

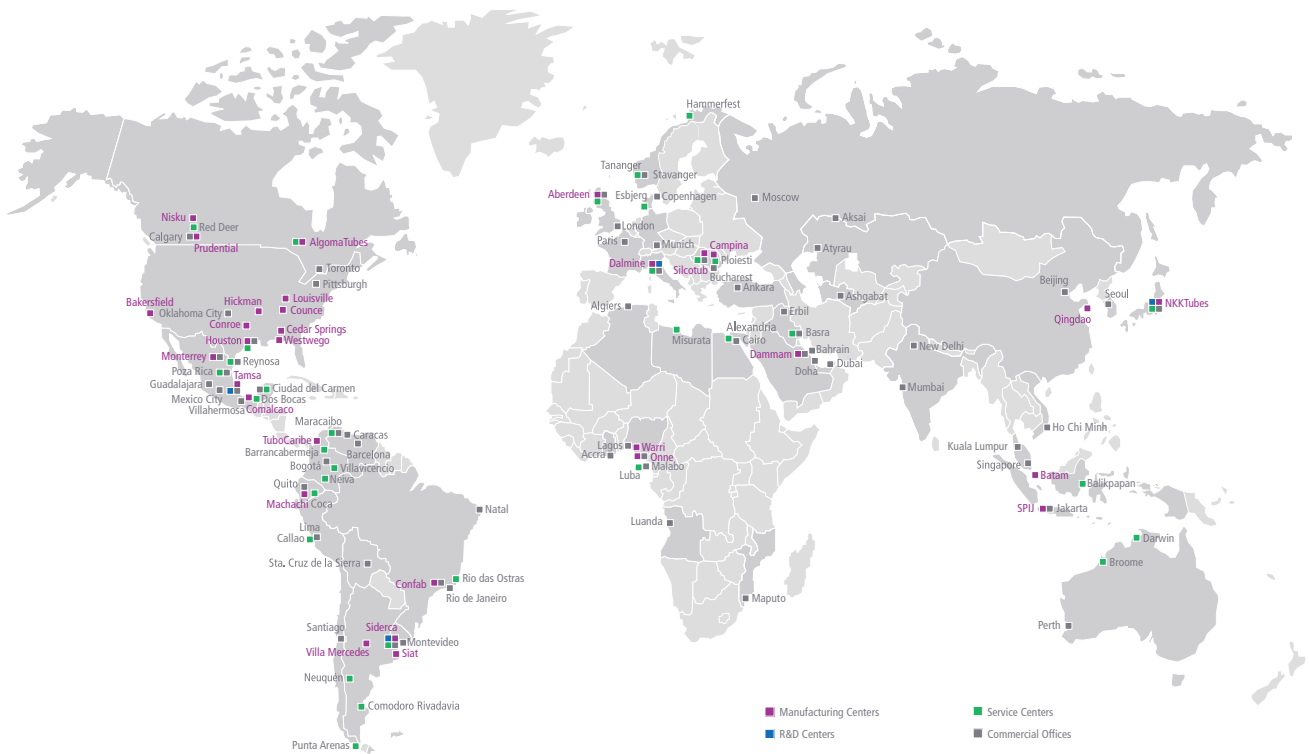
Cylinders for high pressure gases



Tenaris

Tenaris is the leading global manufacturer and supplier of tubular products and services used in the drilling, completion and production of oil and gas and a leading supplier of tubular products and services used in process and power plants and in specialized industrial and automotive applications.

Through our integrated global network of manufacturing, R&D and service facilities, we are working with our customers to meet their needs for the timely supply of high performance products in increasingly complex operating environments. Tenaris has annual revenues of US\$10.8 billion and 26,500 employees worldwide.



Tenaris Gas Cylinders

- Seamless steel high pressure cylinders with working pressures up to 400 bar and above. and/or storage of gases.
- Large capacity cylinders for transportation and/or storage of high pressure gas.
- Assembled Systems for transport



Tenaris is a leader in production of cylinders for compressed gas with a fully integrated cycle including steel casting, seamless hollows rolling, gas cylinders forging and finishing.



In addition to the large range of standard products, Tenaris is also able to manufacture special products designed and set-up with the customers, on the basis of their specific needs. A complete series of accessories can be supplied on request.

