



Cylinders for high pressure gases



Quality System Certified  
N° 110950/002

# Tenaris

Tubular technologies. Innovative services.

Tenaris S.A., constituted in Luxembourg, is quoted on the stock markets of New York, Milan, Mexico City and Buenos Aires.

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.

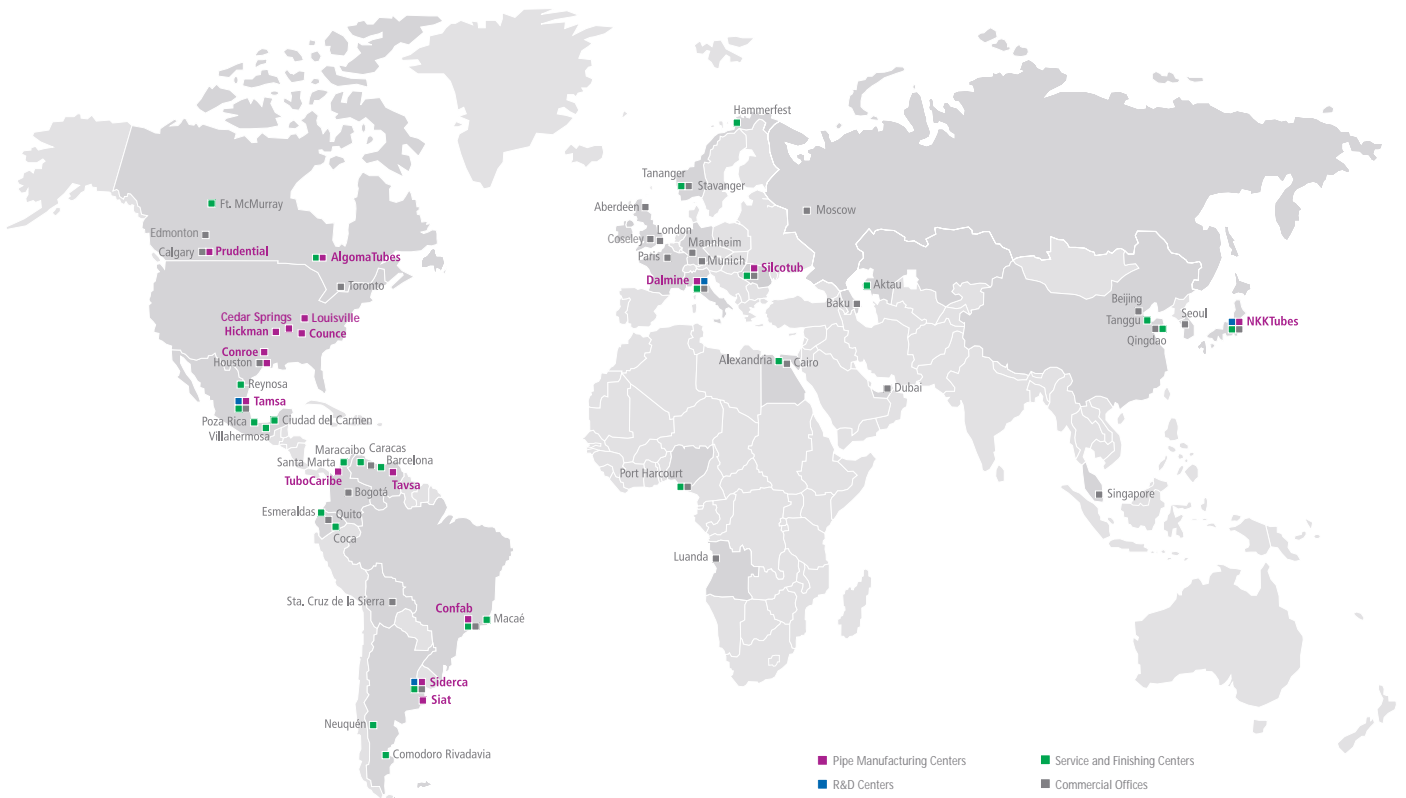
Through our integrated global network of

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 claims world leadership in its sector, with 21,500 employees and an annual manufacturing capacity of more than 6,000,000 tons.

The strong technological and managerial integration existing among the companies has

gained worldwide quality system certification in compliance with ISO 9000 criteria and, for the automotive sector, QS 9000.





