MAZAK AJV-25/404

OPERATOR & SETTER MANUAL

MAZATROL M-32

1989 • SINGLE PALLET • VERTICAL MACHINING CENTRE

OPERATION • SETUP • TOOLING • DATUMS • METROLOGY



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PREPARED BY / SEPTEMBER 2026

EN

DOCUMENT RECORD AND SCOPE

DOCUMENT RECORD	DETAILS
Machine / control	MAZAK AJV-25/404 / MAZATROL M-32
Year / configuration	1989 / single-pallet machine
Version / last updated	2.1 / 03.09.2026
Prepared by / publication date	Mateusz Zulawski / September 2026
Language / format	EN / portrait A4 / 99 pages

Scope of work

Setting and running existing programs, changing parts on one pallet, tool data, WPC, trials, restart and indicator measurements. Displays and optional functions depend on the M-32 version and installed equipment.

Abbreviations and labels: 94. Control panel: 5-9. Index of 22 soft keys: 55. Record configuration and approved sequences on the machine sheet: 89.

Machine and workstation documentation takes priority

The serial-number-specific manual, setup sheet and fixture instructions define permitted actions. Authorised personnel perform ATC mechanism recovery and energy isolation under the applicable procedure. [M1] [H2]

Changes in version 2.1

- Taper cleaning, Z setting and inspection after a D correction.
- Bore-form, datum-repeatability and reversal-error diagnosis.
- Indicator verification, result sheet, batch checklist and fault report.
- Four PL/EN illustration pairs; updated index, sources and links.

M-32 sources include 1992 and 1995 editions. They do not establish that every option exists on a 1989 machine. Numerical examples are not settings to enter directly. Sources: 97, 98, 99.

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01 Feed hold

02 Single block

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04 Emergency stop

05 Datums and coordinates

06 Thermal stability

07 Program and documents

08 Tool and geometry

09 Part inspection

10 Indicator measurement

11 Manual motion

12 Alarms

13 Cutting

14 Lubrication

15 Cleaning

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M-32
CONTROL PANEL OVERVIEW

12 ZONES · READ FUNCTION AND STATE



01	POWER	05	DATA ENTRY	09	AXES
02	SCREEN / SOFT KEYS	06	SPINDLE / FEED	10	SPINDLE
03	KEY SWITCHES	07	MODES	11	E-STOP
04	STATUS / TPS / VFC	08	CYCLE	12	MPG / AXIS SELECT

⚠ "4" ON THE PANEL ≠ CONFIRMED 4TH AXIS

Numbers 01-12: descriptions on page 7. Read the actual lamp and mode states before a command.

CONTROL PANEL: FUNCTIONS AND MODES

Check the active operating mode first. The display you are viewing and the program selected for execution are separate things. Panel labels: 5, 7.

CONTROL	USE	CHECK
HANDLE / MPG	Move the selected axis with the handwheel.	Axis, multiplier, direction and actual increment.
JOG	Move an axis with a direction button.	Clear path and tool motion relative to the part.
RAPID	Manual rapid traverse.	Clearance for the complete assembly. Do not use to touch a datum.
HOME1 / HOME2	Return to a machine-defined position.	Correct procedure and reference state; 13.
MEMORY	Run a program from memory.	The program number selected for execution.
MDI	Execute an entered command.	Can actuate axes, spindle or ATC.
PROGRAM	View and edit a program.	Correct program, field, permission and saved value.
ATC MENU	Tool-change functions.	ATC state and the machine-specific manual sequence.
COOLANT MENU	Available coolant circuits.	Circuit and manual/automatic control mode.

Common error: viewing a program does not select it for a cycle

Before CYCLE START, check WORK NO., the active mode and the pending command. Changing the display alone does not prepare the machine to run.

Selector position 4 does not establish that an axis is installed. The equipment manual defines TPS/VFC and additional lamps and keys. Configuration record: 89.

BUTTONS: LOCATION AND PURPOSE

Find the number on the diagram on page 5. Confirm the operating mode and function states on the control before issuing a command.

NO. / PANEL CONTROL	PRACTICAL USE
01 I / O	Power on/off from the panel. Establish which systems are switched and the startup order from the machine manual; see page 13.
02 Screen and soft keys	Select the function labelled above the key. The 22-function index and menu diagrams are on pages 55-65. Trial functions and restart: pages 39 and 47.
03 Key switches on the left	PROGRAM LOCK / ENABLE: editing access. DOOR INTERLOCK AUTO / TEST: door interlock; use the position specified by the workstation instructions.
04 Lamps and TPS / VFC	Read the signal name and message. Confirm the meaning of every lamp and the operation of TPS/VFC options in the machine manual.
05 Keypad and cursor arrows	Select fields and enter data. Do not confuse the cursor arrows with the separate axis movement buttons (no. 09).
06 SPINDLE / FEED	Spindle and feed settings. This area also includes the rapid traverse scale; distinguish it from cutting feed. Relationships: page 45.
07 Operating modes	HANDLE, RAPID, JOG, HOME2, HOME1, MDI, TAPE and MEMORY. Check the active mode before a command; see pages 6 and 13.
08 CYCLE START / FEED HOLD	Green: start or continue. FEED HOLD: request a feed stop. FEED HOLD does not confirm safe access; page 10.
09 Axis buttons + / -	For manual movement, read the axis and sign markings rather than relying on button layout. +4/-4 markings do not prove an axis is installed.
10 SPINDLE: START, STOP, REV, JOG	Separate spindle controls. Do not confuse spindle START with program start, or spindle JOG with manual axis movement mode.
11 Red mushroom button	Emergency stop. Releasing the button does not mean the machine is ready; establish the cause and machine state before resuming.
12 Handwheel and axis selector	MPG with OFF / X / Y / Z / 4 selection. The ×1/×10/×100 multipliers are above, beside HANDLE. Check the axis, increment and clear travel path.

Use page 5 to locate the controls. Stopping, reference return, tool changing and restart are covered on pages 10, 13, 23 and 47-49. Manual movement diagrams: page 9.

MANUAL MOTION
AXIS FIRST

01 SELECT AXIS



OFF	NO MOTION
X Y Z	LINEAR AXES
4	OPTIONAL AXIS*

02 SELECT MULTIPLIER



SELECT WITH A KEY

HANDLE ×1, ×10 or ×100.
Check which key is active.

×1	HIGHEST SENSITIVITY
×10	MEDIUM SENSITIVITY
×100	LOWEST SENSITIVITY

03 THEN TURN THE MPG



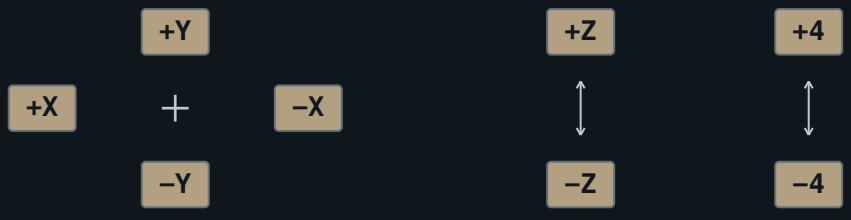
+	POSITIVE DIRECTION
–	NEGATIVE DIRECTION
1 PULSE	= 1 CLICK

HANDLE INCREMENT

PULSES × MULTIPLIER × BASE INCREMENT

JOG

PRESS FOR AXIS MOTION



HOLD = MOTION | RELEASE = STOP

* Axis 4 requires the corresponding equipment.

WARNING

×1 DOES NOT AUTOMATICALLY MEAN 0,001 mm

Select the axis, multiplier and direction while observing actual motion. Position 4 applies only to a configured axis.

MANUAL MOTION: JOG AND HANDLE

Before moving, select the mode, axis and direction. Check clearance for the tool, holder, head and workholding. Button locations: 8.

Why table motion can appear reversed



X-axis schematic: with the tool stationary, moving the table and part left produces rightward tool motion relative to the part. Confirm the axis sign on the control. [M5]

01 **Select JOG or HANDLE**
In JOG, use the correct axis button. In HANDLE, select the axis and multiplier. Use axis 4 only if it is configured.

02 **Verify a small move in free space**
Compare the coordinate change with tool motion relative to the part. Do not judge direction only by the way the table travels.

03 **Approach with a controlled increment**
Near a surface, use the smallest verified increment. Watch the gap and the indicator range. Stop the movement when finished.

Common error: ×1 is not a length unit

×1, ×10 and ×100 are multipliers. One pulse at ×1 need not equal 0.001 mm. Verify units and the base increment in free space.

STOPPING: FOUR DIFFERENT STATES

FUNCTION	OPERATOR ACTION
FEED HOLD	Requests a feed stop. It does not confirm that the spindle or auxiliary functions have stopped, or that access is safe.
SINGLE BLOCK	Stops at points defined by the control and cycle. The next START may execute the complete next stage.
RESET	Interrupts or resets the execution state. Re-establish the program, start point, data and approach path before restarting.
E-STOP	Use the emergency stop for immediate danger. It does not disconnect every energy source.

Common error: FEED HOLD is not permission to reach inside

Wait for the workstation-defined safe-access state. During tapping and ATC, do not assume that every action stops immediately; action table: 49.

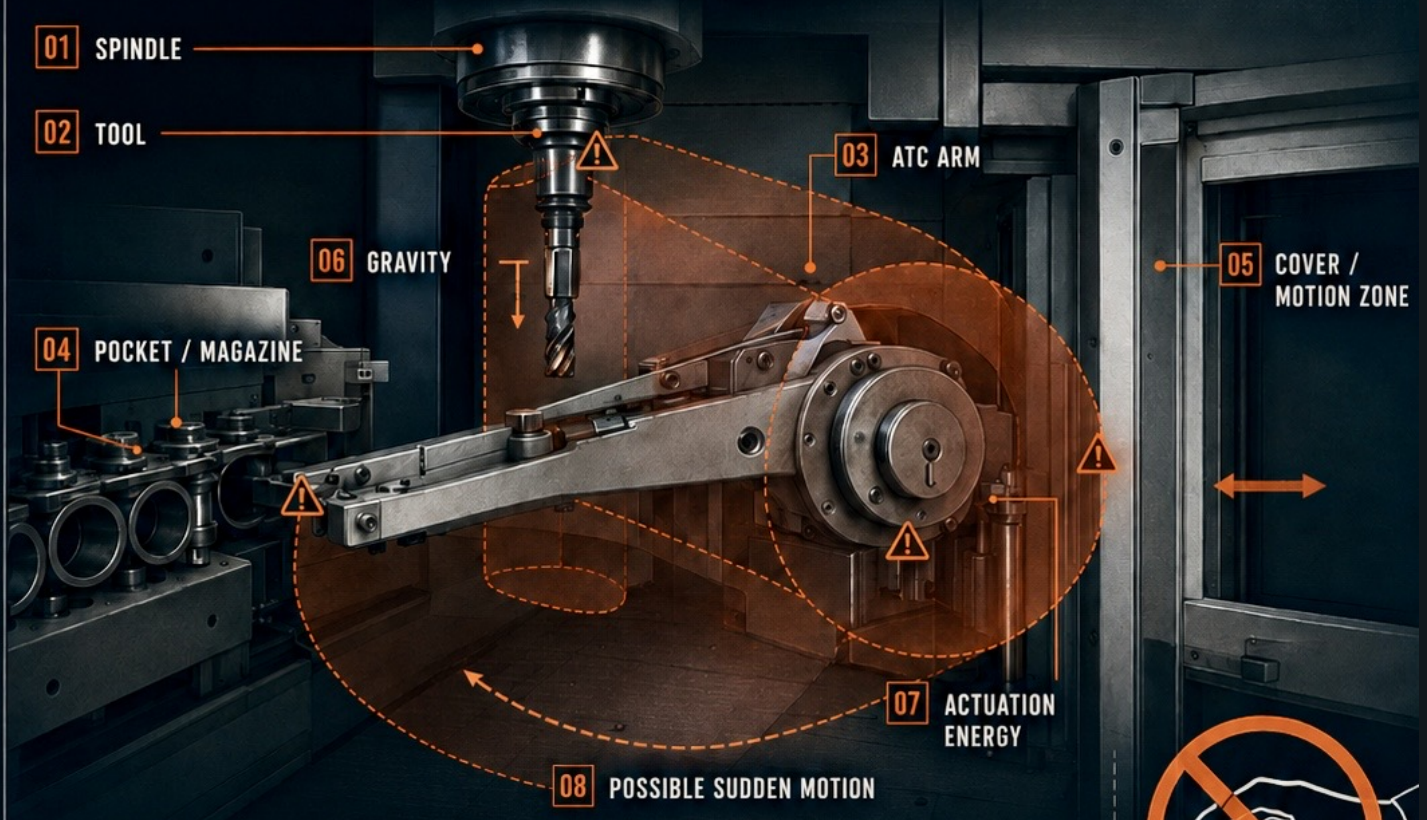
Before opening and accessing the work area

- ☐ The spindle, axes and mechanisms have reached the required stopped state.
- ☐ The tool is clear of the access area; cutting edges do not endanger the hands.
- ☐ Nobody else can restart motion during access. Guards and interlocks function.
- ☐ For a jam or access to a mechanism, follow the energy-isolation procedure when required.

Releasing E-STOP or selecting TEST on the key switch does not replace checking the cause and machine state. [H2]

ATC MID-CYCLE IS STILL STORED ENERGY

STOPPED MOTION DOES NOT MEAN THE MECHANISM IS SAFE TO TOUCH



STORED ENERGY ZONE
RISK OF SUDDEN MOVEMENT

STORED HYDRAULIC ENERGY
p: see manual

KEEP HANDS OUT OF THE MOTION ZONE

RECORD THE STATE

ALARM	SPINDLE	TOOL	ARM	POCKET

GENERIC ATC STATE DIAGRAM — NOT A CLAIM OF THE MACHINE'S HIDDEN INTERNAL KINEMATICS.

STOP · RECORD THE STATE · DO NOT MANIPULATE · USE AUTHORISED RECOVERY

MATEUSZ ZULAWSKI
PRACTICAL MANUFACTURING AI

A stopped mechanism may retain energy. The machine manual defines pressures, isolation and recovery.

LOTO AND PERSONAL PROTECTIVE EQUIPMENT

Routine part changing requires the workstation-defined safe-access state. Clearing a jam, servicing or accessing ATC/spindle mechanisms requires assessment of energy sources and the applicable isolation. E-STOP or an open door does not replace LOTO. [H2]

Protective equipment and clothing

AREA	RULE
Eyes, feet, hearing	Use safety eyewear and footwear selected by the risk assessment. Use hearing protection where noise exposure and site instructions require it.
Clothing and hands	Secure long hair, fasten sleeves and remove jewellery. Do not wear gloves where rotating parts can catch them.
Chips and fluids	With the machine stopped and properly secured, use chip-handling tools and gloves suited to the task. Respiratory protection follows the exposure assessment; it does not replace enclosure and extraction.

Energy isolation: sequence for authorised personnel

STAGE	REQUIRED RESULT
01 Prepare	Define the work and inform affected people. Identify all sources: electrical, air, hydraulic, spring and gravity energy.
02 Stop	Stop by the correct procedure. Support parts that could fall before releasing pressure or clamping force.
03 Isolate	Disconnect the required sources at designated points. Lock and tag them under the LOTO procedure to prevent unintended reconnection.
04 Control energy	Dissipate or restrain stored energy as the manual specifies. Do not loosen loaded lines or components as a way to release pressure.
05 Verify	Verify effective isolation and absence of uncontrolled motion by the prescribed method before access begins.
06 Restore	Clear tools and people; restore guards. Remove locks under the procedure and their owners’ responsibilities. Re-energise and test in a controlled manner after readiness checks.

Protective equipment: [H4] [H5]. Fluid mist and clearance time before opening: [H1]. Restart after ATC/tapping: 49.

START OF SHIFT AND REFERENCE RETURN

01 **Establish the machine's current state**
Check whether the previous cycle ended normally. If a tool remains in the material, power was lost or the ATC stopped mid-sequence, go to pages 47-49.

02 **Check the workstation before power-up**
Remove loose items; inspect the workpiece, tool and axis travel path. Check the available supply indicators and fluid levels against the machine markings.

03 **Follow the workstation power-up sequence**
Use the correct supply and control power button; wait for startup to finish and the ready state to be reached. Read messages before clearing them.

04 **Establish whether reference return is required**
If this machine and control state require it, follow the approved procedure. Do not begin with a tool trapped in material or the ATC outside its rest position.

05 **Confirm every required reference**
Check the reference-reached indication, not just a displayed 0.000. Stop movement and establish the cause if the direction is unexpected or an alarm occurs.

06 **Run the warm-up routine**
Use the program and operating ranges approved for this machine, with clearance checks. Watch for stable spindle operation, correct lubrication and unusual sounds.

HOME1 and HOME2 are not interchangeable

This panel family distinguishes first and second reference returns. The second point may serve an operational position. This does not mean both buttons run the same procedure or that HOME2 can be used before the reference is established.

Record on page 89: axis order, how reference is confirmed, tool position at startup and the warm-up program. No universal Z-X-Y order or fixed warm-up time/rpm is specified without this machine's documentation.

AJV-25/404: distinguish working head travel from tool change travel. Axis motion diagram and area checks: page 36.

Record startup, supply readings and pre-production checks: 86.

TAKE OVER THE JOB AND PROGRAM

First establish what must be produced. A matching program number is insufficient if the drawing revision, clamping orientation or fixture has changed.

AREA	QUESTION BEFORE SETTING
Documentation	Do the part number, operation, revision and material match the job sheet? How is the trial part identified, and when is quality approval required?
Blank / stock	Do the dimensions, allowance and orientation match the program? Is there enough material for both machining and clamping?
Active program	Which WORK NO. is selected to run? Has the starting point been left at a restart position from the previous part?
Coordinate system	Are you using MAZATROL with WPC, EIA/ISO or a mixed program? Which work offsets and transformations are active?
Tools	Does the tool sheet match the operation? Are replacement tools available, and which selection rules apply?
Fixture	Do the fixture number and the positions of stops, supports and clamps match the approved setup?
Changes since the previous batch	Have any tools, jaws, work offsets, programs, material or cutting parameters changed? Which checks must therefore be repeated?

Before editing

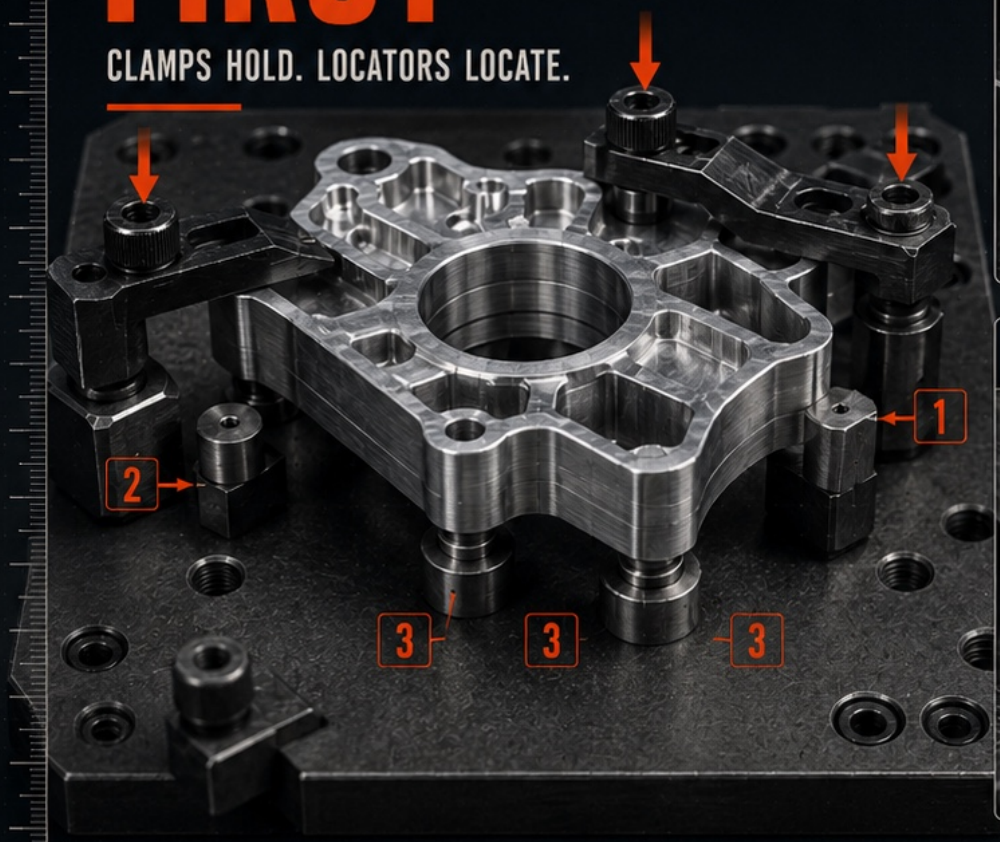
Record the original value, field name and reason for the change. Preserve the program version under site rules. Viewing a program, selecting it to run and editing it are separate actions.