The quality assurance system, conforming to the ISO 9001:2008 standard, is recognized by the major producers and distributors of technical gases, for export to all European countries and the majority of the world. Tenaris is also approved to sell vessels in the United States and Canada.

Tenaris has also received the ISO TS 16949 certification for use of gas cylinders in the automotive business.

A broad production range for every type of gas

- Special products to customer specifications
- Accessories supplied and fitted on request

Tenaris cylinders can be supplied with:

- Shot blasted internal surface
- External surface painted on a primer layer according to specification
- Stamping and inspection according to the requested standards



In addition to traditional vessels, Tenaris produces cylinders for:

- Fire extinguishers
- Medical applications
- Alimentary uses
- Compressed Natural Gas Vehicles

DIMENSIONAL RANGE								
APPLICATION	Working pressure		Test pressure		External diameter		Capacity	
	bar	psi	bar	psi	mm	inch	l	lb
Technical gases	200	2900	300	4350	168,3	6. 5/8	from 14 to 30	from 31 to 66
	200	2900	300	4350	177,8	7	from 20 to 30	from 31 to 66
	200	2900	300	4350	203	8	from 14 to 40	from 44 to 88
	200	2900	300	4350	227-229	8. 94 - 9	from 27 to 60	from 60 to 132
	300	4350	450	6525	227-229	8. 94 - 9	from 27 to 60	from 60 to 132
Acetylene	15-19	218-276	60	870	203	8	from 14 to 40	from 31 to 88
	15-19	218-276	60	870	227-229	8. 94 - 9	from 27 to 60	from 60 to 132
	200	2900	300	4350	168,3	6. 5/8	from 14 to 20	from 31 to 44
	200	2900	300	4350	203	8	from 20 to 40	from 44 to 88
CNG (Compressed Natural Gas for vehicles)	200	2900	300	4350	227-229	8. 94 - 9	from 30 to 60	from 66 to 132
	200	2900	300	4350	244	9. 5/8	from 30 to 75	from 66 to 165
	200	2900	300	4350	273	10. 3/4	from 35 to 95	from 77 to 209



Identification of contents

Identification of manufacturer

Country of origin

Thread identification

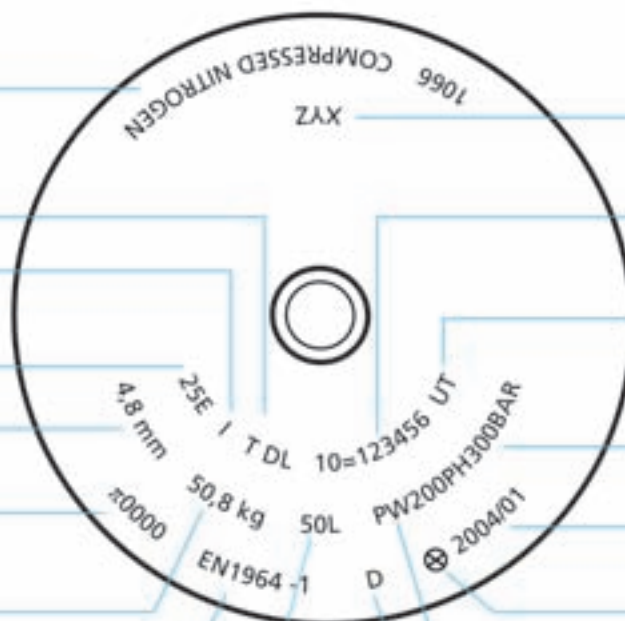
Minimum wall thickness

TPED conformity mark

Empty weight

Reference standard

Water capacity



Customer identification

Manufacturer's serial number

Non-destructive test mark

Test pressure

Test date

Stamp of expert

Working pressure

Country of notified body

The Quality Assurance System

The production cycle meets all the international standards, conforms to ISO 9001:2008 and has been approved by Lloyd's Register of Shipping, which has given Tenaris the first group certificate (R001) certifying that all the production units conform to the requirements of ISO 9001:2008.