# TenarisDalmine Gas Cylinders Division

- Cylinders for gas at high pressure and hydraulic accumulator shells, with working pressures of 300 bar and over.
- High capacity cylinder systems mounted directly onto trailers or housed in mobile container bodies, for transport and accumulation of gases.
- Fixed plants used to accumulate gas at high pressure.



TenarisDalmine Gas Cylinders Division is a leader in production of cylinders for compressed gas, and is one of the very few production units in the world that covers every phase of production vertically: from the steel, to production of seamless tubes, to the finished product.

In addition to the large range of standard products, TenarisDalmine 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 9001:2000 standard, is recognized by the major producers and distributors of technical gases, for export to all European countries and the majority of the world. TenarisDalmine is also approved to sell vessels in the United States and Canada.



# A broad production range for every type of gas

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

TenarisDalmine cylinders supplied with:

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

In addition to traditional vessels, TenarisDalmine produces cylinders for:

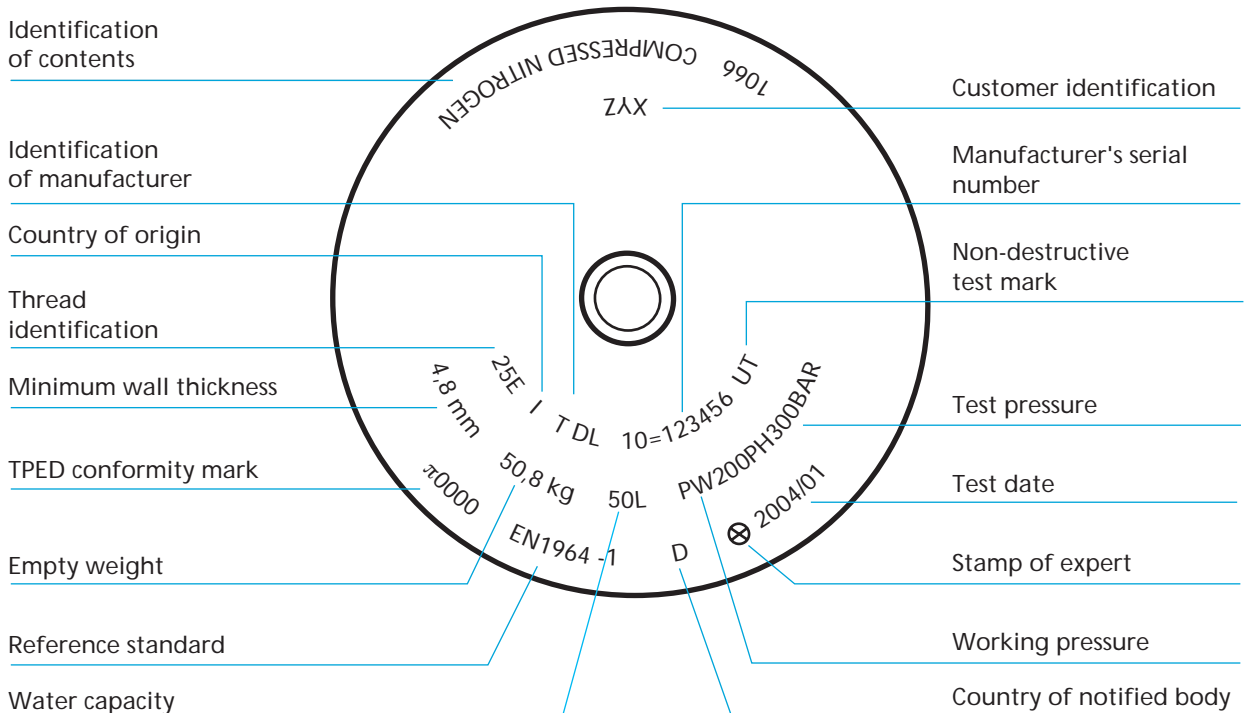
- Fire extinguishers;
- Medical applications;
- Alimentary uses.

