/approach/scan, decomposed)	3.47 min	0.06	11.7	23
Operator relaxation (ILO)	0.021 min	0.01	2.4	24
Deburr (cross-bore + edges)	0.33 min	0.18	32.7	25
Forklift in (raw material)	0.1 min/part	0.05	9.9	26
Forklift out (finished goods)	0.08 min/part	0.04	7.9	27
Machine Burden	14.3 min	3.92	100.0	
Roughing (drawn toolpath)	3.82 min	0.77	19.6	17
Finishing (drawn toolpath)	4.17 min	0.84	21.4	18
Bought cut blank (service centre)	—	1.05	26.9	28
Feature processing	0.944 min	0.19	4.8	19
Tool changes (19x)	1.43 min	0.29	7.3	29
Load/unload (2× setup)	0.333 min	0.07	1.7	30
Finish-bore pass (machined)	0.086 min	0.02	0.4	22
Non-cutting (rapid/approach/scan, decomposed)	3.47 min	0.70	17.7	23
Parts wash (aqueous)	100 parts/basket	0.01	0.2	31
Setup	0.0178 hr/part (1.78 hr over 100 parts)	0.93	100.0	
Labor (setup time)	1.78 hr/batch	0.72	77.1	32
Machine (setup time)	1.78 hr/batch	0.21	22.9	33
Programming (CAM)	0.0579 min/part (86.9 min over 1,500 parts)	0.04	100.0	
CAM setup (import, stock, work offset, post)	10 min (one-time)	0.00	11.5	34
Planning (read the drawing, choose the process)	39.9 min (one-time)	0.02	45.9	35
Build and check each operation	35.1 min (one-time)	0.01	40.4	36
3D model preparation for surface toolpaths	1.85 min (one-time)	0.00	2.1	37
Perishable Tooling	1 x AI wear	0.61	100.0	
Perishable tooling	15.3 machine-min	0.32	52.8	38
Soft jaws (flip op 2)	1 pair/batch	0.29	47.2	39
Overhead	17.8 min occupied	2.44	100.0	

Operation / step	Time / qty	Amount (USD)	% of element	Note
Supervision (people)	0.2 x labour	0.24	9.9	40
Engineering, inspection, toolroom (machine time)	17.8 min	2.20	90.1	41
Scrap	2.3 % value-add	0.34	100.0	
Scrap allowance	2.25 %	0.34	100.0	42
Packaging	0.269 USD/part	0.27	100.0	
Primary poly bag / wrap	0.035 m2 film	0.05	17.0	43
Primary pack labor + overhead	13 s/unit	0.16	59.0	44
Secondary master carton (distribution)	70 parts/carton	0.06	22.6	45
Secondary pack labor (distribution)	20 s/carton	0.00	0.9	46
Tertiary pallet + stretch wrap (distribution)	2,800 parts/pallet	0.00	0.5	47
Inspection	0.144 USD/part	0.14	100.0	
Hand gauge (caliper / micrometer / pin): 1 characteristic	5.2 min/lot	0.03	19.0	48
First-article / start-up inspection	1 parts/lot	0.00	0.0	49
Inspection setup / reporting	15 min/lot	0.12	81.0	50
SG&A	12 % mfg cost	1.86	100.0	
SG&A rate	12 %	1.86	100.0	51
Profit	10 % mfg cost	1.55	100.0	
Markup on cost (profit)	10 %	1.55	100.0	52
Freight	0.251 kg	0.46	100.0	
Line-haul (parcel, 255 km)	—	0.37	80.6	53
fuel surcharge	—	0.09	19.4	54

Each element foots to the should-cost in the Cost build-up above — expansion is a decomposition of the same dollars and adds no cost. The **Note** column keys each step to its full derivation and sources in the Calculation appendix at the back.

