APOLO

# Garantia de
# *qualidade e segurança*

A Apolo possui soluções de alta qualidade e complexidade, visando sempre oferecer toda a segurança necessária para o seu projeto, seja qual for o seu segmento.

# *Há exatos 85 anos, temos tradição em olhar para frente*

Se tem uma coisa que a experiência de mais de oito décadas nos mostrou é que precisamos estar em movimento para acompanhar as mudanças no mundo.

Para superar novos desafios, a união é fundamental. Para oferecer mais e melhor aos clientes, é necessário integrar nossas potencialidades.

> ***É por isso que, a partir de agora, Apolo Tubos e Apolo Tubulars são uma só Apolo.***

Com uma gestão completa, unida e diversificada, vamos integrar inteligência, tecnologia e estratégia para oferecer mais soluções, com a melhor qualidade de atendimento e o máximo de eficiência.

As duas empresas que antes caminhavam separadas, hoje passam a ser uma só com uma única direção e objetivo.

Dessa forma, seremos capazes de unificar nossos valores e propósitos e vencer os desafios do futuro.

***Somos a Apolo de sempre, Prontos para ir cada vez mais longe.***

# SUMÁRIO

# ***Pioneirismo e tradição na produção de tubos de aço.***

***A Apolo começou a operar em 1938***, primeira empresa industrial do Grupo Peixoto de Castro e pioneira no Brasil na fabricação de tubos de aço ERW.

Muito desta trajetória vitoriosa pode ser atribuído à ***dedicação do elemento humano***, o que proporcionou a formação de profissionais altamente qualificados, sempre atentos à satisfação dos clientes e conscientes das necessidades de seus fornecedores.

Enfim, uma atuação voltada para o sucesso dos parceiros como a forma de obter suas próprias vitórias.

A agilidade em definir novos horizontes possibilitou uma precisa adequação ao mundo globalizado, sobretudo graças ao processo de verticalização dos negócios, dos pesados investimentos em tecnologia, do compromisso com o meio ambiente, das parcerias com empresas especializadas, do esforço contínuo pela competitividade internacional, nos traz a certeza de outros anos à frente.

**1938**
Fabricação de Tubos ERW
Unidade Pavuna (RJ)

**1977**
Fabricação de Tubos ERW
Unidade Lorena (SP)

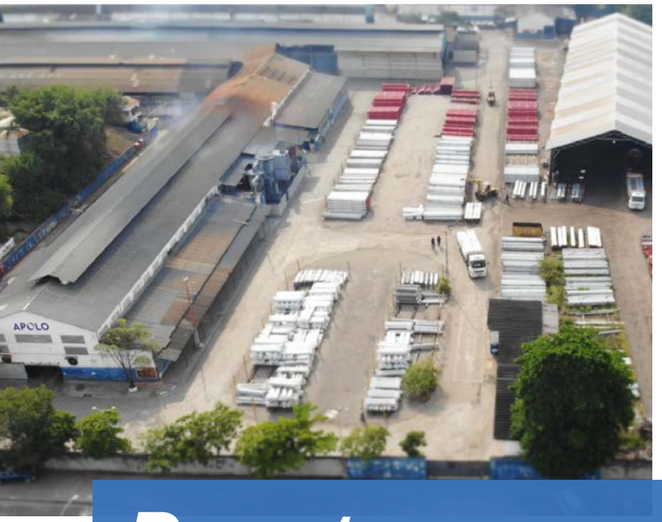
**2000**
Atendimento ao mercado
de tubos API Line Pipe

**2007**
Unidade Lorena realiza JV
com a Lone Star Steel

**2009**
Atendimento ao mercado
de tubos API OCTG

**2017**
Recompra das ações
da US Steel

## Capacidade instalada





# Pronta para o Brasil, pronta para o mundo.

Atualmente, a Apolo possui 2 plantas industriais, em Lorena/SP e Rio de Janeiro/RJ.

No total, tem capacidade instalada para produzir 180 mil toneladas de tubos de aço ao ano, voltados à fabricação de tubos para os principais mercados:

- Petróleo & Gás
- Máquinas e equipamentos industriais
- Construção civil
- Energia fotovoltaica
- Agronegócio

Com tecnologia, qualificação de equipe e diversificação, a Apolo fornece as mais diversas soluções tubulares para atender cada necessidade do mercado.



# Tecnologia de ponta e segurança.

## Produtos cada vez melhores para um mercado exigente.

Os investimentos em tecnologia de ponta e infraestrutura fabril, nos permite oferecer ao mercado soluções tubulares de alta qualidade.

Tubos acabados (OCTG) para exploração e produção (E&P) com conexões API 5CT, Premium (JFEBEAR e FOX) e Semipremium (GEOCONN, SUPERMAX e FLUSHMAX).

Tubos para aplicações especiais tais como: High Collapse para elevada pressão externa, grau L80 Cr1% ou revestidos interna e externamente para ambientes corrosivos e restrito controle dimensional Special Drift.

Tubos de condução de petróleo e gás, nos níveis de produto API 5L / PSL1 e PSL2, revestidos interna e externamente para ambientes corrosivos.

Tubos para aplicação estrutural, caldeiras, estacas de linha de transmissão e cilindros hidráulicos de alta resistência, além de tubos industriais, perfis quadrados e retangulares que permitem processos subsequentes de corte e dobra, entre outros, garantindo a integridade da solda.

O processo de fabricação é monitorado e certificado por diferentes tipos de controles que conferem aos tubos a garantia da qualidade e a rastreabilidade total do produto, através de inspeções em linha, tais como: ultrassom, eletromagnético e por partícula magnética, dimensional com instrumentos sofisticados, além de teste hidrostático de alta pressão, ensaios mecânicos e químicos, todos interligados em um sistema computadorizado.

As máquinas e equipamentos que compõem o parque fabril possuem sensores e sistemas de proteção que tornam a operação segura e promovem o bem estar dos operadores. Com a visão de que vida é o nosso maior patrimônio, foram implementados programas internos de treinamento e conscientização focados na saúde e segurança, continuamente monitorados através da Política de Qualidade Total.

# Sustentabilidade

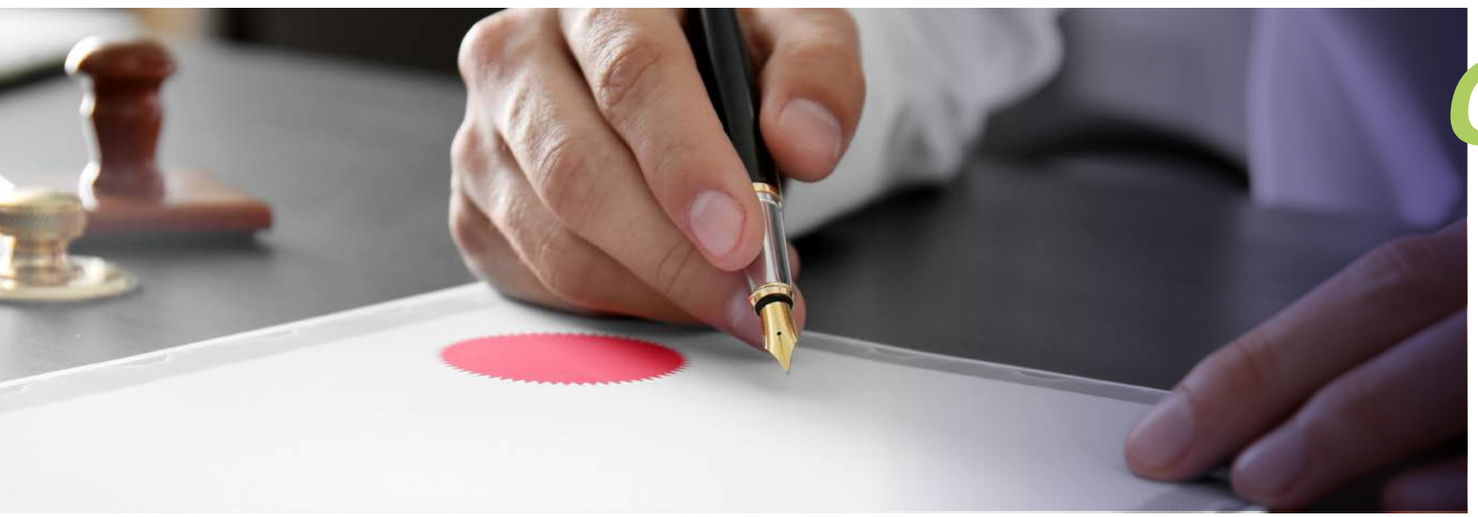
**Acreditamos que todos podem evoluir juntos.**

A Apolo contribui de forma efetiva na busca por um Brasil mais sustentável, desenvolvendo diversos programas ligadas ao meio ambiente e responsabilidade social como: remanejo de áreas verdes, plantio de espécies nativas, ajuda a vítimas de enchentes, saúde da mulher, saúde bucal, Natal das crianças, entre outros.

# Compliance

**Acreditamos que a melhor forma de fazer negócios é agindo com clareza, ética e segurança.**

Nosso código de conduta é um conjunto de normas que visam orientar o comportamento da empresa. A Política Anticorrupção reafirma nosso compromisso de conduzir os negócios com integridade.



# Certificações

Atendendo a crescente exigência do mercado, a Apolo está constantemente focada na ***busca pela excelência*** e em ***agregar valor*** aos seus produtos através do reconhecimento dos principais institutos e órgãos certificadores internacionais.

A melhor opção em

***soluções tubulares***

para os principais
segmentos da indústria.

***Nosso portfólio de soluções***

Automotivo

Máquinas e equipamentos industriais

Construção civil

Redes de incêndio

Máquinas e implmentos agrícolas

Eletrodutos

Energia fotovoltaica

Petróleo

Captura de carbono

Refinaria

# Perfuração Completação Workover

Tubos de revestimento (casing), tubos de produção (tubing) e tubos curtos (pup joint) fornecidos com ou sem upset (EU/NU), roscadas com conexões API, Premium ou Semipremium.



## Premium Connection

**JFEBEAR**
Premium Connection

JFEBEAR™ has been designed and tested to meet the needs for critical well loads. The design incorporates metal-to-metal seals with a 15° internal torque shoulder to ensure sealing under extreme loads.

The negative load flank thread form and coupled design provide 100% tensile efficiency for the standard coupling.

| DESIGN | ADVANTAGE |
|---|---|
| Negative (-5°) load flank angle on threads | Superior bending capability due to hook threads |
| 25° angle for thread stabbing flank | Excellent stabbing performance due to high stabbing flank angle |
| 15° torque shoulder | Reduced hoop stress |
| Reduced gap between stabbing flanks on pipe and coupling thread | High compression rating & galling esistance due to optimum gap |
| Contour metal-to-metal seal between pin and coupling | Galling resistance due to point s eal type |

## Semi Premium Connection

**GEOCONN**

**Completely interchangeable with API BTC**
As GEOCONN is perfectly interchangeable with API Buttress, Casing Accessories with Buttress Thread may be used.

**Internally flush with pin abutment**
· Prevention of turbulencence flow;
· High over torque resistance;
· Abutment works as metal seal under medium tension loads;
· High fatigue resistance.

**Manufactuting of GEOCONN**

**Mill tight end** **Field tight end**

**SUPERMAX**

**· Available size:**
SUPERMAX is tubing connection: 1.900" to 4-1/2"
SUPERMAX2 is casing connection: 5" to 13-3/8"
Modified Coupling with Non-metallic sealv

**· SUPERMAX-TS: 2-3/8" to 4-1/2"** **· SUPERMAX-TS2: 5" to 7"**
Coupling with internal shoulder provides: Internally flush to prevent turbulence flow and high torque and compression resistance.

Non-upset tubing: Clearance programs where smaller OD than API EUE is desired but joint strength must be higher than API EUE.

**· Application:** Casing or Tubing for deviated hole, low pressure gas well and steam injection. Tubing for high-pressure fracturing jobs and thermal applications.

**FLUSHMAX** SERIES

**· Available size:1.66" – 4"**
Completely flush OD & ID, tension with 38-50% of pipe body yield, compression with more than 60% of pipe body yield, 80% of pipe body internal yield pressure and API Collapse pressure.

**· Application:** Liner or slotted liner, wash pipe for gravel packing and casing repair.

**MO-EUE-PA**

**· Available size: 2-3/8"- 4-1/2"**
Pin is identical to API EUE, internally flush, coupling is shorter than EUE to have pin to pin abutment.
Mill end has deeper make up to prevent rotation during field end make up on the rig.
Pin to pin abutment enhances torque resistance.

**· Application:** High Torque and Progressive cavity pump

## Tolêrancias de Comprimento – CASING / TUBING (Joint)

| | Range 1 | | | |
|---|---|---|---|---|
| | Min. | Máx. | Min. | Máx. |
| | m | m | ft | ft |
| Tubing | 6,10 | 7,32 | 20.0 | 24,0 |
| Casing | 4,88 | 7,62 | 16.0 | 25,0 |

| | Range 2 | | | |
|---|---|---|---|---|
| | Min. | Máx. | Min. | Máx. |
| | m | m | ft | ft |
| Tubing | 8,53 | 9,75 | 28.0 | 32.0 |
| Casing | 7,62 | 10,36 | 25.0 | 34,0 |

| | Range 3 | | | |
|---|---|---|---|---|
| | Min. | Máx. | Min. | Máx. |
| | m | m | ft | ft |
| Tubing | 11,58 | 12,80 | 38.0 | 42.0 |
| Casing | 10,36 | 13,50 | 34.0 | 44.3 |

## Tolerâncias de comprimento – PUP JOINT

| Nominal | | Mínimo | | Máximo | |
|---|---|---|---|---|---|
| ft | m | ft | m | ft | m |
| 2.0 | 0,61 | 1.7 | 0,53 | 2.3 | 0,69 |
| 4.0 | 1,22 | 3.7 | 1,14 | 4.3 | 1,30 |
| 6.0 | 1,83 | 5.7 | 1,75 | 6.3 | 1,91 |
| 8.0 | 2,44 | 7.7 | 2,36 | 8.3 | 2,52 |
| 10.0 | 3,05 | 9.7 | 2,97 | 10.3 | 3,13 |
| 12.0 | 3,66 | 11.7 | 3,58 | 12.3 | 3,74 |

## Requisitos para propriedades mecânicas *(Ensaio de tração)*

Tensile and hardness requirements

| | Grau | LIMITE DE ESCOAMENTO (LE) | | | | LIMITE DE RESISTÊNCIA (LR) | | DUREZA |
|---|---|---|---|---|---|---|---|---|
| | | mín. | | máx. | | mín. | | máx. |
| | | MPa | psi | MPa | psi | MPa | psi | HRC |
| API General Service | H40 | 276 | 40.000 | 552 | 80.000 | 414 | 60.000 | - |
| | J55 | 379 | 55.000 | 552 | 80.000 | 517 | 75.000 | – |
| | K55 | 379 | 55.000 | 552 | 80.000 | 655 | 95.000 | – |
| API Sour Service | L80 | 552 | 80.000 | 655 | 95.000 | 655 | 95.000 | 23 |
| API High-Strength | N80 | 552 | 80.000 | 758 | 110.000 | 689 | 100.000 | – |
| | P110 | 758 | 110.000 | 965 | 140.000 | 862 | 125.000 | – |

**NOTE:** Ensaio Charpy conforme API 5CT.



## Composição Química *(porcentagem de fração em massa)*

| Grupo | Grau | Tipo | % Máxima | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | Mn | Mo | Cr | Ni | Cu | P | S | Si |
| 1 | H40 | – | – | - | - | – | – | – | 0,030 | 0,030 | – |
| | J55 | – | – | – | – | – | – | – | 0,030 | 0,030 | – |
| | K55 | – | – | – | – | – | – | – | 0,030 | 0,030 | – |
| | N80 | Q | – | – | – | – | – | – | 0,030 | 0,030 | – |
| 2 | L80 | 1 | 0,43 | 1,90 | – | – | 0,25 | 0,35 | 0,030 | 0,030 | 0,45 |
| 3 | P110 | – | – | – | – | – | – | – | 0,020 | 0,010 | – |

## Inspeções e ensaios aplicáveis

| Group | Grade | Chemical Properties | Tensile Tests | Impact Tests | Hardness Tests | Dimensional Testing | Flattening Test |
|---|---|---|---|---|---|---|---|
| 1 | H40 | x | x | - | - | x | x |
| | J55 | x | x | – | – | x | x |
| | K55 | x | x | – | – | x | x |
| | N80Q | x | x | x | – | x | x |
| 2 | L80-1 | x | x | x | x | x | x |
| 3 | P110 | x | x | x | – | x | x |

| Drift Tests | Hydrostatic Tests | Ultrasonic Inspection (Weld Seam) | Electromag-netic Inspection (Full Body)a | Magnetic Particles Inspection (Pipe Ends)a | Ultrasonic Inspection (Pipe Ends)a | Visual Inspection (including varnishing) |
|---|---|---|---|---|---|---|
| H40 | x | x | - | - | x | x |
| J55 | x | x | – | – | x | x |
| K55 | x | x | – | – | x | x |
| N80Q | x | x | x | – | x | x |
| L80-1 | x | x | x | x | x | x |
| P110 | x | x | x | – | x | x |

a Requisito aplicável quando o tubo passa por tratamento térmico.
Nivel de calibração da Inspeção END são definidos conforme API 5CT

