

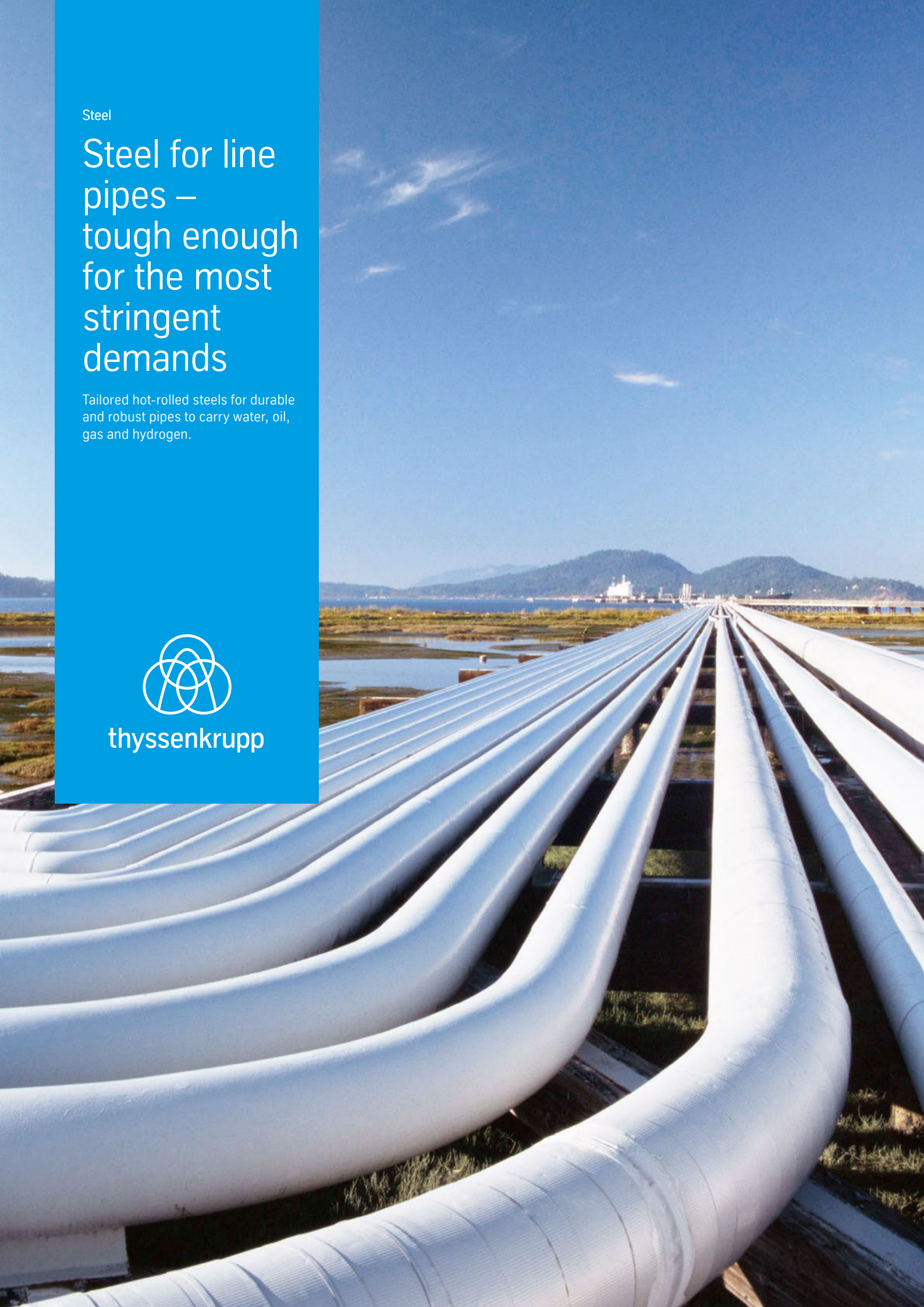
Steel

# Steel for line pipes – tough enough for the most stringent demands

Tailored hot-rolled steels for durable and robust pipes to carry water, oil, gas and hydrogen.



thyssenkrupp





High standards, complex regulations, exposure to extreme environmental pressures – the demands placed on pipeline transportation systems are stringent and ever changing. And no two projects are alike. thyssenkrupp supplies steels for line pipes and know-how both for oil, gas and water as well as for hydrogen (H<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) transportation. Since the 1950s, pipeline projects all over the world have relied on us for custom solutions to master the toughest challenges.