## 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
	200	2900	300	4350	273	10. 3/4	from 40 to 90	from 88 to 198
ACETYLENE	15-19	218-276	60	870	168,3	6. 5/8	from 14 to 20	from 31 to 44
	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
CNG (Compressed natural gas for vehicles)	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
	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



O <sub>2</sub> + N <sub>2</sub> O White + Blue	O <sub>2</sub> + CO <sub>2</sub> White + Grey	ACETYLENE Reddish brown	AMMONIA Yellow	ARGON Dark green	NITROGEN Black	CARBON DIOXIDE Grey
CHLORINE Yellow	HELIUM Brown	HYDROGEN Red	OXYGEN White	NITROUS OXIDE Blue	INERT Brilliant Green	FLAMMABLE Red
OXIDIZER Light Blue	TOXIC AND/OR CORROSIVE Yellow	TOXIC AND FLAMMABLE Yellow + Red	TOXIC AND OXIDIZER Yellow + Light Blue	INDUSTRIAL AIR Brilliant Green	BREATHABLE AIR White + Black	HELIUM-OXYGEN MIXTURE White + Brown



# The Quality Assurance System

The production cycle meets all the international standards, conforms to ISO 9001:2000 and has been approved by Lloyd's Register of Shipping, which

has given TenarisDalmine the first group certificate (R001) certifying that all the production units conform to the requirements of ISO 9001:2000.

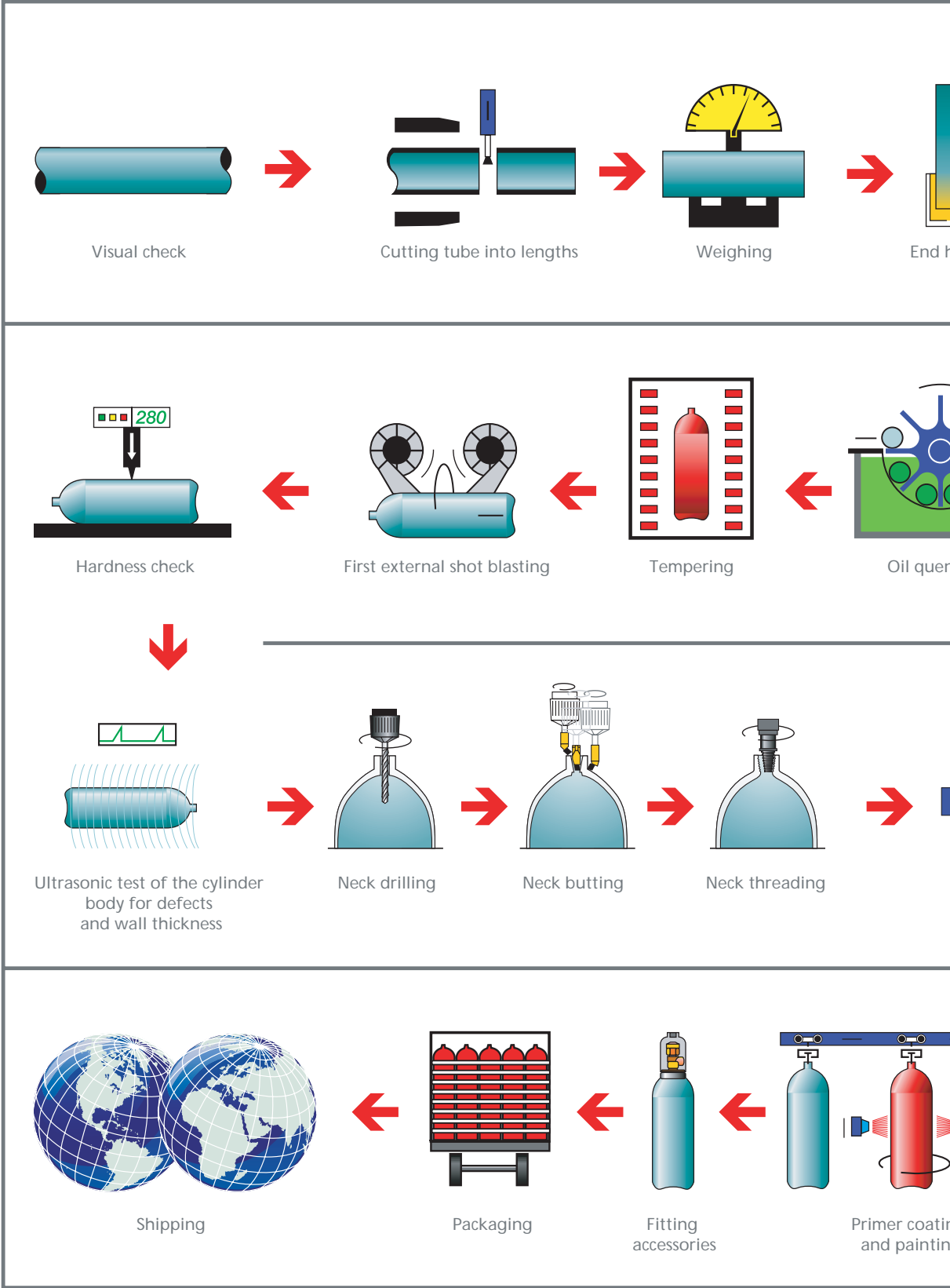
Furthermore, TenarisDalmine products respect the requirements of the main international standards.