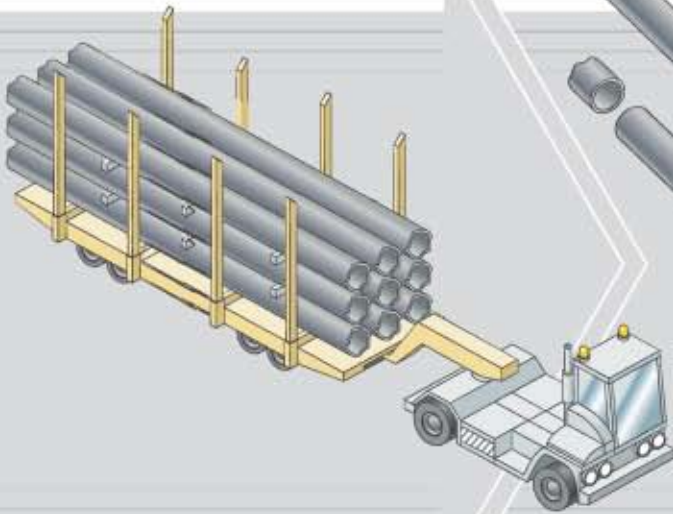
Furthermore, Tenaris products respect the requirements of the main international standards.

Tenaris gas cylinders products for the automotive business also hold the ISO TS 16949 certification.

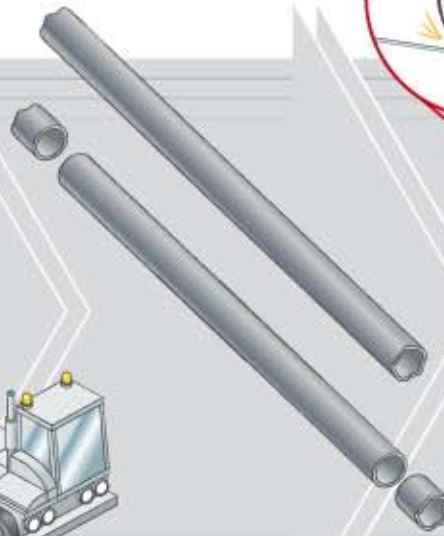
STANDARDS AND TECHNICAL REGULATIONS			
	EUROPEAN COMMUNITY DIRECTIVES	STANDARDS AND TECHNICAL REGULATIONS	
		INTERNATIONAL or internationally recognized	NATIONAL
Cylinders for transport	2010/35/EU (TPED)	EN 1964	DOT3AA
		ISO 9809	BS 5045
		84/525/EC	TRG 310
		DOT3AA	DRIRE
		BS 5045	GB5099
			IRAM 2526
Cylinders for portable extinguishers	97/23/EC (PED)	EN 1964	
		84/525/EC	
Natural gas cylinders for vehicles		ISO 11439	D.M. 12.09.25
		ECE-ONU R.110	
Tubes for transport	2010/35/EU (TPED)	EN ISO 11120	DOT3AAX
		DOT3AAX	DOT3T
		DOT3T	
Large capacity vessels for storage	97/23/EC (PED)	BS 5045	AD-Merkblatt
		ASME VIII DIV. 1	VSR
			BS 5045
			DRIRE + CODAP
			ASME VIII DIV. 1
Vessels for marine and offshore applications		Lloyd's Register of Shipping	American Bureau of Shipping
		American Bureau of Shipping	R.I.Na.
		Det Norske Veritas	
Shells for accumulators	97/23/EC (PED)	ASME VIII DIV. 1	AD-Merkblatt
		AD-Merkblatt	BS 7201
			ASME VIII DIV. 1

Large Gas Cylinders Production Cycle

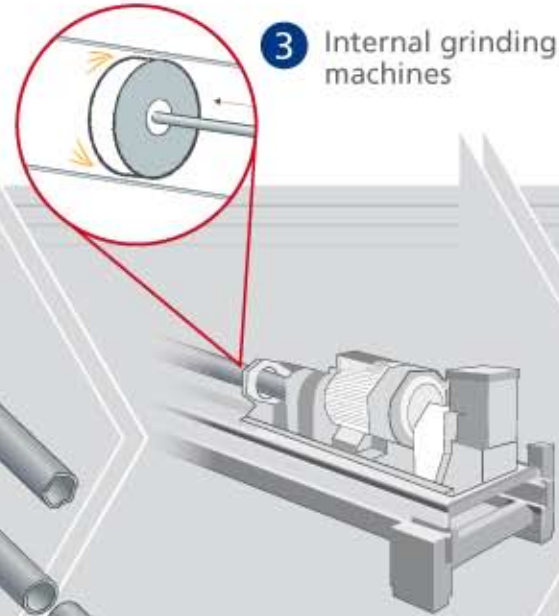
1 Tubes arrival from Dalmine Expander Mill