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# Steels for line pipes – expertise to build on

Steels for line pipes from thyssenkrupp are engineered to meet the exacting requirements of the energy and chemicals industries. In decades of close cooperation with line pipe manufacturers and pipeline construction companies, we have developed a tailored portfolio of hot-rolled steels that precisely meets the needs of pipeline projects.

## Your advantages at a glance



Thicknesses up to 25.4 millimeters and widths up to 2,000 millimeters



Special grades for the transport of hydrogen (H<sub>2</sub>) as well as for sour oil and gas, tested in our HIC lab



Coil weights of up to 36 metric tons



Longitudinal welding of pipes up to 24 inches in diameter

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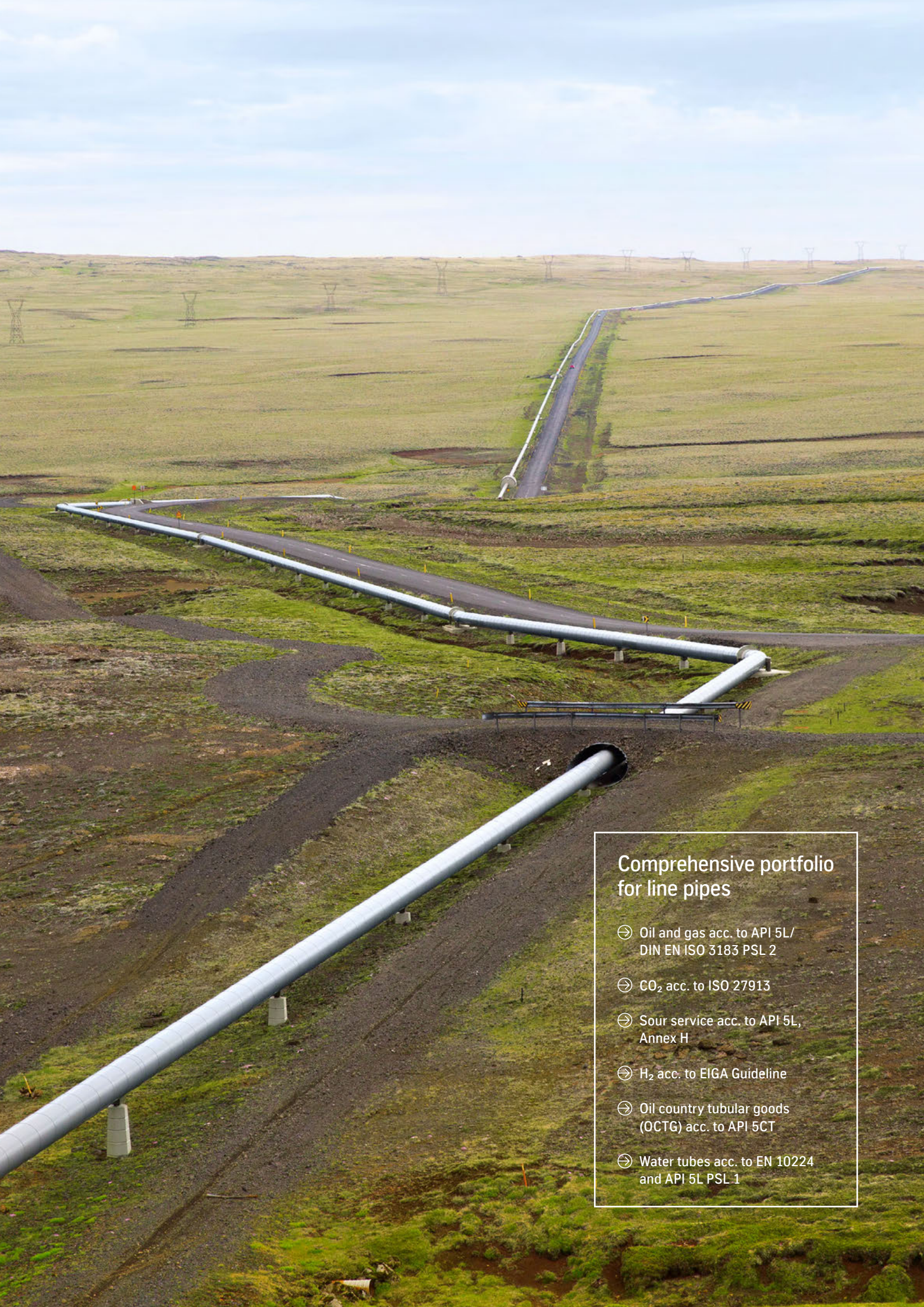