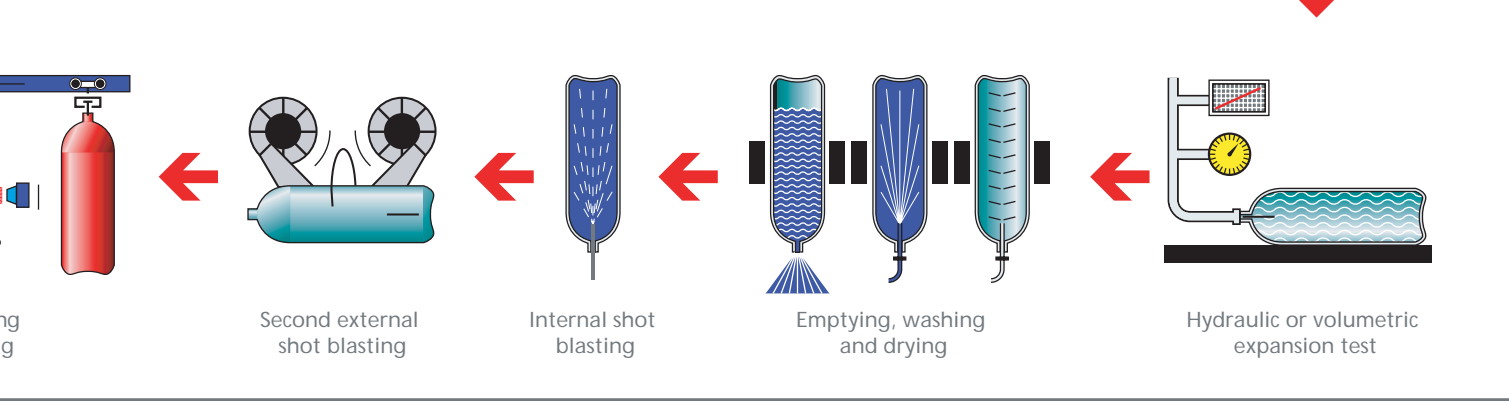
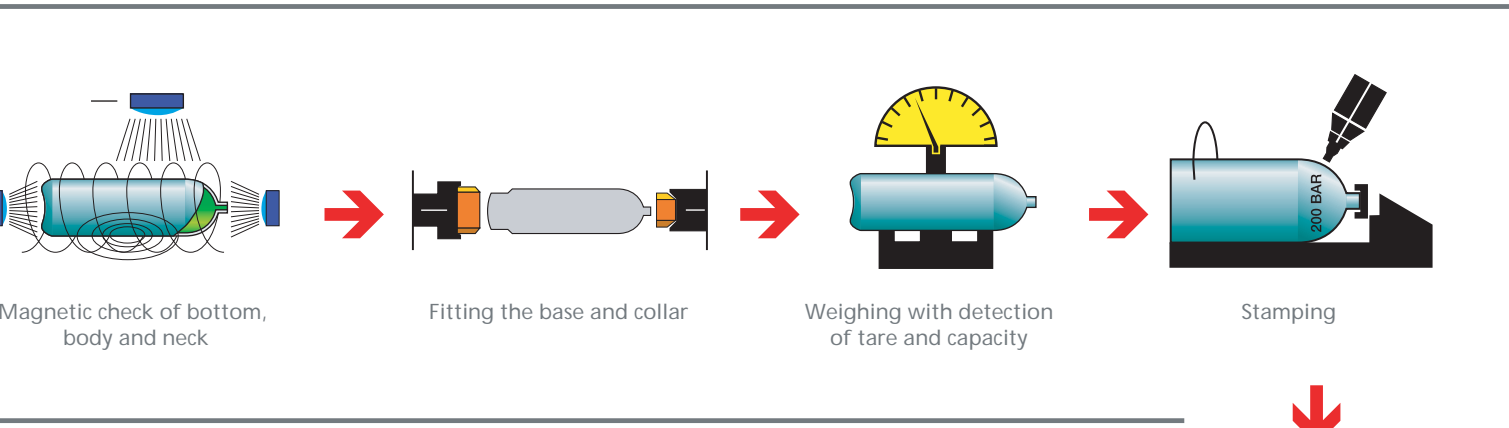
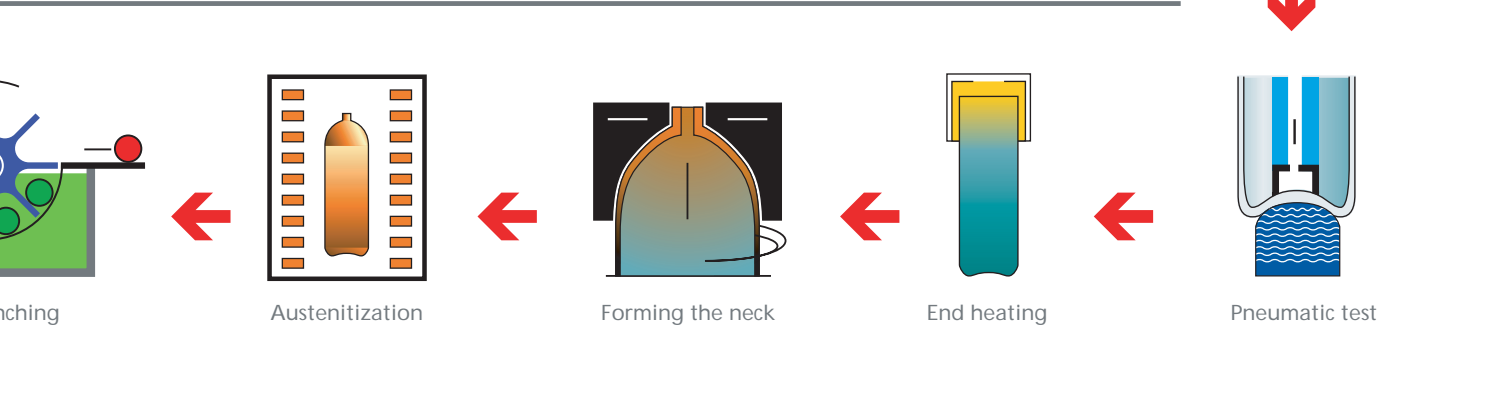
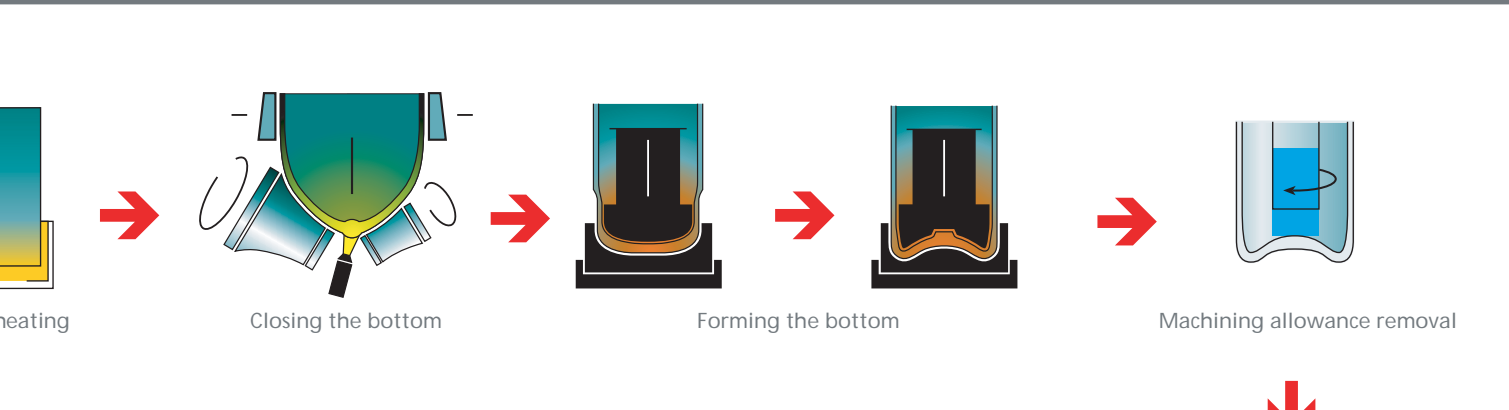
## STANDARDS AND TECHNICAL REGULATIONS

