TUBE VS PIPE

Tube vs pipe in instrumentation

“Half inch” can mean a 12.70 mm tube or a 21.34 mm pipe. Read the size, wall and end connection correctly before comparing bore, flow or maintenance access.

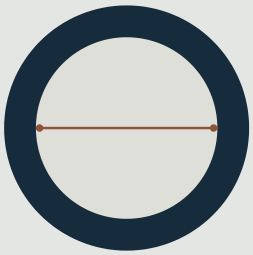
Tubing Supply AS | 23 November 2026

½ in. OD tube
0.049 in. wall



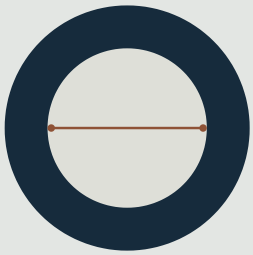
0.402 in. bore

NPS ½ pipe
Schedule 40S



0.622 in. bore

NPS ½ pipe
Schedule 80S



0.546 in. bore

DIMENSIONAL PLATE

½ in. compared

Nominal cross sections at the same scale. Dark areas show metal. The white opening shows the nominal bore. Pipe dimensions · CCTF · p. 16

OUTSIDE DIAMETER

21.34 mm

NPS ½ stainless pipe has an outside diameter of 0.840 in. A ½ in. instrumentation tube has an outside diameter of 0.500 in. They need different end descriptions.

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OD, NPS & SCHEDULE

How large is a “half-inch” line?

Instrumentation tubing is commonly specified by actual outside diameter (OD) and wall thickness. Pipe is identified by nominal pipe size (NPS, or its DN designation) and schedule. At one NPS, changing schedule changes the wall and bore while the OD stays constant.

Nominal dimensions · inches unless indicated

Example	Outside diameter	Wall	Inside diameter
½ in. OD tube × 0.049 in. wall	0.500 in. / 12.70 mm	0.049 in.	0.402 in.
NPS ½ / DN 15 pipe · Sch 40S	0.840 in. / 21.34 mm	0.109 in.	0.622 in.
NPS ½ / DN 15 pipe · Sch 80S	0.840 in. / 21.34 mm	0.147 in.	0.546 in.

Quick dimension check

For a straight circular section, nominal ID equals OD minus twice the nominal wall. The Schedule 40S example gives 0.840 − 2 × 0.109 = 0.622 in. Use actual tolerances when minimum bore matters.

What DN 15 identifies

DN 15 is a nominal size corresponding to NPS ½. The number 15 gives neither a 15 mm OD nor a guaranteed 15 mm bore. A metric 12 mm tube is also a different OD from a ½ in. tube.

The hydraulic consequence

The 0.622 in. bore has about 2.39 times the nominal flow area of the 0.402 in. tube bore. This ratio describes an area. Actual flow depends on length, fluid, roughness, fittings, valves and available differential pressure.

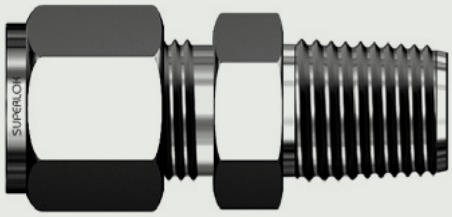
“Piping” describes the system. Its project code and line class can also govern instrumentation tubing within the defined boundary. A switch to tubing changes the dimensional and connection convention while the design obligations still follow the service.

SOURCES ASME B36.19 · Stainless steel pipe dimensions / CCTF · Stainless pipe dimension table · p. 16 / BMT · SUPERLOK Tube Fitting, R38 · p. 9 / ASME B31.3 · Process piping

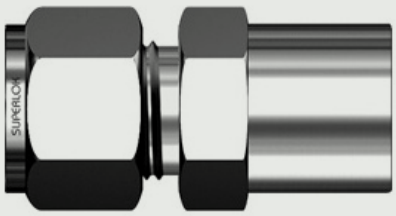
END CONNECTIONS

Two half-inch ends, two different orders

A connector has two interfaces. Describe what enters the tube end, then identify the port or weld end on the process side. Two BMT catalogue entries show how much information is lost when both are labelled simply “½ inch”.



SMC · male pipe thread



SPWC · male pipe weld

BMT SUPERLOK R38 examples

Part number	Tube side	Process side
SMC-8-8N	½ in. OD instrumentation tube.	½ in. male NPT. The mating equipment has a ½ in. female NPT port. Identify thread form and the approved sealing practice.
SPWC-8-8P	½ in. OD instrumentation tube.	Nominal ½ in. male pipe weld end. Check the weld detail, matching pipe wall and project procedure. BMT lists its bevel option separately.

The tube fitting seals at the ferrules on a suitable tube. An NPT joint uses a tapered thread and the specified sealing practice. A welded interface relies on a qualified joint. Choosing the same OD on the tube side solves only one of the two interfaces.

Field example

A pressure transmitter has a ½ in. female NPT process port and the impulse line is 12 mm OD. The SMC-8-8N example fits a ½ in. OD tube. The correct selection needs a 12 mm tube end and a ½ in. male NPT end. BMT lists SMC-12M-8N for that combination. R38 gives a minimum passage of 9.5 mm for the 12 mm version and 10.41 mm for SMC-8-8N. That dimension is a further check when the branch has a minimum-bore requirement.

SOURCES BMT · fractional SMC · p. 15 / BMT · metric SMC · p. 17 / BMT · SPWC · p. 61

DESIGN TRADE-OFFS

Where should tubing end and pipe begin?

Consider a process header supplying a small analyser panel. The header carries the main flow. A branch carries a sample to the analyser. Its volume, routing and maintenance requirements can justify changing connection systems at the take-off.

Review the boundary before redrawing the line

Flow and response	Size the header for required flow and allowable loss. For an analyser branch also consider transport delay, dead legs and the bore of the valve and connector.
Installation and movement	A bent tube can reduce elbows and joints. Confirm bend space, mechanical support, vibration and thermal movement. On the process side, check loads, access and inspection around the branch weld.
Maintenance and reinstatement	A removable tube end can simplify panel service where the design allows it. Leave tool clearance and a supported run. A welded boundary needs the specified fabrication and inspection access.
Pressure and temperature	Check the allowable pressure of the actual tube, pipe, fitting, valve and joint at the design temperature under the applicable code. Schedule and OD alone do not establish system pressure.

What the bore means for an analyser

Using the nominal bores compared above, a straight 3 m length contains about 0.25 L in the tube and 0.59 L in the Schedule 40S pipe. At a steady actual liquid sample flow of 1 L/min, ideal displacement takes roughly 15 s and 35 s. Mixing, filter volumes, valves and the analyser add delay.

A line description such as “12 mm OD × 1.5 mm wall instrumentation tube to ½ in. female NPT equipment port” gives the designer a checkable boundary. Add grade, delivery condition, design pressure and temperature, required bore and approved joining method to complete the selection.

SOURCES CCTF · Stainless pipe dimension table · p. 16 / BMT · SUPERLOK Tube Fitting, R38 · pp. 8–9 / ASME B31.3 · Process piping

Tubing Supply catalogue · SMC-12M-8N connector