1. Connection Compatibility - What Actually Determines Fit

Start with the two mating components, not with the crossover OD. A crossover is only useful if each end is defined from the actual component it must connect. The connection orientation, thread designation, shoulder geometry and body dimensions are separate checks; passing one check does not prove the assembly will fit.

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5
Mating Components Identify the rig-side and bit-side components.	Connection Designations Record the exact connection at both ends.	Pin / Box Orientation Determine the required end arrangement.	Shoulder / Connection Geometry Confirm the specified mating interface.	OD / Bore / Length Fit the crossover body to the assembled string.

Compatibility release checklist

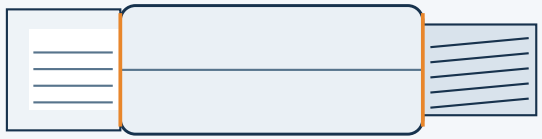
Check	Pass condition	Why it matters
Upper connection	Exact designation matches the component above.	Defines one side of the crossover; "pin" or "box" alone is incomplete.
Lower connection	Exact designation matches the component below.	The two crossover ends can be different and must be verified independently.
Shoulder interface	Specified shoulder geometry corresponds to the mating connection.	Correct make-up depends on the thread and shoulder acting as a connection system.
OD	Fits adjacent component envelope and planned clearance.	A correct thread can still be unusable if the body profile interferes with the assembly.
Bore	Maintains the required internal clearance and fluid passage.	Avoids an unintended restriction through the crossover.
Overall length	Fits the planned string spacing / tool stack-up.	Controls the final assembled position of surrounding components.

GO / NO-GO RULE: Do not release a crossover from OD + Box/Pin description alone. The exact connection designation on both sides must be known first.

2. End Configuration Is Not the Same as Connection Compatibility

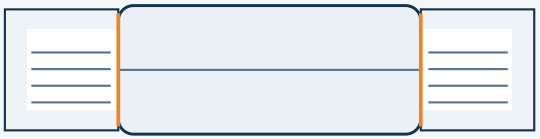
Box x Pin, Box x Box and Pin x Pin describe which end is male or female. They do not identify the connection family, thread size or exact shoulder geometry. Use these configurations only after the two mating components and their connection designations are known.

BOX x PIN



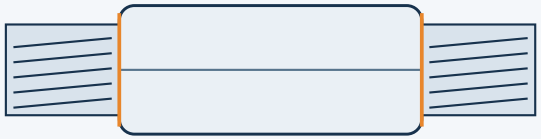
Orientation only - actual connection designation still required

BOX x BOX



Orientation only - actual connection designation still required

PIN x PIN



Orientation only - actual connection designation still required

Use this two-layer check

Layer	Question	Decision
1 - End orientation	Does each mating component present a pin or a box?	Determines Box x Pin, Box x Box or Pin x Pin.
2 - Actual connection	What is the exact connection designation and size on each component?	Determines whether the two ends can be machined to the required interfaces.
3 - Connection geometry	Does the specified shoulder/thread geometry correspond to the mating component?	Required for correct make-up; orientation alone does not establish this.
4 - Body fit	Will OD, bore and length work in the planned assembly?	Confirms the crossover fits both mechanically and hydraulically.

Field note: If the two adjoining components already have the same compatible connection and the assembly geometry is acceptable, a crossover is not needed. A crossover is introduced only to solve a real interface mismatch.

Standard boundary

API Spec 7-1 applies to rotary drill stem elements, including drill stem subs within its scope. API Spec 7-2 controls threading and gauging of standardized rotary shouldered connections. A component can meet its product requirements and still be unsuitable for a specific assembly if the actual mating connection at either end is different.

3. Interface Selection - When a Crossover Is Actually Required

The useful question is not "Where can a crossover be installed?" but "What mismatch exists at this interface?" The table below converts common drill-string interfaces into practical selection logic. This avoids adding a crossover where the adjoining components can already connect directly.

Drill-String Interface	Use a Crossover When...	No Crossover Needed When...	Key Data to Confirm
Drill Pipe <-> Drill Pipe	Two sections/tool joints use different specified connections.	Both sides already have the same compatible connection and geometry.	Connection on both ends; pin/box; OD; bore.
Drill Pipe <-> HWDP	The drill-pipe connection differs from the HWDP connection.	The selected drill pipe and HWDP are already connection-compatible.	Drill-pipe connection; HWDP connection; bore; clearance.
Drill Pipe <-> Drill Collar	The transition to the lower drill-collar section uses a different connection size/type.	The drill pipe and drill collar have directly compatible mating connections.	Upper/lower connection; shoulder; OD; bore.
Drill Pipe / HWDP <-> BHA Tool	A downhole tool presents a different rotary connection from the adjacent tubular.	The tool connection already matches the adjacent drill-string component.	Tool connection; string-side connection; bore; assembly length.
Drill Collar <-> BHA Tool	The lower-string tool and drill collar have different connections.	The lower BHA is already configured with compatible connections.	Both lower-string connections; shoulder geometry; OD; bore.

Three field situations that deserve an interface check

- Tool substitution: a replacement BHA tool may have a different connection from the tool originally planned, even if its functional role is similar.
- String transition: moving from drill pipe to HWDP or drill collar can introduce a different connection family or size at the transition point.
- Mixed inventory: drill-string components sourced from different equipment sets may have different connections even when their ODs appear similar.

> Compatibility first: The crossover should be selected from the actual components on both sides of the interface. Avoid assuming compatibility from product name, OD, or general "API connection" wording.

4. Final Selection Map - From Mating Components to Release

Use the sequence below to define the crossover from the actual components outward. Lock the two mating connections first; body dimensions and material follow only after the interface is known.

1 IDENTIFY THE TWO COMPONENTS

INPUT	Rig-side component + bit-side component
CHECK	Use the actual drill pipe, HWDP, drill collar or BHA tool - not only a generic product family.
OUTPUT	Upper and lower mating interfaces are fixed.

2 LOCK BOTH CONNECTIONS

INPUT	Exact connection designation at each mating end
CHECK	Confirm connection type/size and the end presented by each component (pin or box).
OUTPUT	Box x Pin, Box x Box or Pin x Pin orientation is resolved.

3 FIT THE CROSSOVER BODY

INPUT	OD, bore and overall length
CHECK	Verify external clearance, internal fluid passage and assembly spacing after the connections are fixed.
OUTPUT	Body geometry fits the planned drill-string assembly.

4 CONFIRM SERVICE BASIS

INPUT	Material / heat treatment + applicable requirements
CHECK	Match the finished sub to the required mechanical/service condition and connection-control basis.
OUTPUT	Selection basis is complete before machining or release.

Components → Connections → Pin/Box → Shoulder → OD + Bore → Length → Material

STOP AND RECHECK IF

Only OD, a generic "pin/box" description, or one side of the connection is known. These inputs do not define a compatible crossover.

PROCEED WHEN

Both mating components and exact connection designations are fixed, pin/box orientation is resolved, and OD, bore and length fit the planned assembly.

Final selection record

A complete selection record should state all of the following in one place:

- Mating component pair
- Upper connection
- Lower connection
- Pin/Box orientation
- OD
- Bore
- Overall length
- Material / heat treatment