# Qualities you can count on

Only steel of 100% reliable quality is tough and dependable enough for your line pipes. For this reason, our hot-rolled steel for pipes undergoes constant quality control at each processing stage, from primary material to final manufacture.

Available according to standards like API, DIN EN ISO and EIGA, in various widths and coil weights as well as special corrosion-resistant grades, it is characterized by excellent weldability, extreme toughness and consistently precise thickness. Testing for resistance to hydrogen induced cracking (HIC) in our HIC lab guarantees maximum reliability in pipelines for sour oil and gas.





## Comprehensive portfolio for line pipes

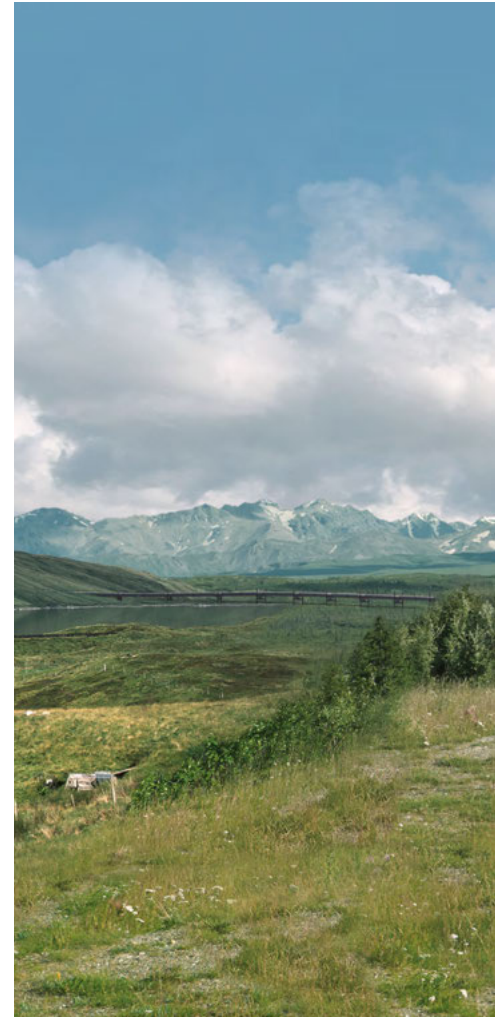
- ⊕ Oil and gas acc. to API 5L/  
DIN EN ISO 3183 PSL 2
- ⊕ CO<sub>2</sub> acc. to ISO 27913
- ⊕ Sour service acc. to API 5L,  
Annex H
- ⊕ H<sub>2</sub> acc. to EIGA Guideline
- ⊕ Oil country tubular goods  
(OCTG) acc. to API 5CT
- ⊕ Water tubes acc. to EN 10224  
and API 5L PSL 1



# Partnering right down the line

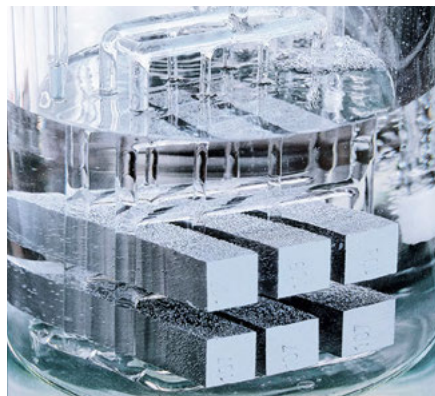
Whatever grade of line pipe steel you're looking for, we can offer the entire spectrum: from steel to produce pipes according to API 5L/DIN EN ISO 3183, EN 10224, API 5CT, ISO 27913 and EIGA Guideline or even customized steel grades based on customer specification.