Units and signs

Check mm/inch, numerical sign and decimal position. Entering '20' instead of '2.0', selecting the wrong axis or editing a similar program number may look plausible until the first approach. Read the field again after confirming.

SEAT IT FIRST

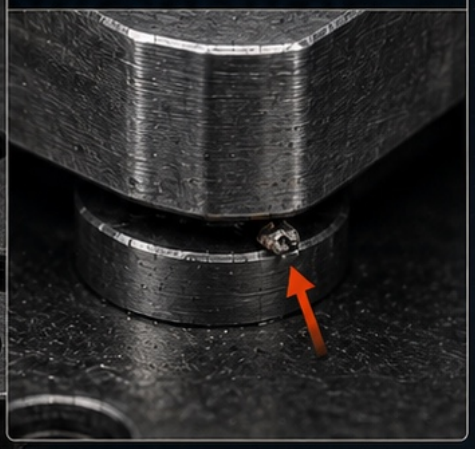
CLAMPS HOLD. LOCATORS LOCATE.



NO-GO — BLADE DOES NOT ENTER



CHIP UNDER DATUM CAUSES LIFT

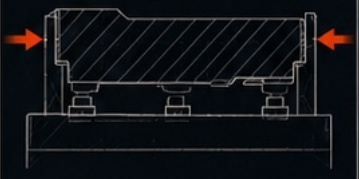


3 — PRIMARY



- 3 LOWER SUPPORTS
- PRIMARY DATUM PLANE

2 — SECONDARY



- 2 SIDE LOCATORS
- DIRECTIONAL CONSTRAINT

1 — TERTIARY



- 1 END STOP
- AXIAL LOCATION

- CLAMP FORCE
- LOCATOR / SUPPORT
- STOP
- CLAMP
- ADJUSTABLE SUPPORT

BLADE SIZE AND ACCEPTANCE CRITERION ALWAYS COME FROM THE FIXTURE SHEET.

The fixture sheet defines the blade thickness and NO-GO criterion. Check the specified datum contacts.

WORKHOLDING: SEAT FIRST, THEN CHECK

A clamp must hold a correctly located workpiece. It must not conceal a chip beneath a datum or pull an incorrectly seated part into position.

COMPONENT	ROLE
Locators / stops	Define the workpiece position. In a conventional 3-2-1 arrangement, three points establish the primary plane, two locate the second surface and one locates the third.
Additional supports	Support areas that could deflect. Adjustable supports must not move the workpiece off its locators.
Clamps	Maintain contact with the locators and resist cutting forces. Clamping above a support helps limit distortion. [P1]

01 **Clean the contact surfaces**
Check the workpiece, jaws, packing and stops. Remove chips with the correct tool while the machine is stopped. Do not close a clamp onto a contaminated datum.

02 **Confirm the face and orientation**
Compare a distinctive part feature with the setup drawing. A similar overall shape does not confirm correct orientation.

03 **Seat the part as the fixture sheet specifies**
Bring it onto the required locators. Follow this fixture's specified order for initial clamping, support adjustment and final tightening.

04 **Apply the correct clamping force**
Use the torque, pressure or position specified by the workholding instructions. Do not replace a defined value with 'as tight as possible'.

05 **Check after tightening**
Confirm contact at the inspection points, workpiece height and stability. Check access for the tool and clearance for the holder and spindle body.

Feeler gauge - use the fixture's acceptance criterion

If the sheet specifies a NO-GO check, the stated blade must not enter the identified gap. Blade thickness, location and test conditions must come from that sheet. 0.05 mm is not a universal seating tolerance.

ONE PALLET ONE CYCLE

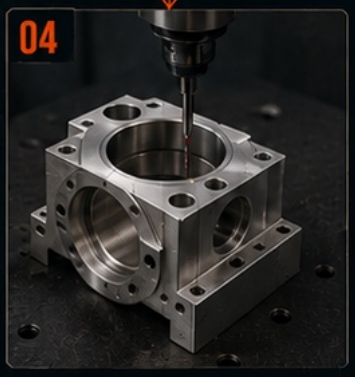
PREPARE THE NEXT STEP WHILE THE MACHINE IS CUTTING

BLANK • DOCUMENTATION • MEASUREMENT • INSPECTION

















ONE PALLET = ONE LOADING AND MACHINING ZONE.

During cutting, prepare material, documents and inspection equipment outside the machine movement area.

WORKING WITH ONE PALLET

There is one workholding area. Load the next part after machining finishes and safe access is established. Pallet count does not indicate how many tools the magazine holds.

Illustration: page 17.

DURING MACHINING - OUTSIDE THE AREA	WHILE THE MACHINE IS STOPPED
Prepare the correct blank and documentation.	Confirm the cycle is complete and the tool is clear.
Measure the previous part if the inspection plan permits it.	Release the workpiece, clean the locating surfaces and seat the next part.
Prepare gauges and a place for the finished part.	Clamp and inspect as described on page 16.
Record measurement trends and prepare a replacement tool.	Remove loose equipment, close the guard and check the start conditions.

Checks to repeat for every part

Check clean datums, correct orientation, complete clamping and no loose equipment in the machining area. Changing a workpiece alone does not require resetting WPC if the fixture and locating assumptions remain valid.

Measuring the actual time per part

```
Time/part = machining + handling while stopped + other stops
```

Planning example: 6.0 min machining + 1.5 min changing and checking = 7.5 min/part, or theoretically 8 parts/h before other losses. Reduce searching and preparation outside the machining area; do not omit seating checks.

ONE TOOL FOUR IDENTITIES

TNO. ≠ PKNO.



Numbers are examples. Match the program requirement, TNO., PKNO. and measurement to the physical assembly.

TOOLS: WHAT MUST MATCH

Check the chain: program requirement → tool identity → assigned pocket → physical assembly → measured data. TNO. and PKNO. have different roles. [M1]

CHECK	WHAT MUST MATCH
Program and tool designation	Type, NOM-Ø, suffix and other program requirements with the tool sheet.
TNO.	The identifier with the physical assembly intended for the operation.
PKNO.	The assigned pocket with the actual tool location. Do not assume that the pocket field takes the TNO.
TOOL DATA	Entered LENGTH and ACT-Ø with measurements of this assembly after its latest assembly. Check sign and units.
TOOL FILE	Tool type and reference data. This display does not replace the data for the tool installed in the machine.
COMP. / ACT-Ø	The field meaning with the configuration: length, diameter or radius. Do not assume a universal wear offset.
Physical assembly	Correct cutter, projection, holder and pull stud; approved mass, length and ATC envelope.

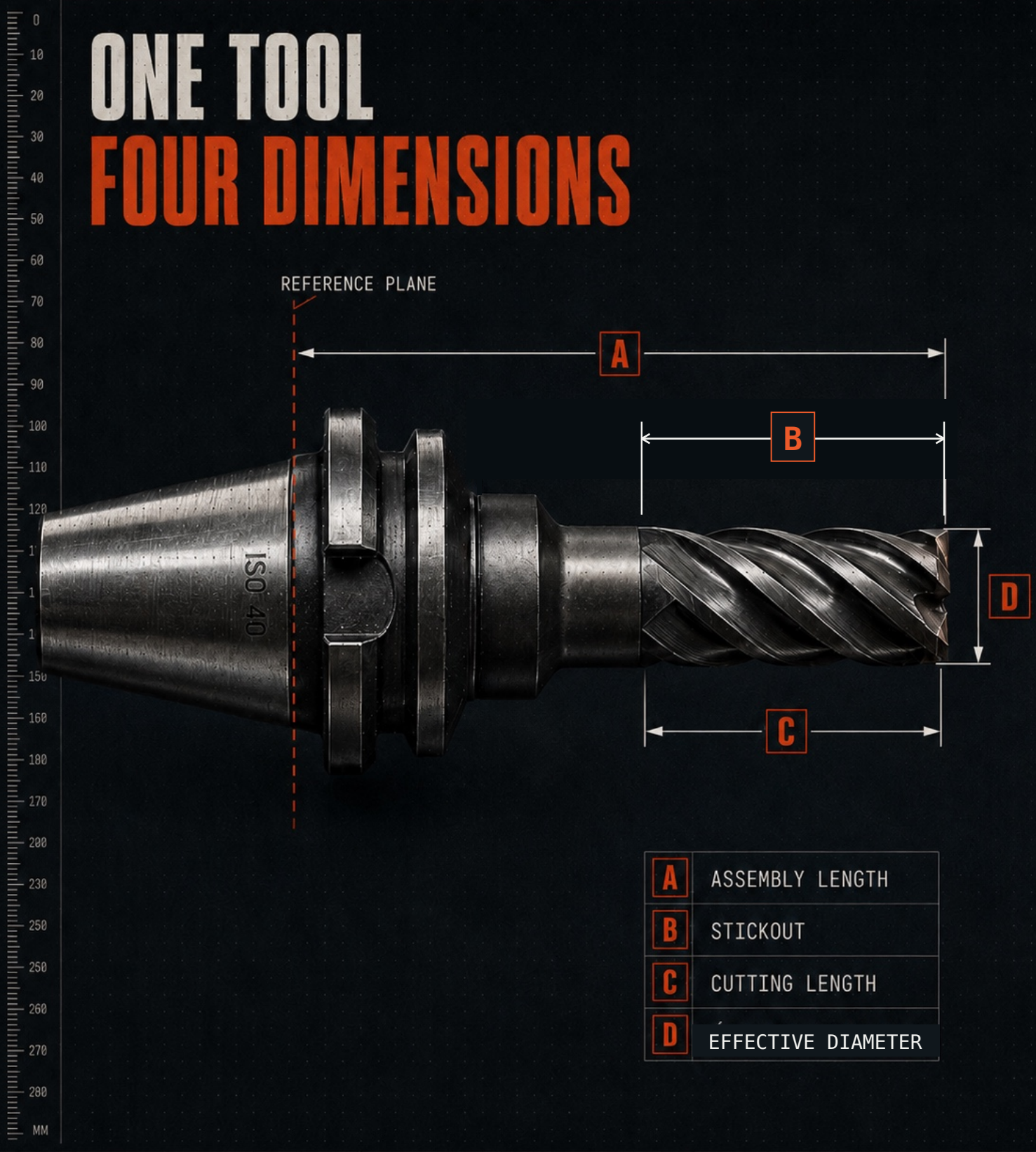
Example of a valid assignment

TNO. 12 → PKNO. 7 → the correct Ø10 end mill → its current measurements. Different numbers can be valid with a separate pocket map. These example numbers do not describe this machine's magazine.

A size-40 designation alone does not identify the interface. CAT, BT and SK/DV are not interchangeable by name. Match the taper, flange and pull stud to the machine manual. [T1]

Change and measurement: 23, 26. ATC limits: 35.

ONE TOOL FOUR DIMENSIONS



A	ASSEMBLY LENGTH
B	STICKOUT
C	CUTTING LENGTH
D	EFFECTIVE DIAMETER

THE SAME TNO. DOES NOT GUARANTEE THE SAME LENGTH AFTER REASSEMBLY.

A: gauge length. B: projection from the clamping face. C: cutting-edge length. D: cutting diameter.

CHANGE MEASURE VERIFY

HOLDER + CUTTER = ONE MEASURED ASSEMBLY

MACHINE	MAZAK AJV-25/404
YEAR	1989
CONTROL	MAZATROL M-32
PALLET	1 (SINGLE)

01 → 02 → 03

01 PHYSICAL ASSEMBLY

ASSEMBLY BEFORE SEATING



02 MEASURE ASSEMBLY

MEASUREMENT EXAMPLE



03 VERIFY IN MACHINE

ASSEMBLY BEFORE SEATING



CLEARANCE

From the setup sheet and the full travel path.

AFTER REASSEMBLY, DO NOT ASSUME THE TOOL LENGTH IS UNCHANGED.

Before a cycle, confirm full taper seating, clamping and clearance along the complete path. Procedure: pages 23-26.

CHANGING A TOOL: STEP BY STEP

Calling a magazine tool in MDI

The M-32 manual describes: **MDI → TOOL CHANGE → number requested by the display → INPUT → check the command and conditions → CYCLE START**. It uses the pocket number. Confirm numbering and ATC readiness. TOOL SELECT prepares selection; it does not seat a tool in the spindle. [M2]

01 **Prepare the change**
Identify the spindle tool and destination. Check references, ATC state and a clear path for the complete assembly.

02 **Install the correct assembly**
Follow the machine sequence for manual unclamping. Support the holder as specified; keep clear of cutting edges. Check taper cleanliness, the correct pull stud and clamp state.

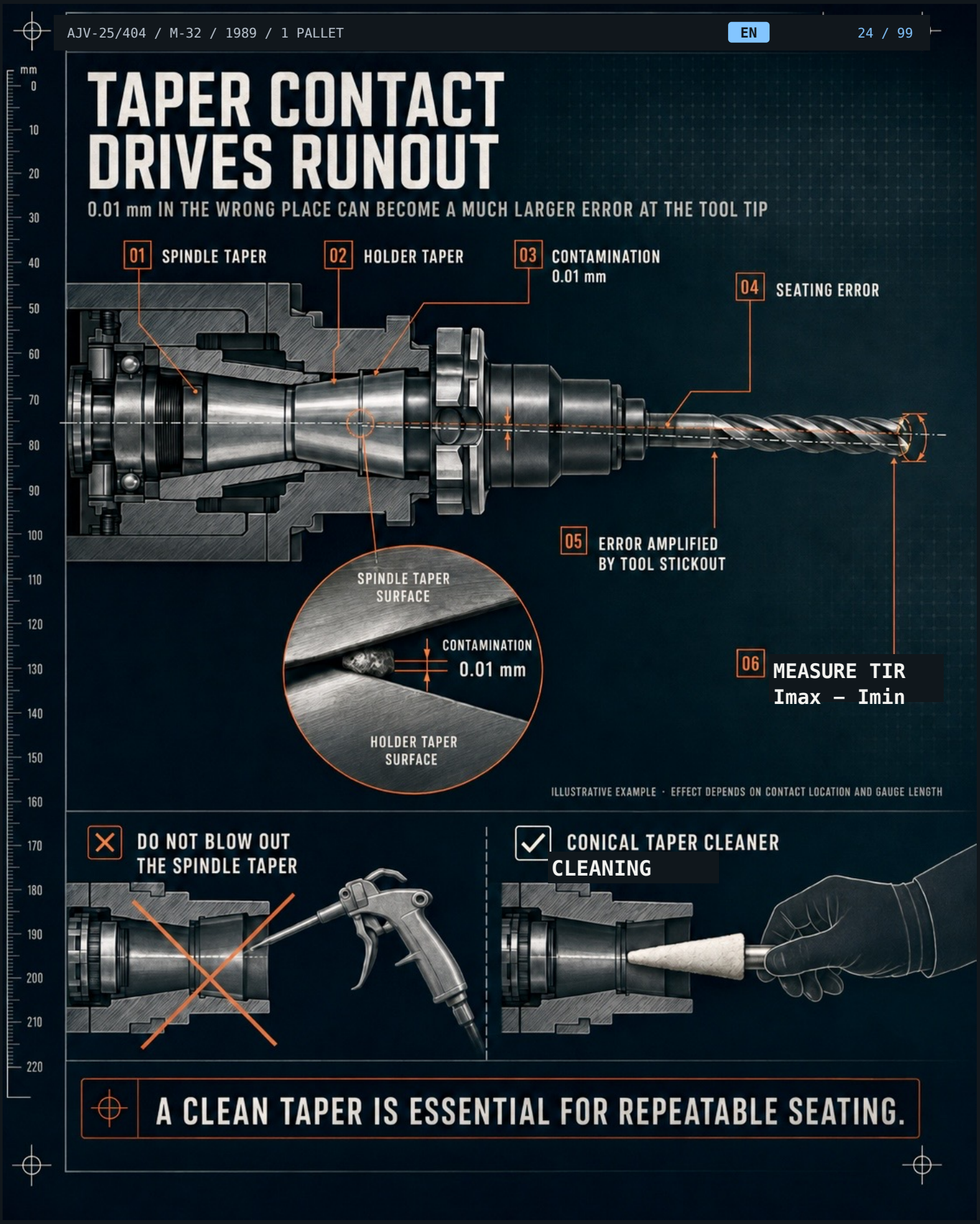
03 **Measure and save the data**
Use the workstation method for LENGTH and ACT-Ø. After saving, read the entire row: identity, value, sign and unit.

04 **Check the effect of the change**
A different projection, new cutter or reseating can alter length or runout. Measurements must apply to the current assembly.

05 **Verify the first approach**
Compare the spindle, pocket map and TOOL DATA. Check the tip at a known checking position and observe the first approach.

Common error: START as an installation confirmation

CYCLE START can execute the pending command in the active mode. Read that command first. Record pedals, TOOL UNCLAMP and ATC behaviour during manual changes here: 89.



Stickout can magnify seating error. TIR depends on the complete assembly and measuring location, not only chip thickness.

SPINDLE TAPER: CLEANING

A clean taper contact supports repeatable seating. This task does not include socket repair, drawbar adjustment or ATC alignment. Effect of contamination: 24. [T2]

01 **Prepare access**
Unload the tool by the documented procedure; do not call an arbitrary empty pocket. Secure the spindle, axes and ATC against movement during cleaning. Establish access conditions and energy isolation under the machine manual and LOTO procedure; 12.

02 **Inspect the surfaces**
Under good lighting inspect the socket, holder taper and drive keys. Report scoring, dents, fretting or cracking. Segregate a damaged holder for assessment; do not remove defects with abrasive paper or a file.

03 **Clean without driving debris inward**
Use a clean wiper matching the taper profile and lint-free cloth. Make the gentle movements specified for the wiper. Do not direct an air gun into the spindle or flood the socket with cleaner.

04 **Use the specified agent and surface condition**
If a chemical cleaner is needed, use a product approved for this machine and wiper, in the specified quantity. Do not substitute brake cleaner. Do not add oil or anti-seize to the working contact unless the machine manual explicitly requires it.

05 **Reassemble and check the result**
Before assembly remove cleaning residue as instructed. Seat the clean assembly, confirm clamping and check TIR at the same section. If seating or length changed, verify LENGTH and the safe Z checking position.

Storage protection versus spindle operation

Oil protecting a stored holder is not automatically permitted on its working contact. Restore the manufacturer-required condition before mounting. ISO #40 alone does not establish dual taper-and-face contact.

If runout remains, check seating, an approved test arbor, the holder and tool shank in turn. An arbitrary flange is not a precision reference. Measurement: 79. Fault report: 52.

TOOL LENGTH AND Z VERIFICATION

Complete assembly length, cutter stickout from the holder and cutting edge length describe different dimensions. Z setting must use the same reference plane and convention as the control.

WORKSTATION METHOD	CONDITION FOR A VALID RESULT
Presetter	Measurement and machine data refer to the same gauge plane; assembly identity and units agree.
Measurement on the machine	A known, checked reference point and a verified measuring function. Do not guess the relationship between an axis reading and tool length.
Comparative method	A recorded master reference and sign convention. Changing the master requires rechecking the complete reference chain.

Example after reassembling the tool

```
Old L = 155.320 mm
New L = 153.970 mm
Change = -1.350 mm
```

For a positive full length measured from the same plane, the new assembly is 1.350 mm shorter. Do not retain the old measurement merely because the tool number is unchanged. With a comparative method or another convention, convert the result as the workstation sheet requires.

Check independently of the entered number

01 **Select a known check position**
Use an approved approach to a reference surface with a large, known clearance. Do not run an arbitrary MDI block with an unknown compensation state.

02 **Compare expected and actual positions**
First confirm clearance without inserting measuring equipment beneath a moving tool. Measure the gap only after establishing safe access.

03 **Resolve any discrepancy before starting**
Check the tool number, active work zero, measuring method, gauge block or spacer, and data sign. Do not alter WPC to conceal a single-tool error.