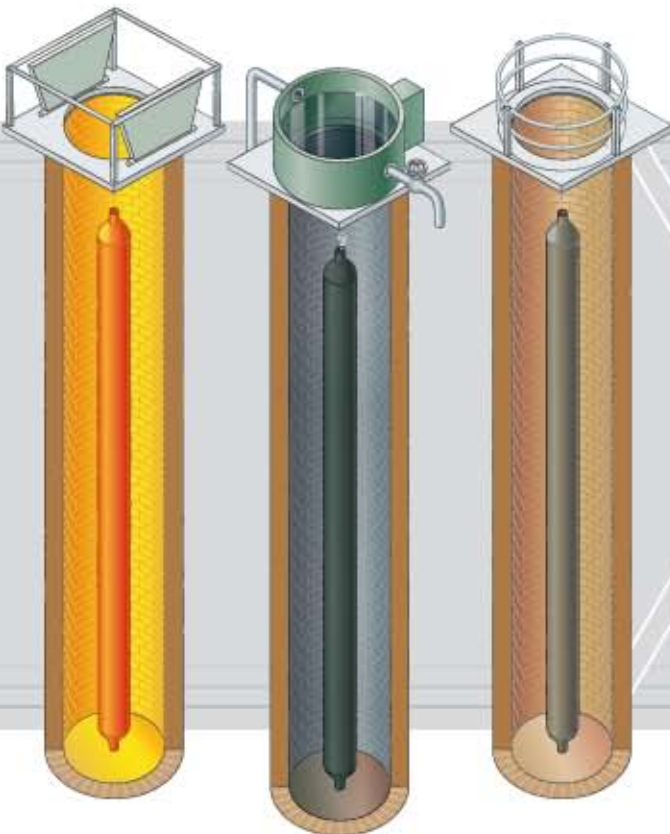
2 Cutting tubes into lengths



3 Internal grinding machines



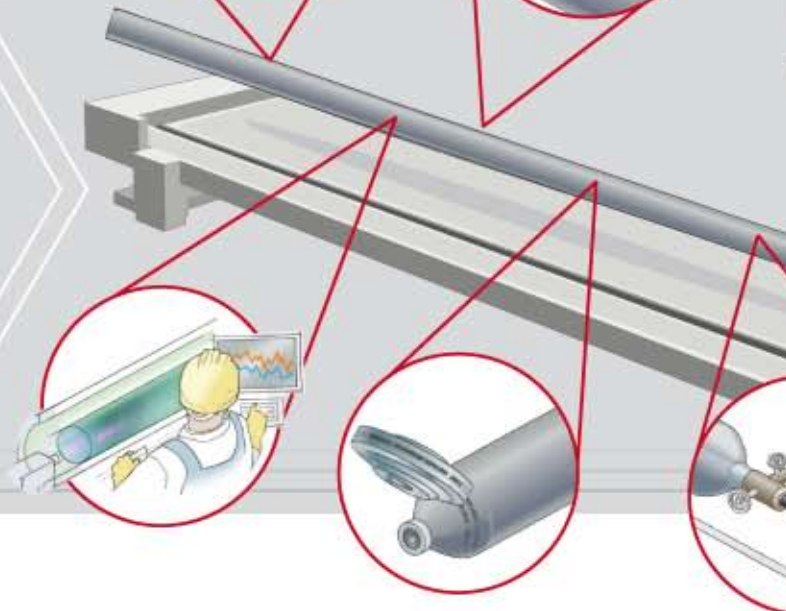
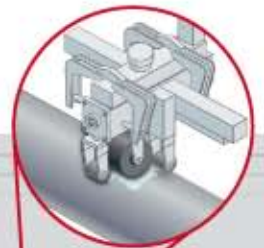
7 Vertical heat treatment (internal & external austenitization, internal & external quenching in chemical (water, tempering)