	EUROPEAN COMMUNITY DIRECTIVES	STANDARDS AND TECHNICAL REGULATIONS	
		INTERNATIONAL or internationally recognized	NATIONAL
<b>Cylinders for transport</b>	99/36/EC (TPED)	EN 1964	DOT3AA
		ISO 9809 - ISO 4705	BS 5045
		84/525/EC	TRG 310
		DOT3AA	DRIRE
		BS 5045	GB5099 IRAM 2526
<b>Cylinders for portable extinguishers</b>	97/23/EC (PED)	EN 1964	
		84/525/EC	
<b>Natural gas cylinders for vehicles</b>		ISO 11439	D.M. 12.09.25
		ECE-ONU R.110	
<b>Tubes for transport</b>	99/36/EC (TPED)	EN ISO 11120	DOT3AAX
		DOT3AAX	DOT3T
		DOT3T	
<b>Large capacity vessels for storage</b>	97/23/EC (PED)	BS 5045	AD-Merkblatt
		ASME VIII DIV. 1	VSR
			BS 5045
			DRIRE + CODAP
			ASME VIII DIV. 1
<b>Vessels for marine and offshore applications</b>		Lloyd's Register of Shipping	American Bureau of Shipping
		American Bureau of Shipping	R.I.Na.
<b>Shells for accumulators</b>	97/23/EC (PED)	ASME VIII DIV. 1	AD-Merkblatt
		AD-Merkblatt	BS 7201
			ASME VIII DIV. 1