In addition to our hot-rolled steels for durable and robust line pipes, thyssenkrupp is your reliable partner with the expertise and resources to support you in every aspect of processing. Vast experience as well as our in-house testing laboratories place us in a unique position to develop tailor-made solutions. Assistance with various welding techniques is also included. Your advantage: minimized risk of setbacks and enhanced project efficiency throughout.



## HIC laboratory

Our state-of-the-art corrosion laboratory located in Duisburg, Germany tests steels for resistance to sour media: HIC test (hydrogen induced cracking) and HSCC test (hydrogen sulfide stress cracking) in accordance with the requirements of API 5L and NACE. Certified according to DIN EN ISO/IEC 17025, DaKKs and accredited according to ARAMCO regulations.

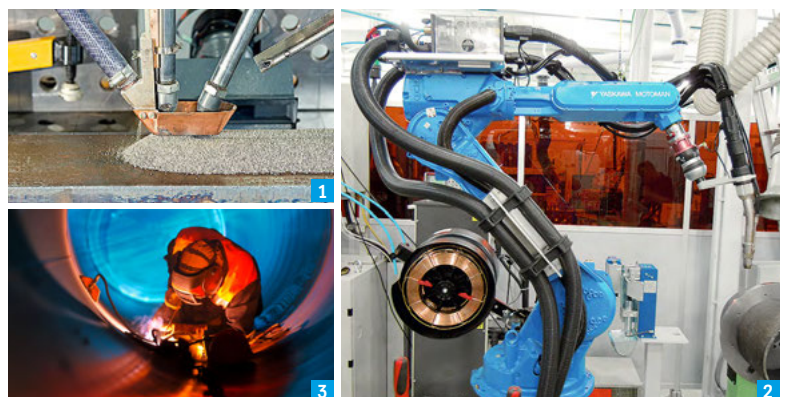




**1 Submerged arc welding** including single, tandem, double-wire and narrow-gap welding. **2 Gas metal arc welding** including single- and double-wire welding as well as impulse and flux-cored filler wire welding. **3 Manual arc welding** with all standard electrodes.

## Welding laboratory

Assistance with various welding techniques, including submerged arc, gas metal arc and laser welding. In addition, our welding experts in the welding laboratory are at your disposal for any questions and carry out simulations or test welds.



# The right grade for your demands

Our portfolio for line pipes includes all relevant grades available in various thicknesses and widths. Depending on the specific requirements of your project, our experts will advise you on the most suitable material. We offer coil weights of up to 36 metric tons or flexible agreement of target weights on request.

## Steel for line pipes

	Thickness <sup>1</sup> from_to in mm	Width <sup>1</sup> max. in mm	Thickness <sup>1</sup> from_to in mm	Width <sup>1</sup> max. in mm
For the transport of oil and other flammable liquids, natural gas and other gaseous media and for CO <sub>2</sub> transportation				
<b>API 5L/DIN EN ISO 3183 PSL 2 + DWTT</b>				
Steel grade	API 5L/DIN EN ISO 3183 PSL 2 <sup>1</sup>		With Battelle drop weight tear test (DWT test) <sup>3</sup>	
L245/Grade B	3.00–25.40	2,000	on request	on request
L290/X42	3.00–25.40	2,000	on request	on request
L360/X52	3.00–25.40	2,000	on request	on request
L415/X60	3.00–25.40	1,900	6.00–14.00	1,600
L450/X65	3.00–25.40	1,900	6.00–23.00	1,700
L485/X70	3.00–23.00	1,900	6.00–23.00	1,700
L555/X80	on request	on request	on request	on request

<sup>1</sup>Not all thickness and width combinations are possible. <sup>2</sup>As-delivered condition +N: Grade B, X42, X52, as-delivered condition +M: all grades.

<sup>3</sup>No requirements for this steel grade according to API/DIN EN ISO; Steel grades ≤ X52 on request.







### Steel for line pipes \_ continued

Thickness<sup>1</sup>  
from \_ to in mm

Width<sup>1</sup>  
max. in mm

#### API 5L Annex H PSL 2 + Sour Service

##### Steel grade

L245/Grade B	3.00–25.40	2,000
L290/X42	3.00–25.40	2,000
L360/X52	3.00–25.40	2,000
L415/X60	3.00–16.00	1,600
L450/X65	3.00–16.00	1,600
L485/X70	on request	on request

<sup>1</sup>Not all thickness and width combinations are possible.