8 Hardness check on the whole tube length



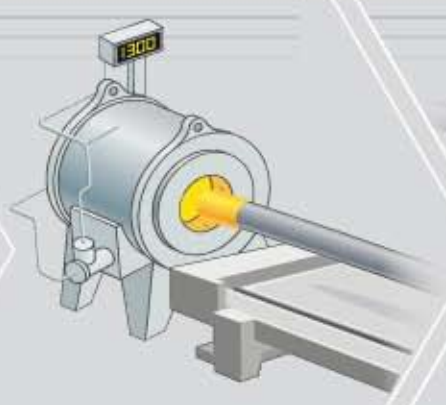
9 Ultrasonic test



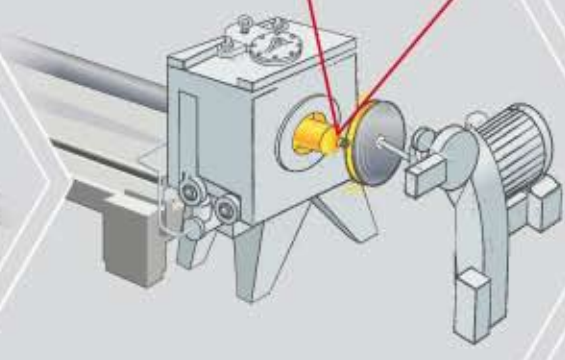
11 Magnetic particles test

12 Die stamping & coding machine

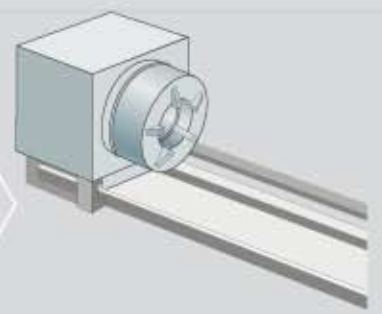
4 End heating furnaces



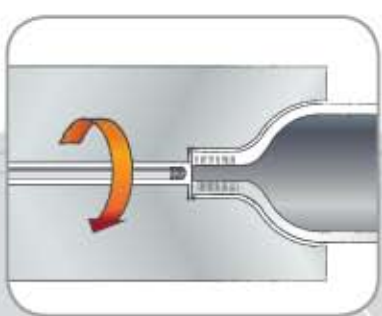
5 End forging through spinner machine



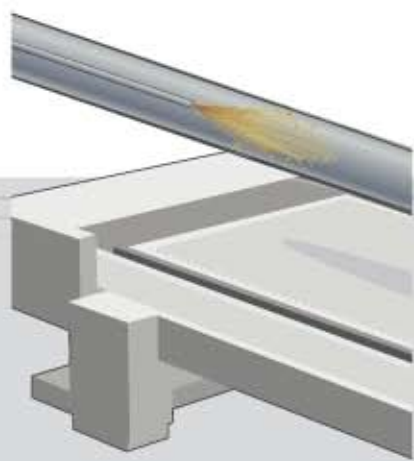
6 Internal boring



10 End threading machines



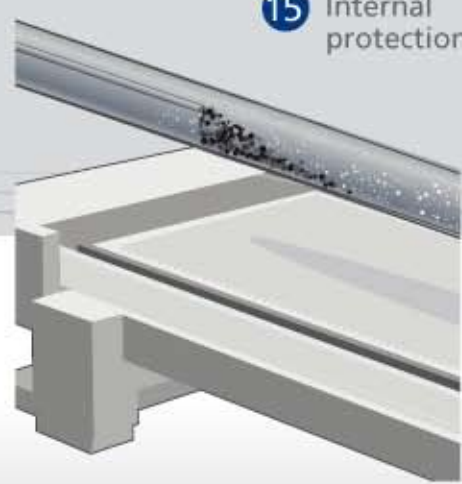
14 Internal deep cleaning



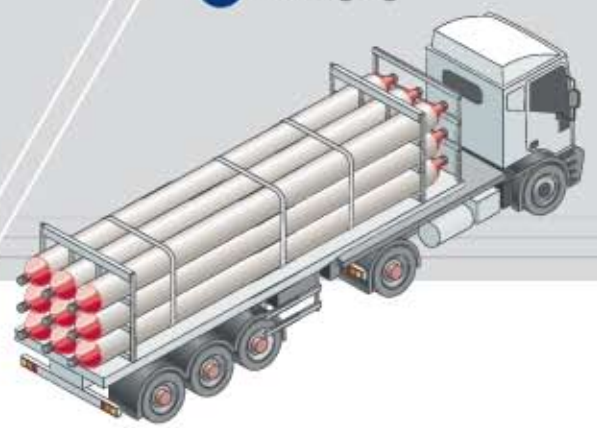
16 External painting



15 Internal protection



17 Packaging



13 Hydraulic test and/or water jacket



High pressure cylinders for CNG applications

Tenaris pays attention to the environment as one of its key mission points and produces cylinders for the on-board storage of natural gas according to ISO 11439 and ECE-ONU R110 standards.