Technical specification

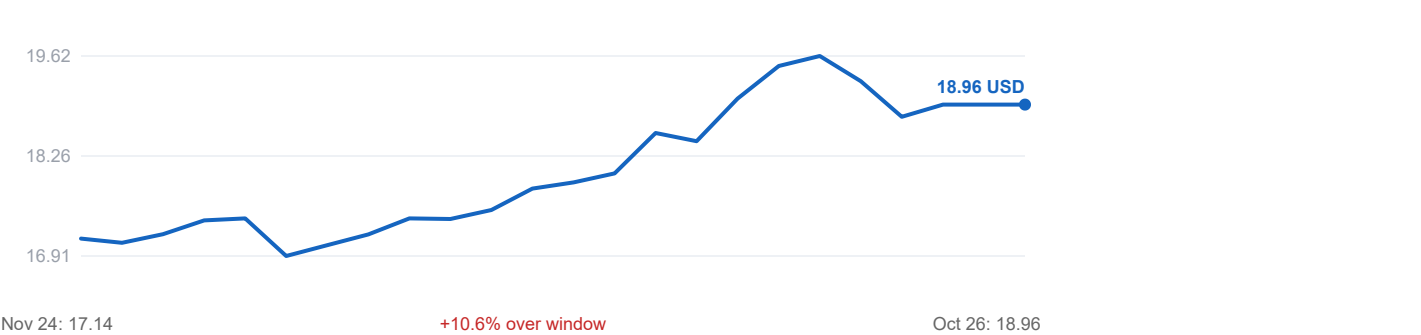
Material	Aluminum 6061-T6
Tolerance	ISO-2768-m
Bounding dimensions	110 × 80 × 32 mm
Wall thickness	—
Surface area	42,046.6 mm²
Feature count	13
Net part volume	87.4 cm³
Removal volume	194.2 cm³
Stock form	35 mm plate, 85x115 mm sawn

Per-face machining cost (VAVE)

Roughing (bulk)	0.84 USD / 3.8 min
Finishing	0.92 USD / 4.2 min
Drilling	0.09 USD / 0.4 min

Face #	Finishing route	Area (cm²)	Cost (USD)
33	flat→face(endmill)	58.6	0.04
9	drill	—	0.03
10	drill	—	0.03
11	drill	—	0.03
28	drill	—	0.03
36	drill	—	0.03
35	drill	—	0.03
37	drill	—	0.03

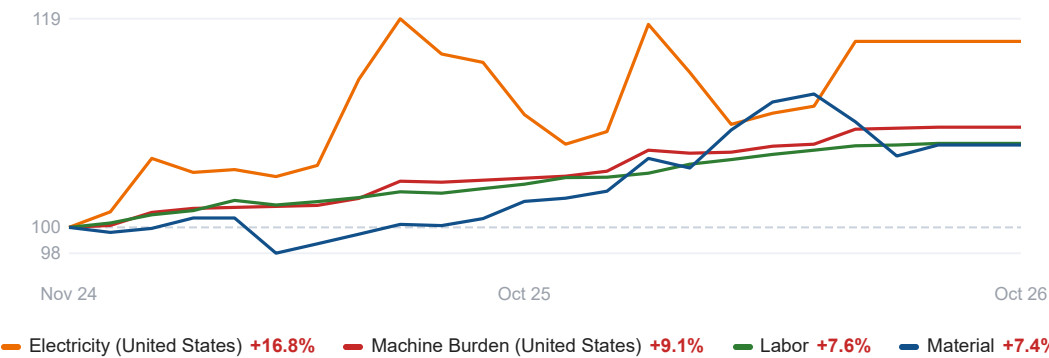
Should-cost history (24 months)



Month	Should-cost (USD)	Month	Should-cost (USD)
Nov 24	17.14	Nov 25	17.90
Dec 24	17.09	Dec 25	18.03
Jan 25	17.21	Jan 26	18.58
Feb 25	17.39	Feb 26	18.46
Mar 25	17.42	Mar 26	19.04
Apr 25	16.91	Apr 26	19.48
May 25	17.05	May 26	19.62
Jun 25	17.20	Jun 26	19.28
Jul 25	17.42	Jul 26	18.79
Aug 25	17.41	Aug 26	18.96
Sep 25	17.53	Sep 26	18.96
Oct 25	17.82	Oct 26	18.96