THREE ZEROS
THREE DIFFERENT REFERENCES



SAME PALLET – TWO POSITIONS, TWO WPC ZEROS



⚠ RETURNING THE MACHINE TO REFERENCE DOES NOT MOVE THE WPC ZERO.

Coordinate directions are schematic. Relative zero, WPC and machine reference serve different purposes.

THREE COORDINATE REFERENCES

REFERENCE	MEANING
Machine coordinates	Position relative to the machine reference. Referencing the axes does not automatically set the work zero for a new part.
Workpiece / program coordinates	The origin and axes used to produce the part geometry. They should match the drawing and setup sheet.
Relative / auxiliary display	A readout useful for measurement. Zeroing the display alone does not prove that the active program origin has changed.

MAZATROL and EIA/ISO

In MAZATROL, the WPC unit defines the work coordinate system location. EIA/ISO programs may use systems such as G54. Do not assume a shared data location or automatic transfer between these modes. [M4]

Setting work zero

01 **Identify the physical origin**
A corner, bore centre, fixture plane or finished surface? Mark the origin on the setup drawing before measuring.

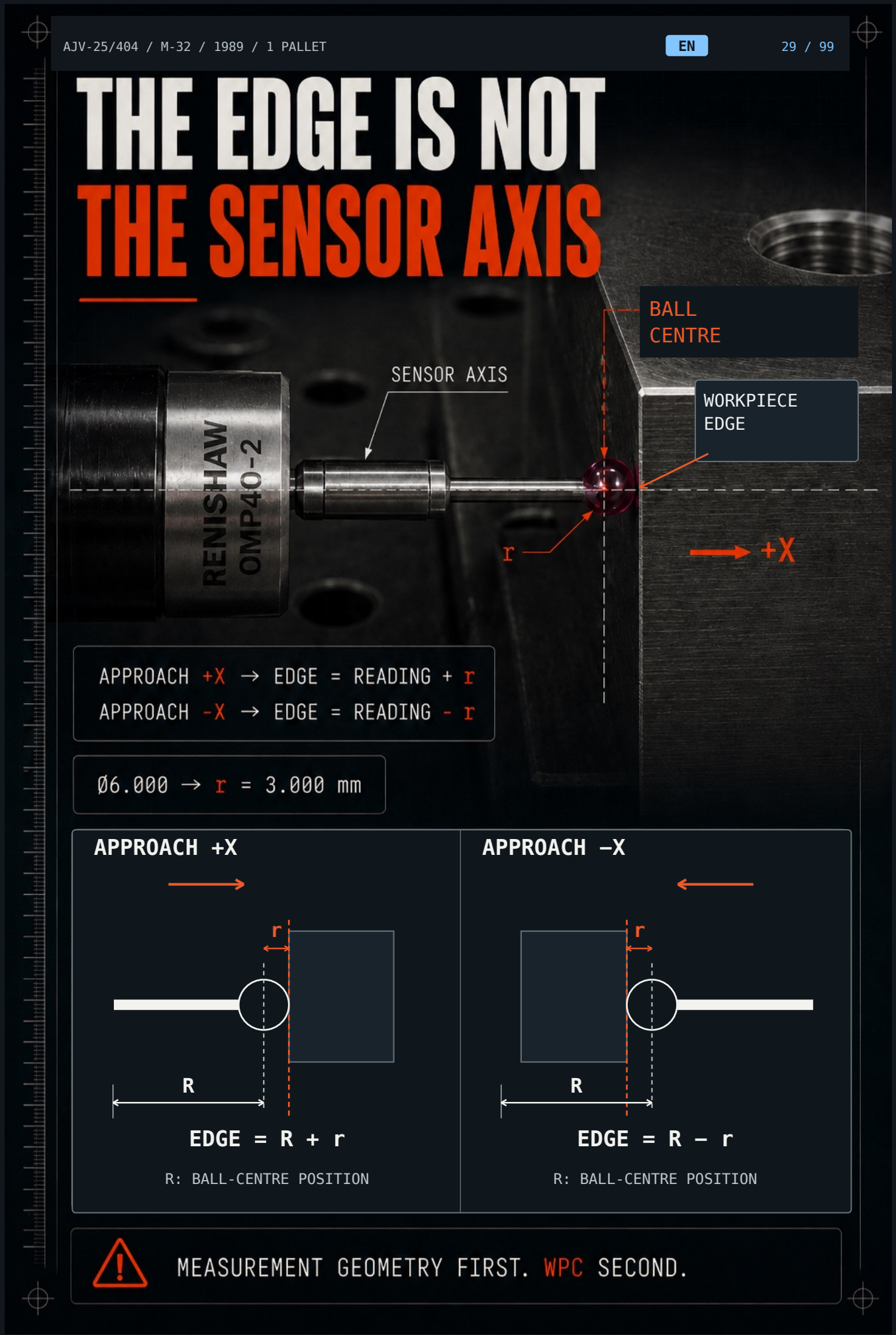
02 **Select the correct data location**
Check the program number and the specific unit/coordinate system. Establish whether more than one origin, shift or rotation is used.

03 **Measure and record**
Use the appropriate measuring method, tip radius and gauge block thickness. Preserve the original values before saving.

04 **Check independently**
After retracting into clear space, confirm a known point and the axis directions. Verify by measurement; seeing the tool 'roughly above the corner' is insufficient.

One pallet does not mean one WPC. One table can carry several positions or workpieces. Check the coordinate system used by the current operation.

THE EDGE IS NOT THE SENSOR AXIS



The ±r rule applies to the raw stylus-centre position. A probing cycle may already compensate the radius; page 30.

X AND Y: RADIUS AND APPROACH DIRECTION

This example measures a side face with an edge finder whose centreline is offset by a known radius r at contact. All readings must use the same coordinate reference, without resetting its zero between contacts.

Illustration: page 29.

APPROACH ALONG THE AXIS	SURFACE POSITION
From lower to higher coordinate values	Finder centreline reading + r
From higher to lower coordinate values	Finder centreline reading - r

```
Example: tip diameter 6.000 mm, r = 3.000 mm
X at contact = -425.250 mm, approaching in +X
X at edge = -425.250 + 3.000 = -422.250 mm
```

Centre between two parallel faces

With the same tip and correct measurements from opposite sides, the centre is the average of the two finder centreline positions. Example: (-503.100 + -423.100) / 2 = **-463.100 mm**. Do not add the radius again to the calculated centre.

Establish measurement geometry before entering WPC

The result above is the edge position in the coordinate reference used for measurement. Data entry or TEACH must follow the workstation convention. For a probe or 3D tester, use its own method; do not automatically apply this example's ±r rule.

A rotating edge finder, dial indicator and probe require different operating conditions. Select movement, spindle speed or a stationary spindle as the specific instrument's instructions require.

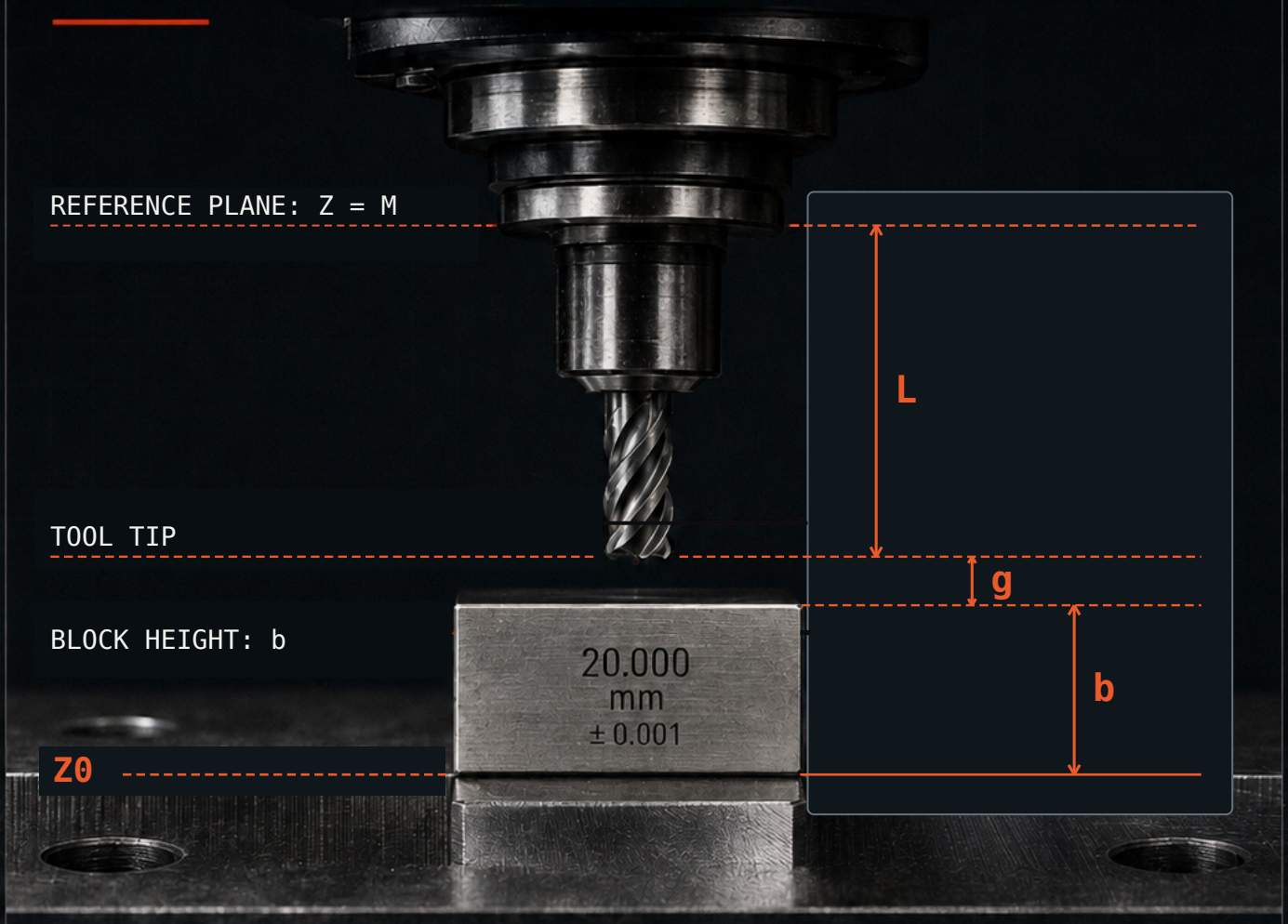
Raw reading versus a probing-cycle result

Distinguish the axis position at contact from the calculated surface position. A probing cycle may already apply the calibrated radius and stylus offset. Applying r again introduces an error. The electronic probe radius need not equal half the nominal ball diameter. [MT3]

The probe shown illustrates contact geometry. Automatic measurement requires a working, calibrated probe and the appropriate measurement software for the machine.

Z0

DON'T LOSE THE REFERENCE



$$Z0 = M - L - b - g$$

CONTACT: g = 0 → Z0 = M − L − b

L: LENGTH · b: BLOCK HEIGHT · g: GAP

DO NOT SUBTRACT TOOL LENGTH TWICE IF THE READING ALREADY INCLUDES IT.

M is a coordinate; L and b are lengths. At contact with the block, gap g = 0. Convention and example: page 32.

Z: ACCOUNT FOR LENGTH AND GAUGE BLOCK

First establish whether Z0 lies on a raw surface, finished surface or fixture. Gauge block thickness and stock above the finished surface are separate distances.

Illustration: page 31.

Geometric example - defined convention

Assumptions: positive Z is upwards; M is the spindle gauge-plane coordinate; L is the positive full tool length; block b sits directly on the Z0 surface, and the tool tip contacts its top face. Then:

```
Z0 = M - L - b
M = -200.000; L = 150.000; b = 20.000 mm
Z0 = -200.000 - 150.000 - 20.000 = -370.000 mm
```

If the measured raw surface is 0.500 mm above the required Z0 of the finished surface, that Z0 is a further 0.500 mm lower: **-370.500 mm**. This is a geometry example, not a recommended stock allowance.

Verify what the display represents before using the result

The screen may display a different quantity from M in this example, and the workstation method may use a different reference. Use the approved measurement/TEACH procedure and its convention. Do not subtract tool length again from a reading that already accounts for it.

After saving: verify a known clearance and the work zero in use. A tool change requires checking tool data; by itself it is not a reason to change the datum for the whole part.

The contact condition

The equation above assumes the tool tip contacts the top of the block. The illustration marks the gap g to distinguish approach from the measurement instant. With positive Z upward and the same reference plane for M and L:

```
Z0 = M − L − b − g
g = 0 → Z0 = M − L − b
```

M is a signed coordinate. It is not the spindle-to-table distance. L, b and g are positive lengths in this model. Do not assume g = 0 before establishing proper contact.

Practical approach and reference check: 33.

SETTING Z WITH A HEIGHT REFERENCE

Place the reference on the specified datum. Distinguish a rigid gauge block from a setter with a moving sensing face. Height h is the distance at the valid indication; check the model, unit and certificate.

DEVICE	WHAT DEFINES CONTACT
Mechanical or electronic setter	A defined dial reading or signal under its manual conditions. A “50 mm” label is not the exact height of every setter.
Rigid gauge block	An approved comparative method with clearance control. There is no protective travel; do not drive the axis against a trapped block.

01 **Check and position the reference**
Clean the datum and reference faces. Check operation, stability and usable range. Keep the spindle stopped and secured against unintended drive; use the site procedure for access and manual axis motion.

02 **Plan the approach**
Approach through clear space while watching the cutting edge and complete assembly. Stop with a clearance reserve; use the smallest verified HANDLE increment for the final approach. Do not equate ×1 with a fixed distance.

03 **Obtain the reading without holding a block under motion**
Moving-plate setter: keep hands clear, approach the indication and stop the feed without exceeding travel. Insert or remove a rigid block only with the axis stopped and clearance assured; perform Z movements separately, with hands clear of the tool.

04 **Record using the correct reference**
Record the reading, active frame, h and tool-length reference. Use the verified WPC/TEACH procedure. Do not choose +h or −h arbitrarily. After retracting and removing the reference, check a known safe clearance.

The machine coordinate need not refer to the holder gauge line

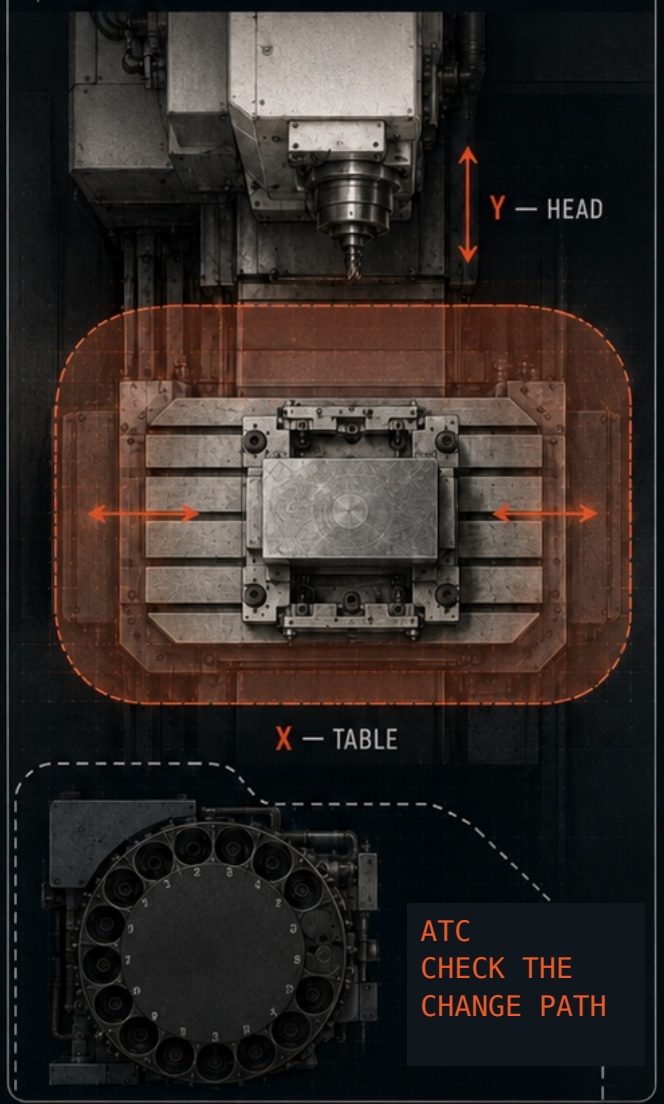
The M-32 description relates MACHINE to the spindle end face. Z0 = M − L − h requires M and L to share a reference plane and contact with no gap. Do not substitute the raw Z reading without establishing this agreement or subtract L twice. Geometry and example: 32. [M1]

Example of a contact setter and its limitations: [TS1]. An electronic setter requires a functioning signal; absence of the LED does not justify further pressure.

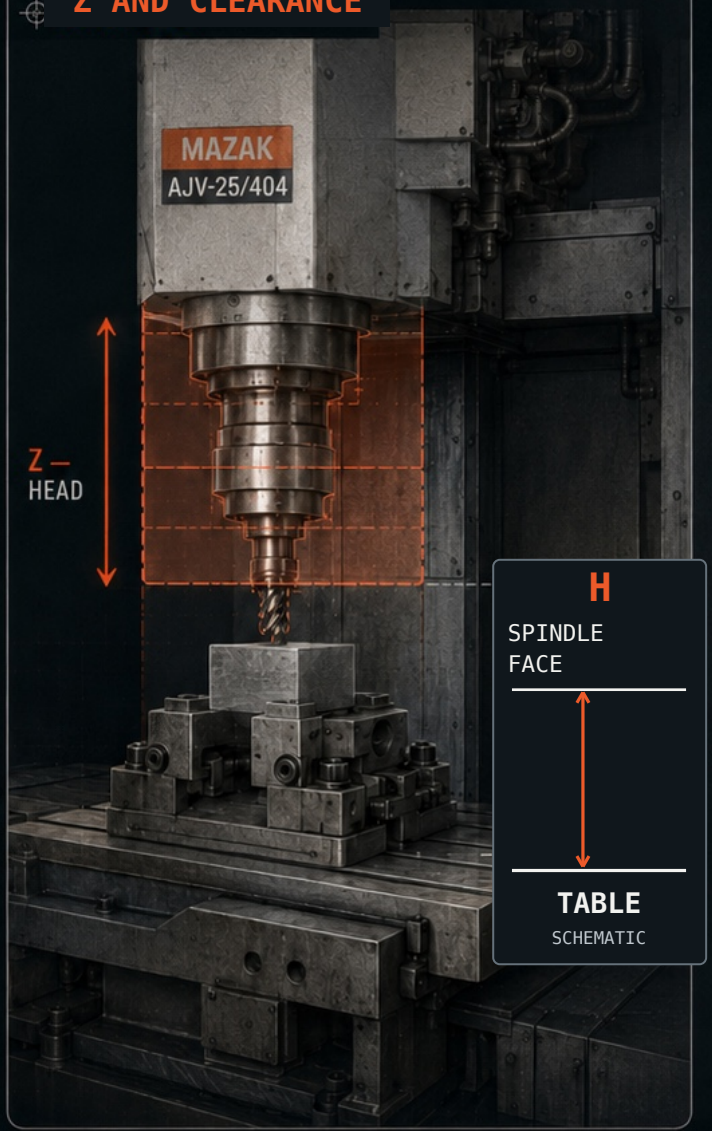
EIA TEACH example: for Z in WORK OFFSET DATA, the M-32 manual specifies the distance from the tool tip to work zero. With the tip 50.000 mm above Z0 and positive Z upward, this is **−50.000 mm**. It is the distance for the TEACH prompt, not a new WPC or LENGTH value. Confirm the display, unit and length treatment before use. [M1]

CLEARANCE IS MORE THAN THE CUTTER TIP

X / Y MOTION



Z AND CLEARANCE





Include the part, fixture, holder, head and ATC travel. Illustration scales do not specify clearances.

AJV-25/404: DATA AND ATC LIMITS

Data from the manufacturer's /404 column. Match equipment variants to the serial number and machine-specific manual. [M5]

PARAMETER	VALUE / CONDITION
X / Y / Z travel	1000 / 508 / 460 mm
Table / load	550 × 1240 mm / 800 kg
Spindle taper / motor	ISO #40 / 11 kW continuous; 15 kW / 30 min
Speed: standard / option	28-4000 / 42-6000 rpm
Magazine: standard / options	30 / 40, 60 tools
ATC: complete assembly mass	8 kg including holder and pull stud
ATC: assembly length	300 mm from gauge line to tool tip
Spindle nose to table	200-660 mm; Hi-column option: 400-860 mm
ATC: ordinary tool diameter	**VERIFY IN THE MACHINE-SPECIFIC MANUAL**
ATC: oversized tool	The table gives Ø150 mm with the adjacent-pocket-empty condition (*2). The manual defines the required empty-pocket arrangement.

