PFMEA — bracket welding line

All records

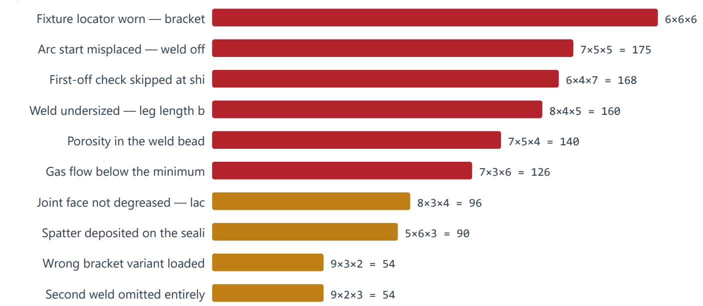
CAPSULEM8
CM8-211 · FMEA Worksheet
August 9, 2026

FAILURE MODES ANALYSED	HIGHEST RPN	HIGH-SEVERITY LINES	ABOVE THE RPN THRESHOLD	OPEN ACTIONS
11	**216**	**2**	**6**	**6**
7 items or functions covered	Fixture locator worn — bracket welded ou	severity 9 or more — act whatever the RPN	RPN 100 or more, of 11 scored lines	2 overdue · 3 done, awaiting re-score

AVERAGE RPN CUT
133
across 1 re-scored line

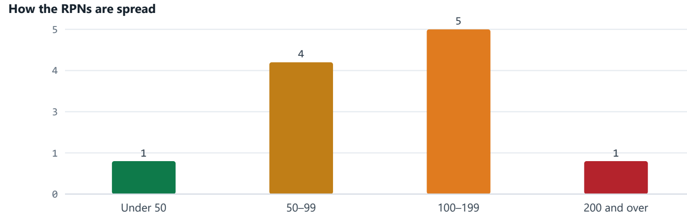
11 of 11 record(s) included. All records. Amounts in USD.

Highest RPN failure modes



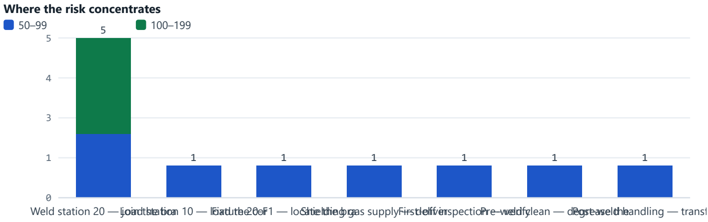
Bars at or above your action threshold are drawn red. Read the ranking as a starting order for discussion, not a verdict — check the severity column beside it before you decide what to work on first. Bars at or above your action threshold are drawn red. Read the ranking as a starting order for discussion, not a verdict — check the severity column beside it before you decide what to work on first.

How the RPNs are spread



A worksheet with a long tail in the two right-hand buckets is telling you the process is not yet under control. A worksheet with everything on the left either is in good shape, or has been scored optimistically. A worksheet with a long tail in the two right-hand buckets is telling you the process is not yet under control. A worksheet with everything on the left either is in good shape, or has been scored optimistically.

Where the risk concentrates



Count of lines against each step or component, coloured by RPN band. One tall dark bar usually means one operation is carrying most of the risk in the whole process — and that is where a single fix buys the most. Count of lines against each step or component, coloured by RPN band. One tall dark bar usually means one operation is carrying most of the risk in the whole process — and that is where a single fix buys the most.

Before and after the action

The bar is the RPN as it now stands, so a short bar is a good result. The label beside it gives the score before the action and the score after. A line that was re-scored without anything actually changing on the shop floor is the easiest number in quality to fake — the action taken field is where you show it was not. The bar is the RPN as it now stands, so a short bar is a good result. The label beside it gives the score before the action and the score after. A line that was re-scored without anything actually changing on the shop floor is the easiest number in quality to fake — the action taken field is where you show it was not.