Each month's should-cost is the booked estimate with its input prices rewound to that month's actual rates — material x us_aluminum_midwest (US aluminium domestic — imf_aluminum + CME Midwest premium (\$/kg)), labor x bls_oews_cnc_operator (US CNC tool operator burdened hourly wage (SOC 51-9161, derived from bls_oews_machinist)), machine capital x PCU33353335 (PPI: Metalworking Machinery Manufacturing (NAICS 3335) — machine tool / press deflator), quality labor x bls_oews_cnc_operator (US CNC tool operator burdened hourly wage (SOC 51-9161, derived from bls_oews_machinist)); consumable_tooling, packaging, programming kept flat (no monthly index available). Scrap, overhead, SG&A and profit scale with those. The line is anchored so the latest month equals today's should-cost.

Why the should-cost moved



Each input price indexed to 100 at the window start (Nov 24); a line above 100 is an input that got dearer. How far a line moves is not how much it moved the should-cost; that depends on the input's share of the cost. Should-cost change over the window: **+\$1.32**, of which **Material** +\$0.44, **Machine Burden** +\$0.31, **Overhead** +\$0.17.

Sources & methodology

Input series	Value	Source	Confidence
US CNC tool operator burdened hourly wage (SOC 51-9161, derived from bls_oews_machinist) bls_oews_cnc_operator	37.0517 USD/hr	BLS Current Employment Statistics	Medium
Machine Rate v2_machine_rate	12.0402 USD/hr	Haas VF-2 machine rate; \$65,000 OEM-published capex, straight-line depreciation + floor space + energy + maintenance (3150 billable hr/yr; energy series EIA_IND_ELECTRICITY_US); incl. robot machine-tending cell \$6.62/hr (\$115,000 cell, 12 yr)	Medium
US industrial electricity price (EIA, national average) EIA_IND_ELECTRICITY_US	9.17 cents/kWh	U.S. Energy Information Administration	High
US aluminium domestic — imf_aluminum + CME Midwest premium (\$/kg) us_aluminum_midwest	5.301 USD/kg	Imf_aluminum (IMF PCPS global spot) + CME Aluminum MW U.S. Transaction Premium Platts (AUP) futures settlement ~\$2.05/kg (2026-08-28); public exchange number, additive to imf_aluminum (BA_REPLACEMENT_OPEN_DATA_LEVELS \$5.4.11)	Medium
Plate Saw Rate v2_plate_saw_rate	5.25 USD/hr	Marvel Spartan PS2828/10 machine rate; \$84,500 market-estimate capex, straight-line depreciation + floor space + energy + maintenance (3150 billable hr/yr; energy series EIA_IND_ELECTRICITY_US)	Medium
Grade B	Worked out from the part's CAD by the physics engine.		
As of	Oct 12, 2026		

Terms used

- Ex-works:** the price at the supplier's door. It includes getting the raw material to the supplier; it leaves out shipping the part to you and import duty
- Landed:** the ex-works price plus shipping to you and import duty
- Program volume:** one-time costs such as CAM programming are spread over the yearly volume times the years the program runs
- Markup on cost:** the supplier's profit as a % of its cost, not of the selling price: a 10% markup is 9.1% of the price
- Direct cost:** the machine, labour and setup a step uses, before overhead
- With overhead:** a cost line plus its share of factory overhead and scrap
- SG&A:** the supplier's selling, general and administrative costs
- Rest allowance (ILO):** the operator's rest and personal time, from the International Labour Organization's work-study tables
- IT5 to IT7:** ISO 286 tolerance grades; a lower number is a tighter tolerance
- MH29, MH31:** Machinery's Handbook, 29th and 31st editions, cited by page

Calculation appendix — notes & sources

How each line was worked out, numbered to match the Note column of the Cost breakdown and the Process expansion. Source references are shown in grey so the working reads first. Every cost line includes its share of factory overhead and scrap.