Ordinary diameter: do not treat the entry as an operating limit

The scan states **Ø90 mm (3.93 in)**, but 3.93 in equals 99.822 mm. This does not establish which value is wrong. Do not automatically adopt either Ø90 or Ø100. Record the approved limit and source on the machine sheet.

Until resolved, use only assemblies covered by the workstation's approved tool sheet. Do not find the diameter limit by an ATC trial. Ø150 requires compatible documentation, magazine configuration and travel clearance. Machine record: 89.

AJV: MOTION AND CLEARANCES

The table moves in X; the head moves in Y and Z. This functional diagram is not to scale and does not assign positive directions. [M5]

Illustration: page 34.

ATC travel does not increase the machining envelope

The manufacturer's table excludes the **270 mm** ATC stroke from the **508 mm** working Y travel. Do not add these values when planning machining.

AREA	PRACTICAL CHECK
Table movement	Check the complete workpiece and fixture envelope, including cable and hose routing. Consider the entire workholding assembly's path, including return and rapid moves.
Head movement	Check the spindle body, holder and projecting parts of the tool assembly. Clearance at the cutter tip does not establish clearance around the whole holder.
H versus tool length	H in the diagram is measured from the spindle nose. Gauge-line length may use a different reference; do not subtract it from H without confirming the geometry. See pages 26 and 32.

Before the first run: compare the program ranges with the active WPC and fixture position. Nominal axis travel is not a coordinate to enter in the program or proof of a clear path.

Check the path as well as the endpoint

- ☐ The tool and holder clear all links between operations and approaches to clearance planes.
- ☐ The head and spindle clear tall workholding and clamps as X/Y/Z positions change.
- ☐ Tool-change and ATC paths are clear for the length and diameter of the actual assembly.
- ☐ Dimension H runs from the spindle face to the table. Tool-tip clearance also depends on holder, tool and workholding geometry.

AJV: SUPPLIES AND PERIODIC MAINTENANCE

Selected checks from the available transcription of section 1-3. Intervals and task allocation must follow this machine's manual and the site plan. MT = maintenance team. [M6]

INTERVAL	SELECTED CHECKS	RESPONSIBILITY
Daily	Table and guard cleanliness; central and head lubrication oil levels, coolant, condensate, leaks and pressure readings.	Operator within authorised duties
Weekly	Spindle nose and holders for damage; hydraulic oil level.	As the workstation plan specifies
Monthly	Filters, wipers, interlocks, wiring and machine level.	MT
Every 6 months	Oils, filters, drives, geometry and axis backlash.	MT

Lubricants: match the full specification

Use a product approved for the particular circuit. An ISO viscosity grade alone does not establish full compatibility. Record the product and reservoir; do not confuse lubrication circuits with hydraulics.

Archived pressures and legacy units

CIRCUIT	SOURCE ENTRY	CONVERSION
Air supply	5 kg/cm²	0.490 MPa / 4.90 bar
Hydraulic unit	70 kg/cm²	6.865 MPa / 68.65 bar

The legacy kg/cm² notation is interpreted as kgf/cm². These are archived values from a transcription, **not adjustment instructions**. Confirm the permitted range and reading point in the machine manual before assessing this machine's indications.

WORKSTATION RECORD	COMPLETE
Air: range / point / reading	.....
Hydraulics: range / point / reading	.....
Document / checked by / date	.....

An out-of-range pressure, leak or uncertain clamp state must be resolved before a cycle. Work on valves, the electrical cabinet and compensation parameters is for authorised maintenance personnel.

TEST MODE
DOES NOT MEAN “NO MOTION”

Trial functions do not replace knowledge of the program and machine.



01 SINGLE BLOCK

Stops follow the control and cycle. The next step can execute real axis motion.

REAL MOTION



02 RAPID OVERRIDE

Changes the rapid-traverse speed. RAPID travel is still real machine motion.

REAL MOTION



03 FEED OVERRIDE

Changes the actual working feed. The axes still move according to the program.

REAL MOTION



04 DRY RUN

The axes move. Test feed can substitute for or modify the programmed feed.

REAL MOTION



05 MACHINE LOCK

Program processing continues, but X/Y/Z axis motion is locked.

X/Y/Z MOTION LOCKED

! None of these functions guarantees collision-free operation.

Comparison of trial functions. It does not define the TEST soft key or DOOR INTERLOCK switch; pages 39 and 57.

PROGRAM TESTS: WHAT THEY VERIFY

FUNCTION	LIMITATION
SINGLE BLOCK	Provides observation points between execution stages. It does not detect an incorrect work zero or guarantee a stop before every obstruction.
RAPID override	Reduces the applicable rapid traverse speeds. Select a known value before approaching; do not assume R0 means no movement.
Feed override	Changes the feed movements covered by the override. It does not regulate every type of movement or replace a toolpath check.
DRY RUN	May replace the programmed feed with the test feed setting, potentially speeding up a section intended to be slow.
MACHINE LOCK	Allows program processing without normal axis motion. Do not treat it as a lock on all auxiliary commands.
MST LOCK / Z AXIS CANCEL	M-32 distinguishes auxiliary command lock from axis lock. These modes do not reproduce the full physical machining process. [M2]

Checks before the first cut

01 **Check data and travel ranges**
Compare tools, work offsets, minimum Z and the envelope of the workpiece and clamps. Include the holder, not only the cutting diameter.

02 **Use the available graphics check**
If the function is available, inspect the path and read any errors. The graphic does not verify physical workholding or provide complete collision protection.

03 **Prepare a controlled run**
Define observation points, rapid override and cutting conditions. Before returning from a test, confirm actual positions and function states.

Do not create an 'air cut' by arbitrarily shifting WPC. That method needs a separate approved procedure, checks covering every movement type and documented restoration of the setting.

FIRST PART AND RELEASE TO PRODUCTION

01 **Complete the preparation checks**
Program, orientation, datums, clamping, tools, work zero, clearances and function states are checked. Remove spanners, indicators and loose equipment from the machining area.

02 **Watch the first approach**
Check movement direction, the tool in the spindle and distance from the workpiece. Stop execution if anything differs from expectations; do not wait for the program to resolve it.

03 **Check the first operation of every tool**
Confirm spindle rotation, coolant delivery and entry into the material. After a tool change, recheck length and holder clearance.

04 **Inspect the first part**
After completion and safe access, measure the features specified by the inspection plan: sizes, positions, depths, surfaces and datum features.

05 **Decide whether a correction is required**
Distinguish setup, tool, program and measurement errors. Address one identified cause at a time and record values before and after the change.

06 **Release the process to production**
Obtain the required quality approval. Record the accepted setup and subsequent inspection frequency. Only then use the agreed production mode.

When should first-part checks be repeated?

Tool replacement or adjustment, workholding or WPC changes, program edits, restart after an abnormal stop and material changes can affect the result. The scope of reinspection should match the actual effect of the change.

Watch the process

Unusual sound, rising load, poor coolant supply or a change in chips requires a process check. A correct program number alone does not confirm that actual cutting conditions remain correct.

CORRECTING D GEOMETRY FIRST

TWO DIFFERENT FEATURES • SAME SIGN WHEN YOU NEED TO REMOVE MORE MATERIAL

POCKET / HOLE



$\Delta s = |\Delta D| / 2$

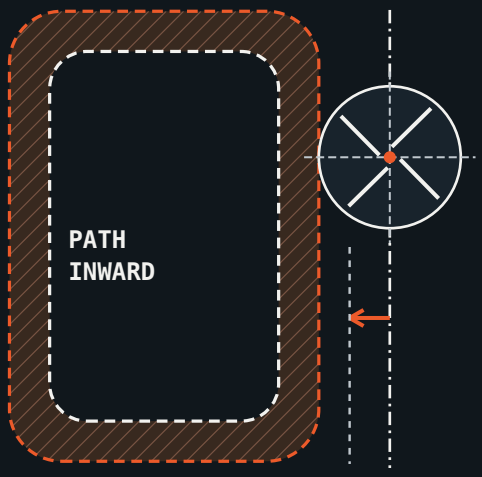
- NOMINAL CONTOUR
- CURRENT CONTOUR
- CUTTER CENTRE PATH
- CUTTER CIRCLE
- STOCK TO REMOVE

POCKET TOO SMALL
REMOVE MORE
INCR. → $\Delta D < 0$

NEED TO REMOVE MORE = NEGATIVE D INCREMENT

$\Delta D < 0$

EXTERNAL SIZE



$\Delta s = |\Delta D| / 2$

- NOMINAL CONTOUR
- CURRENT CONTOUR
- CUTTER CENTRE PATH
- CUTTER CIRCLE
- STOCK TO REMOVE

EXTERNAL SIZE TOO LARGE
REMOVE MORE
INCR. → $\Delta D < 0$



$$D_{new} = D_{old} + \Delta D$$

FULL-DIAMETER MODEL. ΔD IS THE SIGNED INCREMENT.
Δs: PATH SHIFT AT ONE WALL.

Full-diameter model: the path shift at one wall is half the change in D. Model and conditions: page 42.

SIZE CORRECTION: IDENTIFY THE CAUSE FIRST

Before changing an offset, repeat the measurement with the correct instrument and check workpiece location and tool condition. All features shifting suggests a different cause from one incorrect diameter. Adjust the correct field, not simply the easiest one to access.

Example: milling with full-diameter compensation

Assumptions: unchanged physical cutter diameter; a path calculated from the nominal contour using effective diameter D; no other corrections. This is a geometric model, not a rule for drilling, tapping or machining without compensation.

MEASURED RESULT	EFFECT OF CHANGING D IN THIS MODEL
Pocket undersize	Reducing D makes the pocket larger.
Pocket oversize	Increasing D makes the next pocket smaller. It cannot restore material removed from the current part.
External feature oversize	Reducing D makes the external feature smaller.
External feature undersize	Increasing D makes the next external feature larger; it cannot replace missing material.

```
Pocket: target 20.000; measured 19.960 mm
Diameter is 0.040 mm undersize
Full-diameter model: change D by -0.040 mm
Radius model: equivalent change is -0.020 mm
```

If the previous D value was 10.000 mm, this correction gives 9.960 mm. -0.040 is the increment, not the new full diameter.

M-32's INCR. function supports incremental changes to fields including ACT-Ø and LENGTH. Confirm the field, entry mode and final value before use. In EIA/ISO, length/diameter data may combine with other offsets, depending on the configuration. [M1]

Do not apply one sign rule to every field

Z-depth correction depends on the length and work-zero convention. Record the required physical direction, confirm how the chosen field acts and verify the result. Do not make a trial cut if the sign or scope of the effect is unknown.

After entry complete the inspection and record the result on page 43.

INSPECTION AFTER A D CORRECTION

Complete after changing a field that affects cutter diameter or radius, before releasing the process. Sign convention and numerical example: 42. Illustration: 41.

01 **Confirm a valid measurement**
Use the instrument and method in the inspection plan. Clean the feature and account for temperature and measurement uncertainty. Do not choose a caliper, micrometer or bore gauge from a universal tolerance threshold.

02 **Identify the field, model and affected operations**
Match the physical tool to TNO. and its record. Distinguish ACT-Ø, radius adjustment and other compensation fields. TOOL FILE and TOOL DATA have different roles. Check every operation using the changed data; address one cause at a time.

03 **Record and read back the entered result**
Record old value, increment, new value and unit. For INCR., confirm incremental entry. Read the result back and compare it with the calculation; do not change WPC at the same time.

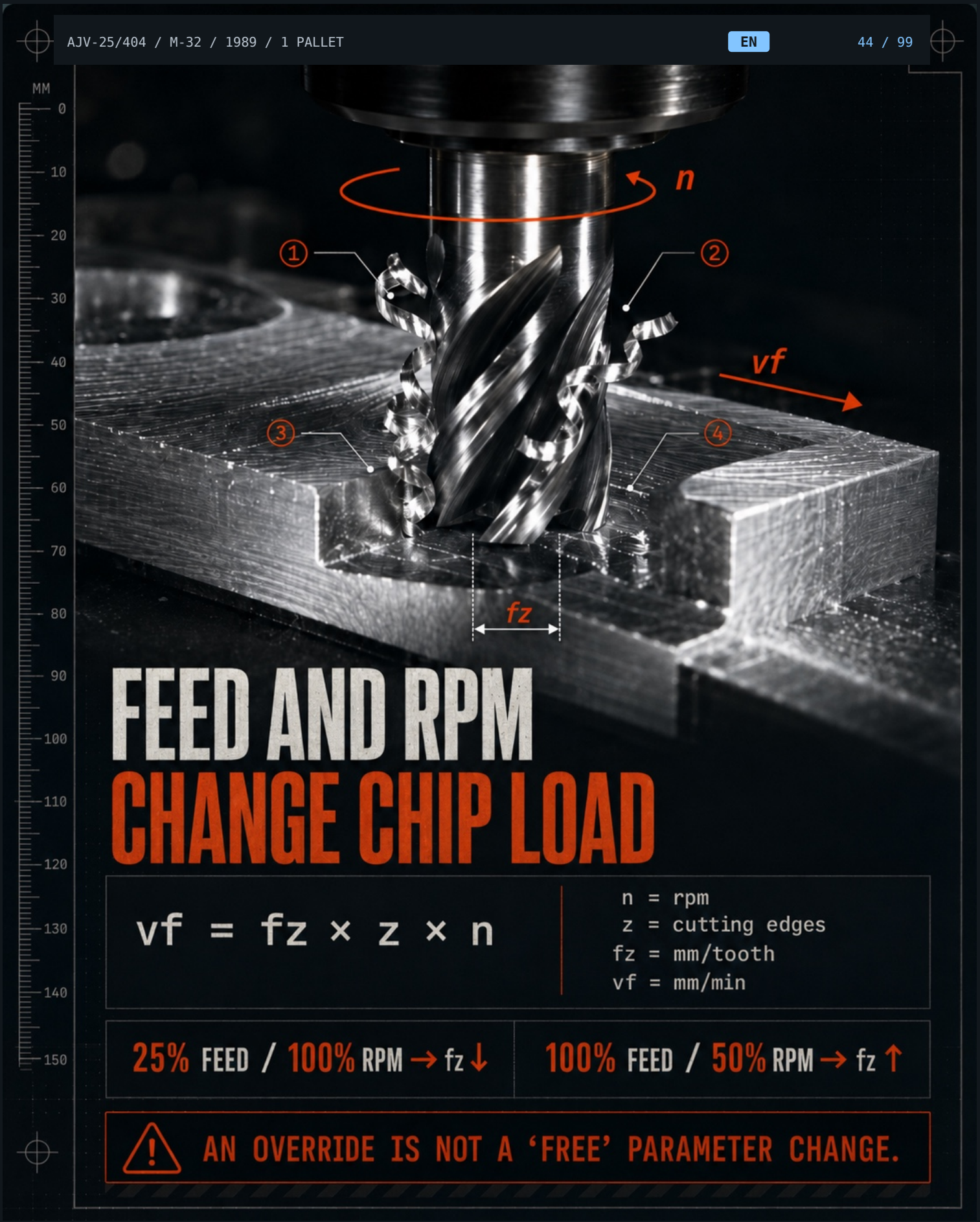
04 **Return to machining in a controlled manner**
Establish an approved start point, modal state and complete approach path. Use planned observation points and an appropriate RAPID limit. SINGLE BLOCK does not ensure a stop before every obstruction. FEED OVERRIDE at 0% does not inhibit all motion.

05 **Measure and release the first part**
After machining and safe access, remeasure the feature and other affected features. Compare with the inspection plan. Chip appearance does not verify a dimensional correction. Record the decision and batch inspection frequency.

Full size versus one wall

A −0.040 mm change in D shifts a compensated path by 0.020 mm in the full-diameter model. A size spanning two machined sides may change by 0.040 mm; a single wall measured from a fixed datum responds differently. Do not apply this rule to drilling or tapping.

CORRECTION RECORD	VALUES / DECISION
TNO. / field / unit	
Measurement before → after / target / tolerance	
Old value / increment / new value	
Part / person / date / release	



The relation gives feed per tooth for a fixed cutting-edge count. The process defines permissible settings.

FEED, SPEED AND PROCESS SYMPTOMS

Reducing travel speed to check an approach and selecting cutting parameters are different tasks. In material, use approved conditions for the tool, material and operation.

```
v_f = f_z × z × n
f_z = v_f / (z × n)
```

v_f = feed in mm/min; f_z = feed per tooth; z = number of cutting edges used in the calculation; n = rpm. These relationships are described by Sandvik Coromant. [C1]

CALCULATION EXAMPLE	RESULT
n = 2000, z = 4, f_z = 0.050 mm	v_f = 400 mm/min
Feed 25%, spindle 100%	v_f = 100; f_z = 0.0125 mm/tooth
Feed 100%, spindle 50%	n = 1000; f_z = 0.100 mm/tooth

This example shows that independent changes to the two overrides alter tooth loading. It does not establish suitable cutting parameters for your machine. Tapping and synchronised cycles require their own override rules.

A symptom guides a check; it is not a diagnosis

SYMPTOM	CHECK FIRST
Vibration / poorer surface finish	Workholding, stickout, cutting edges, parameter changes and the location in the toolpath.
Rising spindle load	Cutting edge condition, chip accumulation, stock allowance and coolant suited to the process.
All features shift in a similar way	Active coordinate system, orientation, seating and any transformation.
Error affecting one tool only	Identity, length/diameter, wear and the associated data.
Size changes over time	Trend, temperature, tooling, location and measurement reliability.



The action depends on the retained program, axis, tool and changer state. Procedure: pages 47-49.

RESTART: ESTABLISH THE STATE FIRST

Establish what changed after the stop, then select the procedure for that state. Tapping and ATC: 49.

STATE	ACTION AFTER CHECKING	DO NOT ASSUME
Pause, no changes	Continue under the procedure for that stop once its cause is cleared.	That absence of an alarm means readiness.
Manual axis movement	Restore position by the approved method while checking the complete path.	An automatic return along a safe path.
RESET / power loss	Re-establish references, program, tool, data and start point.	That the prior modal state and synchronisation remain valid.
Tool or data change	Measure the assembly and check the approach and whether the part can continue.	That the same TNO. means the same length.
Tap in hole / interrupted ATC	Secure the state, record the alarm and use the recovery procedure; 49.	That an ordinary START, HOME or RESET restores the cycle.

Record before restart

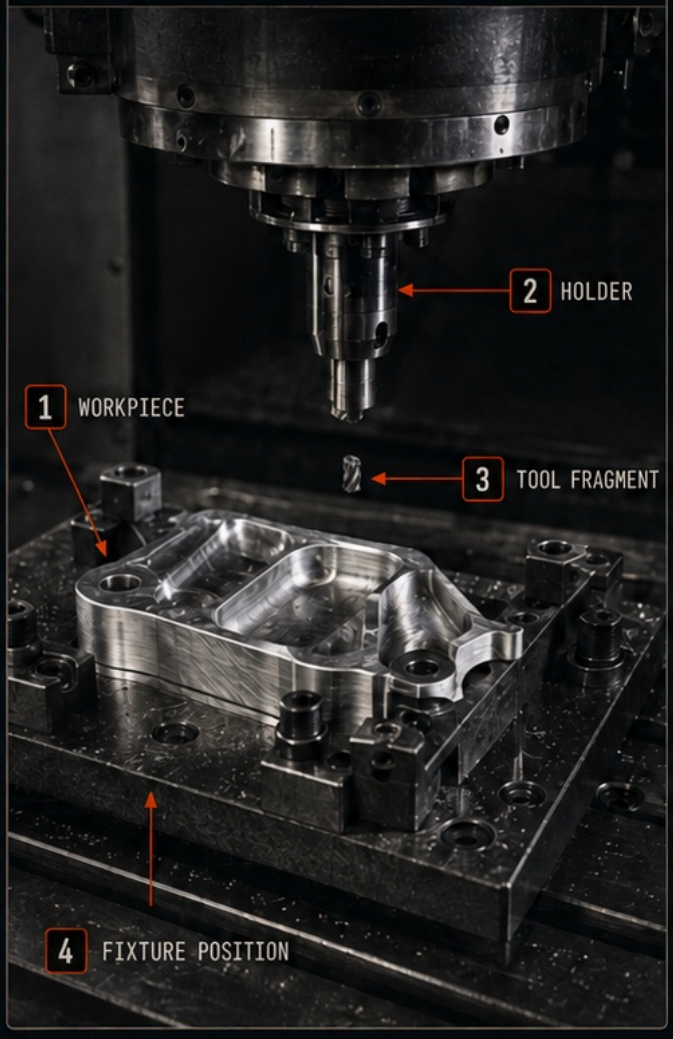
- ☐ Program and MAZATROL unit/sequence or EIA/ISO block.
- ☐ Physical tool, axis positions and changes since the stop.
- ☐ What is already machined and what the control will execute first.
- ☐ Approved approach path and verified restart conditions.

