

THE ENGINEERING EQUIPMENT AND MATERIALS USERS' ASSOCIATION

Quality requirements for the manufacture and supply of duplex stainless steels

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ENGINEERING EQUIPMENT AND MATERIALS USERS' ASSOCIATION

The Engineering Equipment and Materials Users' Association, more commonly known as EEMUA, is a European non-profit membership Association helping companies that own or operate industrial facilities - the *users* of engineering equipment and materials.

EEMUA aims to improve the safety, environmental and operating performance of industrial facilities in the most cost-effective way, thereby demonstrating and pursuing leadership in asset management.

EEMUA Members pursue these aims through collaboration for mutual benefit, sharing engineering experiences and expertise and by promoting their distinct interests as the users of engineering products.

Specifically, the aims of EEMUA Member companies are achieved by:

- providing the organisation within which networking, information sharing and collaboration on non-competitive technical matters can take place;
- influencing the way written regulations are interpreted and applied in practice;
- presenting and promoting Members' views, and encouraging the application of good, sound engineering practices;
- developing user guides, specifications, training and competency schemes;
- facilitating Members' participation in national and international standards making;
- influencing relevant national and European legislation and regulations.

Formed in 1949 as the Engineering Equipment Users' Association, and re-named in 1983 (as a result of taking over the materials association, OCMA), EEMUA has for more than fifty years given companies that own and operate process plants, power stations and other significant industrial facilities, a collaborative voice in addressing technical and engineering related issues that impact on good integrity management and asset management practices. The Association is open to companies of all sizes that meet its 'engineering user' criteria. Further details of current Members of EEMUA is available on the Association's website, www.eemua.org.

EEMUA activities often lead to the production of publications. These are prepared for Members' use and are often offered for sale as well.

A list of EEMUA publications for sale is given at the end of this Publication. The full list is also on the Association's website, including details of on-line shopping facilities.

To enquire about corporate Membership, write to enquiries@eemua.org or call +44 (0)20 7621 0011.

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The use of standards is not a legal requirement in some countries in Europe and around the world. However, it is stressed that where a contract is placed which states that manufacture is to be in accordance with specified standards, this may be determined as a legal requirement. Manufacturers of equipment may offer equipment not conforming to standards, but, in such cases, they should have to be able to prove that all legislation concerning essential safety has been complied with. This could be a time-consuming and expensive task.

In this Publication, "Section" refers to a part of this Publication. "Clause" refers to a part of a third-party document, such as a standard.

Consultation and Feedback

EEMUA encourages constructive comments on this Publication from both Members of the Association and others. Comments should be sent on the standard feedback form, a copy of which is provided towards the end of this Publication.

Comments are considered by the relevant EEMUA Technical Committee and may be incorporated in future editions of this Publication. New editions are publicised on the EEMUA website.

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1. Introduction

This EEMUA publication is aimed at manufacturers, designers, purchasers, stockists and end-users of duplex stainless steel components.

It provides requirements and recommendations for the manufacture and supply of these materials in order to ensure that they meet the minimum in-service requirements of end-users in the process industries, both on- and offshore.

These minimum requirements and recommendations for manufacture and supply are considered necessary for the following reasons:

- In the experience of EEMUA members, there has been an inconsistency in the quality of duplex stainless steel components from manufacturers and stockists globally despite most end-users having detailed manufacturing specifications in place.
- The inconsistency in quality appears to have been largely due to variations in manufacturing process and the quality controls used by manufacturers.
- Until now, there has been little detailed guidance on this topic.
- End-users have generally not employed stringent surveillance on manufacturers and stockists to ensure that their specified requirements have been strictly adhered to.
- Most manufacturers have their quality systems certified to recognised international quality standards. However, there is no guarantee that stringent manufacturing quality controls will be consistently maintained.
- The consequences of using duplex stainless steel components that fail to meet the purchaser's specified requirements can be extremely serious. Significant project delays can be incurred as well as other consequences, leading to environmental and personnel safety issues. Failures can also be extremely costly and result in significant business losses.

