Separate control limits from specifications

Classify product conformance and a process signal separately, record the appropriate response, and explain what the supplied chart cannot establish.

A passing part can still carry a process warning

Fictional training case: quality technician Sam reviews width measurements from two different processes. The baseline center and statistical limits are supplied and approved for this exercise; the six displayed values are recent observations, not the data used to calculate those limits. Engineering specifications describe each product requirement.

Your role and the reference condition

Quality technician working with the process owner under a defined reaction plan.
Normal: The measurement, units, relevant process and chart baseline are identified before interpretation. Product acceptance is assessed against specifications; process behavior is assessed against the chart rules.
Gap: A colleague labels every in-specification observation green and proposes ignoring process B sample 5 because it still meets the drawing.

Work within these conditions

1. Only the beyond-limit signal rule is illustrated; other approved pattern rules are not evaluated here.

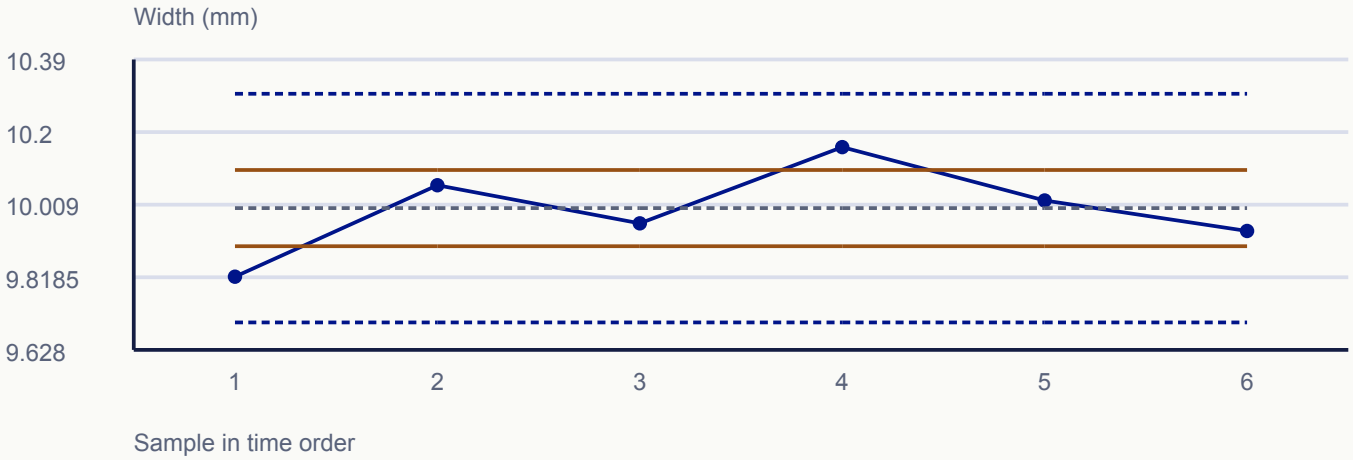
2. Baseline suitability and measurement adequacy are supplied teaching assumptions, not proven by these six points.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

