



Designation: B462 – 18<sup>ε1</sup>

# Standard Specification for Forged or Rolled Nickel Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service <sup>1</sup>

This standard is issued under the fixed designation B462; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

<sup>ε1</sup> NOTE—Editorial corrections were made to [Table 1](#) in January 2021.

## 1. Scope\*

1.1 This specification<sup>2</sup> covers forged or rolled UNS N06030, UNS N06035, UNS N06022, UNS N06200, UNS N06059, UNS N10362, UNS N06686, UNS N08020, UNS N08367, UNS N10276, UNS N10665, UNS N10675, UNS N10629, UNS N08031, UNS N06045, UNS N06025, UNS N06699, and UNS R20033<sup>3</sup> pipe flanges, forged fittings, and valves and parts intended for corrosive high-temperature service.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to become familiar with all hazards including those identified in the appropriate Safety Data Sheet (SDS) for this product/material as provided by the manufacturer, to establish appropriate safety, health, and environmental practices, and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B02 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.07 on Refined Nickel and Cobalt and Their Alloys.

Current edition approved Nov. 1, 2018. Published November 2018. Originally approved in 1967. Last previous edition approved in 2015 as B462 – 15. DOI: 10.1520/B0462-18E01.

<sup>2</sup> For ASME Boiler and Pressure Vessel Code applications see related Specification SB-462 in Section II of that Code.

<sup>3</sup> New designation established in accordance with Practice E527 and SAE J1086, Practice for Numbering Metals and Alloys (UNS).

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>4</sup>

- A262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
- B166 Specification for Nickel-Chromium-Aluminum Alloy, Nickel-Chromium-Iron Alloys, Nickel-Chromium-Cobalt-Molybdenum Alloy, Nickel-Iron-Chromium-Tungsten Alloy, and Nickel-Chromium-Molybdenum-Copper Alloy Rod, Bar, and Wire
- B335 Specification for Nickel-Molybdenum Alloy Rod
- B408 Specification for Nickel-Iron-Chromium Alloy Rod and Bar
- B472 Specification for Nickel Alloy Billets and Bars for Reforging
- B473 Specification for UNS N08020, UNS N08024, and UNS N08026 Nickel Alloy Bar and Wire
- B574 Specification for Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Molybdenum-Chromium, Low-Carbon Nickel-Molybdenum-Chromium-Tantalum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, and Low-Carbon Nickel-Chromium-Molybdenum-Tungsten Alloy Rod
- B581 Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Rod
- B649 Specification for Ni-Fe-Cr-Mo-Cu-N Low-Carbon Alloys (UNS N08925, UNS N08031, UNS N08034, UNS N08354, and UNS N08926), and Cr-Ni-Fe-N Low-Carbon Alloy (UNS R20033) Bar and Wire, and Ni-Cr-Fe-Mo-N Alloy (UNS N08936) Wire
- B691 Specification for Iron-Nickel-Chromium-Molybdenum Alloys (UNS N08367) Rod, Bar, and Wire
- B880 Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys and Cobalt Alloys

<sup>4</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

\*A Summary of Changes section appears at the end of this standard

**TABLE 1 Chemical Requirements**

Element	UNS N08020	UNS N08367	UNS R20033
Carbon, max	0.07	0.030	0.015
Manganese, max	2.00	2.00	2.0
Phosphorus, max	0.045	0.040	0.02
Sulfur, max	0.035	0.030	0.01
Silicon, max	1.00	1.00	0.50
Nickel	32.00–38.00	23.50 to 25.50	30.0–33.0
Chromium	19.00–21.00	20.00 to 22.00	31.0–35.0
Molybdenum	2.00–3.00	6.00 to 7.00	0.50–2.0
Copper	3.00–4.00	0.75 max	0.30–1.20
Columbium (Nb) + tantalum	8 × carbon–1.00	...	...
Nitrogen	...	0.18 to 0.25	0.35–0.60
Iron	Remainder <sup>A</sup>	Remainder <sup>A</sup>	Remainder <sup>A</sup>