RESTART / START P. APPOINT

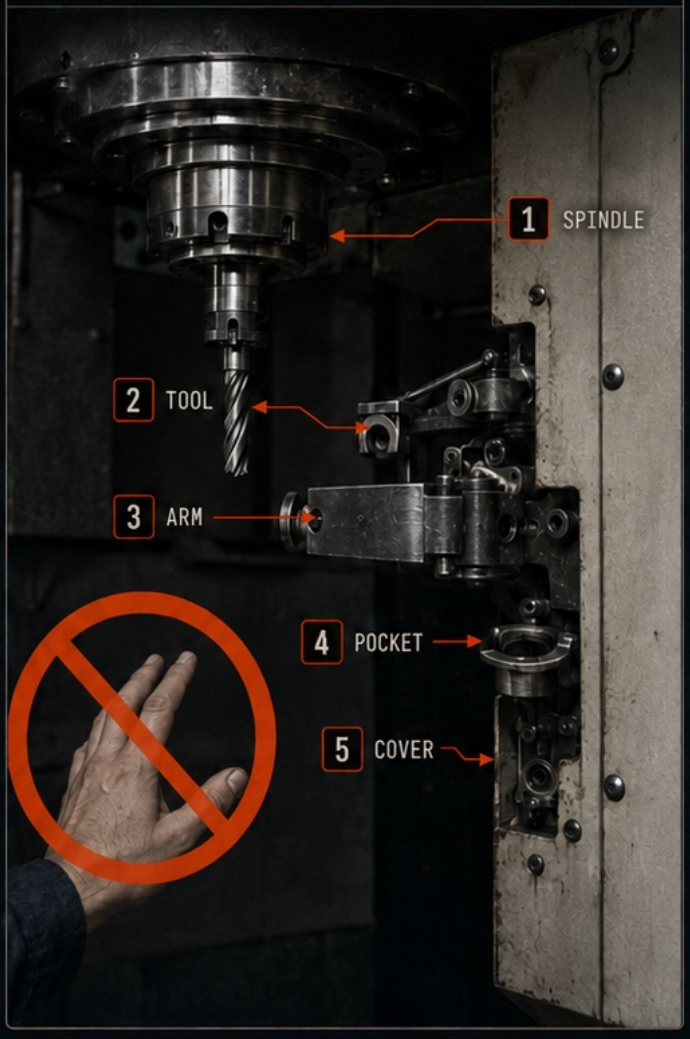
In the documented EIA/ISO function, START P. APPOINT skips earlier program content. It does not prepare the state in the same way as RESTART. Do not choose an arbitrary line as the restart point. [M1]

STOP
RECORD THE STATE

BROKEN TOOL
DO NOT RESTART BLIND



ATC BETWEEN POSITIONS
DO NOT MANIPULATE THE MECHANISM



RECORD ALARM + SPINDLE + ARM + POCKET + TOOL POSITION.

Identify components and record the state for fault handover. ATC recovery requires the machine-specific procedure.

INTERRUPTED MACHINING AND ATC

Use E-STOP for immediate danger. Otherwise secure access and record the state before attempting cycle recovery. [H2] Maintenance fault report: 52.

Tapping and ATC: permitted and prohibited actions

INTERRUPTION	PERMITTED	PROHIBITED
Tap remains in the hole	Record the cycle, position, spindle direction and alarm. Withdraw only under the procedure for the cycle, holder and control.	Jog Z independently, force reverse rotation or treat RESET as restoration of synchronisation.
ATC stopped between positions	Record arm, pocket, spindle and clamp states. An authorised person follows the machine-specific recovery procedure.	Run ordinary HOME/CYCLE START, move the arm by hand, pull out a holder or force sensors.
After recovery	Check mechanics, the TNO./PKNO. map, tool data and part condition. Approve the stage from which work will continue.	Repeat tapping or the whole program without assessing the effect on the partially machined part.

If a tool has broken

01 **Secure and assess**
Do not reach for fragments while motion is active. Check the hole, holder and workholding; identify the part for a quality decision.

02 **Restore the setup**
After correcting the cause, measure the new assembly and check its data and clearance. Continue from an approved stage while checking the first approach.

Common error: RESET as an ATC repair

Clearing an alarm does not establish the mechanism position or tool clamping. T.UNCLAMP is not a complete diagnosis either; use the full message and mechanical state.

ALARMS: INDEX AND STATE RECORD

Record the number, full message, mode and last action. This is the first part of the index of 12 selected M-32 codes; further codes: 51. [M3]

CODE / MESSAGE	FIRST CHECK
603 NO DESIGNATED PROGRAM	Check that the required program/subprogram or restart work number exists in memory.
624 RESTART IMPOSSIBLE	Check the restart point and data completeness. Do not try successive blocks at random.
626 NO TOOL IN MAGAZINE	Compare the program requirement with tools registered in the active magazine.
627 TOOL DATA INPUT PROCESS ERROR	Check required TOOL DATA entries, including length and diameter.
628 NO ASSIGNED TOOL IN TOOL FILE	Check the required tool assignment in TOOL FILE.
629 TOOL FILE INPUT PROCESS ERROR	Check TOOL FILE entry completeness and validity.

Source coverage: [M3], 05.1995 edition, pp. 3-85 and 3-89/3-90. The selection is an operating reference, not a ranking by fault frequency.

Record for the setter / maintenance team

DETAILS	ENTRY
Number and full alarm	
Program / mode / stage / TNO.	
Last action / mechanism state	

Resolve unknown clamping, lost reference or interrupted ATC before motion. T.UNCLAMP alone is not a complete code. Action table: 49.

ALARMS: GEOMETRY AND TOOL DATA

Check entries against the program, tool sheet and measurements. Do not raise limits or alter geometry merely to clear a message. [M3]

CODE / MESSAGE	FIRST CHECK
630 Z DEPTH OF CUT TOO LARGE	Check sequence Z depth of cut against the permitted TOOL FILE value.
635 TOOL DIAMETER ZERO	Check the zero diameter entry in TOOL DATA against the actual assembly.
636 STOCK REMOVAL Z TOO SMALL	Compare unit Z stock removal with Z finishing allowance.
637 STOCK REMOVAL R TOO SMALL	Compare radial stock removal R with finishing allowance R.
647 NOT FOUND END UNIT	Check for the end unit and the intended program ending.
654 TOOL DATA ERROR	Check invalid negative tool length or diameter entries in TOOL DATA. Do not apply this rule to every COMP. field.

Source locations: 630 - 3-90; 635 - 3-91; 636/637 - 3-92; 647 - 3-94; 654 - 3-96. These are page numbers in [M3].

PLC alarms 200-399 are machine-specific

Use the list and action sequence for the model, serial number and version. A code from another Mazak does not establish the cause or ATC recovery method on the AJV-25/404. [M3]

After correcting the cause

Read back the corrected entry and check its effects and restart conditions. RESET alone does not validate data, clamping or the approach path. Discrepancy record: 92.

FAULT REPORT: ATC AND M-32 DATA

Record the state before clearing an alarm or attempting recovery. Observe only from a safe position; do not open a mechanism to fill in a field. Mark “cannot establish” if safe observation is unavailable.

FIELD	RECORD
Machine / serial no. / date / time	
M-32: version / program / mode	
Unit-sequence / EIA block / stage before alarm	
Full alarm code and text / alarm sequence	
X/Y/Z/4 positions and coordinate type / references	
Physical tool in spindle / displayed TNO.	
Source and destination PKNO. / map before and after	
Arm / pocket / cover: observed state	
T.UNCLAMP / other lamps / clamp state	
Supplies: reading, unit and gauge location	
Actions since the stop: RESET / motion / editing	
Area secured / LOTO / person accepting the report	
Backup / measurement reports / attachment IDs	
Maintenance: cause, procedure reference, actions and test result	
Return-to-service approval / tool-map state / person / date	

For alarms 627-629, record TOOL DATA, TOOL FILE and tool assignments separately. Do not reconstruct them by guessing. After recovery, verify mechanics, clamping and data before a trial move. 49, 50.

SHIFT CARE AND SETUP RECORDS

Daily operator checks

- ☐ Coolant and lubricant levels are within the machine's marked ranges; the correct products are in use.
- ☐ No visible leaks, damaged lines or guards, or unusual pressure readings.
- ☐ Fixture datums, table and accessible surfaces are clean; chips do not obstruct seating or movement.
- ☐ Coolant and extraction work as the process requires; fluid condition is checked under the site's plan.

Coolant and cleaning

Use effective guards and extraction when machining with fluid. Observe the specified mist clearance time before opening. Choose a cleaning method that limits spray; compressed air can increase mist concentration and noise. [H1] [H3]

AJV-25/404 supply checks and maintenance: page 37. Follow the allocation of duties between the operator and maintenance personnel.

At batch completion or shift handover

01 **Record the final state**
Program and revision, active work zero, tool set, corrections made, measurement results, part count and unresolved issues.

02 **Preserve the data**
Programs, tool data and settings are not the same file. Use the approved backup method, identifying the machine, date and version. Confirm that saving has finished.

03 **Leave the machine in the specified state**
Clean accessible areas with all movement stopped. Park the axes and tool as instructed; perform shutdown only after saving and cycles are complete.

Do not change communication parameters, servo settings or the magazine map merely to bypass a symptom. Refer battery or data-loss alarms to an authorised person; the replacement procedure depends on the equipment.

Documentation for the machine's serial number can be requested through Mazak support. iCONNECT also provides access to documents and specifications for registered machines. Availability for an older machine must be confirmed. [D1]

SOFT KEY
READ THE SCREEN

THE FUNCTION BELONGS TO THE LABEL, NOT TO A FIXED KEY.



POSITION · COMMAND · TRACE

Select by the current displayed label. Its position changes between displays and menu pages.

SOFT KEYS: 22-FUNCTION GUIDE

The index covers 22 functions. Each description refers to the displayed label, rather than a fixed physical key position. The verification limit for TEST is stated separately.

Illustration: page 54.

FUNCTION	PAGE	FUNCTION	PAGE
01 WORK NO.	56	12 PROGRAM	61
02 MACHINE LOCK	57	13 TOOL FILE	61
03 SINGLE BLOCK	56	14 TOOL DATA	61
04 OPTIONAL STOP	56	15 TOOL LAYOUT	61
05 DRY RUN / DRYRUN	57	16 PAR	63
06 BLOCK SKIP	56	17 DATA I/O	63
07 TEST	57	18 EIA/ISO INFORM	63
08 RESTART	64	19 MODAL INF / INFO	59
09 POSITION	59	20 ALARM	64
10 COMMAND	59	21 PROCESS CONTROL	64
11 TRACE	59	22 HARD COPY	64

Label variants: OPTION STOP / OPTIONAL STOP, DRYRUN / DRY RUN and MODAL INF / INFORM / INFO may identify the same function group. Check the display title and active menu.

Selectors and menu pages: [M1], sections 4-9 and 4-10. Verification scope and the TEST record: page 65. [M1]

WORK NO. AND PROGRAM STOPS

01 / WORK NO.

Selects a program number in the current display context. Selection on POSITION identifies the execution program; WK. PROGRAM may show a different background program. [M3]

Use: with the machine stopped, select the appropriate display, read the WORK NO. prompt, enter the number and confirm with INPUT. Before START, return to POSITION and compare the number, revision and start point with the job sheet. Opening a program for editing is insufficient.

03 / SINGLE BLOCK

Enables stepped execution at the stopping points defined by the control and cycle. Use it to observe a first approach. At each stop, check the next stage before pressing CYCLE START again.

Limit: one MAZATROL row or cycle may contain several movements. An active indication does not confirm a stopped spindle or permission to reach into the work area. See pages 10 and 39.

04 / OPTIONAL STOP / OPTION STOP

Enables a stop at a programmed M01. Select it before a planned check between operations. Enabling it does not create a stopping point where no M01 is programmed. [M2]

06 / BLOCK SKIP

For EIA/ISO, ON skips blocks beginning with “/”; OFF allows their execution. Set the state before the cycle, because a pre-read block may no longer be affected. This is not a universal MAZATROL unit-skip function. [M7]

EIA/ISO COMMAND	MEANING
M00	Program stop independent of OPTIONAL STOP.
M01	Stop when OPTIONAL STOP is enabled.
/ ...	Skip the marked block when BLOCK SKIP is ON.

Do not rely on a last-moment state change to avoid an unknown movement. Review the program first; do not skip required tool, coordinate or auxiliary-function preparation.

TRIALS: TEST, LOCK, DRY RUN

07 / TEST

Key behaviour needs confirmation

The available M-32 manual extracts do not establish what pressing TEST does on this machine. Simulation, motion inhibition and automatic activation of other locks are therefore not attributed to this key. Record its entry, available items and exit behaviour on page 65 from the applicable manual.

The TEST soft key and the TEST position of the DOOR INTERLOCK key switch are separate controls. Their names are not interchangeable. Do not identify an unknown function by trying motion with a guard open.

02 / MACHINE LOCK

Allows command processing with axis motion inhibited. MACHINE LOCK alone does not establish that the spindle, ATC or every M/S/T function is inhibited. [M2]

Use: only in a prepared trial with a known scope. Read the function state; lack of movement does not prove clearance. After the trial, establish agreement between coordinate indications and physical position before restoring motion.

05 / DRY RUN / DRYRUN

Replaces the programmed feed with the trial feed determined by the control and setting. Real movement can occur, potentially faster than the original programmed feed. This is not a graphics check. [M2] [M7]

Use: establish the expected feed and full-path clearance before the trial. Distinguish the trial feed, cutting-feed override and rapid override. No fixed percentage is a universally safe setting.

Changing from a trial to cutting

- ☐ Read and restore the required trial-function states, including additional functions if fitted.
- ☐ Confirm physical position, WPC, tool and start point; pages 28-40.
- ☐ Confirm normal feeds, spindle speed, coolant and how the first approach will be observed.

FOUR SCREENS FOUR QUESTIONS



FIRST CHOOSE THE INFORMATION YOU NEED.

Example fields and values. Position, command, path and modal-state reading are described on page 59.

POSITION, COMMAND, TRACE, MODAL

These displays help you inspect operating status. The descriptions below explain their practical purpose; confirm individual field names and availability on your M-32 version.

09 / POSITION

Displays position and execution status. Read a coordinate together with its coordinate-system label and unit. A zero relative counter does not establish WPC or prove that an axis reference has been reached.

In practice: compare WORK NO. with the job sheet before START. After a manual movement, check the correct axis and physical position. After MACHINE LOCK, do not rely on display numbers alone.

10 / COMMAND

Displays commands and data associated with program execution. Compare command and WPC readings with the program and setup sheet. A commanded value does not necessarily represent a value already reached.

In practice: at a planned stop, identify the current stage, tool and available F/S indications. Opening COMMAND does not automatically select MDI and is not itself a motion command.

11 / TRACE

Displays a graphical path trace. Establish its plane, scale and displayed extent. Refresh behaviour and any ability to draw without machine movement depend on the version and require confirmation.

In practice: look for unexpected path directions or extents. The drawing does not establish clearance from clamps, the holder or the head. Do not equate TRACE with comprehensive collision checking or PATH CHECK; see page 39.

19 / MODAL INF / MODAL INFO / INFORM

Shows the currently effective G-code groups; the information fields are read-only. This is particularly useful for EIA/ISO work and restart checks. [M1]

Compare with the program: G20/G21 units, G90/G91 positioning mode, G17/G18/G19 plane and the selected work coordinate system. Do not assume their state after RESET from experience with another control. [M7]

Display names: [M1], 4-1 to 4-3; MODAL INFO: 4-11. Detailed fields on the first three displays remain edition-dependent; source scope: page 65.

FOUR SCREENS ONE PHYSICAL TOOL



01 PROGRAM
REQUIREMENT

02 TOOL FILE
DEFINITION

03 TOOL DATA
ASSEMBLY DATA

04 TOOL LAYOUT
POCKET

CHANGING A NUMBER DOES NOT MOVE A HOLDER.

Data and pocket must match the same assembly. Editing a record does not perform a physical installation.

PROGRAM AND TOOL RECORDS

12 / PROGRAM

Opens a program for review and editing, normally WK. PROGRAM for MAZATROL. Before editing, check WORK NO., the unit, field and old value. Preserve the previous revision and perform the appropriate checks after the change.

13 / TOOL FILE

The MAZATROL tool-information catalogue. Use it to check the tool name and nominal designation. A catalogue entry does not replace measurement of the currently assembled holder and tool.

14 / TOOL DATA

Records for registered tools, including their dimensions. Identify the exact assembly and compare LENGTH, diameter and identity. Read back an edited field; measurement and correction details: pages 20-26 and 42.

15 / TOOL LAYOUT

Relates the selected WORK NO. tool requirements to pocket allocation. CURRENT and NEXT distinguish the current layout from the layout being prepared for a program. Editing can change assignments; this is more than a viewer. [M1]

Before confirming a layout: compare the spindle tool, pocket contents and control records. Changing a number on screen does not physically relocate a holder. Do not erase the layout to resolve an unknown ATC state.

Illustration: page 60.

Arrows represent operator cross-checks, not automatic data transfer. Every record must agree with the tool actually fitted.



Data-transfer direction schematic. Select the device, format and backup scope for the installed equipment and M-32 documentation.

PAR, DATA I/O, EIA/ISO INFORM

16 / PAR

Opens parameters: cutting conditions, user settings and machine-related settings. Identify the group, address, bit and unit before reading a value. Do not correct a part dimension by making an arbitrary PAR change. [M1]

Editing: requires the applicable parameter list and an assigned responsibility. Record the old value, reason and verification method. A change may affect multiple programs; it is not an ordinary tool-wear correction.

17 / DATA I/O

Transfers data between the NC and a supported device. Paths may include CMT, TAPE and optional DNC. Select the interface actually configured. SAVE/PUNCH sends data out; LOAD brings data into the NC. [M1]

Illustration: page 62.

- ☐ Before transfer: direction, data category, program number and correct file.
- ☐ A backup should include the required programs, TOOL DATA, TOOL FILE and parameters in their respective categories.
- ☐ After transfer: completion indication and a file check. COMPARE compares data; it does not create another backup.

START in the transfer menu starts an I/O operation. LOAD can overwrite data. Do not use port settings or wiring from another control manual.

18 / EIA/ISO INFORM

A group of EIA/ISO data displays, including tool offsets, work offsets and macro variables. Some data can be edited. Identify the subpage and record number first; INFORM does not mean a help-only screen. [M1]

Before editing, compare H/D, the work coordinate system or variable number with the program. Do not assume these edits automatically set MAZATROL WPC; see page 28.

RESTART, ALARMS AND PRINTING

08 / RESTART

Prepares program resumption from a specified point. It is not a substitute for ordinary continuation after FEED HOLD. The applicable path depends on MAZATROL/EIA program type and interruption state; see pages 47-49.

Before execution: confirm the program and restart point, tool, coordinates, offsets, auxiliary functions and complete approach path. Do not choose the “nearest block” without accounting for skipped setup conditions. RESTART does not recover an interrupted ATC mechanism.

20 / ALARM

Opens alarm messages. Record the number, full text, additional data and triggering event before clearing anything. Opening the display does not remove the cause. [M1] [M3]

In practice: establish whether the message concerns the active or background program. Use the alarm list for the applicable version; tool-data alarms are covered on page 50. For inconsistent ATC status, use page 49.

21 / PROCESS CONTROL

Calls the machining-structure view described as PROCESS WORK in M-32 documentation. It helps trace process/program relationships; PRG. LAYOUT PROCE. shows the tool sequence for a process. [M1]

For one pallet: compare the main program and expected subprograms with the operation sheet. This display does not regulate spindle load or perform dimensional inspection. EIA subprogram calls may be absent; do not introduce pallet-change operations from this view.