COST NODES

1	Material Kalpakjian & Schmid; us_aluminum_midwest \$5.301/kg × 1.00 grade factor (United States)
2	Cut blank Bought cut to size: \$1.05 = the cut on a Marvel Spartan PS2828/10 (\$0.75) / (1 - 28.7% Reliance FY2025 10-K gross margin); cheaper than in-house \$1.23 + \$0.4750/part remainder (179.21 kg off 194/294 unused blank(s) on 1 plate(s) bought for the 100-part run, \$47.50/run): carrying (carry \$47.50/run @ 25%/yr APICS/ASCM x 0.20 yr held vs scrap \$484.48/run @ 51% of value lost). 2 x 5.4 in2 / 6.7 in2/min = 1.62 min cut + 0.51 handling = 2.13 min machine, 0.92 min operator (semi-auto, cut at 25%). 250 fpm capped, 4/6 blade, 1 plate = 260 blanks. MH31 p.1243.
3	Mill — rough Drawn toolpath
4	Mill — finish Drawn toolpath
5	Features (drill / tap / mill) Cited per-feature tool-times
6	Tool changes Machine ATC tool-to-tool
7	Re-fixturing Self-loading robot cell: the robot loads and unloads, so there are no operator load/unload minutes (the operator oversees)
8	Non-cutting (rapids / approach) Rapids + approach + residual
9	Operator relaxation (ILO) Personal needs on 0.42 min presence (ILO 1979 p.267/p.280); labor leg only
10	Secondary ops Hand deburr: 1 hole edge (0.3 min/part)
11	Setup 1.779 hr x setup-tech \$40.47/hr / 100 units
12	Material handling (load / unload) Handler \$32.61/hr × 10 min ÷ 100 parts/pallet
13	Packaging End-of-line packing: a box, bag or foam sized to the part, the master carton, and a GMA pallet with stretch wrap, at industrial prices (IndexBox corrugated board, Business Analytiq resin, BLS lumber PPI), plus packing labour from DFMA handling times. The part's own bag or box is a product cost, so it carries overhead, SG&A and profit; the carton and pallet are shipping costs, at cost, next to freight. Materials at US prices; labour at the local wage
14	Inspection Sample size from ISO 2859-1:1999 / ANSI-ASQ Z1.4-2003. Gauging minutes per characteristic from the MOST BasicMOST Tool Use > Measure sequences (Zandin, 3rd ed.) and a published CMM probing cycle. CMM time is priced at the local machine rate of a named CMM (Mitutoyo CRYSTA-Apex V544)

MATERIAL

15	Net material · 0.924 kg 0.9237 kg × \$8.32/kg (\$5.30/kg metal + \$3.02/kg mill plate premium) – \$1.53 chip credit — raw stock 35 mm plate, 85x115 mm sawn (net bbox 0.7603 kg)
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- 16 Inbound freight (2%)** · 2 %
2% × \$7.6864 bought stock (inbound freight, the delivered cost of the material)