Element	Composition, %					
	UNS N06030	UNS N06022	UNS N06200	UNS N10276	UNS10665	UNS N10675
Carbon, max	0.03	0.015	0.010	0.010	0.02	0.01
Manganese, max	1.5	0.50	0.50	1.0	1.0	3.0
Phosphorous, max	0.04	0.02	0.025	0.04	0.04	0.030
Sulphur, max	0.02	0.02	0.010	0.03	0.03	0.010
Silicon, max	0.8	0.08	0.08	0.08	0.10	0.10
Nickel	Remainder <sup>A</sup>	Remainder <sup>A</sup>	Remainder <sup>A</sup>	Remainder <sup>A</sup>	Remainder <sup>A</sup>	Remainder <sup>A</sup>
Chromium	28.0-31.5	20.0-22.5	22.0–24.0	14.5-16.5	1.0 max	1.0-3.0
Molybdenum	4.0-6.0	12.5-14.5	15.0-17.0	15.0-17.0	26.0-30.0	27.0-32.0
Copper	1.0-2.4	...	0.3-1.9	...	...	0.20
Columbium (Nb) + tantalum	0.30-1.50	...	...	...	...	...
Nitrogen	...	...	...	...	...	...
Iron	13.0-17.0	2.0-6.0	3.0 max	4.0-7.0	2.0 max	1.0-3.0
Cobalt, max	5.0	2.5	2.0	2.5	1.0	3.0
Tungsten	1.5-4.0	2.5-3.5	...	3.0-4.5	...	3.0 max
Vanadium, max	...	0.35	...	0.35	...	0.20
Titanium, max	...	...	...	...	...	0.2
Zirconium, max	...	...	...	...	...	0.10
Columbium (Nb)	...	...	...	...	...	0.20 max
Tantalum	...	...	...	...	...	0.20 max
Nickel + Molybdenum	...	...	...	...	...	94.0-98.0
Aluminum, max	...	...	0.50	...	...	0.50

Element	Composition, %								
	UNS N06699	UNS N06059	UNS N10362	UNS N06686	UNS N08031	UNS N06045	UNS† N06025	UNS† N10629	UNS† N06035
Carbon, max	0.005-0.10	0.010	0.010	0.010	0.015	0.05-0.12	0.15-0.25	0.01	0.050
Manganese, max	0.50	0.5	0.60	0.75	2.0	1.0	0.15	1.5	0.50
Phosphorous, max	0.02	0.015	0.025	0.04	0.020	0.02	0.02	0.040	0.030
Sulphur, max	0.01	0.010	0.010	0.02	0.010	0.010	0.010	0.010	0.015
Silicon, max	0.50	0.10	0.08	0.08	0.3	2.5-3.0	0.5	0.05	0.60
Nickel	Remainder <sup>A</sup>	Remainder <sup>A</sup>	Remainder <sup>A</sup>	Remainder <sup>A</sup>	30.0-32.0	45.0 min	Remainder <sup>A</sup>	Remainder <sup>A</sup>	Remainder <sup>A</sup>
Chromium	26.0-30.0	22.0-24.0	13.8-15.6	19.0-23.0	26.0-28.0	26.0-29.0	24.0-26.0	0.5-1.5	32.25-34.25
Molybdenum	...	15.0-16.5	21.5-23.0	15.0-17.0	6.0-7.0	...	...	26.0-30.0	7.60-9.00
Copper	0.50 max	0.50 max	...	...	1.0-1.4	0.3 max	0.1 max	0.5	0.30 max
Yttrium	...	...	...	...	...	...	0.05-0.12	...	...
Nitrogen	0.05 max	...	...	...	0.15-0.25	...	...	...	...
Iron	2.5 max	1.5 max	1.25 max	5.0 max	Remainder <sup>A</sup>	21.0-25.0	8.0–11.0	1.0-6.0	2.00 max
Cobalt, max	...	0.3	...	...	...	...	...	2.5	1.00
Tungsten	...	...	...	3.0-4.4	...	...	...	...	0.60 max
Vanadium, max	...	...	...	...	...	...	...	...	0.20
Titanium, max	0.60	...	...	0.02-0.25	...	...	0.1-0.2	...	...
Zirconium, max	0.10	...	...	...	...	...	0.01-0.10	...	...
Columbium (Nb)	0.50 max	...	...	...	...	...	...	...	...
Tantalum	...	...	...	...	...	...	...	...	...
Cerium	...	...	...	...	...	0.03-0.09	...	...	...
Aluminum, max	1.9-3.0	0.1-0.4	0.50	...	...	...	1.8-2.4	0.1-1.5	0.40
Boron	0.008 max	...	...	...	...	...	...	...	...

<sup>A</sup> Shall be determined arithmetically by difference.

<sup>†</sup> Editorial corrected.