# *Dimensões e propriedades de desempenho (Tubing)*

Dimension and performance properties (tubing)

| Size | Outside diameter | | Inside diameter | | Drift diameter | | Wall thickness | | LABEL | | Grade | Pipe Body Yied Strength[a] | Joint Yield Strength[a] | | Collapse Resistance[a] | Internal Yield Pressure (Pipe body) | Type of end-finish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | NU | EU | | | NU | EU Regular / Sp.C.[b] | | | |
| inch | inch | mm | inch | mm | inch | mm | inch | mm | lb/ft | lb/ft | | lb | lb | lb | psi | psi | |
| 2 3/8 | 2.375 | 60,32 | 2.041 | 51,84 | 1.947 | 49,46 | 0.167 | 4,24 | 4.00 | – | H40 | 46,300 | 30,100 | – | 5,230 | 4,920 | PN |
| | | | | | | | | | | | J55 | 63,700 | 41,400 | – | 7,190 | 6,770 | PN |
| | | | | | | | | | | | K55 | – | – | – | – | – | – |
| | | | | | | | | | | | L80 | 92,600 | 60,200 | – | 9,980 | 9,840 | PN |
| | | | | | | | | | | | N80Q | 92,600 | 60,200 | – | 9,980 | 9,840 | PN |
| | | | | | | | | | | | P110 | – | – | – | – | – | – |
| 2 3/8 | 2375 | 60,32 | 1995 | 50,67 | 1901 | 48,29 | 0.190 | 4,826 | 4.60 | 4.70 | H40 | 52,200 | 36,000 | 52,200 | 5,890 | 5,600 | PNU |
| | | | | | | | | | | | J55 | 71,700 | 49,400 | 71,700 | 8,100 | 7,700 | PNU |
| | | | | | | | | | | | K55 | – | – | – | – | – | – |
| | | | | | | | | | | | L80 | 104,300 | 71,900 | 104,300 | 11,780 | 11,200 | PNU |
| | | | | | | | | | | | N80Q | 104,300 | 71,900 | 104,300 | 11,780 | 11,200 | PNU |
| | | | | | | | | | | | P110 | 143,400 | 98,900 | 143,400 | 16,130 | 15,400 | PNU |
| 2 7/8 | 2.875 | 73,02 | 2.441 | 62,00 | 2.347 | 59,62 | 0,217 | 5,51 | 6,40 | 6,50 | H40 | 72,500 | 52,800 | 72,500 | 5,580 | 5,280 | PNU |
| | | | | | | | | | | | J55 | 99,700 | 72,600 | 99,700 | 7,680 | 7,260 | PNU |
| | | | | | | | | | | | K55 | – | – | – | – | – | – |
| | | | | | | | | | | | L80 | 145,000 | 105,600 | 145,000 | 11,170 | 10,570 | PNU |
| | | | | | | | | | | | N80Q | 145,000 | 105,600 | 145,000 | 11,170 | 10,570 | PNU |
| | | | | | | | | | | | P110 | 199,300 | 145,200 | 199,300 | 14,550 | 14,530 | PNU |
| 2 7/8 | 2.875 | 73,02 | 2,323 | 59,00 | 2229 | 56,62 | 0,276 | 7,01 | 7,80 | 7,90 | H40 | – | – | – | – | – | – |
| | | | | | | | | | | | J55 | – | – | – | – | – | – |
| | | | | | | | | | | | K55 | – | – | – | – | – | – |
| | | | | | | | | | | | L80 | 180,300 | 140,900 | 180,300 | 13,890 | 13,440[c] | PNU |
| | | | | | | | | | | | N80Q | 180,300 | 140,900 | 180,300 | 13,890 | 13,440[c] | PNU |
| | | | | | | | | | | | P110 | 247,900 | 193,700 | 247,900 | 19,090 | 18,480[c] | PNU |
| 3 1/2 | 3.500 | 88,90 | 3.968 | 77,93 | 2.943 | 74,75 | 0,216 | 5,49 | 7,70 | – | H40 | 89,100 | 65,100 | – | 4,630 | 4,320 | PN |
| | | | | | | | | | | | J55 | 122,500 | 89,500 | – | 5,970 | 5,940 | PN |
| | | | | | | | | | | | K55 | – | – | – | – | – | – |
| | | | | | | | | | | | L80 | 178,200 | 130,200 | – | 7,870 | 8,640 | PN |
| | | | | | | | | | | | N80Q | 178,200 | 130,200 | – | 7,870 | 8,640 | PN |
| | | | | | | | | | | | P110 | – | – | – | – | – | – |

| Size | Outside diameter | | Inside diameter | | Drift diameter | | Wall thickness | | LABEL | | Grade | Pipe Body Yied Strength[a] | Joint Yield Strength[a] | | Collapse Resistance | Internal Yield Pressure (Pipe body) | Type of end-finish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | NU | EU | | | NU | EU Regular / Sp.C. | | | |
| inch | inch | mm | inch | mm | inch | mm | inch | mm | lb/ft | lb/ft | | lb | lb | lb | psi | psi | |
| 3 1/2 | 3.500 | 88,90 | 2.992 | 76,00 | 2.867 | 72,82 | 0.254 | 6,45 | 9.20 | 9.30 | H40 | 103,600 | 79,600 | 103,600 | 5,380 | 5,080 | PNU |
| | | | | | | | | | | | J55 | 142,500 | 109,400 | 142,500 | 7,400 | 6,990 | PNU |
| | | | | | | | | | | | K55 | – | – | – | – | – | – |
| | | | | | | | | | | | L80 | 207,200 | 159,100 | 207,200 | 10,540 | 10,160 | PNU |
| | | | | | | | | | | | N80Q | 207,200 | 159,100 | 207,200 | 10,540 | 10,160 | PNU |
| | | | | | | | | | | | P110 | 284,900 | 218,800 | 284,900 | 13,530 | 13,970 | PNU |
| 3 1/2 | 3.500 | 88,90 | 2.922 | 74,22 | 2.797 | 71,04 | 0.289 | 7,34 | 10.20 | – | H40 | 116,600 | 92,600 | – | 6,060 | 5,780 | PN |
| | | | | | | | | | | | J55 | 160,300 | 127,300 | – | 8,330 | 7,950 | PN |
| | | | | | | | | | | | K55 | – | – | – | – | – | – |
| | | | | | | | | | | | L80 | 233,200 | 185,100 | – | 12,120 | 11,560 | PN |
| | | | | | | | | | | | N80Q | 233,200 | 185,100 | – | 12,120 | 11,560 | PN |
| | | | | | | | | | | | P110 | – | – | – | – | – | – |
| 4 1/2 | 4.500 | 114,30 | 3.958 | 100,54 | 3.833 | 97,36 | 0.271 | 6,88 | 12.60 | 12.75 | H40 | 144,000 | 104,400 | 144,000[d] | 4,490 | 4,220 | PNU |
| | | | | | | | | | | | J55 | 198,000 | 143,500 | 198,000[d] | 5,730 | 5,800 | PNU |
| | | | | | | | | | | | K55 | – | – | – | – | – | – |
| | | | | | | | | | | | L80 | 288,000 | 208,700 | 288,000[d] | 7,500 | 8,430 | PNU |
| | | | | | | | | | | | N80Q | 288,000 | 208,700 | 288,000[d] | 7,500 | 8,430 | PNU |
| | | | | | | | | | | | P110 | – | – | – | – | – | – |
| 4 1/2 | 4.500 | 114,30 | 3.826 | 97,18 | 3.701 | 94,00 | 0.337 | 8,56 | 15.20 | – | H40 | – | – | – | – | – | – |
| | | | | | | | | | | | J55 | – | – | – | – | – | – |
| | | | | | | | | | | | K55 | – | – | – | – | – | – |
| | | | | | | | | | | | L80 | 352,600 | – | – | 11,080 | 10,480 | PN |
| | | | | | | | | | | | N80Q | – | – | – | – | – | – |
| | | | | | | | | | | | P110 | – | – | – | – | – | – |

**NOTE:**

a According to API TR 5C3.

b Sp.C. = Special Clearance

c Internal Yield Pressure for pipe body and connection are the same, except for these items with Special Clearance Coupling, verify API TR 5C3.

d These values are applicable for EU Regular only.

**LEGEND:**

NU = Non-upset tubing connection

EU = External upset tubing connection

P = Plain End

N = Non-upset threaded and coupled

U = External upset threaded and coupled.

# *Dimensões e propriedades de desempenho (Casing)*

Dimension and performance properties (Casing)

| Size | Outside diameter | | Inside diameter | | Drift diameter | | | | Wall thickness | | LABEL | Grade | Pipe Body Yied Strength[a] | Joint Yield Strength[a] | | | Collapse Resistance[a] | Internal Yield Pressure[a] (Pipe body) | Type of end-finish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Regular | | Alternative | | | | | | | STC | LTC | BTC | | | |
| inch | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | lb/ft | | lb | lb | lb | lb | psi | psi | |
| 4 1/2 | 4.500 | 114,30 | 4.090 | 103,88 | 3.965 | 100,70 | – | – | 0.205 | 5,21 | 9.50 | H40 | 111,000 | 77,000 | – | – | 2,760 | 3,180 | PS |
| | | | | | | | | | | | | J55 | 152,000 | 101,000 | – | – | 3,310 | 4,380 | PS |
| | | | | | | | | | | | | K55 | 152,000 | 112,000 | – | – | 3,310 | 4,380 | PS |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 4 1/2 | 4.500 | 114,30 | 4.052 | 102,92 | 3.927 | 99,74 | – | – | 0.224 | 5,69 | 10.50 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | 165,000 | 132,000 | – | 203,000 | 4,010 | 4,790 | PSB |
| | | | | | | | | | | | | K55 | 165,000 | 146,000 | – | 249,000 | 4,010 | 4,790 | PSB |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 4 1/2 | 4.500 | 114,30 | 4.000 | 101,60 | 3.875 | 98,42 | – | – | 0.250 | 6,35 | 11.60 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | 184,000 | 154,000 | 162,000 | 225,000 | 4,960 | 5,350 | PSLB |
| | | | | | | | | | | | | K55 | 184,000 | 170,000 | 180,000 | 277,000 | 4,960 | 5,350 | PSLB |
| | | | | | | | | | | | | L80 | 267,000 | – | 212,000 | 291,000 | 6,350 | 7,780 | PLB |
| | | | | | | | | | | | | N80Q | 267,000 | – | 223,000 | 304,000 | 6,350 | 7,780 | PLB |
| | | | | | | | | | | | | P110 | 367,000 | – | 279,000 | 385,000 | 7,580 | 10,690 | PLB |
| 4 1/2 | 4.500 | 114,30 | 3.920 | 99,56 | 3.795 | 96,38 | – | – | 0.290 | 7,37 | 13.50 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | 307,000 | – | 257,000 | 334,000 | 8,540 | 9,020[b] | PLB |
| | | | | | | | | | | | | N80Q | 307,000 | – | 270,000 | 349,000 | 8,540 | 9,020[b] | PLB |
| | | | | | | | | | | | | P110 | 422,000 | – | 338,000 | 443,000 | 10,690 | 12,410[b] | PLB |
| 4 1/2 | 4.500 | 114,30 | 3.826 | 97,18 | 3.701 | 94,00 | – | – | 0.337 | 8,56 | 15.10 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | | | – |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | 485,000 | – | 406,000 | 509,000 | 14,340 | 14,420[b] | PLB |

| Size | Outside diameter | | Inside diameter | | Drift diameter | | | | Wall thickness | | LABEL | Grade | Pipe Body Yied Strength[a] | Joint Yield Strength[a] | | | Collapse Resistance | Internal Yield Pressure (Pipe body) | Type of end-finish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Regular | | Alternative | | | | | | | STC | LTC | BTC | | | |
| inch | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | lb/ft | | lb | lb | lb | lb | psi | psi | |
| 5 1/2 | 5.500 | 139,70 | 5.012 | 127,30 | 4.887 | 124,12 | – | – | 0.244 | 6,20 | 14.00 | H40 | 161,000 | 130,000 | – | – | 2,620 | 3,110 | PS |
| | | | | | | | | | | | | J55 | 222,000 | 172,000 | – | – | 3,120 | 4,270 | PS |
| | | | | | | | | | | | | K55 | 222,000 | 189,000 | – | – | 3,120 | 4,270 | PS |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 5 1/2 | 5.500 | 139,70 | 4.950 | 125,74 | 4.825 | 122,56 | – | – | 0.275 | 6,98 | 15.50 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | 248,000 | 202,000 | 217,000 | 300,000 | 4,040 | 4,810 | PSLB |
| | | | | | | | | | | | | K55 | 248,000 | 222,000 | 239,000 | 366,000 | 4,040 | 4,810 | PSLB |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 5 1/2 | 5.500 | 139,70 | 4.892 | 124,26 | 4.767 | 121,08 | – | – | 0.304 | 7,72 | 17.00 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | 273,000 | 229,000 | 247,000 | 329,000 | 4,910 | 5,320[b] | PSLB |
| | | | | | | | | | | | | K55 | 273,000 | 252,000 | 272,000 | 402,000 | 4,910 | 5,320[b] | PSLB |
| | | | | | | | | | | | | L80 | 397,000 | – | 338,000 | 428,000 | 6,290 | 7,740[b] | PLB |
| | | | | | | | | | | | | N80Q | 397,000 | – | 348,000 | 446,000 | 6,290 | 7,740[b] | PLB |
| | | | | | | | | | | | | P110 | 546,000 | – | 445,000 | 568,000 | 7,480 | 10,640[b] | PLB |
| 5 1/2 | 5.500 | 139,70 | 4.778 | 121,36 | 4.653 | 118,18 | – | – | 0.361 | 9,17 | 20.00 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | 466,000 | – | 416,000 | 503,000 | 8,830 | 9,190[b] | PLB |
| | | | | | | | | | | | | N80Q | 466,000 | – | 428,000 | 524,000 | 8,830 | 9,190[b] | PLB |
| | | | | | | | | | | | | P110 | 641,000 | – | 548,000 | 667,000 | 11,100 | 12,640[b] | PLB |
| 7 | 7.000 | 177,80 | 6.538 | 166,06 | 6.413 | 162,88 | – | – | 0.231 | 5,87 | 17.00 | H40 | 196,000 | 122,000 | – | – | 1,420 | 2,310 | PS |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |

| Size | Outside diameter | | Inside diameter | | Drift diameter | | | | Wall thickness | | LABEL | Grade | Pipe Body Yied Strength[a] | Joint Yield Strength[a] | | | Collapse Resistance | Internal Yield Pressure (Pipe body) | Type of end-finish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Regular | | Alternative | | | | | | | STC | LTC | BTC | | | |
| inch | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | lb/ft | | lb | lb | lb | lb | psi | psi | |
| 7 | 7.000 | 177,80 | 6.456 | 163,98 | 6.331 | 160,80 | – | – | 0.272 | 6,91 | 20.00 | H40 | 230,000 | 176,000 | – | – | 1,970 | 2,720 | PS |
| | | | | | | | | | | | | J55 | 316,000 | 234,000 | – | – | 2,270 | 3,740 | PS |
| | | | | | | | | | | | | K55 | 316,000 | 254,000 | – | – | 2,270 | 3,740 | PS |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 7 | 7.000 | 177,80 | 6.366 | 161,70 | 6.241 | 158,52 | 6.250 | 158,75 | 0.317 | 8,05 | 23.00 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | 366,000 | 284,000 | 313,000 | 432,000 | 3,270 | 4,360 | PSLB |
| | | | | | | | | | | | | K55 | 366,000 | 309,000 | 341,000 | 522,000 | 3,270 | 4,360 | PSLB |
| | | | | | | | | | | | | L80 | 532,000 | – | 435,000 | 565,000 | 3,830 | 6,340b | PLB |
| | | | | | | | | | | | | N80Q | 532,000 | – | 442,000 | 588,000 | 3,830 | 6,340b | PLB |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 7 | 7.000 | 177,80 | 6.276 | 159,42 | 6.151 | 156,24 | – | – | 0.362 | 9,19 | 26.00 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | 415,000 | 334,000 | 367,000 | 490,000 | 4,330 | 4,980[b] | PSLB |
| | | | | | | | | | | | | K55 | 415,000 | 364,000 | 401,000 | 592,000 | 4,330 | 4,980[b] | PSLB |
| | | | | | | | | | | | | L80 | 604,000 | – | 511,000 | 641,000 | 5,410 | 7,240[b] | PLB |
| | | | | | | | | | | | | N80Q | 604,000 | – | 519,000 | 667,000 | 5,410 | 7,240[b] | PLB |
| | | | | | | | | | | | | P110 | 830,000 | – | 693,000 | 853,000 | 6,230 | 9,960[b] | PLB |
| 7 | 7.000 | 177,80 | 6.184 | 157,08 | 6.059 | 153,90 | – | – | 0.408 | 10,36 | 29.00 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | 676,000 | – | 587,000 | 718,000 | 7,030 | 8,160[b] | PLB |
| | | | | | | | | | | | | N80Q | 676,000 | – | 597,000 | 746,000 | 7,030 | 8,160[b] | PLB |
| | | | | | | | | | | | | P110 | 929,000 | – | 797,000 | 955,000 | 8,530 | 11,220[b] | PLB |
| 7 5/8 | 7.625 | 193,68 | 7.025 | 178,44 | 6.900 | 175,26 | – | – | 0.300 | 7,62 | 24.00 | H40 | 276,000 | 212,000 | – | – | 2,030 | 2,750 | PS |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |

| Size | Outside diameter | | Inside diameter | | Drift diameter | | | | Wall thickness | | LABEL | Grade | Pipe Body Yied Strength[a] | Joint Yield Strength[a] | | | Collapse Resistance | Internal Yield Pressure (Pipe body) | Type of end-finish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Regular | | Alternative | | | | | | | STC | LTC | BTC | | | |
| inch | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | lb/ft | | lb | lb | lb | lb | psi | psi | |
| 7 5/8 | 7.625 | 193,68 | 6.969 | 177,02 | 6.844 | 173,84 | – | – | 0.328 | 8,33 | 26.40 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | 414,000 | 315,000 | 346,000 | 483,000 | 2,900 | 4,140 | PSLB |
| | | | | | | | | | | | | K55 | 414,000 | 342,000 | 377,000 | 581,000 | 2,900 | 4,140 | PSLB |
| | | | | | | | | | | | | L80 | 602,000 | – | 482,000 | 635,000 | 3,400 | 6,020 | PLB |
| | | | | | | | | | | | | N80Q | 602,000 | – | 490,000 | 659,000 | 3,400 | 6,020 | PLB |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 7 5/8 | 7.625 | 193,68 | 6.875 | 174,64 | 6.750 | 171,46 | – | – | 0.375 | 9,52 | 29.70 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | 683,000 | – | 566,000 | 721,000 | 4,790 | 6,890[b] | PLB |
| | | | | | | | | | | | | N80Q | 683,000 | – | 575,000 | 749,000 | 4,790 | 6,890[b] | PLB |
| | | | | | | | | | | | | P110 | 940,000 | – | 769,000 | 960,000 | 5,350 | 9,470[b] | PLB |
| 7 5/8 | 7.625 | 193,68 | 6.765 | 171,84 | 6.640 | 168,66 | – | – | 0.430 | 10,92 | 33.70 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | 778,000 | – | 664,000 | 820,000 | 6,560 | 7,900[b] | PLB |
| | | | | | | | | | | | | N80Q | 778,000 | – | 674,000 | 852,000 | 6,560 | 7,900[b] | PLB |
| | | | | | | | | | | | | P110 | 1.069,000 | – | 901,000 | 1.093,000 | 7,870 | 10,860[b] | PLB |
| 7 5/8 | 7.625 | 193,68 | 6.625 | 168,28 | 6.500 | 165,10 | – | – | 0.500 | 12,70 | 39.00 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | 895,000 | – | 786,000 | 945,000 | 8,820 | 9,180[b] | PLB |
| | | | | | | | | | | | | N80Q | 895,000 | – | 798,000 | 981,000 | 8,820 | 9,180[b] | PLB |
| | | | | | | | | | | | | P110 | 1.231,000 | – | 1.066,000 | 1.258,000 | 11,080 | 12,620[b] | PLB |
| 8 5/8 | 8.625 | 219,08 | 8.097 | 205,66 | 7.972 | 202,48 | – | – | 0.264 | 6,71 | 24.00 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | 381,000 | 244,000 | – | – | 1,370 | 2,950 | PS |
| | | | | | | | | | | | | K55 | 381,000 | 263,000 | – | – | 1,370 | 2,950 | PS |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |

| Size | Outside diameter | | Inside diameter | | Drift diameter | | | | Wall thickness | | LABEL | Grade | Pipe Body Yied Strength[a] | Joint Yield Strength[a] | | | Collapse Resistance | Internal Yield Pressure (Pipe body) | Type of end-finish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Regular | | Alternative | | | | | | | STC | LTC | BTC | | | |
| inch | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | lb/ft | | lb | lb | lb | lb | psi | psi | |
| 8 5/8 | 8.625 | 219,08 | 8.017 | 203,64 | 7.892 | 200,46 | – | – | 0.304 | 7,72 | 28.00 | H40 | 318,000 | 233,000 | – | – | 1,610 | 2,470 | PS |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 8 5/8 | 8.625 | 219,08 | 7.921 | 201,20 | 7.796 | 198,02 | 7.875 | 200,02 | 0.352 | 8,94 | 32.00 | H40 | 366,000 | 279,000 | – | – | 2,200 | 2,860 | PS |
| | | | | | | | | | | | | J55 | 503,000 | 372,000 | 417,000 | 579,000 | 2,530 | 3,930 | PSLB |
| | | | | | | | | | | | | K55 | 503,000 | 402,000 | 452,000 | 690,000 | 2,530 | 3,930 | PSLB |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 8 5/8 | 8.625 | 219,08 | 7.825 | 198,76 | 7.700 | 195,58 | – | – | 0.400 | 10,16 | 36.00 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | 568,000 | 434,000 | 486,000 | 654,000 | 3,450 | 4,460[b] | PSLB |
| | | | | | | | | | | | | K55 | 568,000 | 468,000 | 526,000 | 780,000 | 3,450 | 4,460[b] | PSLB |
| | | | | | | | | | | | | L80 | 827,000 | – | 678,000 | 864,000 | 4,100 | 6,490[b] | PLB |
| | | | | | | | | | | | | N80Q | 827,000 | – | 688,000 | 895,000 | 4,100 | 6,490[b] | PLB |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 8 5/8 | 8.625 | 219,08 | 7.725 | 196,22 | 7.600 | 193,04 | 7.625 | 193,68 | 0.450 | 11,43 | 40.00 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | 925,000 | – | 776,000 | 966,000 | 5,520 | 7,300[b] | PLB |
| | | | | | | | | | | | | N80Q | 925,000 | – | 788,000 | 1.001,000 | 5,520 | 7,300[b] | PLB |
| | | | | | | | | | | | | P110 | 1.271,000 | – | 1.055,000 | 1.288,000 | 6,390 | 10,040[b] | PLB |
| 8 5/8 | 8.625 | 219,08 | 7.625 | 193,68 | 7.500 | 190,50 | – | – | 0.500 | 12,70 | 44.00 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | 1.021,000 | – | 874,000 | 1.066,000 | 6,950 | 8,120[b] | PLB |
| | | | | | | | | | | | | N80Q | 1.021,000 | – | 887,000 | 1.105,000 | 6,950 | 8,120[b] | PLB |
| | | | | | | | | | | | | P110 | 1.404,000 | – | 1.186,000 | 1.423,000 | 8,420 | 11,160[b] | PLB |

| Size | Outside diameter | | Inside diameter | | Drift diameter | | | | Wall thickness | | LABEL | Grade | Pipe Body Yied Strength[a] | Joint Yield Strength[a] | | | Collapse Resistance | Internal Yield Pressure (Pipe body) | Type of end-finish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Regular | | Alternative | | | | | | | STC | LTC | BTC | | | |
| inch | inch | mm | inch | mm | inch | mm | inch | mm | inch | mm | lb/ft | | lb | lb | lb | lb | psi | psi | |
| 9 5/8 | 9.625 | 244,48 | 9.001 | 228,64 | 8.845 | 224,67 | – | – | 0.312 | 7,92 | 32.30 | H40 | 365,000 | 254,000 | – | – | 1,370 | 2,270 | PS |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 9 5/8 | 9.625 | 244,48 | 8.921 | 226,60 | 8.765 | 222,63 | – | – | 0.352 | 8,94 | 36.00 | H40 | 410,000 | 294,000 | – | – | 1,720 | 2,560 | PS |
| | | | | | | | | | | | | J55 | 564,000 | 394,000 | 453,000 | 639,000 | 2,020 | 3,520 | PSLB |
| | | | | | | | | | | | | K55 | 564,000 | 423,000 | 489,000 | 755,000 | 2,020 | 3,520 | PSLB |
| | | | | | | | | | | | | L80 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | N80Q | – | – | – | – | – | – | – |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 9 5/8 | 9.625 | 244,48 | 8.835 | 224,42 | 8.679 | 220,45 | 8.750 | 222,25 | 0.395 | 10,03 | 40.00 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | 630,000 | 452,000 | 520,000 | 714,000 | 2,570 | 3,950[b] | PSLB |
| | | | | | | | | | | | | K55 | 630,000 | 486,000 | 561,000 | 843,000 | 2,570 | 3,950[b] | PSLB |
| | | | | | | | | | | | | L80 | 916,000 | – | 727,000 | 947,000 | 3,090 | 5,750[b] | PLB |
| | | | | | | | | | | | | N80Q | 916,000 | – | 737,000 | 979,000 | 3,090 | 5,750[b] | PLB |
| | | | | | | | | | | | | P110 | – | – | – | – | – | – | – |
| 9 5/8 | 9.625 | 244,48 | 8.755 | 222,38 | 8.599 | 218,41 | – | – | 0.435 | 11,05 | 43.50 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | 1.005,000 | – | 813,000 | 1.038,000 | 3,810 | 6,330[b] | PLB |
| | | | | | | | | | | | | N80Q | 1.005,000 | – | 825,000 | 1.074,000 | 3,810 | 6,330[b] | PLB |
| | | | | | | | | | | | | P110 | 1.381,000 | – | 1.105,000 | 1.388,000 | 4,420 | 8,700[b] | PLB |
| 9 5/8 | 9.625 | 244,48 | 8.681 | 220,50 | 8.525 | 216,53 | – | – | 0.472 | 11,99 | 47.00 | H40 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | J55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | K55 | – | – | – | – | – | – | – |
| | | | | | | | | | | | | L80 | 1.086,000 | – | 893,000 | 1.122,000 | 4,750 | 6,870[b] | PLB |
| | | | | | | | | | | | | N80Q | 1.086,000 | – | 905,000 | 1.161,000 | 4,750 | 6,870[b] | PLB |
| | | | | | | | | | | | | | 1.493,000 | – | 1.213,000 | 1.500,000 | 5,300 | 9,440[b] | PLB |

**NOTE:**

a According to API TR 5C3.

b Internal Yield Pressure for pipe body and connection are the same, except for these items with Special Clearance Coupling, verify API TR 5C3.

**LEGEND:**

STC = Short round-thread casing
LTC = Long round-thread casing
BTC = Buttress round-thread casing
P = Plain End

S = Short round-thread
L = Long round-thread
B = Buttress-thread

# *Revestimentos anticorrosivos – Poços produtores & injetores*

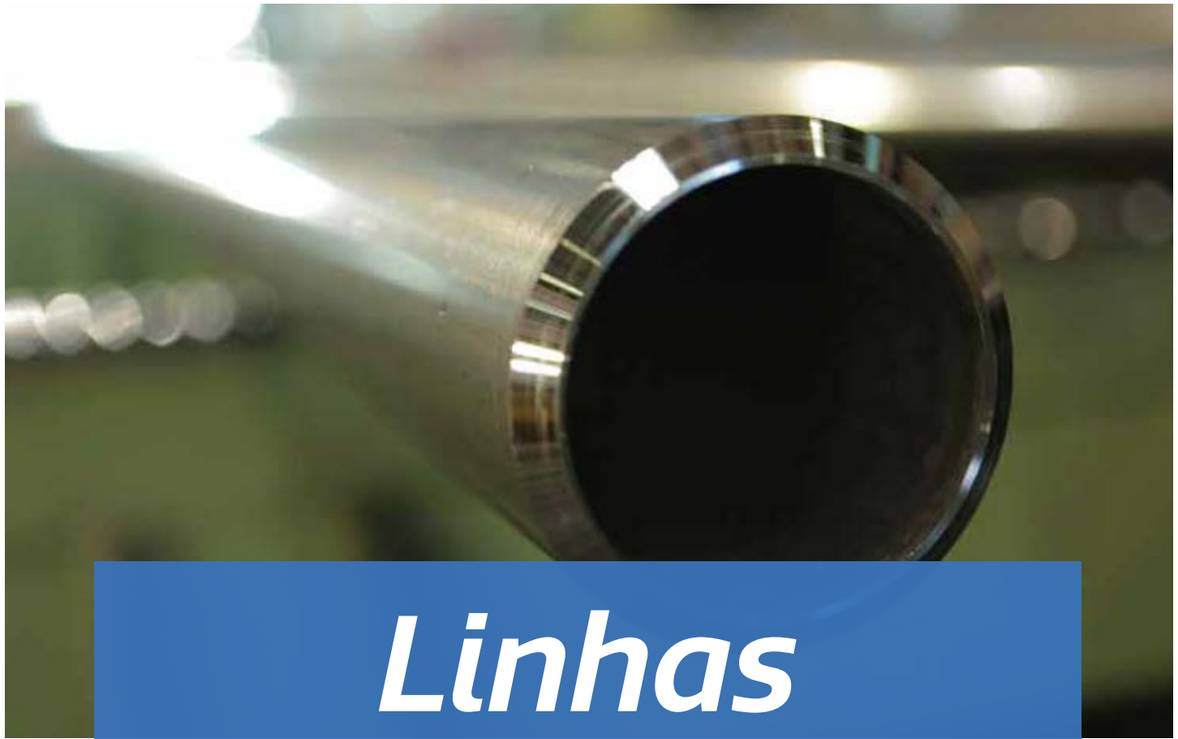
| Fluído | Tipo de Poço | Método de Produção | Pressão / Temperatura* | acima de 2.500 psi<br>Revestimento Interno |
|---|---|---|---|---|
| Petróleo | Produtor | BM | até 60°C | Polietileno<br>(PE) |
| | | | até 75°C | Polietileno Poliamida<br>(PE+PA) |
| | Produtor | BCP | até 60°C | Polietileno<br>(PE) |
| | | | até 75°C | Polietileno Poliamida<br>(PE+PA) |
| | Produtor | BCS | até 120°C | Fibra de Vidro Reforçada (GRE)<br>ou<br>Coating (EPÓXI) |
| | | | até 150°C | Coating<br>(EPÓXI) |
| Petróleo / Gás (condensado) | Produtor | GÁS LIFT | até 120°C | Fibra de Vidro Reforçada<br>(GRE) |
| Gás | Produtor | SURGENTE | até 120°C | Fibra de Vidro Reforçada<br>(GRE) |
| Gás | Injetor | – | até 120°C | Fibra de Vidro Reforçada (GRE)<br>ou<br>Coating (EPÓXI) |
| Água Produzida | Injetor | – | até 120°C | Fibra de Vidro Reforçada (GRE)<br>ou<br>Coating (EPÓXI) |
| CO2 (alternando com água) | Injetor | – | até 120°C | Fibra de Vidro Reforçada<br>(GRE) |
| Vapor | Injetor | – | > 250°C | Soluções especiais de Isolamento Térmico, sob consulta. |

**LEGENDA:**

BM – Bombeio Mecânico / BCP – Bombeio Cavidade Progressiva / BCS – Bombeio Centrífugo Submerso

REVESTIMENTO EXTERNO: Epóxi Reforçado com Polimero (WRAP), pode ser fornecido para poços Produtores e Injetores, para proteção de regiões abaixo do Packer onde há contato externo com fluído produzido/injetado, é resistente à Chave Hidraúlica. Consulta prévia sobre as condições técnicas.

**NOTA:** *A temperatura máxima estabelecida pode variar de acordo com as mudanças das condições de serviço (pressão, acidificação) ou qualquer outra intervenção.



# Linhas de Condução

Tubos de condução (Line Pipe) para aplicações em gasodutos e oleodutos, fornecidos nos níveis de especificação PSL1 e PSL2, com ou sem revestimento.