# Production cycle





# High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles

Today natural gas is regarded as the only ecological fuel that is immediately available and usable, so much that European community programs foresee that in the near future natural gas powered transport could reach 10% of all vehicles in circulation.

TenarisDalmine, who makes attention to the environment as one of its key mission points, 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 TenarisDalmine to supply the main car companies and international markets.



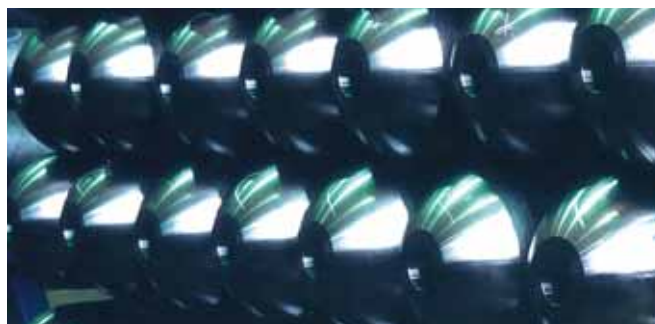


## Special products

TenarisDalmine produces special vessels such as hydraulic accumulator shells and two-neck vessels to be installed in plants for production and gas storage.

### HYDRAULIC ACCUMULATOR SHELLS

<b>Working pressure</b>	from 250 to 360 bar - from 3.626 to 5.220 psi
<b>Internal diameter</b>	from 200 to 353 mm
<b>Capacity</b>	from 20 to 200 l - from 44 to 440 lb
<b>Length</b>	from 710 to 2.000 mm





# Large diameter vessels

TenarisDalmine 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 close tolerances for every type of industrial use, for the gas storage and transportation.



## LARGE DIAMETER VESSELS

### VESSELS FOR TRANSPORT AND STORAGE OF GAS

<b>Working pressure</b>	up to 400 bar - 5800 psi
<b>Internal diameter</b>	from 273 to 622 mm - from 10 3/4 to 24 1/2 inch
<b>Capacity</b>	from 100 to 2.500 l - from 220 to 5512 lb
<b>Length</b>	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.

# Special applications

TenarisDalmine 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 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-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.

In all these applications

TenarisDalmine continuously cooperates with the most prestigious research centers (such as the Materials Development Center) in order to develop ever more efficient and advanced technical solutions.





Accumulators for  
hydropneumatic plant  
1940-1950



Forming of the tube end  
The fifties



Heat treatment  
1940-1950

## 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.
- On May 21, 2002 the Gas Cylinder Division produced the 10,000,000th cylinder.
- In 2002 Tenaris S.A. was constituted, which Dalmine belongs to.



1954 - Conquering K2  
Base camp and summit,  
Dalmine cylinders on the  
ground



1956 - Artist's impression  
of the Sabbio works



Stamping of cylinders,  
The fifties and sixties





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