### Steel for the transport of hydrogen (H<sub>2</sub>)

Thickness<sup>1</sup>  
from \_ to in mm

Width<sup>1</sup>  
max. in mm

#### EIGA Guideline IGC Doc 121/14

##### Steel grade

X42	3.00–25.40	2,000
X52	3.00–25.40	2,000

#### H<sub>2</sub> readiness based on API 5L

##### Steel grade

X60	on request	on request
X65	on request	on request
X70	on request	on request

<sup>1</sup>Not all thickness and width combinations are possible.



### Steel for oil country tubular goods (OCTG)

	Thickness <sup>1</sup> from _ to in mm	Width <sup>1</sup> max. in mm
<b>API 5CT</b>		
Steel grade		
H40	5.00–25.40	2,000
J55	5.00–25.40	2,000
K55 and higher	5.00–25.40	2,000

<sup>1</sup>Not all thickness and width combinations are possible.

### Steel for water tubes

	Thickness <sup>1</sup> from _ to in mm	Width <sup>1</sup> max. in mm
<b>EN 10224</b>		
Steel grade		
L235	3.00–25.40	2,000
L275	3.00–25.40	2,000
L355	3.00–25.40	2,000

### API 5L PSL 1

	Thickness <sup>1</sup> from _ to in mm	Width <sup>1</sup> max. in mm
Steel grade		
L245 /Grade B	3.00–25.40	2,000
L290/X42	3.00–25.40	2,000
L360/X52	3.00–25.40	2,000
L415/X60	3.00–25.40	2,000
L450/X65	3.00–25.40	2,000
L485/X70	3.00–25.40	2,000
L555/X80	on request	on request

<sup>1</sup>Not all thickness and width combinations are possible.



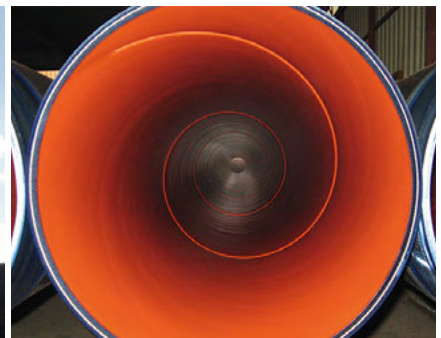
### Delivery details and product specification

Coil ID	762 mm +/-7% (30 inches +/-2 inches)
Coil OD	max. 2,150 mm/max. 85 inches
Coil weight	max. 36 mt
Coil width	max. 2,030 mm/max. 80 inches
Thickness	max. 25.4 mm/max. 1.0 inches

### Specific coil weight

16–23.5 kg/mm for min. 90% of the deliveries, 8–16 kg/mm for max. 10% of the deliveries<sup>1</sup>

<sup>1</sup>Not all thickness and width combinations are possible.





## thyssenkrupp – a partner who understands its business. And yours.

Our mission is to advance your business – through sound advice, individual and innovative solutions and fulfillment of your specific needs. Our extensive technological know-how, gained over many years, makes this possible. As does our ability to see things the way you do. This enables us to develop an in-depth understanding of your business model. Our brand promise says it all: “engineering. tomorrow. together.” Because when it comes to finding successful solutions for tomorrow, the closer we cooperate the better.