## *Composição Química* *(Porcentagem de fração em massa)*

Chemical composition (mass fraction)

| PSL 2 | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| % max | | | | | | | | | | | | | | | | | |
| Grade | C | Mn | P | S | Cu | Ni | Cr | Mo | Si | B | V | Nb | Ti | Nb+–V+Ti | Nb+V | Ce (Pcm)a | Ce (IIW)b |
| L245M ou BM | 0.22[d] | 1.20[d] | 0.025 | 0.015 | 0.50 | 0.30 | 0.30 | 0.15 | 0.45 | c | 0.05 | 0.05 | 0.04 | – | – | 0.25 | 0.43 |
| L290M ou X42M | 0.22[d] | 1.30[d] | 0.025 | 0.015 | 0.50 | 0.30 | 0.30 | 0.15 | 0.45 | c | 0.05 | 0.05 | 0.04 | – | – | 0.25 | 0.43 |
| L320M ou X46M | 0.22[d] | 1.30[d] | 0.025 | 0.015 | 0.50 | 0.30 | 0.30 | 0.15 | 0.45 | c | 0.05 | 0.05 | 0.04 | – | – | 0.25 | 0.43 |
| L360M ou X52M | 0.22[d] | 1.40[d] | 0.025 | 0.015 | 0.50 | 0.30 | 0.30 | 0.15 | 0.45 | c | – | – | – | 0.15 | – | 0.25 | 0.43 |
| L390M ou X56M | 0.22[d] | 1.40[d] | 0.025 | 0.015 | 0.50 | 0.30 | 0.30 | 0.15 | 0.45 | c | – | – | – | 0.15 | – | 0.25 | 0.43 |
| L415M ou X60M | 0.12d[f] | 1.60d[f] | 0.025 | 0.015 | 0.50 | 0.50 | 0.50 | 0.50 | 0.45f | c | – | – | – | 0.15 | – | 0.25 | 0.43 |
| L450M ou X65M | 0.12d[f] | 1.60d[f] | 0.025 | 0.015 | 0.50 | 0.50 | 0.50 | 0.50 | 0.45f | c | – | – | – | 0.15 | – | 0.25 | 0.43 |
| L485M ou X70M | 0.12d[f] | 1.70d[f] | 0.025 | 0.015 | 0.50 | 0.50 | 0.50 | 0.50 | 0.45f | c | – | – | – | 0.15 | – | 0.25 | 0.43 |
| L555M ou X80M | 0.12d[f] | 1.85d[f] | 0.025 | 0.015 | 0.50 | 1.00 | 0.50 | 0.50 | 0.45f | c | – | – | – | 0.15 | – | 0.25 | 0.43 |

| PSL 1[c] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| % max | | | | | | | | | | |
| Grade | C | Mn | P | S | Cu | Ni | Cr | Mo | Nb+–V+Ti | Nb+V |
| L245 ou B | 0.26[d] | 1.20[d] | 0.030 | 0.030 | 0.50 | 0.50 | 0.50 | 0.15 | 0.15 | 0.06 |
| L290 ou X42 | 0.26[d] | 1.30[d] | 0.030 | 0.030 | 0.50 | 0.50 | 0.50 | 0.15 | 0.15 | – |
| L320 ou X46 | 0.26[d] | 1.40[d] | 0.030 | 0.030 | 0.50 | 0.50 | 0.50 | 0.15 | 0.15 | – |
| L360 ou X52 | 0.26[d] | 1.40[d] | 0.030 | 0.030 | 0.50 | 0.50 | 0.50 | 0.15 | 0.15 | – |
| L390 ou X56 | 0.26[d] | 1.40[d] | 0.030 | 0.030 | 0.50 | 0.50 | 0.50 | 0.15 | 0.15 | – |
| L415 ou X60 | 0.26[d,f] | 1.40[d,f] | 0.030 | 0.030 | 0.50 | 0.50 | 0.50 | 0.15 | 0.15 | – |
| L450 ou X65 | 0.26[d,f] | 1.45[d,f] | 0.030 | 0.030 | 0.50 | 0.50 | 0.50 | 0.15 | 0.15 | – |
| L485 ou X70 | 0.26[d,f] | 1.65[d,f] | 0.030 | 0.030 | 0.50 | 0.50 | 0.50 | 0.15 | 0.15 | – |
| L555M ou X80M | 0.12[d,f] | 1.85[d,f] | 0.025 | 0.015 | 0.50 | 1.00 | 0.50 | 0.50 | 0.15 | – |

**NOTE:** Applicable to PSL1 and PSL2

a For PSL 2 pipe with a product analysis carbon mass fraction equal to or less than 0.12 %, the carbon equivalent, CE(Pcm), shall be determined using the following equation:

$$CE(Pcm) = C + \frac{Si}{30} + \frac{Mn}{20} + \frac{Cu}{20} + \frac{Ni}{60} + \frac{Cr}{20} + \frac{Mo}{15} + \frac{V}{10} + 5B$$

b For PSL 2 pipe with a product analysis carbon mass fraction greater than 0.12 %, the carbon equivalent, CE(IIW), shall be determined using the following equation:

$$CE(IIW) = C + \frac{Mn}{6} + \frac{(Cr+Mo+V)}{5} + \frac{(Ni+Cu)}{15}$$

c No deliberate addition of B is permitted and residual B ≤ 0,001%..

d For each reduction of 0.01 % below the specified maximum for carbon, an increase of 0.05 % above the specified maximum for manganese is permissible, up to a maximum of:
– API5L PSL1: 1.65 % for grades ≥ L245 or B, but ≤ L360 or X52; up to a maximum of 1.75 % for grades > L360 or X52, but < L485 or X70; and up to a maximum of 2.00 % for grade L485 or X70.
– API5L PSL2: 1.65 % for grades ≥ L245 or B, but ≤ L360 or X52; up to a maximum of 1.75 % for grades > L360 or X52, but < L485 or X70; up to a maximum of 2.00 % for grades ≥ L485 or X70, but ≤ L555 or X80; and up to a maximum of 2.20 % for grades > L555 or X80.

e As agreed between the purchaser and the manufacturer.

f Unless otherwise agreed.

g Others delivery conditions (suffix R, N or Q) by agreement between purchaser and manufacturer.

# *Composição Química (Porcentagem de fração em massa)*

Chemical composition (mass fraction)

| Sour Service | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| % max | | | | | | | | | | | | | | | | | | | | |
| Grade | C | Mn | P | S | Cu | Ni | Cr | Mo | Si | B | V | Nb | Ti | Al | N | Ca | Nb+V+Ti | Nb+V | Ce (Pcm)[a] | Ce (IIW)[b] |
| L245MS ou BMS | 0.10[d] | 1.25[d] | 0.020 | 0.003[g,h] | 0.35[j] | 0.30 | 0.30 | 0.15[k] | 0.40 | 0.0005 | 0.04 | 0.04 | 0.04 | 0.06[i] | 0.012[j] | 0.006[h] | – | – | 0.19 | – |
| L290MS ou X42MS | 0.10[d] | 1.25[d] | 0.020 | 0.003[g,h] | 0.35[j] | 0.30 | 0.30 | 0.15[k] | 0.40 | 0.0005 | 0.04 | 0.04 | 0.04 | 0.06[i] | 0.012[j] | 0.006[h] | – | – | 0.19 | – |
| L320MS ou X46MS | 0.10[d] | 1.35[d] | 0.020 | 0.003[g,h] | 0.35[j] | 0.30 | 0.30 | 0.15[k] | 0.45 | 0.0005 | 0.05 | 0.05 | 0.04 | 0.06[i] | 0.012[j] | 0.006[h] | – | – | 0.20 | – |
| L360MS ou X52MS | 0.10[d] | 1.45[d] | 0.020 | 0.003[g,h] | 0.35[j] | 0.30 | 0.30 | 0.15[k] | 0.45 | 0.0005 | 0.05 | 0.06 | 0.04 | 0.06[i] | 0.012[j] | 0.006[h] | – | – | 0.20 | – |
| L390MS ou X56MS | 0.10[d] | 1.45[d] | 0.020 | 0.003[g,h] | 0.35[j] | 0.30 | 0.30 | 0.15[k] | 0.45 | 0.0005 | 0.06 | 0.08 | 0.04 | 0.06[i] | 0.012[j] | 0.006[h] | 0.15 | – | 0.21 | – |
| L415MS ou X60MS | 0.10[d] | 1.45[d] | 0.020 | 0.003[g,h] | 0.35[j] | 0.30 | 0.30 | 0.15[k] | 0.45 | 0.0005 | 0.08 | 0.08 | 0.06 | 0.06[i] | 0.012[j] | 0.006[h] | 0.15 | – | 0.21 | – |
| L450MS ou X65MS | 0.10[d] | 1.60[d] | 0.020 | 0.003[g,h] | 0.35[j] | 0.30 | 0.30l | 0.15[k] | 0.45 | 0.0005 | 0.10 | 0.08 | 0.06 | 0.06[i] | 0.012[j] | 0.006[h] | 0.15 | – | 0.22 | – |
| L485MS ou X70MS | 0.10[d] | 1.60[d] | 0.020 | 0.003[g,h] | 0.35[j] | 0.30 | 0.30l | 0.15[k] | 0.45 | 0.0005 | 0.10 | 0.08 | 0.06 | 0.06[i] | 0.012[j] | 0.006[h] | 0.15 | – | 0.22 | – |

| Offshore | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| % max | | | | | | | | | | | | | | | | | | | | |
| Grade | C | Mn | P | S | Cu | Ni | Cr | Mo | Si | B | V | Nb | Ti | Al | N | Ca | Nb+V+Ti | Nb+V | Ce (Pcm)[a] | Ce (IIW)[b] |
| L245MO ou BMO | 0.12[d] | 1.25[d] | 0.020 | 0.010 | 0.35 | 0.30 | 0.30 | 0.10 | 0.40 | 0.0005 | 0.04 | 0.04 | 0.04 | 0.06[i] | 0.012[i] | – | – | – | 0.19 | – |
| L290MO ou X42MO | 0.12[d] | 1.35[d] | 0.020 | 0.010 | 0.35 | 0.30 | 0.30 | 0.10 | 0.40 | 0.0005 | 0.04 | 0.04 | 0.04 | 0.06[i] | 0.012[i] | – | – | – | 0.19 | – |
| L320MO ou X46MO | 0.12[d] | 1.35[d] | 0.020 | 0.010 | 0.35 | 0.30 | 0.30 | 0.10 | 0.45 | 0.0005 | 0.05 | 0.05 | 0.04 | 0.06[i] | 0.012[i] | – | – | – | 0.20 | – |
| L360MO ou X52MO | 0.12[d] | 1.65[d] | 0.020 | 0.010 | 0.50 | 0.50 | 0.50 | 0.50 | 0.45 | 0.0005 | 0.05 | 0.05 | 0.04 | 0.06[i] | 0.012[i] | – | 0.15 | – | 0.20 | – |
| L390MO ou X56MO | 0.12[d] | 1.65[d] | 0.020 | 0.010 | 0.50 | 0.50 | 0.50 | 0.50 | 0.45 | 0.0005 | 0.06 | 0.08 | 0.04 | 0.06[i] | 0.012[i] | – | 0.15 | – | 0.21 | – |
| L415MO ou X60MO | 0.12[d] | 1.65[d] | 0.020 | 0.010 | 0.50 | 0.50 | 0.50 | 0.50 | 0.45 | 0.0005 | 0.08 | 0.08 | 0.06 | 0.06[i] | 0.012[i] | – | 0.15 | – | 0.21 | – |
| L450MO ou X65MO | 0.12[d] | 1.65[d] | 0.020 | 0.010 | 0.50 | 0.50 | 0.50 | 0.50 | 0.45 | 0.0005 | 0.10 | 0.08 | 0.06 | 0.06[i] | 0.012[i] | – | 0.15 | – | 0.22 | – |
| L485MO ou X70MO | 0.12[d] | 1.75[d] | 0.020 | 0.010 | 0.50 | 0.50 | 0.50 | 0.50 | 0.45 | 0.0005 | 0.10 | 0.08 | 0.06 | 0.06[i] | 0.012[i] | – | 0.15 | – | 0.22 | – |
| L555MO ou X80MO | 0.12[d] | 1.85[d] | 0.020 | 0.010 | 0.50 | 0.50 | 0.50 | 0.50 | 0.45 | 0.0005 | 0.10 | 0.08 | 0.06 | 0.06[i] | 0.012[i] | – | 0.15 | – | 0.24 | – |

a For pipe with a product analysis carbon mass fraction equal to or less than 0.12 %, the carbon equivalent, CEPcm, shall be determined using the following equation:

$$CE(IIW) = C + \frac{Si}{30} + \frac{Mn}{20} + \frac{Cu}{20} + \frac{Ni}{60} + \frac{Cr}{20} + \frac{Mo}{15} + \frac{V}{10} + 5B$$

b For pipe with a product analysis carbon mass fraction greater than 0.12 %, the carbon equivalent, CEIIW, shall be determined using the following equation:zx

$$CE(Pcm) = C + \frac{Mn}{6} + \frac{(Cr+Mo+V)}{5} + \frac{(Ni+Cu)}{15}$$

c S = Sour Service; O = Offshore; Others delivery conditions (suffix N or Q) by agreement between purchaser and manufacturer.

d For each reduction of 0.01% below the specified maximum concentration for carbon, an increase of 0.05% above the specified maximum concentration for manganese is permissible, up to a maximum increase of 0.20%.

e As agreed between the purchaser and the manufacturer.

f Not specified.

g If agreed, this limit can be increased to 0.006%, but Ca/S rates shall be reduced.

h If added intentionally, S > 0.0015%, Ca/S ≥ 1.5%.

i The concentration of Al must be higher than or equal to twice the N concentration, except for steels that are titanium-killed or titanium-treated.

j If agreed, this limit can be reduced to 0.10%.

k If agreed, this limit can be increased to 0.35%.

l If agreed, this limit can be increased to 0.45%.

m If agreed, this limit can be increased to 0.50%.

## *Requisitos para propriedades mecânicas (Ensaio de tração)*

Tensile Requirements

| Grade | PSL 1/ PSL 2 and Sour Service | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Yield strength[a] | | | | Tensile strength | | | |
| | min. | | max. [b] | | min. | | max. [b] | |
| | MPa | psi | MPa | psi | MPa | psi | MPa | psi |
| L245 ou B | 245 | 35,500 | 450[c] | 65,300[c] | 415 | 60,200 | 655 | 95,000 |
| L290 ou X42 | 290 | 42,100 | 495 | 71,800 | 415 | 60,200 | 655 | 95,000 |
| L320 ou X46 | 320 | 46,400 | 525 | 76,100 | 435 | 63,100 | 655 | 95,000 |
| L360 ou X52 | 360 | 52,200 | 530 | 76,900 | 460 | 66,700 | 760 | 110,200 |
| L390 ou X56 | 390 | 56,600 | 545 | 79,000 | 490 | 71,100 | 760 | 110,200 |
| L415 ou X60 | 415 | 60,200 | 565 | 81,900 | 520 | 75,400 | 760 | 110,200 |
| L450 ou X65 | 450 | 65,300 | 600 | 87,000 | 535 | 77,600 | 760 | 110,200 |
| L485 ou X70 | 485 | 70,300 | 635 | 92,100 | 570 | 82,700 | 760 | 110,200 |
| L555 ou X80[d] | 555 | 80,500 | 705 | 102,300 | 625 | 90,600 | 825 | 119,700 |

| Grade | Offshore | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Yield strength [a] | | | | Tensile strength | | | |
| | min. | | max. | | min. | | max. | |
| | MPa | psi | MPa | psi | MPa | psi | MPa | psi |
| L245 ou B | 245 | 35,500 | 450 | 65,300 | 415 | 60,200 | 655 | 95,000 |
| L290 ou X42 | 290 | 42,100 | 495 | 71,800 | 415 | 60,200 | 655 | 95,000 |
| L320 ou X46 | 320 | 46,400 | 520 | 75,000 | 435 | 63,100 | 655 | 95,000 |
| L360 ou X52 | 360 | 52,200 | 525 | 76,000 | 460 | 66,700 | 760 | 110,200 |
| L390 ou X56 | 390 | 56,600 | 540 | 78,300 | 490 | 71,100 | 760 | 110,200 |
| L415 ou X60 | 415 | 60,200 | 565 | 81,900 | 520 | 75,400 | 760 | 110,200 |
| L450 ou X65 | 450 | 65,300 | 570 | 82,700 | 535 | 77,600 | 760 | 110,200 |
| L485 ou X70 | 485 | 70,300 | 605 | 87,700 | 570 | 82,700 | 760 | 110,200 |
| L555 ou X80 | 555 | 80,500 | 675 | 97,900 | 625 | 90,600 | 825 | 119,700 |

**NOTE:**

a Applicable for pipe body only.

b Applicable for PSL2 and SOUR SERVICE only. Applicable for PSL2 and SOUR SERVICE only.

c For pipe with D < 219,1 mm (8.625 in), the maximum yield strength shall be equal or smaller than 495 MPa (71,800 psi).

b Applicable for PSL2 only.



## *Requisitos para ensaio charpy – PSL2*

Charpy test requirements – PSL2

| Grade | Minimum CVN absorbed energy requirements[a b] | |
|---|---|---|
| | J | ft.lbf |
| ≤ L415/X60 | 27 | 20 |
| > L415/X60 ≤ L450/X65 | 27 | 20 |
| > L450/X65 ≤ L485/X70 | 27 | 20 |
| > L485/X70 ≤ L555/X80 | 40 | 30 |

**NOTE:**

a Individual test values for any test piece shall be equal or greater than 75% of the required minimum average (of a set of three test pieces) absorbed energy values.

b Full size specimen, at 0°C

## *Tolerância para Line Pipe– Line Pipe[a]*

Tolerances for Randon Length Pipe– Line Pipe[a]

| Random Length Designation | | Minimum[a] | | Minimum average length for each order item | | Maximum[a] | |
|---|---|---|---|---|---|---|---|
| m | ft | m | ft | m | ft | m | ft |
| 12,00 | 40 | 4,27 | 14 | 10,27 | 35 | 13,72 | 45 |

**NOTE:**

a Maximum standard manufactured length pipe is 12,5 m (41 ft).

b The pipes are provide with Plain-End or Threaded and Coupled Pipe.