See how the method works

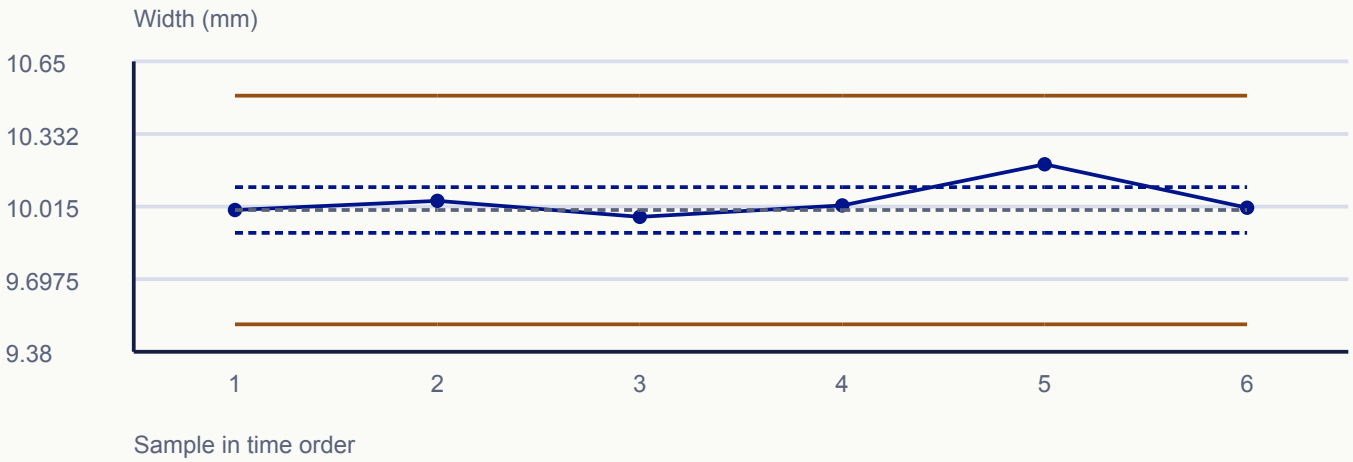
Control limits describe expected process behaviour under a specified baseline model. Specifications express an engineering or customer requirement. They answer different questions and must be labelled differently. A process can behave consistently yet produce unacceptable output because its ordinary variation is too wide or its centre is misplaced. Conversely, a point can be within specification and still signal an unusual process change. Investigate that signal through the approved response instead of accepting it simply because the product passed. Improve the system for common-cause loss; do not continually adjust settings to chase ordinary noise. Stability must be assessed from suitable evidence, not a handful of decorative points.

Stable baseline can miss specification



Center: 10
LCL: 9.7
UCL: 10.3
Spec lower: 9.9
Spec upper: 10.1

A signal can remain within specification



Center: 10
LCL: 9.9
UCL: 10.1
Spec lower: 9.5
Spec upper: 10.5

Baseline stability is supplied for teaching; six points do not establish stability. Only beyond-limit rule illustrated; point 5 in panel 2 is the signal.

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Follow the evidence and decisions

Inspect the supplied case inputs

Reference	Process A: width in mm	Process B: width in mm
Baseline center	10.00	10.00
Control limits	9.70 to 10.30	9.90 to 10.10
Specifications	9.90 to 10.10	9.50 to 10.50
Samples 1-3	9.82; 10.06; 9.96	10.00; 10.04; 9.97
Samples 4-6	10.16; 10.02; 9.94	10.02; 10.20; 10.01

01 / Identify two different authorities

Sam labels the statistical limits as the supplied process baseline and the specifications as the fictional engineering acceptance range. He keeps units and process identity on both charts.

Why: Calling both sets tolerances hides the decision being made. The source of a line determines what crossing it means.

Evidence / check: Process A has narrower specifications than statistical limits; process B has wider specifications.

02 / Make the product decision explicitly

For A, he marks sample 1 at 9.82 and sample 4 at 10.16 as outside 9.90-10.10. For B, every displayed individual observation lies within 9.50-10.50.

Why: This is a conformance comparison for the displayed values, not blanket release of all output or a claim that a process is capable.

Evidence / check: A has two displayed nonconforming observations; B has none by the stated width limits.

03 / Evaluate the process rule separately

He compares each point with its own process control limits. A has no beyond-limit point. B sample 5 at 10.20 exceeds its 10.10 upper control limit by 0.10 mm.

Why: A process signal can occur while the measured part meets specification. Conversely, a statistically predictable process can produce unacceptable output.

Evidence / check: Record B sample 5 as a signal; do not redraw the baseline to include it.

04 / Route the two problems

Sam routes A nonconforming output through disposition and asks the process owner to address the supplied stable but unsuitable baseline. For B he initiates the approved signal investigation and exposure assessment.

Why: Repeated adjustment after every ordinary fluctuation is different from investigating a signal. Neither route is replaced by a green product label.

Evidence / check: Two records: product disposition and process response, each with an owner and evidence requirement.

05 / Keep the inference bounded

He notes that six displayed points cannot establish stability or estimate capability reliably. The example does not calculate control limits or capability indices.

Why: Correct classification should not become an unsupported statement about long-term performance.

Evidence / check: The final decision cites supplied baseline assumptions and asks for suitable history if those assumptions are uncertain.