DIRECT LABOR

- 17 Roughing (drawn toolpath)** · 3.82 min
Drawn toolpath: 3.82 min of roughing (formula plan 1.21 min: tool-ladder Ø25@577 cm³/min (spindle-power-limited) +4 pocket tool(s))
- 18 Finishing (drawn toolpath)** · 4.17 min
Drawn toolpath: 4.18 min of finishing (formula plan 4.12 min: per-face routed: 33 faces, 397 cm² (Ra-driven))
- 19 Feature processing** · 0.944 min
16 end_mill; 7 drilling; 6 tapping (16 physics-covered suppressed) (drill/tap physics)
- 20 Tool changes (19×)** · 1.43 min
4.5s tool-to-tool ATC × 19 tool(s)
- 21 Load/unload (2× setup)**
Self-loading robot cell: the robot loads and unloads, so there are no operator load/unload minutes (the operator oversees)
- 22 Finish-bore pass (machined)** · 0.086 min
1 feature(s) finished on the machining centre instead of the grinder: both operations were checked against what they can hold (MH29 Table 8 p.662 IT rows — boring IT7, reaming IT6, internal grinding IT5-7 — plus the MH29 p.744 finish floor and the cited hardness edges of the MH29 turning data) and the cheaper feasible one was priced; cut with a carbide edge on the cited finishing regime
- 23 Non-cutting (rapid/approach/scan, decomposed)** · 3.47 min
45 ops (drill 7/finish 33/rough 5): rapid 0.58 + approach 0.08 + scan 0.48 (112 passes) @ 25 m/min rapid, trapezoid ramps @ 1569 mm/s² axis accel
- 24 Operator relaxation (ILO)** · 0.021 min
Personal needs 5% of 0.42 min operator presence (ILO Introduction to Work Study 1979 p.267/p.280) — labor only: the machine is unattended-capable
- 25 Deburr (cross-bore + edges)** · 0.33 min
Hand deburr: 1 hole edge (0.3 min/part)
- 26 Forklift in (raw material)** · 0.1 min/part
Handler \$32.61/hr × 10 min ÷ 100 parts/pallet
- 27 Forklift out (finished goods)** · 0.08 min/part
Handler \$32.61/hr × 8 min ÷ 100 parts/pallet

MACHINE BURDEN

- 28 Bought cut blank (service centre)**
Bought cut to size: \$1.05 = the cut on a Marvel Spartan PS2828/10 (\$0.75) / (1 - 28.7% Reliance FY2025 10-K gross margin); cheaper than in-house \$1.23 + \$0.4750/part remainder (179.21 kg off 194/294 unused blank(s) on 1 plate(s) bought for the 100-part run, \$47.50/run): carrying (carry \$47.50/run @ 25%/yr APICS/ASCM x 0.20 yr held vs scrap \$484.48/run @ 51% of value lost). 2 x 5.4 in2 / 6.7 in2/min = 1.62 min cut + 0.51 handling = 2.13 min machine, 0.92 min operator (semi-auto, cut at 25%). 250 fpm capped, 4/6 blade, 1 plate = 260 blanks. MH31 p.1243
- 29 Tool changes (19x)** · 1.43 min
4.5s tool-to-tool ATC × 19 tool(s)
- 30 Load/unload (2× setup)** · 0.333 min
Machine occupied for the robot's own part change: 2 x 10 s (machine-tending unit's published change time)
- 31 Parts wash (aqueous)** · 100 parts/basket
Basket: 8 min ÷ 100 parts/basket @ \$37/hr (unattended) + 8s basket load/unload ÷ 100 @ \$37/hr — cheaper than inline \$76.2684 + drag-out \$0.0009 (detergent film + DI rinse +33× counterflow) + bath dump \$0.0012 (tank fill + wastewater + bath life)

SETUP

32 Labor (setup time) · 1.78 hr/batch
1.779 hr x setup-tech \$40.47/hr / 100 units

33 Machine (setup time) · 1.78 hr/batch
1.779 hr x \$12.04/hr / 100 units

PROGRAMMING (CAM)

34 CAM setup (import, stock, work offset, post) · 10 min (one-time)
10.0 min (band 10.0 to 10.0); fixed per new part. Source: Silva et al., Metals 2022, CAM base time (lit 461 pdf 9)

35 Planning (read the drawing, choose the process) · 39.9 min (one-time)
39.9 min (band 13.2 to 79.8); group 6 (51 reduced dimensions); 0.44 + 0.89 h per program x 0.5 automated-system factor. Source: Goskomtrud USSR typical time norms for preparing CNC programs with a computer, milling Table 3 lines 1-2 (bestpravo.ru/sss/eh-pravila/w9n.htm), p.1.14 factor up to 0.5