# *Dimensões e pressões para teste hidrostático*

Dimensions and Hydrostatic test pressure

| Diameter | | Wall thickness | | Nominal masses | | For reference only | | L245 or B | | L290 or X42 | | L320 or X46 | | L360 or X52 | | L390 or X56 | | L415 or X60 | | L450 or X65 | | L485 or X70 | | L555 or X80 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| inch | mm | inch | mm | lb/ft | kg/m | Dia-meter inch. | Schedule | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi |
| 2 3/8 | 60,3 | 0.110 | 2,80 | 2.66 | 3,97 | 2 | SCH 10 | 2,000 | 2,500 | 2,400 | 3,000 | 2,600 | 3,300 | 3,000 | 3,700 | 3,000 | 4,000 | 3,000 | 4,200 | 3,000 | 4,600 | 3,000 | 4,900 | 3,000 | 5,600 |
| | | 0.125 | 3,20 | 3.01 | 4,51 | | SCH 30 | 2,300 | 2,500 | 2,700 | 3,400 | 3,000 | 3,700 | 3,000 | 4,200 | 3,000 | 4,500 | 3,000 | 4,800 | 3,000 | 5,200 | 3,000 | 5,600 | 3,000 | 6,400 |
| | | 0.141 | 3,60 | 3.37 | 5,03 | | – | 2,500 | 2,500 | 3,000 | 3,800 | 3,000 | 4,200 | 3,000 | 4,700 | 3,000 | 5,100 | 3,000 | 5,400 | 3,000 | 5,900 | 3,000 | 6,300 | 3,000 | 7,200 |
| | | 0.154 | 3,90 | 3.66 | 5,42 | | SCH 40 | 2,500 | 2,500 | 3,000 | 4,100 | 3,000 | 4,600 | 3,000 | 5,100 | 3,000 | 5,600 | 3,000 | 5,900 | 3,000 | 6,400 | 3,000 | 6,900 | 3,000 | 7,300 |
| | | 0.172 | 4,40 | 4.05 | 6,07 | | – | 2,500 | 2,500 | 3,000 | 4,600 | 3,000 | 5,100 | 3,000 | 5,700 | 3,000 | 6,200 | 3,000 | 6,600 | 3,000 | 7,100 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.188 | 4,80 | 4.40 | 6,57 | | – | 2,500 | 2,500 | 3,000 | 5,000 | 3,000 | 5,600 | 3,000 | 6,200 | 3,000 | 6,800 | 3,000 | 7,200 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.218 | 5,50 | 5.03 | 7,43 | | SCH 80 | 2,500 | 2,500 | 3,000 | 5,800 | 3,000 | 6,400 | 3,000 | 7,200 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |
| 2 7/8 | 73,0 | 0.110 | 2,80 | 3.25 | 4,85 | 2 1/2 | – | 1,700 | 2,100 | 2,000 | 2,500 | 2,200 | 2,700 | 2,400 | 3,000 | 2,600 | 3,300 | 2,800 | 3,500 | 3,000 | 3,800 | 3,000 | 4,100 | 3,000 | 4,700 |
| | | 0.125 | 3,20 | 3.67 | 5,51 | | – | 1,900 | 2,400 | 2,200 | 2,800 | 2,500 | 3,100 | 2,800 | 3,500 | 3,000 | 3,700 | 3,000 | 4,000 | 3,000 | 4,300 | 3,000 | 4,600 | 3,000 | 5,300 |
| | | 0.141 | 3,60 | 4.12 | 6,16 | | – | 2,100 | 2,500 | 2,500 | 3,100 | 2,800 | 3,500 | 3,000 | 3,900 | 3,000 | 4,200 | 3,000 | 4,500 | 3,000 | 4,900 | 3,000 | 5,200 | 3,000 | 6,000 |
| | | 0.156 | 4,00 | 4.53 | 6,81 | | – | 2,400 | 2,500 | 2,800 | 3,500 | 3,000 | 3,800 | 3,000 | 4,300 | 3,000 | 4,700 | 3,000 | 4,900 | 3,000 | 5,400 | 3,000 | 5,800 | 3,000 | 6,600 |
| | | 0.172 | 4,40 | 4.97 | 7,44 | | – | 2,500 | 2,500 | 3,000 | 3,800 | 3,000 | 4,200 | 3,000 | 4,700 | 3,000 | 5,100 | 3,000 | 5,500 | 3,000 | 5,900 | 3,000 | 6,400 | 3,000 | 7,300 |
| | | 0.188 | 4,80 | 5.40 | 8,07 | | SCH 30 | 2,500 | 2,500 | 3,000 | 4,200 | 3,000 | 4,600 | 3,000 | 5,200 | 3,000 | 5,600 | 3,000 | 6,000 | 3,000 | 6,500 | 3,000 | 6,900 | 3,000 | 7,300 |
| | | 0.203 | 5,20 | 5.80 | 8,69 | | SCH 40 | 2,500 | 2,500 | 3,000 | 4,500 | 3,000 | 5,000 | 3,000 | 5,600 | 3,000 | 6,000 | 3,000 | 6,400 | 3,000 | 7,000 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.216 | 5,50 | 6.14 | 9,16 | | – | 2,500 | 2,500 | 3,000 | 4,800 | 3,000 | 5,300 | 3,000 | 5,900 | 3,000 | 6,400 | 3,000 | 6,800 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.250 | 6,40 | 7.02 | 10,51 | | – | 2,500 | 2,500 | 3,000 | 5,500 | 3,000 | 6,100 | 3,000 | 6,900 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.279 | 7,10 | 7.74 | 11,54 | | SCH 80 | 2,500 | 2,500 | 3,000 | 6,200 | 3,000 | 6,800 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.300 | 7,60 | 8.26 | 12,26 | | – | 2,500 | 2,500 | 3,000 | 6,600 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |
| 3 | 76,2 | 0.110 | 2,80 | 3.40 | 5,07 | – | – | 1,600 | 2,000 | 1,900 | 2,400 | 2,100 | 2,600 | 2,300 | 2,900 | 2,500 | 3,200 | 2,700 | 3,400 | 2,900 | 3,600 | 3,000 | 3,900 | 3,000 | 4,500 |
| | | 0.125 | 3,20 | 3.84 | 5,76 | | – | 1,800 | 2,300 | 2,200 | 2,700 | 2,400 | 2,900 | 2,700 | 3,300 | 2,900 | 3,600 | 3,000 | 3,800 | 3,000 | 4,100 | 3,000 | 4,400 | 3,000 | 5,100 |
| | | 0.141 | 3,60 | 4.31 | 6,45 | | – | 2,100 | 2,500 | 2,400 | 3,000 | 2,700 | 3,300 | 3,000 | 3,700 | 3,000 | 4,000 | 3,000 | 4,300 | 3,000 | 4,700 | 3,000 | 5,000 | 3,000 | 5,700 |
| | | 0.156 | 4,00 | 4.74 | 7,12 | | – | 2,300 | 2,500 | 2,700 | 3,300 | 2,900 | 3,700 | 3,000 | 4,100 | 3,000 | 4,500 | 3,000 | 4,700 | 3,000 | 5,100 | 3,000 | 5,500 | 3,000 | 6,300 |
| | | 0.172 | 4,40 | 5.20 | 7,79 | | – | 2,500 | 2,500 | 2,900 | 3,700 | 3,000 | 4,000 | 3,000 | 4,500 | 3,000 | 4,900 | 3,000 | 5,200 | 3,000 | 5,700 | 3,000 | 6,100 | 3,000 | 7,000 |
| | | 0.188 | 4,80 | 5.65 | 8,45 | | – | 2,500 | 2,500 | 3,000 | 4,000 | 3,000 | 4,400 | 3,000 | 5,000 | 3,000 | 5,400 | 3,000 | 5,700 | 3,000 | 6,200 | 3,000 | 6,700 | 3,000 | 7,300 |
| | | 0.216 | 5,50 | 6.43 | 9,59 | | – | 2,500 | 2,500 | 3,000 | 4,600 | 3,000 | 5,100 | 3,000 | 5,700 | 3,000 | 6,200 | 3,000 | 6,600 | 3,000 | 7,100 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.250 | 6,40 | 7.35 | 11,02 | | – | 2,500 | 2,500 | 3,000 | 5,300 | 3,000 | 5,800 | 3,000 | 6,600 | 3,000 | 7,100 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.281 | 7,10 | 8.17 | 12,10 | | – | 2,500 | 2,500 | 3,000 | 6,000 | 3,000 | 6,600 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.300 | 7,60 | 8.66 | 12,86 | | – | 2,500 | 2,500 | 3,000 | 6,400 | 3,000 | 7,000 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |
| 3 1/2 | 88,9 | 0.110 | 2,80 | 3.99 | 5,95 | 3 | – | 1,400 | 1,700 | 1,600 | 2,000 | 1,800 | 2,200 | 2,000 | 2,500 | 2,200 | 2,700 | 2,300 | 2,900 | 2,500 | 3,100 | 2,700 | 3,400 | 3,000 | 3,800 |
| | | 0.125 | 3,20 | 4.51 | 6,76 | | – | 1,600 | 2,000 | 1,900 | 2,300 | 2,000 | 2,500 | 2,300 | 2,800 | 2,500 | 3,100 | 2,600 | 3,300 | 2,800 | 3,500 | 3,000 | 3,800 | 3,000 | 4,400 |
| | | 0.141 | 3,60 | 5.06 | 7,57 | | – | 1,800 | 2,200 | 2,100 | 2,600 | 2,300 | 2,900 | 2,600 | 3,200 | 2,800 | 3,500 | 3,000 | 3,700 | 3,000 | 4,000 | 3,000 | 4,300 | 3,000 | 4,900 |
| | | 0.156 | 4,00 | 5.58 | 8,37 | | – | 1,900 | 2,400 | 2,300 | 2,900 | 2,500 | 3,200 | 2,800 | 3,500 | 3,000 | 3,800 | 3,000 | 4,100 | 3,000 | 4,400 | 3,000 | 4,800 | 3,000 | 5,400 |
| | | 0.172 | 4,40 | 6.12 | 9,17 | | – | 2,100 | 2,500 | 2,500 | 3,200 | 2,800 | 3,500 | 3,000 | 3,900 | 3,000 | 4,200 | 3,000 | 4,500 | 3,000 | 4,900 | 3,000 | 5,200 | 3,000 | 6,000 |
| | | 0.188 | 4,80 | 6.66 | 9,95 | | SCH 30 | 2,300 | 2,500 | 2,800 | 3,400 | 3,000 | 3,800 | 3,000 | 4,300 | 3,000 | 4,600 | 3,000 | 4,900 | 3,000 | 5,300 | 3,000 | 5,700 | 3,000 | 6,500 |
| | | 0.216 | 5,50 | 7.58 | 11,31 | | SCH 40 | 2,500 | 2,500 | 3,000 | 3,900 | 3,000 | 4,300 | 3,000 | 4,900 | 3,000 | 5,300 | 3,000 | 5,600 | 3,000 | 6,100 | 3,000 | 6,600 | 3,000 | 7,300 |
| | | 0.250 | 6,40 | 8.69 | 13,02 | | – | 2,500 | 2,500 | 3,000 | 4,600 | 3,000 | 5,000 | 3,000 | 5,600 | 3,000 | 6,100 | 3,000 | 6,500 | 3,000 | 7,000 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.281 | 7,10 | 9.67 | 14,32 | | – | 2,500 | 2,500 | 3,000 | 5,100 | 3,000 | 5,600 | 3,000 | 6,300 | 3,000 | 6,900 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.299 **0.299** | 7,60 | 10.23 | 15,24 | | SCH 80 | 2,500 | 2,500 | 3,000 | 5,400 | 3,000 | 6,000 | 3,000 | 6,700 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |

| Diameter | | Wall thickness | | Nominal masses | | For reference only | | L245 or B | | L290 or X42 | | L320 or X46 | | L360 or X52 | | L390 or X56 | | L415 or X60 | | L450 or X65 | | L485 or X70 | | L555 or X80 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| inch | mm | inch | mm | lb/ft | kg/m | Dia-meter inch. | Schedule | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi |
| 4 | 101,6 | 0.125 | 3,20 | 5.18 | 7,76 | 3 1/2 | – | 1,400 | 1,700 | 1,600 | 2,000 | 1,800 | 2,200 | 2,000 | 2,500 | 2,200 | 2,700 | 2,300 | 2,900 | 2,500 | 3,100 | 2,700 | 3,300 | 3,000 | 3,800 |
| | | 0.141 | 3,60 | 5.82 | 8,70 | | – | 1,600 | 1,900 | 1,800 | 2,300 | 2,000 | 2,500 | 2,300 | 2,800 | 2,400 | 3,000 | 2,600 | 3,200 | 2,800 | 3,500 | 3,000 | 3,800 | 3,000 | 4,300 |
| | | 0.156 | 4,00 | 6.41 | 9,63 | | – | 1,700 | 2,100 | 2,000 | 2,500 | 2,200 | 2,800 | 2,500 | 3,100 | 2,700 | 3,400 | 2,900 | 3,600 | 3,000 | 3,900 | 3,000 | 4,200 | 3,000 | 4,800 |
| | | 0.172 | 4,40 | 7.04 | 10,55 | | – | 1,900 | 2,300 | 2,200 | 2,800 | 2,400 | 3,000 | 2,700 | 3,400 | 3,000 | 3,700 | 3,000 | 3,900 | 3,000 | 4,300 | 3,000 | 4,600 | 3,000 | 5,200 |
| | | 0.188 | 4,80 | 7.66 | 11,46 | | SCH 30 | 2,100 | 2,600 | 2,400 | 3,000 | 2,700 | 3,300 | 3,000 | 3,700 | 3,000 | 4,000 | 3,000 | 4,300 | 3,000 | 4,700 | 3,000 | 5,000 | 3,000 | 5,700 |
| | | 0.226 | 5,70 | 9.12 | 13,48 | | SCH 40 | 2,500 | 2,800 | 2,900 | 3,600 | 3,000 | 4,000 | 3,000 | 4,500 | 3,000 | 4,800 | 3,000 | 5,200 | 3,000 | 5,600 | 3,000 | 6,000 | 3,000 | 6,900 |
| | | 0.250 | 6,40 | 10.02 | 15,02 | | – | 2,700 | 2,800 | 3,000 | 4,000 | 3,000 | 4,400 | 3,000 | 4,900 | 3,000 | 5,400 | 3,000 | 5,700 | 3,000 | 6,200 | 3,000 | 6,600 | 3,000 | 7,300 |
| | | 0.281 | 7,10 | 11.17 | 16,55 | | – | 2,800 | 2,800 | 3,000 | 4,500 | 3,000 | 4,900 | 3,000 | 5,600 | 3,000 | 6,000 | 3,000 | 6,400 | 3,000 | 6,900 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.318 | 8,10 | 12.52 | 18,68 | | SCH 30 | 2,800 | 2,800 | 3,000 | 5,100 | 3,000 | 5,600 | 3,000 | 6,300 | 3,000 | 6,800 | 3,000 | 7,200 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |
| 4 1/2 | 114,3 | 0.125 | 3,20 | 5.85 | 8,77 | 4 | – | 1,200 | 1,500 | 1,500 | 1,800 | 1,600 | 2,000 | 1,800 | 2,200 | 1,900 | 2,400 | 2,100 | 2,600 | 2,200 | 2,800 | 2,400 | 3,000 | 2,700 | 3,400 |
| | | 0.141 | 3,60 | 6.57 | 9,83 | | – | 1,400 | 1,700 | 1,600 | 2,000 | 1,800 | 2,200 | 2,000 | 2,500 | 2,200 | 2,700 | 2,300 | 2,900 | 2,500 | 3,100 | 2,700 | 3,400 | 3,000 | 3,800 |
| | | 0.156 | 4,00 | 7.24 | 10,88 | | – | 1,500 | 1,900 | 1,800 | 2,200 | 2,000 | 2,500 | 2,200 | 2,800 | 2,400 | 3,000 | 2,600 | 3,200 | 2,800 | 3,400 | 3,000 | 3,700 | 3,000 | 4,200 |
| | | 0.172 | 4,40 | 7.96 | 11,92 | | – | 1,700 | 2,100 | 2,000 | 2,500 | 2,200 | 2,700 | 2,400 | 3,000 | 2,600 | 3,300 | 2,800 | 3,500 | 3,000 | 3,800 | 3,000 | 4,100 | 3,000 | 4,700 |
| | | 0.188 | 4,80 | 8.67 | 12,96 | | SCH 30 | 1,800 | 2,300 | 2,200 | 2,700 | 2,400 | 3,000 | 2,700 | 3,300 | 2,900 | 3,600 | 3,000 | 3,800 | 3,000 | 4,100 | 3,000 | 4,500 | 3,000 | 5,100 |
| | | 0.203 | 5,20 | 9.32 | 13,99 | | – | 2,000 | 2,500 | 2,300 | 2,900 | 2,600 | 3,200 | 2,900 | 3,600 | 3,000 | 3,900 | 3,000 | 4,100 | 3,000 | 4,500 | 3,000 | 4,800 | 3,000 | 5,500 |
| | | 0.219 | 5,60 | 10.02 | 15,01 | | – | 2,100 | 2,600 | 2,500 | 3,100 | 2,800 | 3,400 | 3,000 | 3,900 | 3,000 | 4,200 | 3,000 | 4,400 | 3,000 | 4,800 | 3,000 | 5,200 | 3,000 | 5,900 |
| | | 0.237 | 6,00 | 10.80 | 16,02 | | SCH 40 | 2,300 | 2,800 | 2,700 | 3,400 | 3,000 | 3,700 | 3,000 | 4,200 | 3,000 | 4,500 | 3,000 | 4,800 | 3,000 | 5,200 | 3,000 | 5,600 | 3,000 | 6,400 |
| | | 0.250 | 6,40 | 11.36 | 17,03 | | – | 2,400 | 2,800 | 2,900 | 3,600 | 3,000 | 3,900 | 3,000 | 4,400 | 3,000 | 4,800 | 3,000 | 5,100 | 3,000 | 5,500 | 3,000 | 5,900 | 3,000 | 6,800 |
| | | 0.281 | 7,10 | 12.67 | 18,77 | | – | 2,700 | 2,800 | 3,000 | 4,000 | 3,000 | 4,400 | 3,000 | 4,900 | 3,000 | 5,400 | 3,000 | 5,700 | 3,000 | 6,200 | 3,000 | 6,600 | 3,000 | 7,300 |
| | | 0.312 | 7,90 | 13.97 | 20,73 | | – | 2,800 | 2,800 | 3,000 | 4,400 | 3,000 | 4,900 | 3,000 | 5,500 | 3,000 | 5,900 | 3,000 | 6,300 | 3,000 | 6,800 | 3,000 | 7,300 | 3,000 | 7,300 |
| | | 0.337 | 8,60 | 15.00 | 22,42 | | SCH 80 | 2,800 | 2,800 | 3,000 | 4,800 | 3,000 | 5,300 | 3,000 | 5,900 | 3,000 | 6,400 | 3,000 | 6,800 | 3,000 | 7,300 | 3,000 | 7,300 | 3,000 | 7,300 |
| 5 9/16 | 141,3 | 0.156 | 4,00 | 9.02 | 13,54 | 5 | – | 1,200 | 1,500 | 1,500 | 1,800 | 1,600 | 2,000 | 1,800 | 2,200 | 2,000 | 2,400 | 2,100 | 2,600 | 2,200 | 2,800 | 2,400 | 3,000 | 2,800 | 3,400 |
| | | 0.188 | 4,80 | 10.80 | 16,16 | | – | 1,500 | 1,800 | 1,800 | 2,200 | 1,900 | 2,400 | 2,200 | 2,700 | 2,300 | 2,900 | 2,500 | 3,100 | 2,700 | 3,400 | 2,900 | 3,600 | 3,000 | 4,100 |
| | | 0.219 | 5,60 | 12.51 | 18,74 | | – | 1,700 | 2,100 | 2,000 | 2,500 | 2,200 | 2,800 | 2,500 | 3,100 | 2,700 | 3,400 | 2,900 | 3,600 | 3,000 | 3,900 | 3,000 | 4,200 | 3,000 | 4,800 |
| | | 0.258 | 6,60 | 14.63 | 21,92 | | SCH 40 | 2,000 | 2,500 | 2,400 | 3,000 | 2,600 | 3,300 | 3,000 | 3,700 | 3,000 | 4,000 | 3,000 | 4,200 | 3,000 | 4,600 | 3,000 | 4,900 | 3,000 | 5,700 |
| | | 0.281 | 7,10 | 15.87 | 23,50 | | – | 2,200 | 2,700 | 2,600 | 3,200 | 2,900 | 3,600 | 3,000 | 4,000 | 3,000 | 4,300 | 3,000 | 4,600 | 3,000 | 5,000 | 3,000 | 5,400 | 3,000 | 6,100 |
| | | 0.312 | 7,90 | 17.51 | 25,99 | | – | 2,400 | 2,800 | 2,900 | 3,600 | 3,000 | 4,000 | 3,000 | 4,400 | 3,000 | 4,800 | 3,000 | 5,100 | 3,000 | 5,500 | 3,000 | 6,000 | 3,000 | 6,800 |
| | | 0.377 | 9,60 | 20.90 | 31,18 | | SCH 80 | 2,800 | 2,800 | 3,000 | 4,300 | 3,000 | 4,800 | 3,000 | 5,400 | 3,000 | 5,800 | 3,000 | 6,200 | 3,000 | 6,700 | 3,000 | 7,200 | 3,000 | 7,300 |
| 6 1/2 | 165,1 | 0.156 | 4,00 | 10.58 | 15,89 | – | – | 1,100 | 1,300 | 1,600 | 1,600 | 1,700 | 1,700 | 1,900 | 1,900 | 2,100 | 2,100 | 2,200 | 2,200 | 2,400 | 2,400 | 2,600 | 2,600 | 2,900 | 2,900 |
| | | 0.172 | 4,40 | 11.64 | 17,44 | | – | 1,200 | 1,500 | 1,700 | 1,700 | 1,900 | 1,900 | 2,100 | 2,100 | 2,300 | 2,300 | 2,400 | 2,400 | 2,600 | 2,600 | 2,800 | 2,800 | 3,000 | 3,200 |
| | | 0.188 | 4,80 | 12.69 | 18,97 | | – | 1,300 | 1,600 | 1,900 | 1,900 | 2,100 | 2,100 | 2,300 | 2,300 | 2,500 | 2,500 | 2,700 | 2,700 | 2,900 | 2,900 | 3,000 | 3,100 | 3,000 | 3,500 |
| | | 0.203 | 5,20 | 13.66 | 20,50 | | – | 1,400 | 1,700 | 2,000 | 2,000 | 2,200 | 2,200 | 2,500 | 2,500 | 2,700 | 2,700 | 2,900 | 2,900 | 3,000 | 3,100 | 3,000 | 3,300 | 3,000 | 3,800 |
| | | 0.219 | 5,60 | 14.70 | 22,03 | | – | 1,500 | 1,800 | 2,200 | 2,200 | 2,400 | 2,400 | 2,700 | 2,700 | 2,900 | 2,900 | 3,000 | 3,100 | 3,000 | 3,400 | 3,000 | 3,600 | 3,000 | 4,100 |
| | | 0.250 | 6,40 | 16.70 | 25,05 | | – | 1,700 | 2,100 | 2,500 | 2,500 | 2,700 | 2,700 | 3,000 | 3,100 | 3,000 | 3,300 | 3,000 | 3,500 | 3,000 | 3,800 | 3,000 | 4,100 | 3,000 | 4,700 |
| | | 0.280 | 7,10 | 18.62 | 27,66 | | – | 1,900 | 2,300 | 2,800 | 2,800 | 3,000 | 3,000 | 3,000 | 3,400 | 3,000 | 3,700 | 3,000 | 3,900 | 3,000 | 4,300 | 3,000 | 4,600 | 3,000 | 5,300 |
| | | 0.312 | 7,90 | 20.64 | 30,62 | | – | 2,100 | 2,600 | 3,000 | 3,100 | 3,000 | 3,400 | 3,000 | 3,800 | 3,000 | 4,100 | 3,000 | 4,400 | 3,000 | 4,800 | 3,000 | 5,100 | 3,000 | 5,800 |
| | | 0.344 | 8,70 | 22.64 | 33,55 | | – | 2,300 | 2,800 | 3,000 | 3,400 | 3,000 | 3,700 | 3,000 | 4,200 | 3,000 | 4,500 | 3,000 | 4,800 | 3,000 | 5,200 | 3,000 | 5,600 | 3,000 | 6,400 |
| | | 0.375 | 9,50 | 24.55 | 36,45 | | – | 2,500 | 2,800 | 3,000 | 3,700 | 3,000 | 4,100 | 3,000 | 4,600 | 3,000 | 4,900 | 3,000 | 5,300 | 3,000 | 5,700 | 3,000 | 6,100 | 3,000 | 7,000 |

| Diameter | | Wall thickness | | Nominal masses | | For reference only | | L245 or B | | L290 or X42 | | L320 or X46 | | L360 or X52 | | L390 or X56 | | L415 or X60 | | L450 or X65 | | L485 or X70 | | L555 or X80 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| inch | mm | inch | mm | lb/ft | kg/m | Dia-meter inch. | Schedule | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi | SDT psi | ALT psi |
| 6 5/8 | 168,3 | 0.156 | 4,00 | 10.79 | 16,21 | 6 | – | 1,100 | 1,300 | 1,500 | 1,500 | 1,700 | 1,700 | 1,900 | 1,900 | 2,000 | 2,000 | 2,200 | 2,200 | 2,400 | 2,400 | 2,500 | 2,500 | 2,900 | 2,900 |
| | | 0.172 | 4,40 | 11.87 | 17,78 | | – | 1,200 | 1,400 | 1,700 | 1,700 | 1,900 | 1,900 | 2,100 | 2,100 | 2,300 | 2,300 | 2,400 | 2,400 | 2,600 | 2,600 | 2,800 | 2,800 | 3,000 | 3,200 |
| | | 0.188 | 4,80 | 12.94 | 19,35 | | – | 1,300 | 1,600 | 1,800 | 1,800 | 2,000 | 2,000 | 2,300 | 2,300 | 2,500 | 2,500 | 2,600 | 2,600 | 2,800 | 2,800 | 3,000 | 3,000 | 3,000 | 3,500 |
| | | 0.203 | 5,20 | 13.94 | 20,91 | | – | 1,400 | 1,700 | 2,000 | 2,000 | 2,200 | 2,200 | 2,400 | 2,400 | 2,700 | 2,700 | 2,800 | 2,800 | 3,000 | 3,100 | 3,000 | 3,300 | 3,000 | 3,700 |
| | | 0.219 | 5,60 | 15.00 | 22,47 | | – | 1,500 | 1,800 | 2,100 | 2,100 | 2,400 | 2,400 | 2,600 | 2,600 | 2,900 | 2,900 | 3,000 | 3,000 | 3,000 | 3,300 | 3,000 | 3,500 | 3,000 | 4,000 |
| | | 0.250 | 6,40 | 17.04 | 25,55 | | – | 1,700 | 2,100 | 2,400 | 2,400 | 2,700 | 2,700 | 3,000 | 3,000 | 3,000 | 3,300 | 3,000 | 3,500 | 3,000 | 3,700 | 3,000 | 4,000 | 3,000 | 4,600 |
| | | 0.280 | 7,10 | 18.99 | 28,22 | | SCH 40 | 1,900 | 2,300 | 2,700 | 2,700 | 3,000 | 3,000 | 3,000 | 3,400 | 3,000 | 3,600 | 3,000 | 3,900 | 3,000 | 4,200 | 3,000 | 4,500 | 3,000 | 5,200 |
| | | 0.312 | 7,90 | 21.06 | 31,25 | | – | 2,100 | 2,600 | 3,000 | 3,000 | 3,000 | 3,300 | 3,000 | 3,700 | 3,000 | 4,000 | 3,000 | 4,300 | 3,000 | 4,700 | 3,000 | 5,000 | 3,000 | 5,700 |
| | | 0.344 | 8,70 | 23.10 | 34,24 | | – | 2,300 | 2,800 | 3,000 | 3,300 | 3,000 | 3,700 | 3,000 | 4,100 | 3,000 | 4,500 | 3,000 | 4,700 | 3,000 | 5,100 | 3,000 | 5,500 | 3,000 | 6,300 |
| | | 0.375 | 9,50 | 25.05 | 37,20 | | – | 2,500 | 2,800 | 3,000 | 3,600 | 3,000 | 4,000 | 3,000 | 4,500 | 3,000 | 4,900 | 3,000 | 5,200 | 3,000 | 5,600 | 3,000 | 6,000 | 3,000 | 6,900 |
| | | 0.432 | 11,00 | 28.60 | 42,67 | | SCH 80 | 2,800 | 2,800 | 3,000 | 4,200 | 3,000 | 4,600 | 3,000 | 5,200 | 3,000 | 5,600 | 3,000 | 5,900 | 3,000 | 6,400 | 3,000 | 6,900 | 3,000 | 7,300 |
| 8 5/8 | 219,1 | 0.188 | 4,80 | 16.96 | 25,37 | 6 | – | 1,000 | 1,200 | 1,400 | 1,400 | 1,600 | 1,600 | 1,800 | 1,800 | 1,900 | 1,900 | 2,000 | 2,000 | 2,200 | 2,200 | 2,300 | 2,300 | 2,700 | 2,700 |
| | | 0.203 | 5,20 | 18.28 | 27,43 | | – | 1,100 | 1,300 | 1,500 | 1,500 | 1,700 | 1,700 | 1,900 | 1,900 | 2,000 | 2,000 | 2,200 | 2,200 | 2,400 | 2,400 | 2,500 | 2,500 | 2,900 | 2,900 |
| | | 0.219 | 5,60 | 19.68 | 29,48 | | – | 1,100 | 1,400 | 1,700 | 1,700 | 1,800 | 1,800 | 2,000 | 2,000 | 2,200 | 2,200 | 2,300 | 2,300 | 2,500 | 2,500 | 2,700 | 2,700 | 3,000 | 3,100 |
| | | 0.250 | 6,40 | 22.38 | 33,57 | | SCH 20 | 1,300 | 1,600 | 1,900 | 1,900 | 2,100 | 2,100 | 2,300 | 2,300 | 2,500 | 2,500 | 2,700 | 2,700 | 2,900 | 2,900 | 3,000 | 3,100 | 3,000 | 3,500 |
| | | 0.277 | 7,00 | 24.72 | 36,61 | | SCH 30 | 1,400 | 1,800 | 2,100 | 2,100 | 2,300 | 2,300 | 2,600 | 2,600 | 2,800 | 2,800 | 3,000 | 3,000 | 3,000 | 3,200 | 3,000 | 3,400 | 3,000 | 3,900 |
| | | 0.312 | 7,90 | 27.73 | 41,14 | | – | 1,600 | 2,000 | 2,300 | 2,300 | 2,600 | 2,600 | 2,900 | 2,900 | 3,000 | 3,100 | 3,000 | 3,300 | 3,000 | 3,600 | 3,000 | 3,900 | 3,000 | 4,400 |
| | | 0.322 | 8,20 | 28.58 | 42,65 | | SCH 40 | 1,600 | 2,000 | 2,400 | 2,400 | 2,600 | 2,600 | 3,000 | 3,000 | 3,000 | 3,200 | 3,000 | 3,400 | 3,000 | 3,700 | 3,000 | 4,000 | 3,000 | 4,600 |
| | | 0.344 | 8,70 | 30.45 | 45,14 | | – | 1,700 | 2,200 | 2,600 | 2,600 | 2,800 | 2,800 | 3,000 | 3,200 | 3,000 | 3,400 | 3,000 | 3,700 | 3,000 | 4,000 | 3,000 | 4,300 | 3,000 | 4,900 |
| | | 0.375 | 9,50 | 33.07 | 49,10 | | – | 1,900 | 2,400 | 2,800 | 2,800 | 3,000 | 3,100 | 3,000 | 3,500 | 3,000 | 3,700 | 3,000 | 4,000 | 3,000 | 4,300 | 3,000 | 4,600 | 3,000 | 5,300 |
| | | 0.405 | 10,30 | 35.59 | 53,03 | | SCH 60 | 2,100 | 2,600 | 3,000 | 3,000 | 3,000 | 3,300 | 3,000 | 3,700 | 3,000 | 4,000 | 3,000 | 4,300 | 3,000 | 4,600 | 3,000 | 5,000 | 3,000 | 5,700 |
| | | 0.438 | 11,10 | 38.33 | 56,94 | | – | 2,200 | 2,800 | 3,000 | 3,300 | 3,000 | 3,600 | 3,000 | 4,000 | 3,000 | 4,400 | 3,000 | 4,600 | 3,000 | 5,000 | 3,000 | 5,400 | 3,000 | 6,200 |
| | | 0.500 | 12,70 | 43.43 | 64,64 | | SCH 80 | 2,500 | 2,800 | 3,000 | 3,700 | 3,000 | 4,100 | 3,000 | 4,600 | 3,000 | 5,000 | 3,000 | 5,300 | 3,000 | 5,700 | 3,000 | 6,200 | 3,000 | 7,000 |

**NOTE:**

SDT = Standard test pressure

ALT = Alternative test pressure (Applicable if agreed between the purchaser and the manufacturer)

## *Revestimentos anticorrosivos – Linhas de condução*

| Fluído | Método de Escoamento | Pressão | Conforme condições do Projeto | | | |
|---|---|---|---|---|---|---|
| | | Temperatura* | Interno | Externo Enterrado (transição curta distância) | Externo Enterrado (dutos longa distância) | Externo Aéreo |
| Petróleo | LINE PIPE (com Proteção Catódica) | até 85°C | – | – | Polietileno Tripla Camada (3LPE) ou Coating (EPÓXI) | Pinturas especiais (Sob Consulta) |
| | | até 110°C | – | – | Polipropileno (3LPP) | Pinturas especiais (Sob Consulta) |
| Gás | LINE PIPE (com Proteção Catódica) | até 85°C | Epóxi Líquido (Sob Consulta / Tubos 8") | – | Polietileno Tripla Camada (3LPE) ou Coating (EPÓXI) | Pinturas especiais (Sob Consulta) |
| | | até 110°C | Epóxi Líquido (Sob Consulta / Tubos 8") | – | Polipropileno (3LPP) | Pinturas especiais (Sob Consulta) |
| Petróleo | LINE PIPE (escoamento da Produção) | até 75°C | Polietileno Poliamida (PE+PA) | Epóxi Reforçado com Polimero (WRAP) | – | Pinturas especiais (Sob Consulta) |
| Água Produzida | LINE PIPE (escoamento da Produção) | até 75°C | Polietileno Poliamida (PE+PA) | Epóxi Reforçado com Polimero (WRAP) | – | Pinturas especiais (Sob Consulta) |
| Água | CONDUÇÃO INDUSTRIAL | ambiente | Galvanizado | – | – | Galvanizado |

# Tubos Estruturais e Industriais

São amplamente utilizados na fabricação de máquinas e equipamentos industriais devidoà sua versatilidade, resistência mecânica e capacidade de suportar condições adversas em diversos ambientes industriais.