The FMEA worksheet

ITEM / FUNCTION	FAILURE MODE	EFFECT	S	CAUSE	O	CONTROLS — PREVENTION / DETECTION	D	RPN	RECOMMENDED ACTION	OW
Fixture 20-F1 — locate the bracket to the rail datum	Fixture locator worn — bracket welded out of position	The bracket sits outside the position tolerance. Downstream assembly will not fit, and the rail sub-assembly is either reworked by hand or s	6	Hardened locator pins wear with no scheduled replacement or wear limit	6	None — pins are replaced only when somebody notices a problem / Position checked on the first part of each shift and not again	6	216	Add the locators to the preventive maintenance schedule with a stated wear limit and a go/no-go check, and hold a set of spare pins at the s	Mai leac
Weld station 20 — join the bracket to the rail	Arc start misplaced — weld off position	The weld begins outside the joint line, leaving part of the joint unwelded. Found at the position check, or if that is missed, by the custom	7	Torch stick-out varied because the nozzle was cleaned by hand to no set dimension	5	Nozzle cleaned and reset on a fixed time cycle / Operator visual check against a marked datum on the fixture	5	175	Introduce a nozzle setting gauge so stick-out is set to 12 mm every time, and add an automatic torch cleaning station triggered on part coun	Proc eng
First-off inspection — verify the first part of every shift	First-off check skipped at shift start	A whole shift can be produced against a setting nobody verified. When something is wrong, containment covers the full shift's output rather	6	The check competes with line start-up and nothing forces it to happen first	4	First-off is written into the shift start-up routine / Supervisor signs the first-off sheet at the end of the shift — after the parts are made	7	168	Hold the line in setup mode until the first-off result is entered at the station terminal, so production cannot start without it.	Proc mar
Weld station 20 — join the bracket to the rail	Weld undersized — leg length below 6 mm	Joint strength below the design load. The bracket can detach under vibration in service; on the line it is found at final load test and the	8	Wire feed speed drifts as the liner wears	4	Weld parameters locked in the machine program; liner replaced on a 30-day calendar cycle / Operator gauges leg length on every tenth part with a fillet weld gauge	5	160	Move liner replacement onto a wire-consumption trigger rather than a calendar date, and add a wire feed speed alarm that stops the machine w	Proc eng
Weld station 20 — join the bracket to the rail	Porosity in the weld bead	Reduced fatigue life of the joint. Found at the radiographic audit, at which point every part back to the last good audit has to be quaranti	7	Damp or contaminated shielding gas line after a cylinder change	5	Gas line purged and leak-checked after every cylinder change / Radiographic audit of one part per shift	4	140	Fit a moisture trap and an in-line flow meter at the torch, and make the gas line purge a signed step in the cylinder change work instructio	Mai leac
Shielding gas supply — deliver 15 l/min at the torch	Gas flow below the minimum	Oxidised, weak welds across a whole run before anyone notices. Every part made since the last good check	7	Regulator creeps, and a partly closed line valve is not visible from the torch	3	Flow set and recorded at the start of each shift / None at the torch — low flow is inferred later from weld appearance	6	126	Fit a flow switch at the torch that inhibits the weld cycle below 12 l/min, so a low-flow run cannot start at all.	Mai leac