36 Build and check each operation · 35.1 min (one-time)
35.1 min (band 31.3 to 39.9); 19 operations (17 setup-tool pairs + 2 tools that rough and finish) x 1.85 min. Source: Zahid, Case & Watts, IJMERR 2017, Table I (lit 557 pdf 2); Kowalski et al., SV-JME 2021 (lit 561 pdf 7)

37 3D model preparation for surface toolpaths · 1.85 min (one-time)
1.9 min (band 0.0 to 8.4); 1 surface operations, model prep 0.5 of their programming. Source: Autodesk, Fundamentals of CNC Machining, p.9-12 (lit 49 p167): 50-80% of 3D programming

PERISHABLE TOOLING

38 Perishable tooling · 15.3 machine-min
\$1.27/hr budget / 60 x (13.92 cut-min x 1x wear + 0.33 load-min + 1.07 setup-min; no tool cuts while loading or in setup, so those two carry the aluminium baseline)

39 Soft jaws (flip op 2) · 1 pair/batch
One pair of aluminium soft-jaw blanks \$28.95 per batch / 100 parts, bored to grip the finished walls in op 2

OVERHEAD

40 Supervision (people) · 0.2 x labour
0.2 x \$1.2069 operator labour (run + setup)

41 Engineering, inspection, toolroom (machine time) · 17.8 min
0.2 x \$37.05/h x 17.776 min occupied (run + setup)

SCRAP

42 Scrap allowance · 2.25 %
2.25% grade-aware scrap rate: \$14.7982 value-add to this point x $r/(1-r)$

PACKAGING

43 Primary poly bag / wrap · 0.035 m2 film
Poly Bag (Flat) 142x112 mm lay-flat (smallest flat bag closing around the part), 50 um, 500/yr — priced by the type's film + bag-machine build-up

44 Primary pack labor + overhead · 13 s/unit
13 s (handle/place + bag) x \$31.36/hr operator (/1) + overhead 0.2 x labour + 0.2 x wage x bench hours; times from DFMA and Lantech handling elements

45 Secondary master carton (distribution) · 70 parts/carton
Single-wall carton 457x305x305 mm (0.953 m2, Corrugated Box (RSC) type build-up, 7/yr) / 70 parts (5x7x2 auto-fit); gross 16.5 kg vs 29.5 kg (NMFC Item 222, ASTM D5639-05 §7.1.1) — at cost, beside freight

46 Secondary pack labor (distribution) · 20 s/carton

20.0 s x \$31.36/hr / 70 parts

47 Tertiary pallet + stretch wrap (distribution) · 2,800 parts/pallet

GMA 48x40 pallet \$17.10 / 20 trips + 381 g stretch + 240.0 s palletize, / 2800 parts — at cost, beside freight

INSPECTION

48 Hand gauge (caliper / micrometer / pin): 1 characteristic · 5.2 min/lot

ISO 2859-1:1999 / ANSI-ASQ Z1.4-2003, single sampling, normal inspection: lot 100 at level II gives code letter F = 20 parts (20.0 % of the lot);
0.25 min per characteristic

49 First-article / start-up inspection · 1 parts/lot

Full-dimension check on top of the sample; its minutes are inside the gauging line above

50 Inspection setup / reporting · 15 min/lot

Retrieve lot, set gauge or load program, write report / 100 parts

SG&A

51 SG&A rate · 12 %

12% × \$15.4874 manufacturing cost

PROFIT

52 Markup on cost (profit) · 10 %

10% × \$15.4874 manufacturing cost

FREIGHT

53 Line-haul (parcel, 255 km)

\$36.87/shipment ÷ 100 parts

54 fuel surcharge

\$9/shipment door-to-door leg ÷ 100 parts