***Algumas aplicações:***

- Sistemas de Ar e Fluidos
- Troca Térmica e Aquecimento
- Estruturas de Proteção e Segurança
- Indústrias de papel e celulose, petroquímica e refino, energia.

Tubos de aço-carbono com solda longitudinal;
Podem ser fornecidos Pretos ou Galvanizados, nos perfis Circulares, Quadrados e Retangulares.



## *General Map of manufacturing*[a]

Dimensions NBR 5580 / 5590 / 5597 / 5598 / 6591 / 8261 - ASTM A513 / A53 - DIN EN 10305-3

| Nominal diameter | | Wall thickness (mm) | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| inch | mm | 1,50 | 1,80 | 1,90 | 2,00 | 2,25 | 2,59 | 2,65 | 2,70 | 3,00 | 3,25 | 3,35 | 3,52 | 3,75 | 4,25 | 4,75 | 5,00 | 5,30 | 5,60 | 5,75 | 6,30 | 7,60 | 8,20 | 9,60 |
| 21,30 (15)[b] | 1/2 | | | | | | | | | | | | | | | | | | | | | | | |
| 26,70/26,90 (20)[b] | 3/4 | | | | | | | | | | | | | | | | | | | | | | | |
| 33,40/33,70 (25)[b] | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| 42,40 (32)[b] | 1 1/4 | | | | | | | | | | | | | | | | | | | | | | | |
| 25,40 | 1.000 | | | | | | | | | | | | | | | | | | | | | | | |
| 28,57 | 1.125 | | | | | | | | | | | | | | | | | | | | | | | |
| 31,75 | 1.250 | | | | | | | | | | | | | | | | | | | | | | | |
| 34,92 | 1.375 | | | | | | | | | | | | | | | | | | | | | | | |
| 38,10 | 1.500 | | | | | | | | | | | | | | | | | | | | | | | |
| 41,27 | 1.625 | | | | | | | | | | | | | | | | | | | | | | | |
| 47,62 | 1.875 | | | | | | | | | | | | | | | | | | | | | | | |
| 50,80 | 2.000 | | | | | | | | | | | | | | | | | | | | | | | |
| 48,30 (40)[b] | 1 1/2 | | | | | | | | | | | | | | | | | | | | | | | |
| 50,80 | - | | | | | | | | | | | | | | | | | | | | | | | |
| 57,15 | - | | | | | | | | | | | | | | | | | | | | | | | |
| 60,30 (50)[b] | 2 | | | | | | | | | | | | | | | | | | | | | | | |
| 63,50 | - | | | | | | | | | | | | | | | | | | | | | | | |
| 76,10 (65)[b] | 2 1/2 | | | | | | | | | | | | | | | | | | | | | | | |
| 73,00 (65)[b] | 2 1/2 | | | | | | | | | | | | | | | | | | | | | | | |
| 88,90 (80)[b] | 3 | | | | | | | | | | | | | | | | | | | | | | | |
| 101,60 (90)[b] | 3 1/2 | | | | | | | | | | | | | | | | | | | | | | | |
| 114,30 (100)[b] | 4 | | | | | | | | | | | | | | | | | | | | | | | |
| 127,00 | 5 | | | | | | | | | | | | | | | | | | | | | | | |
| 139,70 | 5 1/2 | | | | | | | | | | | | | | | | | | | | | | | |
| 141,30 | 5 9/16 | | | | | | | | | | | | | | | | | | | | | | | |
| 165,10 (150)[b] | 6 | | | | | | | | | | | | | | | | | | | | | | | |
| 168,30 (150)[b] | 6 | | | | | | | | | | | | | | | | | | | | | | | |
| 177,80 | 7 | | | | | | | | | | | | | | | | | | | | | | | |
| 219,10 (200)[b] | 8 | | | | | | | | | | | | | | | | | | | | | | | |
| 244,48 | 9 5/8 | | | | | | | | | | | | | | | | | | | | | | | |

NOTE:

a Consult our Commercial team to describe details about each product.

The pipes are provide with Plain-End beveled, Threaded and Coupled Pipe or Grooved and also with anticorrosive protection such as: Galvanized, Painting, Varnished or Coating.

We be able to provide torque tubes with swaged end and holes along of the length for field assembly dedicated to Solar Trackers.

b Standard dimensions according to the Brazilian market.

## Chemical composition (mass fraction)

| Specification | Grade | % Max. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C | Mn | P | S | Cu | Ni | Cr | Mo | V | Si |
| ASTM A53 | A | 0.25 | 0.95 | 0.050 | 0.045 | a | 0.40[b] | 0.40[b] | 0.15[b] | 0.08[b] | – |
| NBR 5590 | B | 0.30 | 1.20 | 0.050 | 0.045 | a | 0.40[b] | 0.40[b] | 0.15[b] | 0.08[b] | – |
| NBR 6591 | – | 0.23 | 1.00 | 0.04 | 0.05 | – | – | – | – | – | – |
| ASTM A178 | A | 0.06–0.18 | 0.27–0.63 | 0.035 | 0.035 | – | – | – | – | – | – |
| | C | 0.35 | 0.80 | 0.035 | 0.035 | – | – | – | – | – | – |
| | D | 0.27 | 1.00–1.50 | 0.030 | 0.015 | – | – | – | – | – | 0.10[c] |

NOTE:

a– Maximum value Cu: for ASTM A53 Grade A and B = 0.50 / for NBR 5590 Grade A and B = 0.40

b– The sum of these elements shall be smaller than 1.00 %.

c– Minimum value.

## Tensile and Hardness requirements

| Specifica-tion | Grade | Yield strength | | Tensile strength | | | |
|---|---|---|---|---|---|---|---|
| | | min. | | min. | | max. | |
| | | MPa | psi | MPa | psi | MPa | psi |
| ASTM A53 | A | 205 | 30,000 | 330 | 48,000 | – | – |
| NBR 5590 | B | 240 | 35,000 | 415 | 60,000 | – | – |
| ASTM A178 | A[a] | 180 | 26,000 | 325 | 47,000 | – | – |
| | C | 255 | 37,000 | 415 | 60,000 | – | – |
| | D | 275 | 40,000 | 485 | 70,000 | – | – |

NOTE:

a The values from Grade A must be presented for reference only.



## ABNT NBR 5590

Tubos de aço-carbono, com solda longitudinal, pretos ou galvanizados.
(Esta norma contempla e pode substituir a norma ASTM A-53)
Os tubos podem ser fornecidos Pretos ou Galvanizados.

| Nominal diameter | | Outside diameter | | Wall thickness | | SCH | Nominal masses | |
|---|---|---|---|---|---|---|---|---|
| NPS | DN | inch | mm | inch | mm | | lb/ft | kg/m |
| 1/2 | 15 | 0.840 | 21,30 | 0.065 | 1,65 | 5 | 0.54 | 0,80 |
| | | | | 0.083 | 2,11 | 10 | 0.67 | 1,00 |
| | | | | 0.095 | 2,41 | 30 | 0.76 | 1,12 |
| | | | | 0.109 | 2,77 | 40 | 0.85 | 1,27 |
| 3/4 | 20 | 1.050 | 26,70 | 0.065 | 1,65 | 5 | 0.69 | 1,03 |
| | | | | 0.083 | 2,11 | 10 | 0.86 | 1,28 |
| | | | | 0.095 | 2,41 | 30 | 0.97 | 1,44 |
| 1 | 25 | 1.315 | 33,40 | 0.065 | 1,65 | 5 | 0.87 | 1,29 |
| | | | | 0.109 | 2,77 | 10 | 1.41 | 2,09 |
| | | | | 0.114 | 2,90 | 30 | 1.46 | 2,18 |
| | | | | 0.133 | 3,38 | 40 | 1.68 | 2,50 |
| 1 1/4 | 32 | 1.660 | 42,20 | 0.065 | 1,65 | 5 | 1.11 | 1,65 |
| | | | | 0.109 | 2,77 | 10 | 1.81 | 2,69 |
| | | | | 0.117 | 2,97 | 30 | 1.93 | 2,87 |
| | | | | 0.140 | 3,56 | 40 | 2.27 | 3,39 |
| 1 1/2 | 40 | 1.900 | 48,30 | 0.065 | 1,65 | 5 | 1.28 | 1,90 |
| | | | | 0.109 | 2,77 | 10 | 2.09 | 3,11 |
| 2 | 50 | 2 3/8 | 60,30 | 0.065 | 1,65 | 5 | 1.61 | 2,39 |
| | | | | 0.083 | 2,11 | – | 2.03 | 3,03 |
| | | | | 0.109 | 2,77 | 10 | 2.64 | 3,93 |
| | | | | 0.125 | 3,18 | 30 | 3.01 | 4,48 |
| | | | | 0.154 | 3,91 | 40 | 3.66 | 5,44 |
| | | | | 0.218 | 5,54 | 80 | 5.03 | 7,48 |
| 2 1/2 | 65 | 2 7/8 | 73,00 | 0.083 | 2,11 | 5 | 2.48 | 3,69 |
| | | | | 0.109 | 2,77 | – | 3.22 | 4,80 |
| | | | | 0.120 | 3,05 | 10 | 3.53 | 5,26 |
| | | | | 0.125 | 3,18 | – | 3.67 | 5,48 |
| | | | | 0.156 | 3,96 | – | 4.53 | 6,74 |
| | | | | 0.188 | 4,78 | 30 | 5.40 | 8,04 |
| | | | | 0.203 | 5,16 | 40 | 5.80 | 8,63 |
| | | | | 0.276 | 7,01 | 80 | 7.66 | 11,41 |

| Nominal diameter | | Outside diameter | | Wall thickness | | SCH | Nominal masses | |
|---|---|---|---|---|---|---|---|---|
| NPS | DN | inch | mm | inch | mm | | lb/ft | kg/m |
| 3 | 80 | 3 1/2 | 88,90 | 0.083 | 2,11 | 5 | 3.03 | 4,52 |
| | | | | 0.109 | 2,77 | – | 3.95 | 5,88 |
| | | | | 0.120 | 3,05 | 10 | 4.34 | 6,46 |
| | | | | 0.125 | 3,18 | – | 4.52 | 6,72 |
| | | | | 0.156 | 3,96 | – | 5.57 | 8,29 |
| | | | | 0.188 | 4,78 | – | 6.66 | 9,92 |
| | | | | 0.216 | 5,49 | 40 | 7.59 | 11,29 |
| | | | | 0.250 | 6,35 | – | 8.69 | 12,93 |
| | | | | 0.281 | 7,14 | – | 9.67 | 14,40 |
| | | | | 0.300 | 7,62 | 80 | 10.26 | |
| 3 1/2 | 90 | 4 | 101,60 | 0.083 | 2,11 | 5 | 3.48 | 5,18 |
| | | | | 0.109 | 2,77 | – | 4.53 | 6,75 |
| | | | | 0.120 | 3,05 | 10 | 4.98 | 7,41 |
| | | | | 0.125 | 3,18 | – | 5.19 | 7,72 |
| | | | | 0.156 | 3,96 | – | 6.41 | 9,53 |
| | | | | 0.188 | 4,78 | – | 7.67 | 11,41 |
| | | | | 0.226 | 5,74 | 40 | 9.12 | 13,57 |
| | | | | 0.250 | 6,35 | – | 10.02 | 14,92 |
| | | | | 0.281 | 7,14 | – | 11.18 | 16,63 |
| | | | | 0.318 | 8,08 | 80 | 12.52 | 18,63 |
| 4 | 100 | 4 1/2 | 114,30 | 0.083 | 2,11 | 5 | 3.92 | 5,84 |
| | | | | 0.109 | 2,77 | – | 5.12 | 7,62 |
| | | | | 0.120 | 3,05 | 10 | 5.62 | 8,37 |
| | | | | 0.125 | 3,18 | – | 5.86 | 8,71 |
| | | | | 0.156 | 3,96 | – | 7.24 | 10,78 |
| | | | | 0.188 | 4,78 | – | 8.67 | 12,91 |
| | | | | 0.219 | 5,56 | – | 10.02 | 14,91 |
| | | | | 0.237 | 6,02 | 40 | 10.80 | 16,07 |
| | | | | 0.250 | 6,35 | – | 11.36 | 16,90 |
| | | | | 0.281 | 7,14 | – | 12.68 | 18,87 |
| | | | | 0.312 | 7,92 | – | 13.96 | 20,78 |
| | | | | 0.337 | 8,56 | 80 | 15.00 | 22,32 |



| Nominal diameter | | Outside diameter | | Wall thickness | | SCH | Nominal masses | |
|---|---|---|---|---|---|---|---|---|
| NPS | DN | inch | mm | inch | mm | | lb/ft | kg/m |
| 5 | 125 | 5 9/16 | 141,30 | 0.156 | 3,96 | – | 9.02 | 13,41 |
| | | | | 0.188 | 4,78 | – | 10.80 | 16,09 |
| | | | | 0.219 | 5,56 | – | 12.51 | 18,61 |
| | | | | 0.258 | 6,55 | 40 | 14.63 | 21,77 |
| | | | | 0.281 | 7,14 | – | 15.87 | 23,62 |
| | | | | 0.312 | 7,92 | – | 17.51 | 26,05 |
| | | | | 0.344 | 8,74 | – | 19.19 | 28,57 |
| | | | | 0.375 | 9,52 | 80 | 20.80 | 30,94 |
| 6 | 150 | 6 5/8 | 168,30 | 0.134 | 3,40 | 10 | 9.30 | 13,83 |
| | | | | 0.156 | 3,96 | – | 10.79 | 16,05 |
| | | | | 0.188 | 4,78 | – | 12.94 | 19,27 |
| | | | | 0.219 | 5,56 | – | 15.00 | 22,31 |
| | | | | 0.250 | 6,35 | – | 17.04 | 25,36 |
| | | | | 0.280 | 7,11 | 40 | 18.99 | 28,26 |
| | | | | 0.312 | 7,92 | – | 21.06 | 31,32 |
| | | | | 0.344 | 8,74 | – | 23.10 | 34,39 |
| | | | | 0.375 | 9,52 | – | 25.05 | 37,28 |
| | | | | 0.432 | 10,97 | 80 | 28.60 | 42,56 |
| 8 | 200 | 8 5/8 | 219,10 | 0.125 | 3,18 | – | 11.36 | 16,93 |
| | | | | 0.148 | 3,76 | 10 | 13.41 | 19,97 |
| | | | | 0.156 | 3,96 | – | 14.12 | 21,01 |
| | | | | 0.188 | 4,78 | – | 16.96 | 25,26 |
| | | | | 0.203 | 5,16 | – | 18.28 | 27,22 |
| | | | | 0.219 | 5,56 | – | 19.67 | 29,28 |
| | | | | 0.250 | 6,35 | 20 | 22.38 | 33,31 |
| | | | | 0.277 | 7,04 | 30 | 24.72 | 36,31 |
| | | | | 0.289 | 7,34 | – | 25.75 | 38,33 |
| | | | | 0.312 | 7,92 | – | 27.73 | 41,24 |
| | | | | 0.322 | 8,18 | 40 | 28.58 | 42,55 |
| | | | | 0.344 | 8,74 | – | 30.45 | 45,34 |
| | | | | 0.375 | 9,52 | – | 33,07 | 49,20 |
| | | | | 0.406 | 10,31 | 60 | 35.67 | 53,08 |
| | | | | 0.438 | 11,13 | – | 38.33 | 57,08 |
| | | | | | 12,70 | 80 | 43.43 | 64,64 |