ITEM / FUNCTION	FAILURE MODE	EFFECT	S	CAUSE	O	CONTROLS — PREVENTION / DETECTION	D	RPN	RECOMMENDED ACTION	OW
		becomes suspect and has to be conta								
Pre-weld clean — degrease the joint face on the rail	Joint face not degreased — lack of fusion	The weld looks acceptable from outside but has not fused to the parent metal. It fails at load test, or if it passes, in service under a loa	8	Rails arrive with variable oil residue and the wipe is an unmeasured manual step	3	Degrease step in the work instruction with a signed check per pallet / Destructive test on one part per week	4	96	Move to a solvent wipe station with a stroke counter, and add a maximum residue requirement to the incoming specification for rails so the v	Qua eng
Weld station 20 — join the bracket to the rail	Spatter deposited on the sealing face	The sealing face is no longer flat, the gasket does not seat, and the assembly fails the customer's leak test and is returned.	5	Voltage set above the qualified range for the joint, and anti-spatter not reapplied mid-shift	6	Anti-spatter spray applied at the start of each shift / Visual check of the sealing face at the end of the cell	3	90	Fit a simple shield over the sealing face during welding and bring the voltage back inside the qualified range, with the range shown at the	Proc eng
Load station 10 — load the correct bracket variant into the fixture	Wrong bracket variant loaded	The wrong part is built into the assembly. If it escapes, the fixing is short of its design engagement and can fail without any warning to t	9	Two variants differ only by a 4 mm hole position and are stored in adjacent bins	3	Bins colour-coded and labelled with the part number; variants never run in the same shift / Bar-code scan of the bin label against the build order before the fixture will clamp	2	54	Error-proof the fixture: add a locating pin that only the correct variant will accept, so the wrong bracket physically cannot be clamped. Th	Tool eng
Weld station 20 — join the bracket to the rail	Second weld omitted entirely	Only one of the two welds holds the bracket. The joint carries the load until it does not, and it fails in service with no warning — a safet	9	The manual cycle allows the operator to unload after the first weld completes	2	Two-weld sequence programmed into the machine and the cycle counter displayed at the station / Weld count interlock releases the fixture only after both welds complete	3	54	Keep the interlock and add a vision check that confirms two weld beads are present before the fixture unclamps, so a bypassed counter cannot	Con eng
Post-weld handling — transfer to the cooling rack	Cosmetic scuff on the non-functional face	A visible mark on a face that is hidden once the vehicle is assembled. No effect on function, fit, strength or life.	2	Parts touch each other as they are stacked while still hot	5	Rack has separators for the machined faces / Operator sees it during transfer	2	20	— none recorded —	una

Action priority

FAILURE MODE	RPN	SEVERITY	RECOMMENDED ACTION	OWNER	DUE	STATE	STATUS
Fixture locator worn — bracket welded out of position	216	6	Add the locators to the preventive maintenance schedule with a stated wear limit and a go/no-go check, and hold a set of spare pins at the station so replacemen	Maintenance lead	2026-08-03	Overdue	Open
Arc start misplaced — weld off position	175	7	Introduce a nozzle setting gauge so stick-out is set to 12 mm every time, and add an automatic torch cleaning station triggered on part count rather than on the	Process engineer	2026-05-31	Not open	Closed
First-off check skipped at shift start	168	6	Hold the line in setup mode until the first-off result is entered at the station terminal, so production cannot start without it.	Production manager	2026-08-06	Overdue	Open
Weld undersized — leg length below 6 mm	160	8	Move liner replacement onto a wire-consumption trigger rather than a calendar date, and add a wire feed speed alarm that stops the machine when the speed drifts	Process engineer	2026-08-30	Scheduled	Open
Porosity in the weld bead	140	7	Fit a moisture trap and an in-line flow meter at the torch, and make the gas line purge a signed step in the cylinder change work instruction.	Maintenance lead	2026-07-30	Overdue	Actioned
Gas flow below the minimum	126	7	Fit a flow switch at the torch that inhibits the weld cycle below 12 l/min, so a low-flow run cannot start at all.	Maintenance lead	2026-09-06	Scheduled	Open
Wrong bracket variant loaded (high severity)	54	9	Error-proof the fixture: add a locating pin that only the correct variant will accept, so the wrong bracket physically cannot be clamped. The scan stays as a se	Tooling engineer	2026-09-13	Scheduled	Open
Second weld omitted entirely (high severity)	54	9	Keep the interlock and add a vision check that confirms two weld beads are present before the fixture unclamps, so a bypassed counter cannot release a single-we	Controls engineer	2026-07-20	Overdue	Actioned
			8 line(s) above a threshold				

