WHITE PAPER · FADAL VMC 4020-906-1 × OIL & GAS

Fadal VMC 4020 for Oil & Gas

CNC vertical mill for precision milling, drilling, and contouring on prototypes through medium production runs. This paper covers what the machine does, the oil & gas parts we produce with it, the alloys we run, the tolerances and finishes oil & gas buyers expect, and the documentation package.

20" W × 48" L × 24" H workpiece envelope
ENVELOPE

±0.0005" routine on critical features
TOLERANCE

1994
SINCE

ISO 9001:2015
QMS

Same-week / rig-down direct
RESPONSE

Pistol Whiskers · 20" W × 48" L × 24" H workpiece envelope · CNC vertical machining center

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Executive summary

Machine: Fadal VMC 4020-906-1 (shop nickname: *Pistol Whiskers*). CNC vertical machining center at B&R Productions, running from our New Waverly, Texas shop under an ISO 9001:2015 quality system.

Application: CNC vertical mill for precision milling, drilling, and contouring on prototypes through medium production runs for Oil & Gas customers — Frac fleet operators, wellhead crews, wireline and coil-tubing service companies, downhole tool manufacturers, completion tool OEMs, subsea equipment vendors, produced-water handling equipment suppliers.

Envelope: 20" W × 48" L × 24" H workpiece envelope. **Tolerance:** ±0.0005" routine on critical features. **Traceability:** Material by heat and lot on every job.

The machine, in context

The Fadal 4020 is the workhorse of American medium-envelope CNC milling — rigid, well-understood, and forgiving with the harder alloys. Pistol Whiskers is our go-to for prototype work, repair parts, and small-to-medium production runs where the part fits inside the envelope. It handles complex pocketing, milled features, and multi-face setups without flinching on the alloys that would chatter marginal equipment.

Full specifications

Model	Fadal VMC 4020-906-1 ("Pistol Whiskers")
Type	3-axis CNC vertical machining center
Workpiece envelope	20" W × 48" L × 24" H (B&R working spec)
Axis travels	40" X × 20" Y × 20–28" Z (Fadal 4020 platform)
Table size	48" × 20"
Spindle taper	CAT 40
Spindle speed	75 – 7,500 RPM standard; 10,000 RPM on HT-series builds
Spindle drive	15 HP with 220 ft-lb torque (HT class)
Rapid traverse	900 IPM (per axis)
Automatic tool changer	21-tool ATC

Control	Fadal CNC-88 / Format 2 (some HT and later builds run Fanuc 0i-MC)
Machine weight	~12,500 lb
Tolerance capability	±0.0005" routine on critical features
Materials	Aluminum, stainless, tool steel, 4140/4340, Inconel, Hastelloy, titanium

Values marked "platform" reflect the machine manufacturer's published spec range for this platform family; B&R's working spec is what we quote on this specific unit.

Who this serves in Oil & Gas

Typical buyer: Frac fleet operators, wellhead crews, wireline and coil-tubing service companies, downhole tool manufacturers, completion tool OEMs, subsea equipment vendors, produced-water handling equipment suppliers.

What's hard about oil & gas work: Chloride stress-corrosion cracking, sour service (H2S), high-cycle pressure loading, exotic superalloys, and rig-down clocks that turn every hour into money. Documentation trails required for API-adjacent work.

Typical Oil & Gas parts we produce on Pistol Whiskers

- Valve body machining (small and medium, gate/ball/safety)
- Wellhead adapters and hub connectors under 20" envelope
- Choke bodies with complex internal geometry
- Manifold blocks and BOP-adjacent hardware
- Reverse-engineered discontinued OEM parts

Above list is representative; if your part isn't shown, call and ask — most oilfield / aerospace / defense / industrial turned or milled work fits somewhere in the shop.

Alloys we run for Oil & Gas

Standard range: Inconel 718 (aged and annealed) · Inconel 625 · Super Duplex 2507 (UNS S32750) · Duplex 2205 · 17-4 PH (all conditions H900 to H1150) · Monel K-500 · Nitronic 50/60 · F22 · F91 · 4130/4140.

Alloy behavior is different in oilfield service. Inconel 718 in the aged condition (H900, roughly 40-45 HRC) is a different machining problem than annealed 718 — feeds, speeds, and tool geometry all shift. Super Duplex 2507 machined without cutting-temperature control develops brittle intermetallics that destroy the chloride-resistance the alloy was chosen for; a shop that shrugs when you ask about phase balance is a shop that will quietly ruin your part. 17-4 PH in Condition A machines like a well-behaved stainless; in H900 it's a different animal. Every one of these alloys we run weekly, not experimentally.

> **What "we run these weekly" means:** we stock or reliably source the common alloys in the industry's typical spec range. Sharp tooling, proven feeds and speeds, and process control specific to each alloy family. Your part is not the one we're experimenting on.

How we machine it — our 5-step process

This is the process B&R runs on every job, oil & gas or otherwise. The specifics of feeds, speeds, and tooling shift by alloy and machine; the discipline is universal.

1. **Material verification.** Every job starts with material traceability. Heat and lot numbers documented against the mill test report. For customer-supplied material, we verify against the CofC before touching the stock.