## Dimensions ASTM A178

| Nominal Diameter | | Wall Thickness | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | mm | 2,40 | 2,65 | 2,75 | 3,05 | 3,40 | 3,75 | 4,25 |
| inch | mm | inch | 0,094 | 0,104 | 0,108 | 0,120 | 0,134 | 0,148 | 0,167 |
| 2 | 50,80 | kg/m | 2,86 | 3,15 | 3,26 | 3,59 | 3,97 | 4,35 | 4,88 |
| | | lb/ft | 1.92 | 2.11 | 2.19 | 2.41 | 2.67 | 2.92 | 3.28 |
| 2 3/8 | 60,30 | kg/m | 3,43 | 3,77 | 3,90 | 4,31 | 4,77 | 5,23 | 5,87 |
| | | lb/ft | 2.30 | 2.53 | 2.62 | 2.89 | 3.21 | 3.51 | 3.95 |
| 2 1/2 | 63,50 | kg/m | 3,62 | 3,98 | 4,12 | 4,55 | 5,04 | 5,53 | 6,21 |
| | | lb/ft | 2.43 | 2.67 | 2.77 | 3.06 | 3.39 | 3.71 | 4.17 |
| 2 7/8 | 73,00 | kg/m | 4,18 | 4,60 | 4,76 | 5,26 | 5,84 | 6,40 | 7,21 |
| | | lb/ft | 2.81 | 3.09 | 3.20 | 3.54 | 3.92 | 4.30 | 4.84 |
| 3 | 76,20 | kg/m | 4,37 | 4,81 | 4,98 | 5,50 | 6,10 | 6,70 | 7,54 |
| | | lb/ft | 2.94 | 3.23 | 3.35 | 3.70 | 4.10 | 4.50 | 5.07 |
| 3 1/2 | 88,90 | kg/m | 5,12 | 5,64 | 5,84 | 6,46 | 7,17 | 7,87 | 8,87 |
| | | lb/ft | 5.07 | 3.79 | 3.93 | 4.34 | 4.82 | 5.29 | 5.96 |
| 4 | 101,60 | kg/m | 5,87 | 6,47 | 6,70 | 7,41 | 8,23 | 9,05 | 10,20 |
| | | lb/ft | 3.95 | 4.35 | 4.50 | 4.98 | 5.53 | 6.08 | 6.86 |
| 4 1/2 | 114,30 | kg/m | 6,62 | 7,30 | 7,56 | 8,37 | 9,30 | 10,22 | 11,53 |
| | | | 4.45 | 4.90 | 5.08 | 5.62 | 6.25 | 6.87 | 7.75 |



## ABNT NBR 5580

Tubos de aço-carbono para uso comum na condução de fluidos.
Esta norma contempla os requisitos e substitui a norma DIN2440 (cancelada em 2004)
Os tubos podem ser fornecidos Pretos ou Galvanizados.

| Nominal diameter | Outside diameter | | Wall thickness | | Class | Nominal masses | |
|---|---|---|---|---|---|---|---|
| | inch | mm | inch | mm | | lb/ft | kg/m |
| 15 (1/2) | 0.840 | 21,30 | 0.089 | 2,25 | L | 0.73 | 1,06 |
| 20 (3/4) | 1.059 | 26,90 | 0.089 | 2,25 | | 0.95 | 1,37 |
| 25 (1) | 1.327 | 33,70 | 0.104 | 2,65 | | 1.40 | 2,03 |
| 32 (1 1/4) | 1.669 | 42,40 | 0.104 | 2,65 | | 1.79 | 2,60 |
| 40 (1 1/2) | 1.900 | 48,30 | 0.118 | 3,00 | | 2.31 | 3,35 |
| 50 (2) | 2 3/8 | 60,30 | 0.118 | 3,00 | | 2.93 | 4,24 |
| 65 (2 1/2) | 3 | 76,10 | 0.132 | 3,35 | | 4.15 | 6,01 |
| 80 (3) | 3 1/2 | 88,90 | 0.132 | 3,35 | | 4.88 | 7,07 |
| 90 (3 1/2) | 4 | 101,60 | 0.148 | 3,75 | | 6.25 | 9,05 |
| 100 (4) | 4 1/2 | 114,30 | 0.148 | 3,75 | | 7.06 | 10,22 |
| 15 (1/2) | 0.840 | 21,30 | 0.104 | 2,65 | M | 0.84 | 1,22 |
| 20 (3/4) | 1.059 | 26,90 | 0.104 | 2,65 | | 1.09 | 1,58 |
| 25 (1) | 1.327 | 33,70 | 0.132 | 3,35 | | 1.73 | 2,51 |
| 32 (1 1/4) | 1.669 | 42,40 | 0.132 | 3,35 | | 2.23 | 3,23 |
| 40 (1 1/2) | 1.900 | 48,30 | 0.132 | 3,35 | | 2.56 | 3,71 |
| 50 (2) | 2 3/8 | 60,30 | 0.148 | 3,75 | | 3.61 | 5,23 |
| 65 (2 1/2) | 3 | 76,10 | 0.148 | 3,75 | | 4.62 | 6,69 |
| 80 (3) | 3 1/2 | 88,90 | 0.157 | 4,00 | | 5.78 | 8,37 |
| 90 (3 1/2) | 4 | 101,60 | 0.167 | 4,25 | | 7.04 | 10,20 |
| 100 (4) | 4 1/2 | 114,30 | 0.177 | 4,50 | | 8.41 | 12,18 |
| 125 (5) | 5 1/2 | 139,70 | 0.187 | 4,75 | | 10.92 | 15,81 |
| 150 (6) | 6 1/2 | 165,10 | 0.197 | 5,00 | | 13.63 | 19,74 |
| 15 (1/2) | 0.840 | 21,30 | 0.118 | 3,00 | P | 0.93 | 1,35 |
| 20 (3/4) | 1.059 | 26,90 | 0.118 | 3,00 | | 1.22 | 1,77 |
| 25 (1) | 1.327 | 33,70 | 0.148 | 3,75 | | 1.91 | 2,77 |
| 32 (1 1/4) | 1.669 | 42,40 | 0.148 | 3,75 | | 2.46 | 3,57 |
| 40 (1 1/2) | 1.900 | 48,30 | 0.148 | 3,75 | | 2.84 | 4,12 |
| 50 (2) | 2 3/8 | 60,30 | 0.177 | 4,50 | | 4.27 | 6,19 |
| 65 (2 1/2) | 3 | 76,10 | 0.177 | 4,50 | | 5.48 | 7,95 |
| 80 (3) | 3 1/2 | 88,90 | 0.177 | 4,50 | | 6.46 | 9,37 |
| 90 (3 1/2) | 4 | 101,60 | 0.197 | 5,00 | | 8.22 | 11,91 |
| 100 (4) | 4 1/2 | 114,30 | 0.220 | 5,60 | | 10.36 | 15,01 |
| 125 (5) | 5 1/2 | 139,70 | 0.220 | 5,60 | | 12.79 | 18,52 |
| 150 (6) | 6 1/2 | 165,10 | 0.220 | 5,60 | | 15.21 | 22,03 |

**Embalagem:** Os tubos são fornecidos em feixes com quantidades e pesos que irão variar de acordo com a especificação dimensional do produto ou acordo prévio.

* Pressão de Trabalho: 50% da Pressão de Teste

Comprimento de fabricação: ..... 6m (Sob consulta, outros comprimentos poderão ser fornecidos)
Extremidades: ..... Lisas (corte reto) / Rosqueadas (BSP-cônica ISO7/1) / Biseladas / Ranhuradas
Galvanização: ..... Imersão à quente
Massa de zinco por unidade de área: (400g/m2 min.)
Camada: 56 µm

**Tolerâncias de fabricação:**

· Espessura: ..... - 12,5%
· Peso: ..... > 10ton. ± 10% / lote ≥ 10ton. ± 7,5%
· Comprimento: ..... ± 50mm

Rebarba interna removida (RR): ..... > 20 (3/4")

Produto certificado conforme os requisitos da portaria nº 246/2016 do Inmetro

## *ABNT NBR 6591*

Tubos de aço-carbono com solda longitudinal de seção circular, quadrada, retangular e especial para fins industriais.

· Os tubos podem ser fornecidos pretos ou galvanizados e em seção circular, quadrada ou retangular;
· Para tubos galvanizados, somente mediante consulta.

| Grade | Outside diameter | | Wall thickness | | Nominal masses | |
|---|---|---|---|---|---|---|
| | inch | mm | inch | mm | lb/ft | kg/m |
| 1/2 | 0.840 | 21,30 | 0.059 | 1,50 | 0.51 | 0,73 |
| | | | 0.075 | 1,90 | 0.63 | 0,91 |
| | | | 0.079 | 2,00 | 0.66 | 0,95 |
| | | | 0.089 | 2,25 | 0.73 | 1,06 |
| | | | 0.104 | 2,65 | 0.84 | 1,22 |
| 3/4 | 1.059 | 26,90 | 0.059 | 1,50 | 0.65 | 0,94 |
| | | | 0.075 | 1,90 | 0.81 | 1,17 |
| | | | 0.079 | 2,00 | 0.85 | 1,23 |
| | | | 0.089 | 2,25 | 0.94 | 1,37 |
| | | | 0.104 | 2,65 | 1.09 | 1,58 |
| 1 | 1.327 | 33,70 | 0.059 | 1,50 | 0.82 | 1,19 |
| | | | 0.075 | 1,90 | 1.03 | 1,49 |
| | | | 0.079 | 2,00 | 1.08 | 1,56 |
| | | | 0.089 | 2,25 | 1.20 | 1,75 |
| | | | 0.104 | 2,65 | 1.40 | 2,03 |
| | | | 0.118 | 3,00 | 1.57 | 2,27 |
| | | | 0.132 | 3,35 | 1.73 | 2,51 |
| 1 1/4 | 1.669 | 42,70 | 0.059 | 1,50 | 1.04 | 1,51 |
| | | | 0.075 | 1,90 | 1.31 | 1,90 |
| | | | 0.079 | 2,00 | 1.38 | 1,99 |
| | | | 0.089 | 2,25 | 1.54 | 2,23 |
| | | | 0.104 | 2,65 | 1.79 | 2,60 |
| | | | 0.118 | 3,00 | 2.01 | 2,91 |
| | | | 0.132 | 3,35 | 2.23 | 3,23 |
| 1 1/2 | 1.900 | 48,30 | 0.059 | 1,50 | 1.20 | 1,73 |
| | | | 0.075 | 1,90 | 1.50 | 2,17 |
| | | | 0.079 | 2,00 | 1.58 | 2,28 |
| | | | 0.089 | 2,25 | 1.76 | 2,56 |
| | | | 0.104 | 2,65 | 2.06 | 2,98 |
| | | | 0.118 | 3,00 | 2.31 | 3,35 |
| | | | 0.132 | 3,35 | 2.56 | 3,71 |
| | | | 0.148 | 3,75 | 2.84 | 4,12 |
| | | | 0.167 | 4,25 | 3.19 | 4,62 |



| Grade | Outside diameter | | Wall thickness | | Nominal masses | |
|---|---|---|---|---|---|---|
| | inch | mm | inch | mm | lb/ft | kg/m |
| 2 | 2 3/8 | 60,30 | 0.148 | 3,75 | 3.61 | 5,23 |
| | | | 0.167 | 4,25 | 4.06 | 5,87 |
| | | | 0.177 | 4,50 | 4.28 | 6,19 |
| | | | 0.187 | 4,75 | 4.49 | 6,51 |
| 2 1/2 | 2 7/8 | 73,00 | 0.148 | 3,75 | 4.30 | 6,40 |
| | | | 0.167 | 4,25 | 4.84 | 7,20 |
| | | | 0.177 | 4,50 | 5.11 | 7,60 |
| | | | 0.187 | 4,75 | 5.37 | 7,99 |
| | | | 0.248 | 6,30 | 6.96 | 10,36 |
| 3 | 3 1/2 | 88,90 | 0.148 | 3,75 | 5.29 | 7,87 |
| | | | 0.167 | 4,25 | 5.96 | 8,87 |
| | | | 0.187 | 4,75 | 6.62 | 9,85 |
| | | | 0.197 | 5,00 | 6.95 | 10,34 |
| | | | 0.248 | 6,30 | 8.62 | 12,83 |
| | | | 0.315 | 8,00 | 10.72 | 15,95 |
| 4 | 4 1/2 | 114,30 | 0.148 | 3,75 | 6.87 | 10,22 |
| | | | 0.167 | 4,25 | 7.75 | 11,53 |
| | | | 0.177 | 4,50 | 8.19 | 12,19 |
| | | | 0.187 | 4,75 | 8.62 | 12,83 |
| | | | 0.248 | 6,30 | 11.27 | 16,77 |
| | | | 0.315 | 8,00 | 14.09 | 20,97 |
| 5 | 5 1/2 | 139,70 | 0.148 | 3,75a | 8.45 | 12,57 |
| | | | 0.167 | 4,25 | 9.54 | 14,20 |
| | | | 0.177 | 4,50 | 10.08 | 15,00 |
| | | | 0.187 | 4,75 | 10.62 | 15,81 |
| | | | 0.248 | 6,30 | 13.93 | 20,72 |
| | | | 0.315 | 8,00 | 17.46 | 25,98 |
| 6 | 6 1/2 | 165,10 | 0.148 | 3,75a | 10.03 | 14,92 |
| | | | 0.167 | 4,25 | 11.33 | 16,86 |
| | | | 0.177 | 4,50 | 11.98 | 17,82 |
| | | | 0.187 | 4,75 | 12.62 | 18,78 |
| | | | 0.248 | 6,30 | 16.58 | 24,67 |
| | | | 0.315 | 8,00 | 20.83 | 30,99 |
| 6 | 6 5/8 | 168,30 | 0.148 | 3,75a | 10.22 | 15,21 |
| | | | 0.167 | 4,25 | 11.55 | 17,19 |
| | | | 0.177 | 4,50 | 12.21 | 18,17 |
| | | | 0.187 | 4,75 | 12.87 | 19,15 |
| | | | 0.248 | 6,30 | 16.91 | 25,17 |
| | | | 0.315 | 8,00 | 21.25 | 31,62 |

| Grade | Outside diameter | | Wall thickness | | Nominal masses | |
|---|---|---|---|---|---|---|
| | inch | mm | inch | mm | lb/ft | kg/m |
| 7 | 7 | 177,8 | 0.148 | 3,75[a] | 10.81 | 16,09 |
| | | | 0.167 | 4,25[a] | 12.22 | 18,19 |
| | | | 0.187 | 4,75 | 13.62 | 20,27 |
| | | | 0.248 | 6,30 | 17.90 | 26,64 |
| | | | 0.315 | 8,00 | 22.51 | 33,50 |
| 8 | 8 5/8 | 219,1 | 0.148 | 3,75[a] | 13.38 | 19,91 |
| | | | 0.167 | 4,25[a] | 15.13 | 22,52 |
| | | | 0.177 | 4,50[a] | 16.00 | 23,81 |
| | | | 0.187 | 4,75 | 16.87 | 25,11 |
| | | | 0.248 | 6,30 | 22.21 | 33,05 |
| | | | 0.315 | 8,00 | 27.98 | 41,64 |

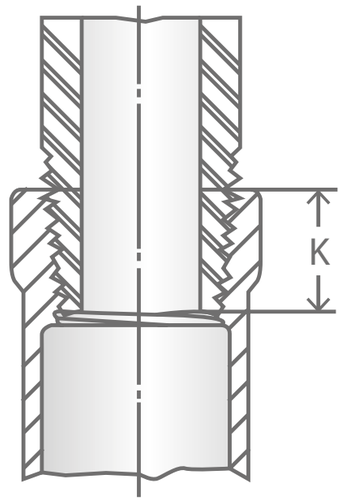


# Tabelas e cálculos úteis

| EQUIVALÊNCIA ENTRE DESIGNAÇÕES DE BITOLAS E DIÂMETROS NOMINAIS – NORMAS DE TUBOS PARA CONDUÇÃO | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SISTEMA INGLÊS (pol) | ¼" | 3/8" | ½" | ¾" | 1" | 1 ¼" | 1 ½" | 2" | 2 ½" | 3" | 4" | 5" | 6" |
| SISTEMA MÉTRICO (mm) | 8 | 10 | 15 | 20 | 25 | 32 | 40 | 50 | 65 | 80 | 100 | 125 | 150 |

# Roscas

| DIA. NOMINAL | COMPRIMENTO DE ROSCA ÚTIL (K) | | | | | |
|---|---|---|---|---|---|---|
| | ROSCA BSP (ISO 7.1) | | PASSO (Nº DE FIOS) | | ROSCA NPT ANSI/ASME B1.20.1 | |
| | MIN (mm) | MAX (mm) | BSP | NPT | MIN (mm) | MAX (mm) |
| ½" | 11,4 | 15,0 | 14 | 14 | 11,4 | 15,0 |
| ¾" | 12,7 | 16,3 | 14 | 14 | 12,7 | 16,3 |
| 1" | 14,5 | 19,1 | 11 | 11,5 | 14,5 | 19,1 |
| 11/4" | 16,8 | 21,4 | 11 | 11,5 | 16,8 | 21,4 |
| 11/2" | 21,1 | 25,7 | 11 | 11,5 | 16,8 | 21,4 |
| 2" | 23,2 | 30,2 | 11 | 8 | 21,1 | 25,7 |
| 21/2" | 26,3 | 33,3 | 11 | 8 | 23,2 | 30,2 |
| 3" | 32,3 | 39,3 | 11 | 8 | 16,3 | 33,3 |
| 4" | 36,6 | 43,6 | 11 | 8 | 32,3 | 39,3 |
| 6" | 36,6 | 43,6 | 11 | 8 | ------ | ------ |



APOLO

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