FMEA worksheet

ANALYSIS	ITEM / FUNCTION	FAILURE MODE	S	CAUSE	O	D	OWNER	DUE	SCORED	STATUS	RPN	NEW RPN	RPN CUT	CRITICAL
PFMEA — bracket welding line	Weld station 20 — join the bracket to the rail	Weld undersized — leg length below 6 mm	8	Wire feed speed drifts as the liner wears	4	5	Process engineer	2026-08-30	2026-06-30	Open	160	–	–	–
PFMEA — bracket welding line	Weld station 20 — join the bracket to the rail	Porosity in the weld bead	7	Damp or contaminated shielding gas line after a cylinder change	5	4	Maintenance lead	2026-07-30	2026-06-18	Actioned	140	–	–	–
PFMEA — bracket welding line	Load station 10 — load the correct bracket variant into the fixture	Wrong bracket variant loaded	9	Two variants differ only by a 4 mm hole position and are stored in adjacent bins	3	2	Tooling engineer	2026-09-13	2026-06-18	Open	54	–	–	Severity 9–10
PFMEA — bracket welding line	Fixture 20-F1 — locate the bracket to the rail datum	Fixture locator worn — bracket welded out of position	6	Hardened locator pins wear with no scheduled replacement or wear limit	6	6	Maintenance lead	2026-08-03	2026-06-18	Open	216	–	–	–
PFMEA — bracket welding line	Weld station 20 — join the bracket to the rail	Spatter deposited on the sealing face	5	Voltage set above the qualified range for the joint, and anti-spatter not reapplied mid-shift	6	3	Process engineer	2026-08-23	2026-07-02	Open	90	–	–	–
PFMEA — bracket welding line	Weld station 20 — join the bracket to the rail	Second weld omitted entirely	9	The manual cycle allows the operator to unload after the first weld completes	2	3	Controls engineer	2026-07-20	2026-06-10	Actioned	54	–	–	Severity 9–10
PFMEA — bracket welding line	Shielding gas supply — deliver 15 l/min at the torch	Gas flow below the minimum	7	Regulator creeps, and a partly closed line valve is not visible from the torch	3	6	Maintenance lead	2026-09-06	2026-07-10	Open	126	–	–	–
PFMEA — bracket welding line	First-off inspection — verify the first part of every shift	First-off check skipped at shift start	6	The check competes with line start-up and nothing	4	7	Production manager	2026-08-06	2026-07-16	Open	168	–	–	–

ANALYSIS	ITEM / FUNCTION	FAILURE MODE	S	CAUSE	O	D	OWNER	DUE	SCORED	STATUS	RPN	NEW RPN	RPN CUT	CRITICAL
				forces it to happen first										
PFMEA — bracket welding line	Pre-weld clean — degrease the joint face on the rail	Joint face not degreased — lack of fusion	8	Rails arrive with variable oil residue and the wipe is an unmeasured manual step	3	4	Quality engineer	2026-09-23	2026-07-22	Actioned	96	–	–	–
PFMEA — bracket welding line	Weld station 20 — join the bracket to the rail	Arc start misplaced — weld off position	7	Torch stick-out varied because the nozzle was cleaned by hand to no set dimension	5	5	Process engineer	2026-05-31	2026-05-11	Closed	175	42	133	–
PFMEA — bracket welding line	Post-weld handling — transfer to the cooling rack	Cosmetic scuff on the non-functional face	2	Parts touch each other as they are stacked while still hot	5	2	—	—	2026-07-28	Accepted	20	–	–	–

Notes

Sample worksheet — replace every line with your own before relying on it or circulating it. Scores here are illustrative and were not produced by a real cross-functional team.

An RPN ranks; it does not decide. Two lines can share an RPN of 100 and carry completely different risk — 10 × 5 × 2 is a safety failure you cannot see coming, 5 × 5 × 4 is an annoyance you catch late. A low RPN on a safety-critical failure is still a safety-critical failure, and severity is the one number an action can rarely change. Scores are structured team judgement, not measurement, and they are only comparable inside one analysis using one agreed set of scale definitions. This worksheet records and ranks what a competent team decides; it does not analyse anything by itself, and it is not a substitute for the design, process or safety expertise that produced the entries.