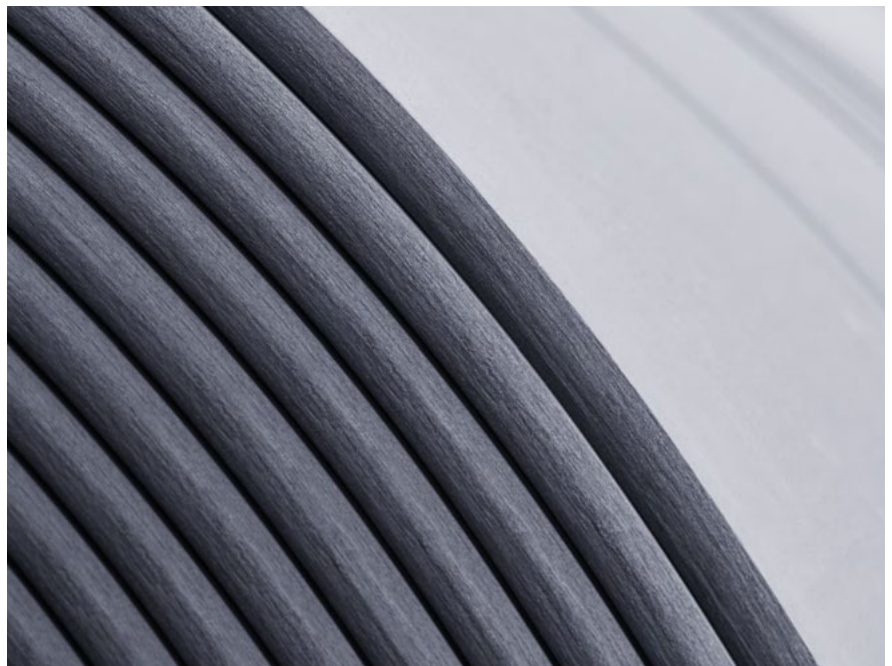


### Comprehensive customer support.

Turn to our Technical Customer Service for full support in the selection and processing of our pipeline steel for your project. Our experts will help you with all aspects of project logistics and coil-to-pipe processing, providing answers to structure- and forming-related issues, product training and optimization of fabrication processes.

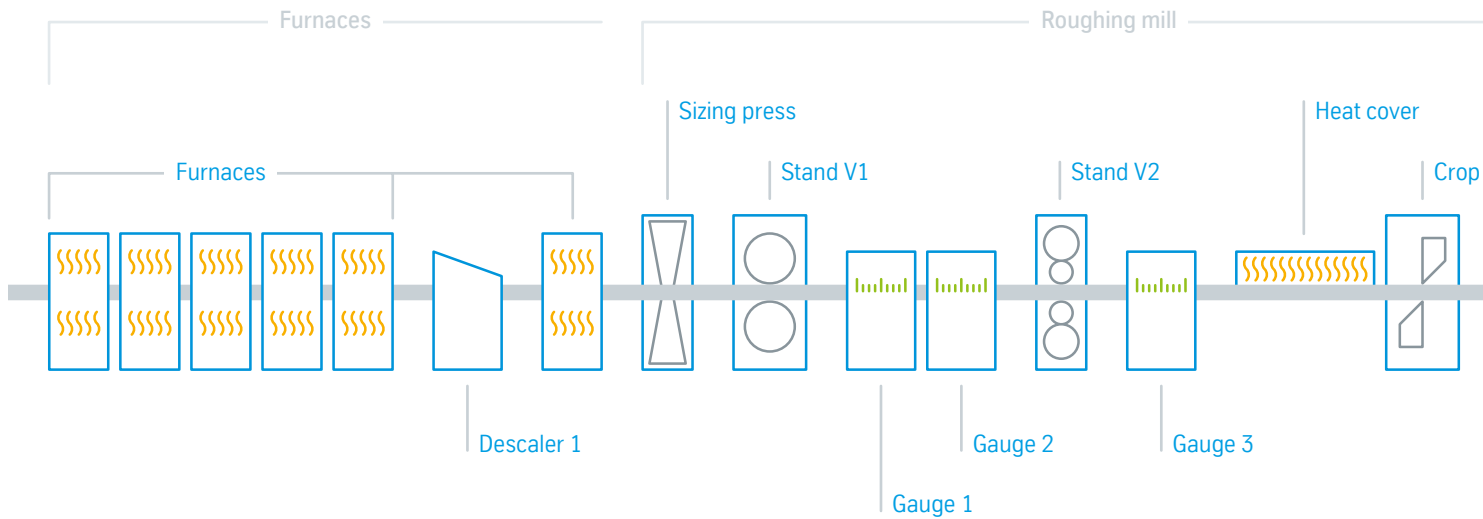
### Custom services.

To ensure you precisely get the right product in the right place at the right time, we provide highly efficient logistics services for targeted delivery of pipeline steel. In addition, we offer custom prefabrication to meet your project needs.