Two decisions for the same observations

Observation	Specification decision	Chart decision / response
A sample 1:9.82 mm	Below 9.90; nonconforming	Within 9.70-10.30; disposition required
A sample 4:10.16 mm	Above 10.10; nonconforming	No beyond-limit point; improve baseline suitability
B sample 5:10.20 mm	Within 9.50-10.50	Above UCL 10.10; investigate signal
All six points	Not a full output release	Do not infer stability from this short display

The baseline belongs to a different setup

Sam learns that process B changed tooling before sample 1, and the owner has not confirmed whether the supplied baseline remains applicable.

Decision

Keep the observation and prior signal comparison visible, but mark interpretation provisional and escalate baseline suitability. Continue the applicable product controls; do not create new limits from six points.

Reasoning

A control limit is meaningful only for the process and statistic it represents. A baseline problem is not resolved by substituting specification limits.

What would change the decision?

Tool-change time, approved chart definition, measurement record and suitable process history are required.

Practise with a changed case

Which line was crossed?

New fictional process C measures length. Its approved baseline has center 20.00 mm and limits 19.80-20.20 mm. Specifications are 19.90-20.10 mm. The exercise again uses only the beyond-limit rule and supplies baseline validity.

Time-order observation	Length
1	20.05 mm
2	20.15 mm
3	20.25 mm
4	19.95 mm

Your task

1. Classify each observation for specification conformance and a beyond-limit signal.
2. Write the response for observations 2 and 3; explain why their chart decisions differ.
3. State one conclusion this small set cannot support.

Use the next page to record your reasoning before reading the answer.

Your practice worksheet

Which line was crossed?

Observation / measured value

In or outside specification

In or outside statistical limits

Response owner and next evidence

Unproven conclusion / required history

Complete your reasoning before turning to the answer. Use the separate learner workbook for group practice.

Check your reasoning and transfer it

1. Observations 1 and 4 meet specifications and do not cross a control limit. Observation 2 exceeds USL 20.10 by 0.05 mm but remains inside UCL 20.20. Observation 3 exceeds both USL and UCL.

2. Both 2 and 3 need product disposition under the applicable plan. Observation 3 additionally supplies the illustrated process signal; observation 2 alone does not.

3. The four points cannot establish stability, capability or the complete containment boundary. Other pattern rules and process context may alter the broader response.

Suggested completed record

Observation / mm	Specification status	Beyond-limit decision
1:20.05	In specification	No beyond-limit signal
2:20.15	Nonconforming	No beyond-limit signal
3:20.25	Nonconforming	Beyond UCL; process investigation
4:19.95	In specification	No beyond-limit signal

Plausible wrong turns

1. Passing the drawing does not cancel a process signal.

2. Control limits are not customer tolerances and must not be moved merely to remove an alarm.

Evidence of a sound answer

1. Give both classifications for every observation.

2. Separate product disposition from process investigation.

3. State the baseline assumption and a limit on the inference.

Take the learning back to work

Commitment	Agreed follow-through
Owner	Process owner with quality engineering
Record	Chart event and product-disposition references
Review	At the signal response and subsequent approved verification
Verification evidence	Correct chart identity, baseline, measurement context, affected-output assessment and disposition authority
If unresolved	Retain the signal/hold records and escalate the uncertainty; obtain suitable evidence before revising limits or declaring performance.

Help someone else apply the method

Prepare

1. Two labelled native charts and the supplied values
2. Blank dual-decision record
3. Ruler or highlighter; separate answer

Minutes	Activity and coaching prompt
5	Name the lines Who or what established each line?
8	Demonstrate the two decisions What does B sample 5 require despite meeting specification?
9	Complete changed-case record How does observation 2 differ from 3?
6	Challenge the baseline What if these limits came from another setup?

Debrief

1. If a learner writes all good, ask whether they answered product or process status.
2. Ask for the missing evidence before accepting a capability claim.

Individual or remote practice

Complete the two classifications in separate columns before writing any response; then compare each with the answer.

Connect the method and check its boundaries

Before application

1. A stated process baseline
2. Separate source of engineering requirements

Outside this lesson

1. Capability qualification
2. A complete catalog of signal rules

NIST: What are control charts?

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Control charts follow a statistic in time, using limits derived from a reference process; nonrandom patterns can matter even within limits.

Public primary-source summary; underlying paid standards/forms are not reproduced.

NIST: Stable but unacceptable processes

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Statistical stability does not imply acceptable output; reducing common-cause variation requires process improvement.

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Open this lesson and its visual aids