

DEP SPECIFICATION

SPECIFICATION FOR NICKEL BASE ALLOY 625 PLUS (UNS N07716) AND ALLOY 725 (UNS N07725) FOR OIL AND GAS DRILLING AND PRODUCTION EQUIPMENT

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DESIGN AND ENGINEERING PRACTICE

DEM1



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1. INTRODUCTION

1.1 SCOPE

This new DEP specifies requirements and gives recommendations for manufacture of nickel base Alloy 625 PLUS (UNS N07716) and nickel base Alloy 725 (UNS N07725) in precipitation hardened (double aged) condition.

This DEP applies to the manufacture of uniform bar and shaped forged base materials in solid or hollow form, for subsequent use in the fabrication of downhole equipment for oil and gas applications manufactured from Alloy 625 PLUS or Alloy 725. Typical components manufactured from these alloys include cross-overs, SSSVs, tubing hangers and production packers. Requirements for threaded connections are also included.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual DEM 1 – Application of Technical Standards.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them.

This DEP is intended for use in oil and gas production including water injection. Application in other facilities may also apply.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regard to the safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The lower-case word **shall** indicates a requirement.

The capitalised term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Term	Definition
Deleterious phases	Secondary phases present in the microstructure of an alloy that have a negative effect on the desired mechanical properties, toughness, or corrosion resistance of the alloy.
Total hot work reduction ratio	The total hot work reduction ratio is defined as the product of the individual reduction ratios achieved at each step in the hot work operation from ingot cross section to final hot work cross section (prior to any closed die work), where the ingot cross section is the cross section of the ingot obtained after the last remelt step and any ingot grinding or surface preparation prior to hot working.
Eta phase	Precipitated secondary phase in iron-nickel, nickel and cobalt based alloys which have had extended high-temperature exposure with a chemical composition of Ni ₃ Ti- type.
Hot worked	Mechanical process that shapes metal at an elevated temperature utilising one or more dies, for example open/closed die forging, ring-rolling, extrusion, rolling etc.

1.3.3 Acronyms

Definitions of acronyms used in this DEP are in the table below.

Acronym	Definition
AOD	argon oxygen decarburization
EF	electric furnace
EFR	electroflux remelting
ESR	electro-slag remelting
NDT	non-destructive testing
SSSV	sub-surface safety valve
QTC	qualification test coupon
VAR	vacuum arc remelting
VIM	vacuum induction melting
VOD	vacuum oxygen decarburization

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets (). Other documents referenced by this DEP are listed in (7).

1.5 COMMENTS ON THIS DEP

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1.6 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

1.7 DOCUMENT PRECEDENCE

Where the requirements of this document conflict with the requirements of other referenced codes, standards, or instructions, this document takes precedence.