These norms provide for adoption of automatic safety devices that, in case of an accident, allow a controlled discharge of the gas and pass the most severe tests, among which are, for example, 'bonfire test' and 'bullet penetration test'. The 'bonfire test' simulates a fire on board the vehicle by using a large flame to cause a cylinder under pressure to heat and verifies the integrity of the vessel up to the point when the safety device opens to allow the gas to evacuate completely.

The 'bullet penetration test' checks, by means of the impact of a bullet fired from a gun, that the complete penetration of the cylinder wall under pressure by a foreign body does not cause anything other than a hole of minimum size.

This allows Tenaris to supply the main automotive companies globally.



Special products

Tenaris is able to manufacture special products designed and set-up with the customers, on the basis of their specific needs. Special products include accumulators for the offshore industry, high speed die casting, etc.



Large diameter vessels

Tenaris is one of the few manufacturers in the world to have an Expander Rolling Mill for large diameter seamless tube production.

This makes possible to produce high quality vessels with tight tolerances for every type of industrial use, for the gas storage and transportation.



VESSELS FOR TRANSPORT AND STORAGE OF GAS	
Working pressure	up to 400 bar - 5,800 psi
Outside diameter	from 273 to 660 mm - from 10 3/4 to 28 inch
Capacity	from 100 to 3.000 l - from 220 to 6614 lb and more
Length	from 1.700 to 12.192 mm - from 5,58 to 40 feet

Special vessels with larger dimensions and capacity can be designed and manufactured on request.

Vertical integration

Tenaris can satisfy the most diversified equipment needs for transport and storage of fluids compressed at high pressure, and makes available to the customer its own technical resources and experience, from the initial development phases of every of equipment type.

The application field features road transport equipment for compressed gases, systems for storage of pressurized fluids in fixed industrial installations, on-ship or off-shore equipment, extinguishing fluid accumulator systems for fire-fighting facilities.

There is considerable commitment to leading-edge environmental projects like accumulator systems at filling stations for CNG and hydrogen powered vehicles, large tanks for biogas storage (methane-rich gas obtained exclusively from biomass fermentation) for industrial vehicle fleets and urban public transport bus refilling stations, as well as compressed gas storage to regulate pneumatically turbine blade trim in wind-driven power stations.

For all these applications Tenaris can rely on an extensive R&D activity.



Advanced R&D activity

Tenaris can rely on an integrated network of researchers and experts worldwide, through its own R&D Centers in Italy, Mexico, Argentina and Japan - each one with its own field of specialization - and the most important Universities and Research Centers. Together we work both on the finished product and the process technology in order to develop ever more efficient and advanced technical solutions.

The Tenaris R&D Center in Italy, inside the Dalmine mill, is specialized in hot rolling of hollows and in product development for industrial and thermal applications. The Center coordinates the research and development activities on high-pressure gas cylinders through the collaboration with recognized national and international research institutes and universities.

As safety and reliability are essential requirements of cylinders for compressed gas at high pressures, structural integrity of material and product are key features.

At our Italian R&D Center, we're equipped with state-of-the-art capabilities for the development of basic and advanced knowledge in the field of fracture mechanics.

Efforts have been recently devoted to assess resistance to fatigue, even in environments such as mild sour CNG and high-pressure gaseous hydrogen, through the set-up of special laboratory and full-scale tests reproducing typical service conditions.



A century of history

- The company was established in Milan on June 27, 1906. In 1909, a year after the first stone was laid down, the first tube was rolled at Dalmine. In 1910 the first cylinder was produced from seamless tube.
- In 1956 the Sabbio Bergamasco plant was built for gas cylinders production.
- On February 27, 1996 Dalmine became part of the Techint Group.
- In 2002 Tenaris s.a., which Dalmine belongs to, was constituted.
- In August, 2012 Tenaris produced the 12,000,000th cylinder.





For additional information, please visit
www.tenaris.com

For technical assistance, please contact
Gas.cylinders@tenaris.com



Cylinders for high pressure gases / Version 06 / April 2014

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