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## Schematic layout of hot strip mill 2



### Facts at a glance

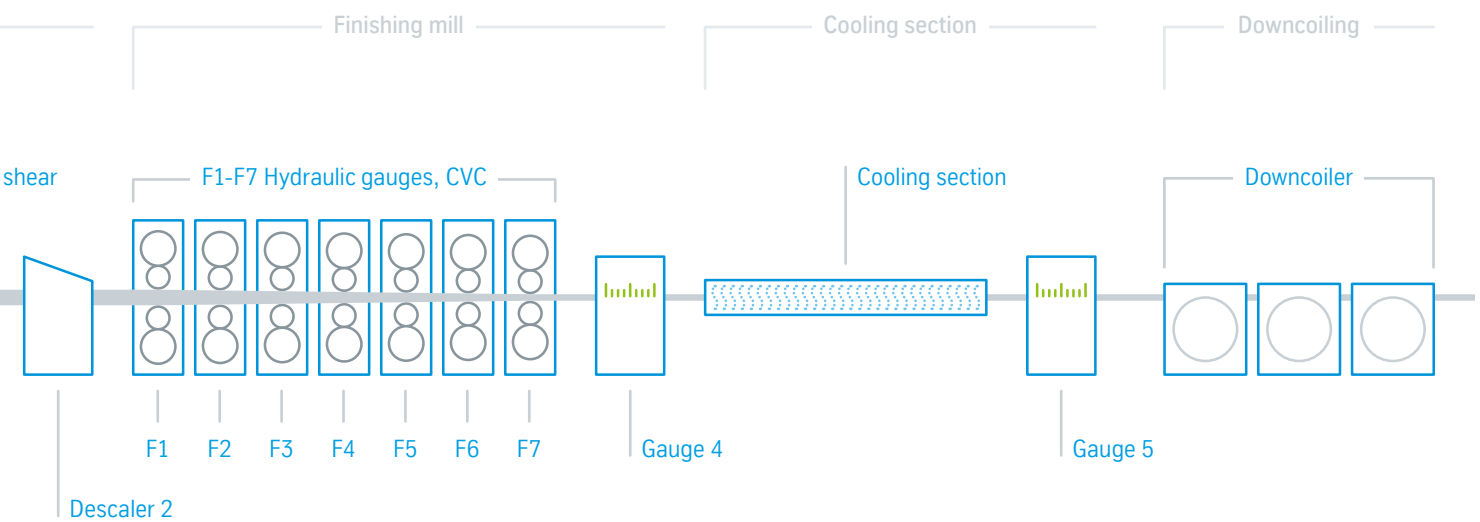
Width: max. 2,030 mm  
 Thickness: max. 25.40 mm  
 Coil weight: 36 t

- ⌚ 4 Pusher furnaces
- ⌚ 2 Walking beams
- ⌚ 1 Sizing press
- ⌚ 1 Two-high reversing stand
- ⌚ 1 Four-high reversing stand
- ⌚ 7 Four-high stands

Latest modernisation in 2022: construction of a new walking beam, which is aimed at further revamping and flexibilizing the plant. The walking beam furnace ensures that surface defects are prevented during the re-heating and rolling of slabs. This is achieved by special lifting and lowering devices, which prevent damage to the surfaces of the slabs weighing up to 36 tons.







## Hot strip manufacture

Our hot strip mill 2 at the Duisburg location is fully automated and equipped with state-of-the-art computer systems for the control and regulation of the production process and for continuous supervision of the material flow pattern, while concurrently monitoring and documenting the actual condition and location of the respective material.

The production sequence is subdivided into:

- ⊖ Preparation and sorting the slabs
- ⊖ Heating the slabs
- ⊖ Rolling the slabs to hot-rolled wide strip
- ⊖ Cooling and coiling the hot-rolled wide strip

The slabs are heated up to rolling temperature in gas-fired furnaces. Rolling starts on the roughing train and is completed on the 7-stand finishing train in a semi- to three-quarter-continuous rolling process. Leading-edge instrumentation monitors the exact adherence to thickness, width, profile, flatness and temperature specifications. In the framework of quality management, these measuring instruments are subject to constant inspection (calibration, maintenance). Adherence to strict thickness tolerances is assured through a hydraulic gauge control system.

To produce desired steel grades, rolling temperature and strip cooling must be coordinated. The hot strip mill is equipped with high-pressure pumps and height-adjustable nozzle bars (intensive cooling zone) in order to achieve the highest possible cooling rates if required. After cooling, the strip is coiled in one of the three downcoilers. In addition to the online checks performed by surface inspection systems, a measuring and sampling station at the downcoiler carries out a final inspection of the finished hot strip.



## Steel

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