22 / HARD COPY

Prints the displayed screen data through a supported, configured printer. For a program, this means the current display, not automatically the entire program. The required equipment must be available. [M1]

Use: select the required display, check its number and page, start HARD COPY and wait for completion. Avoid changing the display or cursor while printing, as this can interrupt the printout. Mark the print with the machine ID and date.

> ### Backup: DATA I/O
>
> A printout helps you read data, but it is not a file for restoring memory. Preserve programs and required data through the appropriate DATA I/O path; pages 53 and 63.

SOFT KEYS: MACHINE-SIDE VERIFICATION

This section covers the 22 functions indexed on page 55. It is not a catalogue of every submenu in every M-32 version. Available sources include later editions and options; a label does not establish that equipment is fitted.

TEST: complete from the applicable manual

ITEM	RECORD / REFERENCE
M-32 version / manual / page	.....
Display and conditions for TEST	.....
Effect of pressing / available items	....
Exit / states that remain active	.....
Verified by / date	.....

Until confirmed, use only trial procedures defined for this machine. Do not fill this record with behaviour inferred from Smooth, Matrix or another machine model.

Basis of the descriptions

SCOPE	REFERENCE
Navigation, tools, PAR, I/O, EIA	[M1]: available descriptions in 4-6 to 4-10.
MODAL / ALARM / PROCESS / HARD COPY	[M1]: 4-11, 4-12, 4-13, 5.
Execution conditions and M01 stop	[M2]: available section 1-1; later complete procedures have not been verified.
WORK NO. / ALARM	[M3]: foreground/background program distinction.
POSITION / COMMAND / TRACE	[M1]: names and chapter structure; general practical descriptions. Detailed fields require the applicable edition.

[M7] Yamazaki Mazak: Programming EIA/ISO, C735PBT019E, 08.2002. The shared manual lists M1, M2, M32, MPlus and later controls. Used for the basic “/” behaviour in 3-4, code distinctions and trial cautions. Later optional functions and numeric formats have not been transferred.

Source M7 | Other sources: page 97. Accessed: 02 September 2026.

INDICATOR GEOMETRY MATTERS

LEVER / DTI

EXCESSIVE STYLUS ANGLE

ALIGN BEFORE MEASURING



TARGET: STYLUS ≈ PARALLEL



MEASURED MOTION ⊥ SURFACE

PLUNGER TYPE

PLUNGER AXIS = MEASUREMENT DIRECTION



GRADUATION ≠ COMPLETE MEASUREMENT ACCURACY

For a DTI, the stylus angle relative to the measured face matters. Rotating the dial alone does not remove cosine error.

MITUTOYO: PREPARE THE INDICATOR

Indicating compares readings against a chosen reference. Select the indicator type, unit and contact point for the available access and the job tolerance.

Illustration: page 66.

CHECK	MEASUREMENT CONDITION
Model and scale	Read the unit, graduation, range and inspection status. A graduation is not the accuracy of the complete measurement.
Contact point and mounting	DTI: use the stylus length specified for the model. Use a short, rigid holder and the intended mounting interface. [MT1]

01 **Clean and establish contact**
Remove chips from the reference and ball. Apply preload with useful travel available in both directions. Contact the face, clear of chamfers and corner radii.

02 **Check response and return**
Use a small contact change to establish the indication response. Return to the same point three times. An unstable zero means the measuring setup needs attention.

Conventional indicator: spindle drive off

Do not start spindle rotation, SPINDLE JOG or a program with this setup. Sweep only by an approved manual rotation method. Do not force a locked spindle. Mount the instrument and move axes under the machine's permitted setting conditions; pages 10 and 9.

Contact geometry: [MT1] [MT2] Diagrams show the operating principle without identifying a particular catalogue model.

PROGRAM LOCK does not inhibit the spindle drive

The key protects program editing. HANDLE, MDI and SPINDLE STOP alone do not replace protection against unintended movement. Manual sweeping requires an approved setting state. Instrument check: 68.

DTI stylus setup

For motion normal to a surface, align the stylus as nearly parallel to that surface as the model instructions require. A large stylus angle increases cosine error. Use the specified stylus length and a rigid holder; turning the dial only changes readability. [MT1] [MT2]

For a plunger indicator, the plunger axis should align with the measured motion. Do not transfer the DTI stylus arrangement to a plunger indicator.

CHECKING AN INDICATOR BEFORE USE

A pre-use check detects evident problems and supports suitability for the task. It does not replace scheduled calibration or a full indication-error assessment. The model, range, graduation and permissible errors must be known. [MT4]

01 **Check the instrument and conditions**
Read the ID and calibration status. Inspect the contact point, mounting, return and free movement. Use references with valid metrological traceability. Allow the instrument, references and station to reach thermal stability; a fixed “30 minutes” does not ensure equilibrium.

02 **Establish geometry and range reserve**
DTI: use the correct stylus length and the model’s prescribed orientation. Plunger indicator: align its axis with the height change. Select preload and checking step for the usable range; do not prescribe 1 mm or one pointer revolution.

03 **Check return: five controlled contacts**
Establish a reference reading on the standard. Using the instrument’s permitted mechanism, lift only far enough to break contact and gently restore it five times. Record every result without re-zeroing between contacts. Do not drop the contact point freely from 5 mm.

04 **Compare a known step**
Choose a height difference within the working range at the selected preload. Retract the contact before changing the reference. Read the change for increasing and decreasing height and recheck the reference. Use a multi-point checking plan for a wider range.

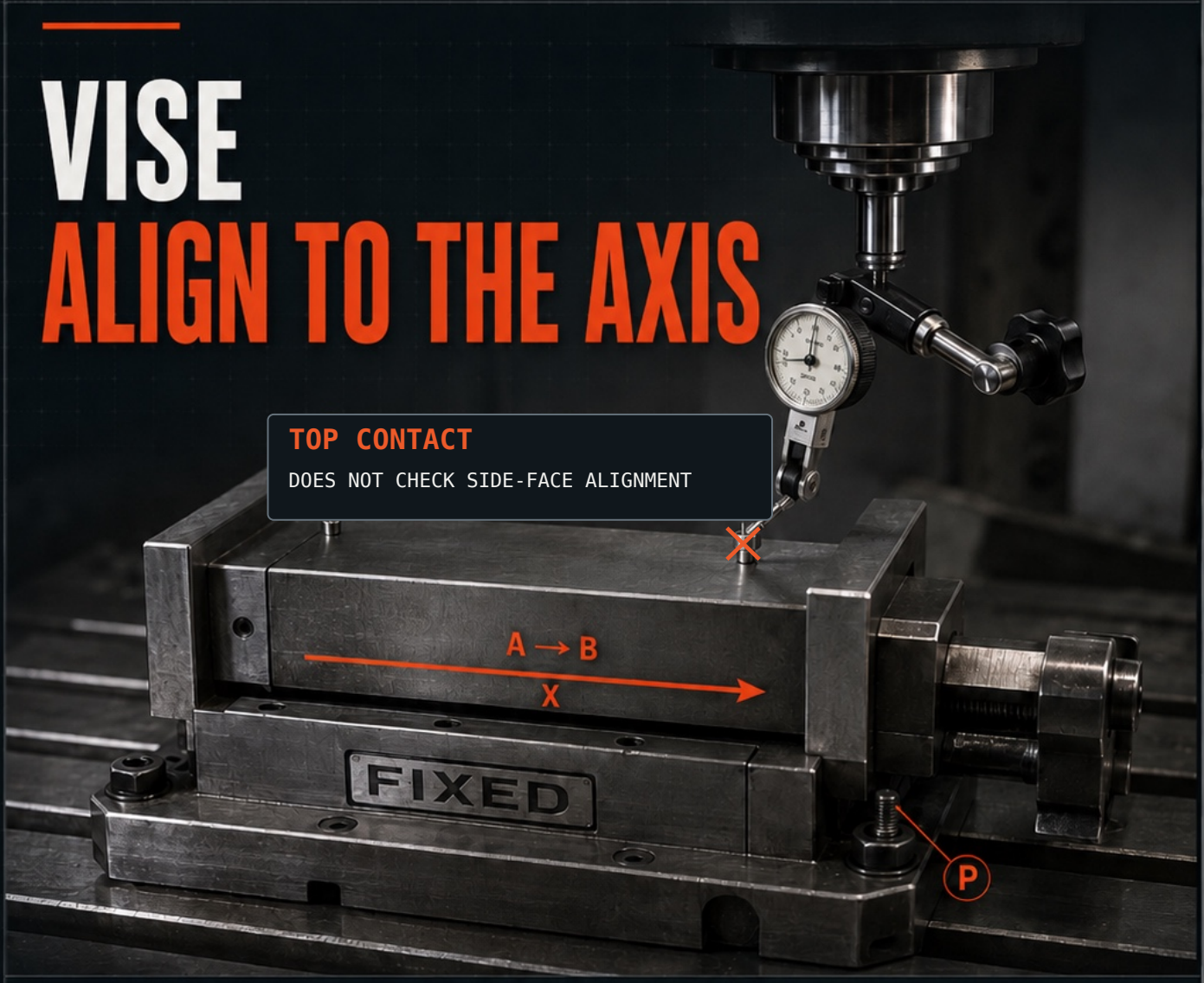
05 **Make the decision**
Compare return and step error with model criteria and task needs, accounting for reference and method uncertainty. If unsuitable, check conditions, identify the instrument and remove it from the task pending assessment. One reading does not diagnose a specific internal mechanical failure.

```
Return: R = highest reading − lowest reading
Step error: E = indicated change − known change
```

Graduation is not accuracy

Do not apply a universal 0.002 mm limit to every indicator. A small DTI may have less than 1 mm total range. Do not adjust WPC to hide instrument inconsistency. Geometry: 67. Record sheet: 91.

VISE
ALIGN TO THE AXIS



CONTACT THE SIDE FACE

PLAN VIEW / CONSTANT Z



ALIGN → TIGHTEN → A-B-A

L	=	200 mm
A	=	0.000
B	=	+0.060 mm
Δ	=	0.030 mm / 100 mm

⚠ THE FINAL RESULT IS THE RESULT AFTER TIGHTENING.

Measure the relevant side face of the fixed jaw at constant height. Its top face checks a different feature.

VISE AND FIXTURE: ALIGN TO AN AXIS

Aim: align the selected datum face with X travel. Exchange the axes for Y alignment. On a vise, measure the relevant face of the fixed jaw.

Illustration: page 69.

01 **Seat the fixture**
Clean the table and underside. Use the intended mounting locations. Retain only the permitted adjustment freedom; support the fixture securely. [FX1]

02 **Mount the indicator independently of the table**
An indicator on the spindle or head measures table movement relative to it. A base on the same moving fixture cannot perform this check.

03 **Traverse from A to B**
Keep Y and Z fixed. Establish A, record the reading, and traverse slowly in X to B. Watch intermediate points too. Record length L and the reading difference.

04 **Adjust the alignment angle**
Stop motion. Use the intended adjustment screws or permitted light positioning method. Do not strike the indicator or datum face. Recheck A and B.

05 **Tighten and measure again**
Tighten the mounting to the fixture instructions. Repeat A-B-A under the same conditions. Accept the result only after final tightening and a return check.

```
Example: L = 200 mm; A = 0.000; B = +0.060 mm
Difference = 0.060 mm / 200 mm = 0.030 mm / 100 mm
```

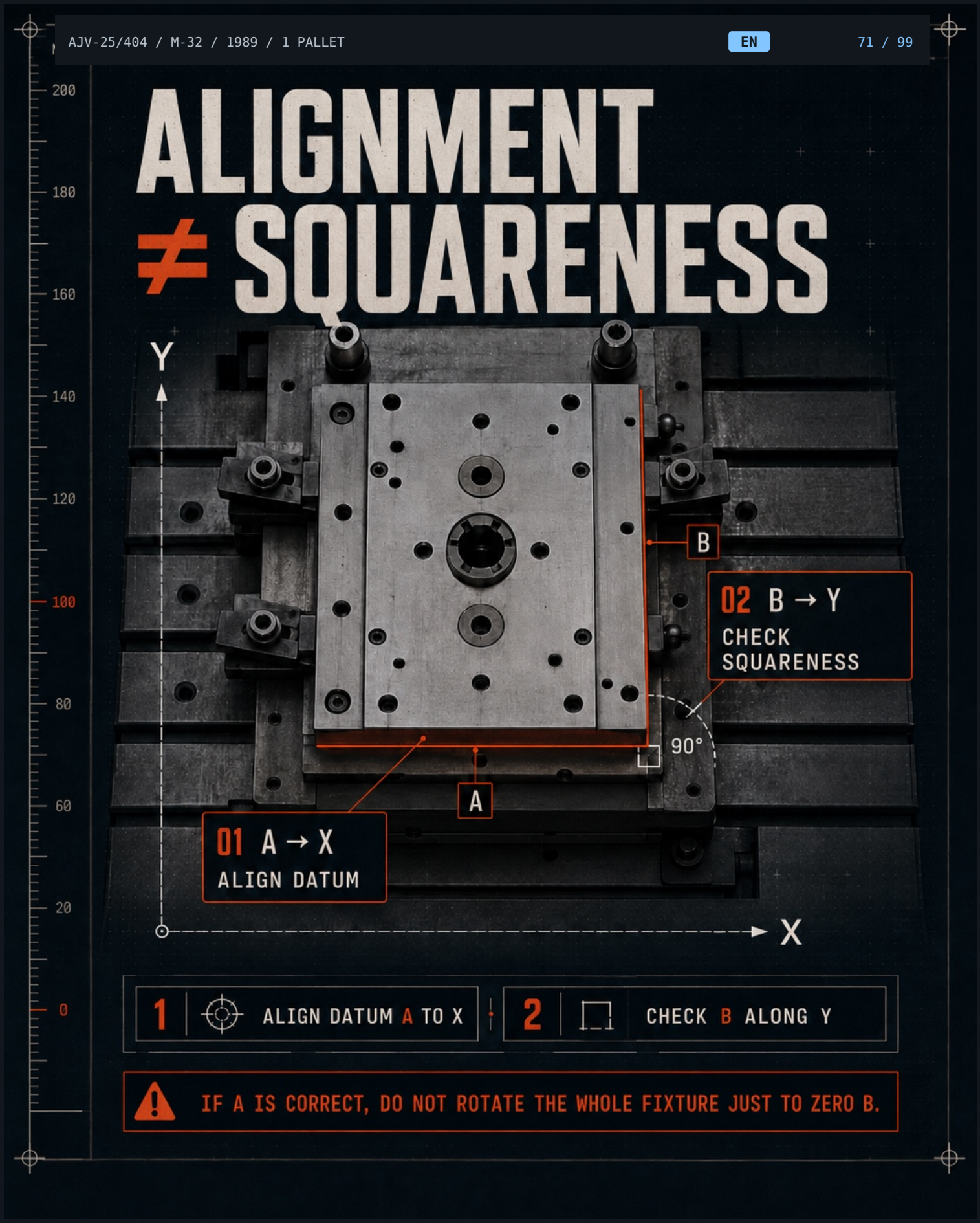
Do not automatically halve this difference. With a pivot near A, the required change near B is approximately the full difference. A different pivot changes the proportion. The example is not an acceptance tolerance.

Choosing the contact face

To align the jaw to X, traverse the relevant side face with Y and Z fixed and contact at constant height. Contacting the top of the jaw or locating buttons checks height or another feature. It does not replace the side-face alignment check.

Return to A after tightening

Traverse A-B-A under the same conditions. Failure to return to the initial reading calls for checking fixture seating, indicator mounting, contact and play. Record the final result and measuring length L.



Axis alignment includes machine geometry. Acceptance of fixture squareness requires an appropriate reference.

FIXTURE: ALIGNMENT AND SQUARENESS

Aligning a fixture to the axes and measuring the angle between its faces are different tasks. First select the datum required by the drawing and workholding method.

Illustration: page 71.

01 **Align face A**
Traverse in X along A as on page 70. Tighten the fixture and confirm the result. A and B here identify reference faces.

02 **Reposition the indicator on B**
Arrange contact normal to B at a fixed height. Traverse in Y and record the length and extreme readings. Recheck indicator return after repositioning its holder.

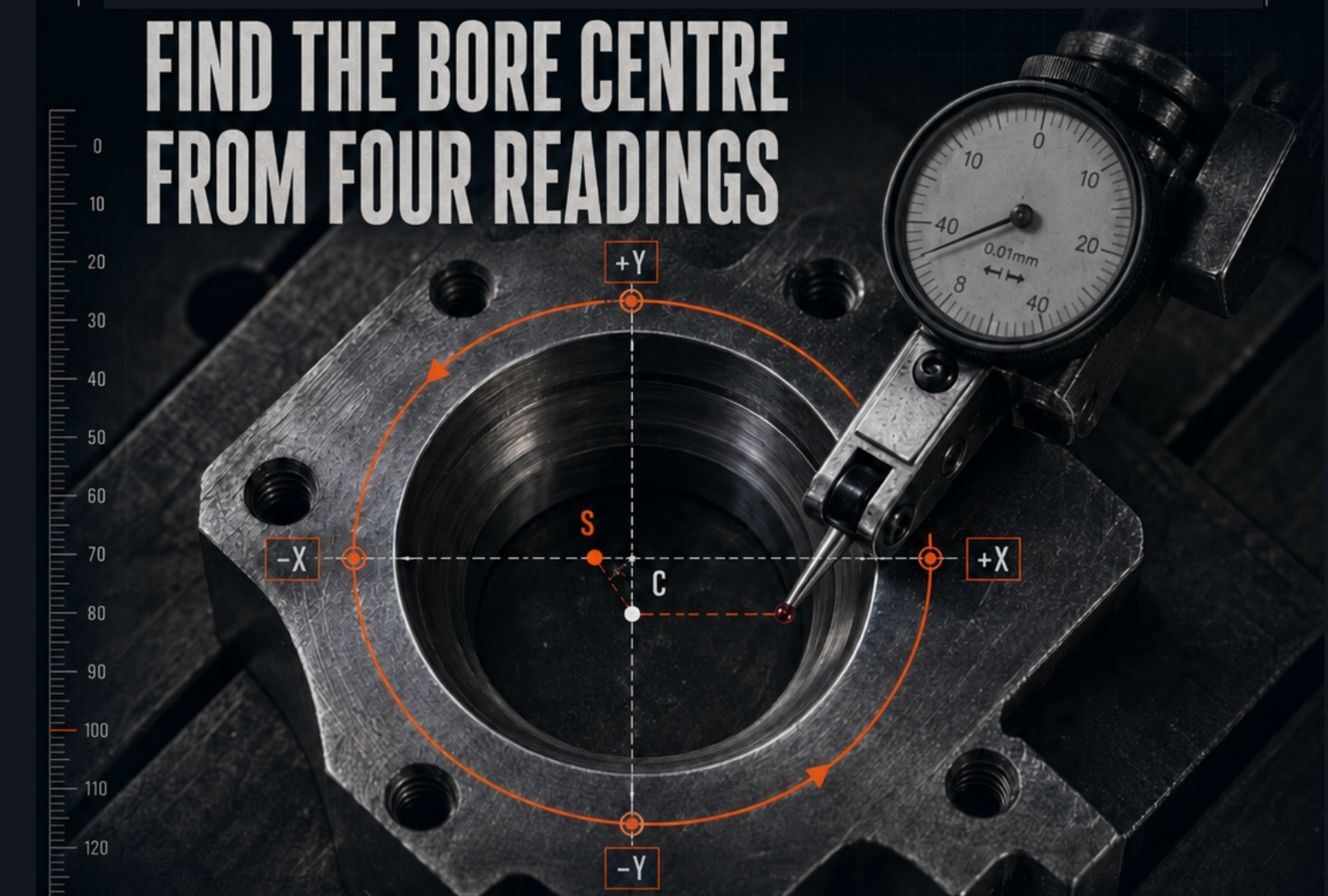
03 **Compare with the requirement**
Assess the allowed deviation over the stated length. If A is aligned but B fails the requirement, do not rotate the whole fixture merely to zero B.

RESULT	INTERPRETATION
A passes; B deviates	Check face B, seating, clamping distortion and axis geometry. One reading alone does not identify the cause.
Difference varies with Z height	Possible face tilt, form variation or measurement setup error. Check a second section and the intended datum.

Part squareness depends on the reference

An on-machine reading includes machine geometry. To assess the fixture itself, use an approved method with a reference square or cylinder on a surface plate. Do not adjust AJV geometry or axis parameters from this setup check.