2. Scope

This document covers all grades of duplex stainless steel and all components for both offshore (subsea and topsides) and onshore applications in the energy, chemical and other process industries. It deals with duplex stainless steel components purchased directly from the manufacturer or from stockists.

Orders for duplex stainless steel components are often placed through stockists and it is strongly recommended that stockists should adopt the requirements detailed in this EEMUA publication.

There are many grades and designations of duplex stainless steel with three generic types principally used in the aforementioned industries. These are generally distinguished by their Pitting Resistance Equivalent Number (PREN)*:

- 22% chromium duplex stainless steels with a PREN generally > 35;
- 25% chromium duplex stainless steels with a PREN <40; and
- 25% chromium super duplex stainless steels with a PREN ≥ 40.

In addition, there are further proprietary variations such as “lean” and “hyper” grades. Further information can be found in Table 1 (overleaf) and associated footnotes in EEMUA 194¹.

The more commonly used standards and grades are listed in NORSOK (Norwegian standards authority) Standard M-630² and in Table 1.

The main manufacturing processes for duplex stainless steel are plate and pipe rolling, forging, casting, tube drawing, extrusion and hot isostatic pressing. All these processes are followed by solution annealing and water quenching.

Typical components that are regularly manufactured in duplex stainless steel are:

- process vessels, pipework and pipelines (seamless and welded);
- flanges, hubs and fittings such as tees, elbows and bends;
- valve bodies and valve trim;
- pump casings;
- wellhead equipment and downhole tubing and accessories;
- hydraulic control and chemical injection tubing;
- plates and bars;
- bolts and fasteners; and
- heat exchanger tubes/tube plates.

* PREN = %Cr + 3.3%Mo + 16%N (several other equations exist)

Table 1 Commonly-used standards and grades of duplex stainless steel

Generic Grade	Product Type	Standard	Grade
22 % Cr	Seamless Pipe	ASTM A 790	UNS S31803
			UNS S32205
	Welded Pipe	ASTM A 928	UNS S31803
			UNS S32205
	Wrought Fittings	ASTM A 815	UNS S31803
			UNS S32205
	Forgings	ASTM A182	F51
			F60
	Plates	ASTM A 240	UNS S31803
			UNS S32205
25 % Cr	Seamless Pipe	ASTM A 790	UNS S32550
			UNS S32750
			UNS S32760
			UNS S 32974
	Welded Pipe	ASTM A 790	UNS S32550
			UNS S32750
			UNS S32760
	Wrought Fittings	ASTM A 815	UNS S32550
			UNS S32750
			UNS S32760
	Forgings	ASTM A 182	UNS S32550
			UNS S32750
			UNS S32760
			F53
			F55
	Plates	ASTM A 240	F61
			UNS S32550
			UNS S32750
	Castings	ASTM A 995 ASTM A 890	UNS S32760
			5A (UNS J93404)
	Bars	ASTM A 479 and ASTM A276	6A (UNS J93380)
			UNS S32550
			UNS S32750
	Tubes	ASTM A 789	UNS S32760
			UNS S32550
			UNS S32750
			UNS S32974

3. Definitions

Throughout this EEMUA publication, the following definitions apply.

Roles recognised

Designer[†]	An organisation that takes responsibility for equipment or system design, including material selection.
End-user[†]	An owner or organisation that is responsible for operation of an installation/facility.
Manufacturer	The company that carries out the primary steelmaking and/or further processing of the duplex stainless steel components.
Purchaser	The company that places the contract or purchase order for the manufacture or supply of the duplex stainless steel components. The purchaser may be an end-user, designer or stockist.
Stockist	The company that acts as an intermediary supplier between the manufacturer and the purchaser but does not itself carry out manufacturing operations.

Terms used

Approval	A written response from the purchaser confirming agreement to a proposal by the manufacturer or stockist.
May	Is used to indicate that the manufacturer or stockist is permitted to do something, or that the purchaser reserves the right to do something, according to context.
Shall	Is used to indicate that the manufacturer or stockist is required to take action.
Should	Is used to indicate that the manufacturer or stockist is recommended to take action.

[†] From DIS/ISO 21457.