2. **First-article layout.** Stock is measured and laid out before any cutting starts. Concentricity, roundness, and squareness of the starting material established; if the stock is out of tolerance we call the customer before wasting time on a bad blank.

3. **Roughing with process control for the alloy.** Feeds, speeds, and coolant strategy set for the specific alloy family — sharp coated carbide (or PCD for high-volume Ti Grade 5), positive rake, high-pressure through-tool coolant on 2507 and Inconel to control cutting temperature. Interrupted cuts get extra attention because they cycle heat into the workpiece.

4. **Finish pass to spec.** Finish pass with a fresh insert, controlled DOC, and measured surface-finish targets. Critical features (bore concentricity, seat grooves, sealing surfaces) are held tighter than most job-shop lathes can offer.

5 **CMM verification + documentation.** Every critical dimension CMM-verified. First-article report generated. Certificate of conformance issued with delivery. Customer-specific ITPs and PPAP-style packages produced on demand.

Tolerance and finish expectations in Oil & Gas

±0.0005" routine on critical sealing and mating surfaces. Bore concentricity and roundness held tighter than most job-shop lathes can offer. Surface-finish targets measured with a profilometer, not estimated. For seat grooves and packing bores, finish is often the difference between a sealing part and a leak-path.

Documentation and quality workflow

Material traceability by heat and lot on every job — non-negotiable for API-adjacent work. First-article layout and CMM verification standard. Customer-specific ITPs (Inspection and Test Plans) supported. PPAP-style packages produced on demand. Certificate of conformance issued with delivery.

Response time and emergency work

Rig-down and fleet-down work prioritized over routine production. Same-day and next-day realistic when material is on the shelf. Call (936) 291-7827 direct — say "rig-down" and the phone gets to the shop floor. For emergency work off-hours, leave a voicemail; we route emergencies.

How we compare

Compared to buying finished components from an OEM: we're faster for one-offs and low-volume runs, and we hold traceability the OEM often won't share when you're outside their warranty window. Compared to a commodity job shop: we run the alloys weekly and won't ruin your metallurgy on cutting-temperature mistakes.

Working with B&R Productions

New customer or existing, the process starts the same way: call (936) 291-7827 or send a print through the quote form. Prints are accepted as PDF, STEP, IGES, DWG, or DXF; if you only have a sample part, we reverse-engineer routinely. NDAs on request. ITAR-controlled prints handled under document control with prints staying in-shop.

Quotes typically come back within 24 hours for standard work, same-day for repeat customers on stocked materials, and near-immediately by phone for emergency and rig-down situations. Lead times are quoted honestly — we don't promise Wednesday and deliver next month.

Frequently asked questions

8 questions covering the Fadal VMC 4020 platform and Oil & Gas work. Also indexed as FAQ schema for AI answer engines.

What's the workpiece envelope on the Fadal VMC 4020?

20" W × 48" L × 24" H is B&R's stated working envelope. The Fadal 4020 platform itself has 40" X, 20" Y, 20–28" Z travels — plenty of headroom for the parts we quote on this machine.

What tolerances can the Fadal hold on Inconel or 17-4 PH?

±0.0005" routine on critical features. The 15 HP spindle and 220 ft-lb torque handle roughing without chatter; sharp carbide with the right feed keeps aged-condition alloys behaving.

How many tools can be loaded at once?

21-tool automatic tool changer. Enough for most single-setup jobs — plan the tool list with us in the RFQ and we'll confirm the setup fits.

What kind of oil & gas customers does B&R Productions work with?

Frac fleet operators, wellhead crews, wireline and coil-tubing service companies, downhole tool manufacturers, completion tool OEMs, and subsea equipment vendors. We work with new customers regularly — first-time orders don't get worse service.

Do you handle rig-down and emergency work?

Yes. Same-day and next-day are realistic when the material is on the shelf (Inconel 718, 625, Super Duplex 2507, 17-4 PH, 4140/4340). Call (936) 291-7827 direct and say "rig-down" — the phone gets to the shop floor, not a form.

Do you machine to API 6A / API 6D tolerances?

Yes. API-adjacent tolerances routine. Material traceability by heat and lot standard on every job. Customer-specific ITPs and PPAP-style packages supported.

How do you keep Super Duplex 2507 from losing its chloride resistance during machining?

Controlled cutting temperature — moderate SFM, aggressive feed with sharp coated carbide, high-pressure through-tool coolant. The failure mode nobody wants (sigma-phase intermetallics forming from overheating) shows up months later in service. We run 2507 weekly — this is a process we've internalized, not a spec we're learning on your part.

Can you reverse-engineer discontinued OEM oilfield parts?

Yes — routine work. Send a worn sample and any print or spec you have. We produce the replacement with material traceability the OEM often won't share when you're outside their warranty window.

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Ready to talk about your Oil & Gas work?

Send us a print or a sample photo and specs. Emergencies: call direct and say "rig-down."

Published by B&R Productions — a precision CNC machining shop in New Waverly, Texas, in business since 1994. ISO 9001:2015 certified. Serving oil & gas, aerospace, defense, and industrial customers across Texas and the Gulf Coast.

Written by the B&R Productions team. Machine specs verified against manufacturer data. Alloy and process notes reflect shop practice as of 2026-01-15.