FIND THE BORE CENTRE FROM FOUR READINGS



DATA	
+X	+0.080
-X	+0.020
+Y	+0.050
-Y	+0.030

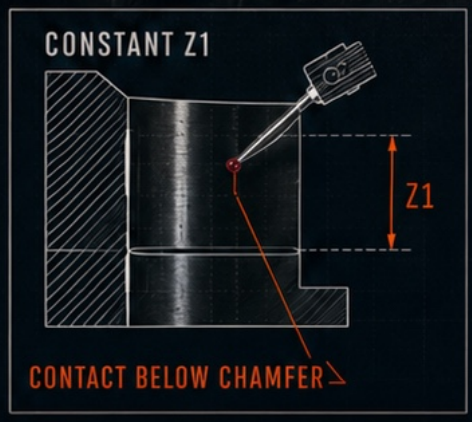
$$|eX| \approx |I(+X) - I(-X)| / 2$$

$$|eY| \approx |I(+Y) - I(-Y)| / 2$$

RESULT

$|eX| \approx 0.030$ mm

$|eY| \approx 0.010$ mm



THIS GIVES THE CORRECTION MAGNITUDE – CONFIRM THE DIRECTION BY OBSERVATION.

ZEROING THE DIAL ≠ SETTING WPC

S: spindle axis; C: bore centre. Rotate manually only, following the workstation procedure; finish with a full sweep.

HOLE: CENTRE WITH AN INDICATOR

Aim: place the spindle axis at the centre of the specified bore section. Contact a continuous cylindrical surface, clear of chamfers, threads and damage.

Illustration: page 73.

01 **Prepare the sweep**
Position the spindle approximately over the centre. Fit the indicator in a rigid holder. Before entry, check the complete assembly envelope and the withdrawal path.

02 **Establish contact and height**
Bring the ball to the chosen depth Z1. Establish the correct sensing direction and preload reserve. Keep Z and the holder adjustment fixed during the sweep.

03 **Compare the X pair**
Rotate manually to the +X and -X points, 180° apart. Keep the same dial setting for the pair. Adjust X in small movements using page 75; move an axis only after stopping rotation.

04 **Compare Y and recheck X**
Repeat for +Y and -Y. After adjusting Y, recheck X. Each adjustment can affect the preceding result.

05 **Check the full circumference**
Complete a manual 360° sweep without losing contact and check the return. Observe between the four points too. If travel may exceed the range, stop and reset the measuring setup.

One depth establishes the centre of one section. If the bore axis must be checked, compare centres at two heights using an approved method. For a bore with form error, the inspection plan defines how to establish its centre; matching four readings alone is insufficient.

BORE: READINGS, CORRECTION AND WPC

For a round bore with correct radial sensing, the distance difference on opposite sides is twice the centre offset. Use this as an estimate for the first correction, then measure again.

```
|eX| ≈ |I(+X) - I(-X)| / 2
|eY| ≈ |I(+Y) - I(-Y)| / 2
```

POINT	EXAMPLE READING
+X	+0.080 mm
-X	+0.020 mm
+Y	+0.050 mm
-Y	+0.030 mm

Example: |eX| ≈ 0.030 mm; |eY| ≈ 0.010 mm. Readings share the same unit and contact geometry. These are movement magnitudes, not ready-made +X or -X commands or acceptance tolerances.

> ### Confirm the direction by observation
>
> Establish whether a small movement reduces the pair difference. Needle direction does not universally specify axis direction. AJV table and head movement may look different relative to the part. With a large DTI stylus angle, correct the measuring setup before treating the reading difference as distance; page 67.

After centring: work coordinates

01 **Identify this hole's coordinates**
The centre may be X0/Y0 or a point with other drawing coordinates. Check the program datum and active coordinate system.

02 **Record WPC by the applicable method**
Use the current axis position and the approved WPC/TEACH procedure; page 28. Zeroing the indicator dial does not change program zero.

03 **Verify independently**
Confirm the centre by repeating the sweep or checking a second reference. Do not add the bore or ball radius to the established centre. Remove the measuring setup before running a cycle.

If the full sweep remains inconsistent, separate centring from form error: 76.

BORE: FORM VERSUS CENTRE POSITION

Do not try to remove form error by changing WPC. First distinguish centre offset from radius variation around the circumference, contact error and clamping distortion. Centring procedure: 74-75.

Why four equal readings are insufficient

Keep one dial setting for the full sweep. Re-zeroing separately for X and Y removes the common reference between the pairs. Equal readings at 90° intervals can coexist with error between those points.

OBSERVATION	NEXT CHECK
Difference between opposite sides	Possible centre offset; make a small adjustment after verifying direction. Repeat both axes and the full sweep.
Uneven sweep after matching the pairs	Check cleanliness, rigidity and contact angle. Then measure diameters in several directions and sections with an appropriate instrument.
Result depends on clamping	Compare clamping loads only under an approved test with the part secured. Record loads and sequence.
Centre changes with depth	Check bore-axis alignment, part tilt and the measurement method. One section does not establish the complete bore axis.

Inspection beyond centring

The inspection plan defines sections, directions and method. Two-point diameter measurements may reveal ovality but can miss other form errors. Roundness acceptance requires an appropriate circumferential method and profile evaluation. [MT5]

Do not routinely loosen clamps “by half”

This can compromise location and holding capacity. Agree a distortion test with engineering and quality. After a clamping change recheck seating, datums and machining readiness. Fixture pressure is not the pressure of the machine’s central hydraulic unit.

Before deciding on the datum, record Z section, directions, readings and clamping state. The inspection plan defines how to establish the centre of a bore with form error. Withhold release if conformity cannot be demonstrated. Measurement record: 90.

5 POINTS ARE NOT FLATNESS



DATA

A	0.000
B	+0.020
C	+0.030
D	+0.010
E	+0.014 mm

FORMULA

R = Imax - Imin = 0.030 mm

- FIXED Z
- TRAVERSE X / Y
- RETURN TO A

YOU ARE MEASURING THE SAMPLED POINTS + TILT RELATIVE TO MACHINE TRAVEL.

Keep Z and the dial setting unchanged; avoid holes and clamps. Five readings are not a complete flatness measurement.

SURFACE: HEIGHT VARIATION AND TILT

An indicator mounted on the head or spindle compares heights at unchanged Z. X/Y traverses check the surface against the machine's plane of travel.

Illustration: page 77.

01 **Choose points and path**
Choose points on the working surface, clear of edges, holes and clamps. Establish a consistent clamping state and the traverse lengths.

02 **Establish A and measure**
Establish contact and the reference reading at A. Read B, C, D and E without changing Z or the dial. If contact must be broken to clear an obstacle, restore the conditions and recheck A.

03 **Assess and recheck after clamping**
Compare readings with the setup requirement. Adjust only the intended supports or workholding. After tightening, repeat the points and return to A.

POINT	A	B	C	D	E
Example [mm]	0.000	+0.020	+0.030	+0.010	+0.014

```
Reading range R = Imax - Imin
Example: R = 0.030 - 0.000 = 0.030 mm
```

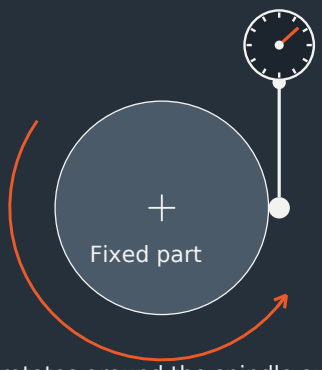
This is not a complete flatness measurement

Five points describe only the sampled locations. The result also includes tilt relative to axis travel and workholding effects. Drawing flatness or perpendicularity acceptance requires the appropriate measurement method and coverage. Table values are examples.

BOSS, TEST ARBOR AND TIR

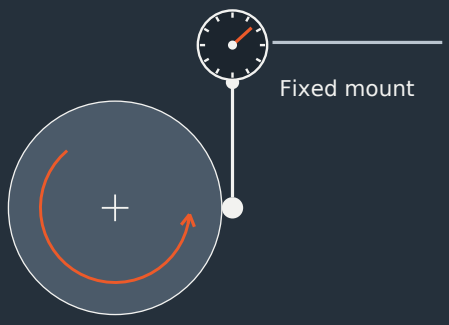
A boss is an external cylindrical feature. For centring, the indicator sweeps around the fixed part; for runout, the indicator stays fixed while the measured element rotates.

CENTRING A BOSS



Indicator rotates around the spindle axis.

RUNOUT CHECK



Indicator fixed. Test arbor rotates.

A / Centre an external diameter

Mount the indicator for a manual sweep around the spindle axis. Contact the cylinder at one height. Compare opposed X and Y pairs as on pages 74-75, establishing the response direction for external contact. Check the full 360° and the complete holder clearance.

B / Measure assembly runout

01 **Fixed indicator, cylindrical surface**
Fix the base independently of the rotating assembly. Contact a smooth test arbor or suitable shank surface, not flutes. Record the measuring distance from the holder. [RT1]

02 **Manual rotation and extreme readings**
With correct contact and range reserve, complete an approved manual 360° rotation. Record minimum, maximum and return. The result belongs to the whole mounted assembly at that section.

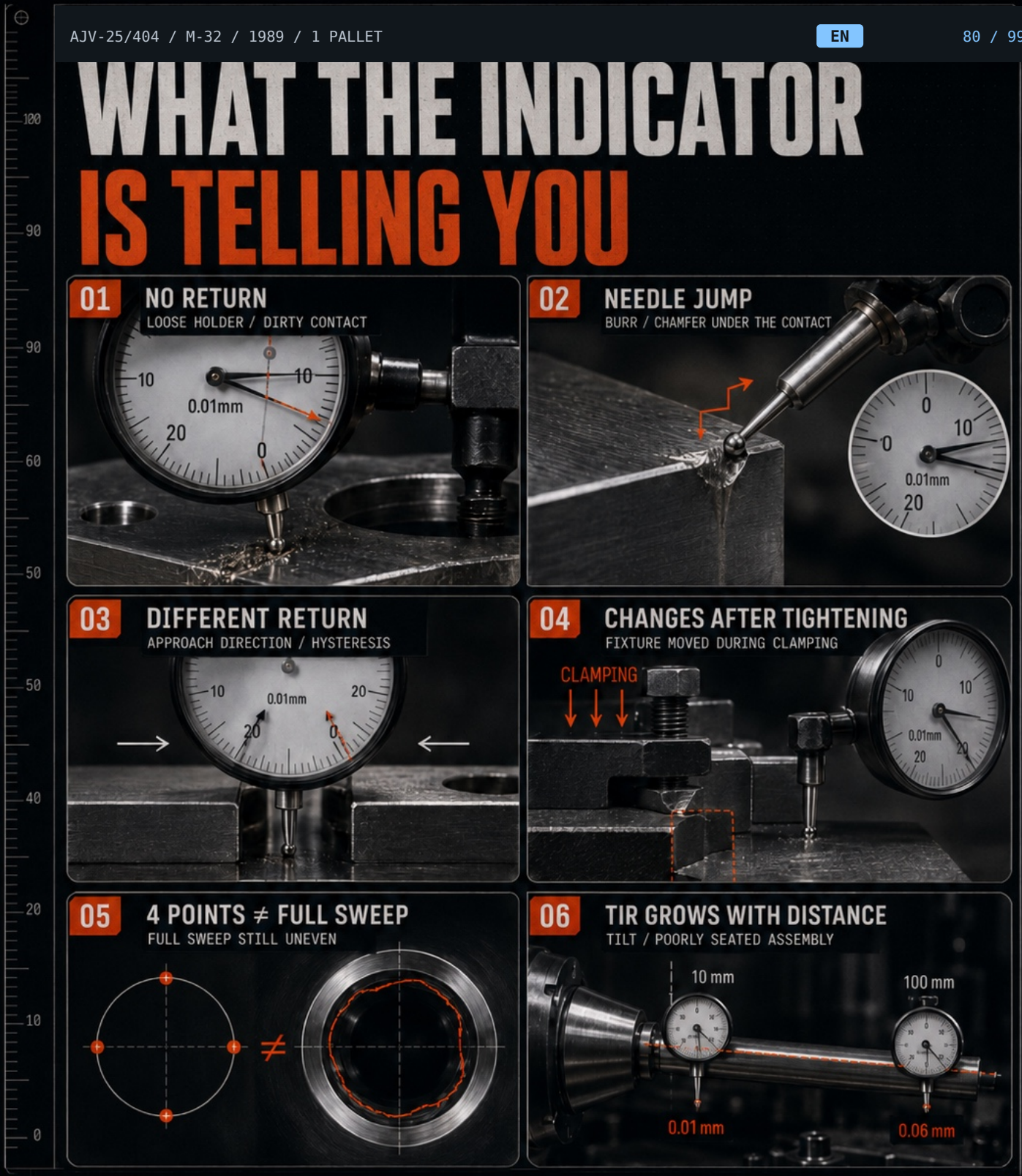
```
TIR = Imax - Imin
Example: +0.014 - (-0.006) = 0.020 mm
```

TIR/2 is not a universal correction. Eccentricity ≈ TIR/2 only for an ideal round section offset from the axis, with other errors absent. Form, tilt, holder and seating affect the result. The example TIR of 0.020 mm is not an acceptance limit.

Installation order and scope of the result

Load the tool before placing an indicator in an axis or ATC path. Runout on a smooth shank does not establish runout at the cutting edges; compare specified sections. Remove the indicator and base after the test. Cleaning and further seating checks: 25.

WHAT THE INDICATOR IS TELLING YOU



DO NOT RE-ZERO TO HIDE THE PROBLEM.

Values illustrate symptoms, not acceptance limits. Record the result after final tightening.

INDICATING: ERRORS AND COMPLETION

SYMPTOM	CHECK BEFORE ADJUSTING
Does not return at A	Holder looseness, base movement, contamination, overtravel or indicator sticking. Do not re-zero to hide the change.
Needle jumps at one location	Burr, chamfer, hole, groove or contact loss. Stop and inspect the surface and contact-point path.
Different result on return	Axis approach direction, indicator hysteresis and holder rigidity. Repeat the comparison with a consistent approach direction.
Changes after tightening	Fixture movement, dirt underneath, support or distortion. Use the result after final clamping.
Four equal points; uneven sweep	Check bore form and contact between the points. Four readings are not a roundness measurement.
Runout grows away from holder	Possible assembly tilt, deflection or poor seating. Record TIR at two sections and investigate the assembly.
Uncertain sign or scale	Check graduation, unit and response to a controlled contact change. On some DTIs, stylus deflection in either direction turns the pointer the same way. [MT1]

```
Scale example: 6 divisions × 0.002 mm = 0.012 mm
Read the graduation on the instrument being used.
```

Before proceeding to machining

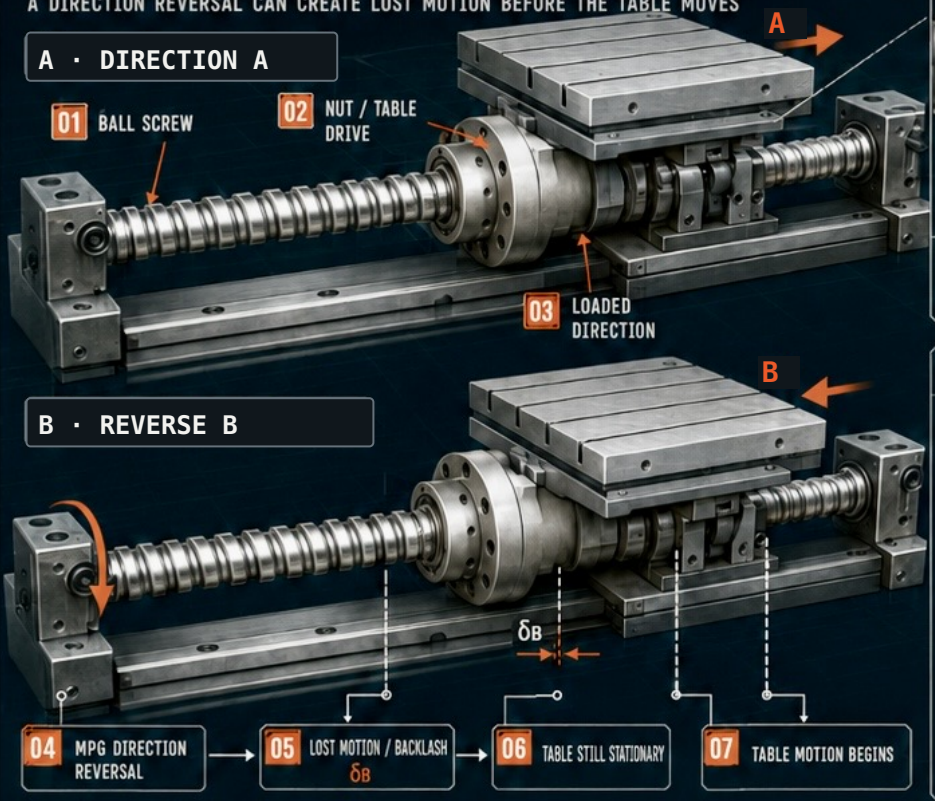
- ☐ The result after tightening, return check and acceptance criterion are recorded on page 90.
- ☐ WPC has been independently checked. The indicator, holder and other measuring equipment are removed; the correct tooling is restored.
- ☐ The pre-START check on page 85 is complete. A controlled first run is planned after the setup change.

Choose the next diagnostic check

Unstable indicator: 68. Uneven bore form: 76. Datum repeatability and axis reversal: 83. Maintenance record: 52.

BACKLASH SHIFTS THE REFERENCE

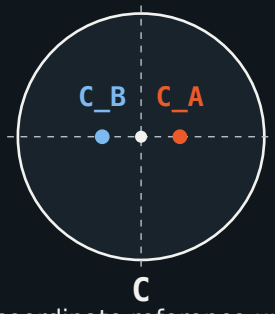
A DIRECTION REVERSAL CAN CREATE LOST MOTION BEFORE THE TABLE MOVES







DIRECTION-DEPENDENT READING

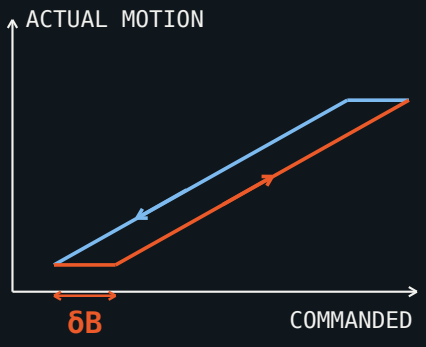


C — geometric centre

C_A / C_B — results after opposite approach directions.

Keep the coordinate reference unchanged. Contact and mounting errors can also affect the difference.

LOST-MOTION MODEL



SCHEMATIC, NOT TEST DATA

08 HYSTERESIS ERROR » **APPROACH A MEASUREMENT IN A CONTROLLED, REPEATABLE DIRECTION.**

Generic schematic: A/B are opposite directions. Confirm AJV axis signs on the control. One symptom does not identify one fault.

WPC: DIAGNOSING A DRIFTING DATUM

Collect repeat readings first; do not adjust WPC between trials. An unstable result can arise from the measuring setup, workholding, temperature, axis motion or reading the wrong coordinate frame. Reversal-error illustration: 82.

01 **Fix the comparison conditions**
Use the same part, clamping, Z section, indicator, stylus and setting. Record warm-up condition and measurement time. Check instrument model/ID, holder rigidity and controlled return of the reading; 68.

02 **Check the coordinate frame**
Read the same coordinate type in POSITION. Check active WPC/EIA frame, compensation and transformations in the relevant displays. COMMAND describes the command, and MODAL INF displays the state; it is not a transformation-clear function.

03 **Repeat the approach from one direction**
Choose a clear path and a withdrawal distance suited to the setup. Return several times to the same feature or indication from the same direction, recording position. This checks repeatability of the complete method; it is not an isolated ballscrew-backlash measurement.

04 **Separate reversal effects**
If the result depends on direction, refer it to maintenance. A bidirectional test needs a stable reference, independent displacement measurement and safe access from both directions. The indicator must retain contact within its range. Record results separately for each direction.

05 **Check seating and thermal condition**
Check supports, clamps, chips under datums and part movement after tightening. Compare under stable conditions. Do not attribute every change to ballscrew wear; friction, drive response, mounting and contact geometry can also contribute.

Do not compensate without diagnosis

Zeroing RELATIVE does not remove mechanical error. A reading of 0.010 or 0.015 mm is not a universal AJV fault threshold. Compare it with process requirements and the machine manual. Parameter compensation changes require diagnosis and an approved maintenance measurement.

Maintenance may extend assessment with positioning measurement or a ballbar test. One reversal does not separate every error source. [AX1] Record and decision: 52.

MEASUREMENT ACCEPTANCE CRITERIA

Acceptance criteria come from the machine manual, drawing, setup sheet or inspection plan. No single table of typical tolerances applies to every 1989 AJV-25/404. The table identifies each measurement and provides space for its approved limit.

CHECK	DEFINE THE RESULT	DOCUMENT LIMIT
Spindle TIR on a test mandrel	Certified mandrel; section and distance L, temperature, Imax-Imin. Acceptance to the manual/test certificate.	.....
Holder-tool assembly TIR	Measure at a defined section. The result covers the complete assembly, not only the spindle; 79.	.....
Jaw-side alignment to X	|B-A| over length L after final tightening; traverse A-B-A.	.....
Fixture-datum squareness	Specify the datum, reference artefact and length L. Axis alignment alone does not separate machine error.	.....
Bore / boss centring	Opposed pairs and a full 360° sweep. Assess centre location against the requirement, not merely matching dial zeros.	.....
Contact heights / reading return	Reading range and A-B-A return. Five points do not replace a complete flatness measurement.	.....

Illustrative assessment, not a Mazak tolerance

Suppose a setup sheet requires **≤0.020 mm over 200 mm**. After tightening: A=0.000; B=+0.012 mm; return A=0.000. The 0.012 mm difference falls within that example limit. Do not automatically transfer these numbers to another fixture or spindle TIR.

The inspection plan defines the instrument, conditions and decision rule, including uncertainty. A 0.001 mm division does not imply ±0.001 mm accuracy. Resolve borderline results or unstable return readings before acceptance. Measurement record: 90. [MT1] [MT2]

AT-MACHINE CHECKLIST: BEFORE START

For each subsequent part in an established run

- [ ] **Cycle complete:** the machine state permits safe workpiece changing.
- [ ] **Correct new workpiece:** part, material, face and orientation match.
- [ ] **Clean datums:** contact surfaces are free of chips and obstructions.
- [ ] **Workpiece seated:** contact at the required points has been checked.
- [ ] **Complete workholding:** every required clamp, support and setting matches the sheet.
- [ ] **Area clear:** no spanners, indicators, loose equipment or people.
- [ ] **Correct program:** the right program and starting point for the next part.
- [ ] **Guard closed:** start conditions and function states match the production setup.

Additional checks after a setup or tool change

- [ ] Required tool or work-zero measurement completed; entered data checked and documented.
- [ ] Effect on other operations assessed; clearances checked again.
- [ ] Scope of the controlled first run and subsequent measurements established.
- [ ] Required approval obtained before continuing production.

If the cycle differs from expectations

Stop execution as the situation requires. Do not change several values at once or press START just to see 'whether it works now'. Record the state; use pages 47-49 for restart.

Program: ..... **Operation:** .....
Fixture: ..... **Operator:** .....
Date / shift: .....

First part and batch release: 86. D correction: 43.

PRE-PRODUCTION VERIFICATION SHEET

Before the first part or after a setup change, tick every required item. Mark “N/A” only with a reason on the job record. Start the batch after inspection and the required first-part release.

JOB / WORK NO. / OPERATION / REVISION	DATE / SHIFT / PERSON

1. Workstation, supplies and startup

- [ ] Loose items removed; guards, access conditions and protective equipment checked.
- [ ] Correct oil and coolant levels; no unexplained leaks.
- [ ] Required axis references confirmed by the proper indication; ATC ready.
- [ ] Warm-up and thermal conditions meet the workstation sheet.

PRESSURE / UNIT	MANUAL / SHEET RANGE	READING
Air		
Central hydraulics		
Fixture (if applicable)		

2. Job, program and workholding

- [ ] Drawing, material and operation match; WORK NO. and start point checked.
- [ ] Datums clean; blank correctly oriented and seated.
- [ ] Required NO-GO check completed at the specified points with the specified blade.
- [ ] Supports and clamps complete; torque or pressure matches the fixture sheet.

3. Tools and work coordinate system

- [ ] Type, diameter, edges, stickout, holder and pull stud match the tool sheet.
- [ ] Spindle state and TNO./PKNO. map match the physical assemblies.
- [ ] LENGTH, ACT-Ø and required corrections measured; units and entries checked.
- [ ] Active WPC/EIA frame, transformations and Z datum independently verified.

4. Trial and first-part release

- [ ] Observation points, SINGLE BLOCK and a suitable RAPID limit established.
- [ ] First approach checked at a safe point: coordinate reading and physical position.
- [ ] Tool, holder, head and ATC paths clear; measuring equipment removed.
- [ ] First-part results recorded; batch inspection and release decision established.

REPORT NO. / RESULT: RELEASED OR HELD	DATE / APPROVER SIGNATURE

Subsequent parts: 85. Supplies and units: 37. After a D correction: 43.

JOB SETUP SHEET

BASIC DETAILS	RECORD
Machine / serial number	.....
Part / operation / revision	.....
Material / blank	.....
WORK NO. / program version	.....
Fixture / part orientation	.....
Tool measurement method	.....

WORK ZERO / REFERENCE	RECORD
Mode: MAZATROL / EIA / mixed	.....
WPC unit / active coordinate system	.....
Physical location of X0 / Y0 / Z0	....
X / Y / Z recorded in the control	....
Measuring instrument / master	.....
Independent verification point	.....

WORKHOLDING AND APPROVAL	RECORD
Sequence / torques / pressure	....
Seating check points	.....
First-part measurements / report	.....
Set by / checked by / date	.....

Attach the setup drawing and tool list. Record the active coordinate system name and readout convention; three X/Y/Z numbers alone are insufficient.

TOOL SHEET AND CORRECTION LOG

Machine / program: .....
Date / measurement method / unit: .....

TNO.	PKNO.*	ASSEMBLY / TYPE / Ø	LENGTH	EFF. Ø	CHECKED BY

* Complete PKNO. only where this identification method is used. This table is not an instruction to change the magazine map.

Data change and inspection result

TIME / FEATURE / REASON	FIELD + BEFORE → AFTER	RESULT / DECISION / PERSON

Record the exact field name, unit and sign. Distinguish an absolute value from an increment. After a correction, retain the measurement result and the decision on continued production.

MACHINE AND CONTROL RECORD

Record configuration from identification plates, control identification displays and the serial-number-specific manual. Give the document and page for sequences. A blank field does not establish that equipment is absent.

CONFIGURATION FIELD	ENTRY / DOCUMENT AND PAGE
Model / year / pallets	MAZAK AJV-25/404 / 1989 / 1
Machine serial number	.....
NC serial number / M-32 software version	.....
Axis 4: absent / type / indexed or continuous	.....
Measurement: indicator / work probe / tool setter / laser	.....
Device models / calibration / measurement programs	.....
Magazine: type / capacity / PKNO. numbering range	.....
TNO.-PKNO. map: fixed / random / checking display	.....
Holder / pull stud / ATC mass-L-Ø limits	.....
Maximum rpm / warm-up program and conditions	.....
Power on/off / HOME1-HOME2 / axis sequence	.....
LENGTH / ACT-Ø / COMP. / WPC display and TEACH	.....
TPS / VFC / reference lamps / additional functions	.....
Trials / tapping / restart restrictions	.....
Manual change: required mode and position / pedals	.....
TOOL UNCLAMP: conditions / full-clamp indication	.....
ATC after manual change: movements / map update / next command	.....

Approve diameter limits against the machine-specific manual. Table entry requiring clarification: 35.

Checked by / date: .....

INDICATING RECORD

IDENTIFICATION	RECORD
Machine / program / date	.....
Fixture / part / drawing	.....
Datum / feature / Z section	.....
Indicator: model / ID / inspection	.....
Graduation / unit / contact point	.....
Holder / reach / length L	.....
Acceptance criterion and document	.....

Readings in the same unit

FEATURE / POINTS	BEFORE	AFTER CLAMPING	RESULT / LIMIT
Edge A → B / length			
Second face / length			
Bore / +X and -X			
Bore / +Y and -Y			
Circumference / min. and max.			
Surface / A-B-C-D-E			
Return to reference point			

For a bore, record all four readings, not just the calculated half-difference. For runout, record the measuring section as well. Mark unused checks as not applicable.

WPC / INDEPENDENT CHECK	PERSON / DECISION
.....	.....
.....	.....

INDICATOR VERIFICATION RECORD

Complete for the pre-use check on page 68. This records checks at specified points; it is not a full calibration certificate.

INSTRUMENT AND CONDITIONS	RECORD
Maker / model / ID / type: DTI or plunger	
Range / graduation / unit / contact point and length	
Calibration status / acceptance criteria / document	
References: IDs / values / certificate / uncertainty	
Temperature and stability / mounting / geometry	
Date / person / intended measurement task	

1. Return to the same reference

CONTACT	1	2	3	4	5
Reading [unit]					

MIN. / MAX. / R = MAX. − MIN.	CRITERION / RESULT

2. Known step: increasing and decreasing height

KNOWN STEP	READING ↑	READING ↓	ERROR E / LIMIT

Record the change from the same reference reading. E = indicated change − known change. Mark rows outside the task scope “N/A”; never increase the step beyond the indicator range.

FINAL RETURN / CONDITIONS ASSESSED	DECISION / PERSON / DATE

- ☐ Accepted for the specified task.
- ☐ Removed from the task; referred for assessment / calibration.

OPERATOR AND SETTER FEEDBACK

Record a difference between this manual and the machine’s actual behaviour or equipment. Use the record to check documentation and close the issue; it does not replace an approved procedure.

FIELD	ENTRY
Document / language / page	v2.1 / EN / .....
Machine / serial no. / date / shift	
Person / program / mode / stage	
What does the manual state?	
What was observed? Full alarm and mechanism state, if applicable.	
Effect / secured state / was work stopped?	
Action / owner / due date / machine-manual reference	
At-machine verification / result / conditions	
Closure / checked by / date / documentation entry	

A discrepancy affecting safety or geometry

Suspend the affected action until resolved. Secure the state and pass the record to the responsible person. Do not change parameters or interlocks to make the machine match the description.

QUICK REMINDERS

Before pressing START, read the machine state as well as the display title. Resolve uncertainty using the relevant procedure.

01 **Program and mode**
Correct WORK NO., units and active mode. Know which command will execute first. 14, 56.

02 **Part and workholding**
Clean datums, full seating and all clamps. Apply the feeler NO-GO check specified by the fixture sheet. 16, 15.

03 **Tool and pocket**
Correct assembly, TNO., current PKNO. and measured data. Matching numbers alone prove nothing. 20.

04 **Datum and length**
Correct WPC, sign and units. Stylus radius and tool length have each been applied only once. 28, 30, 32.

05 **Manual movement**
Select axis and multiplier first. Verify the increment and tool motion relative to the part. 9.

06 **Path and trial**
Check the holder, head, workholding and ATC path. SINGLE BLOCK, DRY RUN and MACHINE LOCK do not guarantee clearance. 36, 39.

07 **Stop and restart**
FEED HOLD does not authorise access. After RESET, manual moves or a tool change, restore the proper state; tapping and ATC require their own procedure. 10, 47, 49.

08 **First part and records**
Check the required features after a change. Record the result, limit, tool, datum and date. 40, 84, 90.

Immediate danger

Use E-STOP. Follow the applicable energy-isolation procedure before accessing mechanisms. Releasing the button does not establish readiness to restart.

GLOSSARY OF ABBREVIATIONS AND LABELS

Display names and control labels are unchanged in PL and EN. Definitions below explain their use in this manual.

ABBREVIATION / LABEL	EXPANSION AND MEANING
ATC	Automatic Tool Changer - the automatic tool changer and its cycle.
WPC	Workpiece Coordinates - workpiece coordinate reference; the WPC unit in MAZATROL.
TIR	Total Indicator Reading - full reading range, Imax−Imin, for a defined measurement. It is not automatically the centre offset.
MPG	Manual Pulse Generator - manual pulse generator: the electronic handwheel.
DTI	Dial Test Indicator - lever-type dial test indicator. A plunger indicator has different contact geometry.
EIA / ISO	Electronic Industries Association / International Organization for Standardization - here: the coded programming format supported by the control.
CNC / NC	Computer Numerical Control / Numerical Control - computer numerical control / numerical control.
MDI	Manual Data Input - manual entry of commands for execution.
UR	Maintenance department - the Polish abbreviation used for machine diagnosis and technical maintenance.
LOTO	Lockout / Tagout - isolation, locking and tagging of energy sources under the site procedure.
PPE	Personal Protective Equipment - personal protective equipment selected for the hazards.
DTR	Polish abbreviation for the machine technical, operating and maintenance documentation.
TNO.	Tool Number - tool identifier; do not assume it is the pocket number.
PKNO.	Pocket Number - magazine pocket number under the current assignment.
WORK NO. / WNO.	Work Number - work/program number used by the M-32.
NOM-Ø / ACT-Ø	Nominal Diameter / Actual Diameter - nominal / actual diameter in the relevant data field.
COMP.	Compensation - compensation field; the control documentation defines its meaning and unit.
T.UNCLAMP	Tool Unclamp - tool-unclamp state label; the label alone is not a complete alarm code.
E-STOP	Emergency Stop - emergency stop, separate from energy isolation.
NO-GO	A no-entry criterion: the specified feeler must not enter the checked contact, as defined by the fixture sheet.

Identify TPS, VFC and optional functions from the equipment manual and record them on the machine sheet. 89.

SUBJECT INDEX: A-M

Terms and page numbers. Control labels retain their original wording.

A-B-A: return reading 70, 81, 84
Acceptance criteria 84
Accuracy versus indicator division 67, 84
ACT-Ø: actual diameter 20, 26, 42
Alarms 603, 624, 626-629 50
Alarms 630, 635-637, 647, 654 51
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Assembly length / LENGTH 20, 26, 32
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TECHNICAL SOURCES AND DOCUMENTATION

[M1] Yamazaki Mazak: Operating Manual, MAZATROL M-32
H731SA0576E, 01.1995; sections 4-6–4-13, 4-15-4 and 5. Soft-key coverage: 65.

[M2] Yamazaki Mazak: M-32 Automatic Operation
H731SA0600E, 1992; available preview of 1-1–1-3 and trial functions.

[M3] Mazak: Alarm & Parameter Manual, M-32 Series
C731SA0551E, 05.1995; codes 603, 624, 626–630, 635–637, 647, 654; pp. 3-85–3-96.

[M4] Mazak: Programming Manual, M-32A (B Version)
H731PA0530E; introduction and WPC unit example; confirm installed options in the machine manual.

[M5] Mazak: Accura Jigmatic AJV-25/404 / 25/405 — Operating Manual
Section 2-2, p. 5; /404 table extract. Conflicting ATC diameter units: 35.

[M6] Mazak: Accura Jigmatic AJV-25/404 / 25/405 — Maintenance Manual
Public transcription of 1-3, pp. 1-2; edition unidentified. Supplies and intervals require the machine manual.

[T1] BIG DAISHOWA: CNC Tool Holders
Holder interfaces and pull-stud selection to the machine specification.

[P1] Carr Lane: Locating & Clamping Principles
Location, support and clamping-force direction.

[C1] Sandvik Coromant: Milling formulas and definitions
Feed, speed and chip-load relationships.

[H1] HSE: MW1 — CNC machining
Enclosure, extraction, fluid mist and clearance time before opening.

[H2] HSE: Maintenance of work equipment
Safe maintenance, isolation and stored energy.

[H3] HSE: Engineering — Frequently asked questions
Compressed-air cleaning, aerosol and noise.

[H4] HSE: Machinery safety
Clothing, eye, foot and hearing protection; guards and training.

[H5] HSE: Using the right type of PPE
PPE selection and glove entanglement risk near moving parts.

[D1] Mazak Europe: iCONNECT
Documents and data for registered machines. Confirm availability for the 1989 machine with Mazak. The portal does not establish remote functions on this control.
mazak.com/eu-en/service-support/mazak-iconnect/

Accessed: 02-03.09.2026. M1-M5: manufacturer documents on third-party sites; M6: transcription with limited traceability. Indicating references and instrument documentation: 98.

INDICATING: TECHNICAL REFERENCES

Select the indicator and contact point using the manual for the actual model. Acceptance criteria come from the drawing, setup sheet and inspection plan. The sources below concern measurement methods and equipment preparation.

[MT1] Mitutoyo: Dial Test Indicator, User's Manual
No. 99MAG023A1, 27 June 2019; sections 2-3. Stylus, indication direction, rigid mounting and comparative measurement.
https://cdn.grovesindustrial.com/pdf/sds/Mitutoyo_513-501_User_Manual.pdf

[MT2] Mitutoyo: Quick Guide - Dial Indicators / Dial Test Indicators
PDF pages 2 and 4. Plunger alignment, orientation and the lever indicator cosine effect.
https://www2.mitutoyo.co.jp/eng/products/menu/QuickGuide_Dial-Indicators

[FX1] Kurt: DX8H Crossover AngLock Vise Manual
13 June 2024 edition, page 4: surface preparation and mounting locations. Use the actual vise manual for its settings.
https://www.kurtworkholding.com/wp-content/uploads/2024/06/Kurt-DX8H_Manual_2024-06-13.pdf

[RT1] PreciseBits / Think & Tinker: Measuring spindle runout
Section “Measuring Combined Spindle / Collet TIR”: fixed indicator, smooth test arbor and measurement location. Router limits are not AJV limits.
https://www.precisebits.com/tutorials/spindle_runout.htm

Interpreting DTI readings

For a stylus inclined by angle α from the surface-parallel position, normal displacement is approximately the reading × cos α in the model described by Mitutoyo. In practice, correct contact geometry first. Do not use this relationship as a universal plunger-indicator correction. [MT2]

Meaning of the result

Record the datum, measuring length or depth, clamping state and unit. Matching setup readings do not replace full geometric acceptance of the part. Dial zeroing, mechanical centring and WPC setting are separate actions.

Sources accessed: 02 September 2026. Machine-side procedures: pages 10, 23, 28 and 9. Measurement record: page 90.
Taper cleaning, Z setters and machine diagnosis: 99.

[MT3] Renishaw: OMP40-2 installation guide
Sections 3-10 and 3-11: stylus-offset, electronic-radius and probe-length calibration. Probing-method documentation; it does not define this machine’s equipment.
https://www.renishaw.com/resourcecentre/download/installation-guide-omp40-2-optical-machine-probe--141394?userLanguage=en

SOURCES: WORKSHOP PROCEDURES

These sources describe measurement principles and equipment care. They do not define settings or acceptance tolerances for a specific AJV-25/404. Task limits must refer to the machine manual, drawing or approved sheet.

[T2] BIG DAISHOWA: Simple Answers to Potentially Costly Spindle and Tool Holder Issues
Spindle-holder contact cleanliness, seating checks and the separate issues of ATC alignment and retention force. This manual uses hand rotation; the article does not replace AJV access requirements.
https://www.bigdaishowa.com/en/blog/simple-answers-potentially-costly-spindle-and-tool-holder-issues

[TS1] BIG DAISHOWA: Base Master BM-50 / BM-2, Operation Manual
Pages 1-2: surface detection, signal conditions, indicated height and travel limit. BM-50 and BM-2 are separate metric/inch variants; 50 mm is not the conversion of 2 inches.
https://www.bigdaishowa.com/sites/default/files/documents/2018-02/manual-big_daishowa-base_master.pdf

[MT4] Mitutoyo: Support - Service & Maintenance
Instrument manuals and calibration traceable to national/international standards. A shop-floor check does not replace a complete, properly documented metrological assessment.
https://www2.mitutoyo.co.jp/eng/support/service/

[MT5] Mitutoyo: Glossary of Measurement - Roundness
Roundness measurement methods and limitations of two- and three-point diameter measurement. The indicator reading range is not automatically roundness error.
https://cx.mitutoyo.com.sg/measurement-terms-01-01_sg

[AX1] Renishaw: Ballbar Testing Explained
Measurement of actual versus commanded path and machine-error analysis. Diagnosis requires the correct setup and interpretation; one symptom does not identify a unique faulty component.
https://www.renishaw.com/en/ballbar-testing-explained--6818

Application to the workstation

Calculation examples are conditional geometric models. Startup, checking and recording procedures apply these principles to workstation preparation. They do not authorise service-parameter changes or bypassing interlocks.

Accessed: 3 September 2026. M-32 and safety documentation: 97. Indicator and probe geometry: 98.