

DEP SPECIFICATION

AC ELECTRICAL ADJUSTABLE SPEED DRIVE SYSTEMS - RATED 375 KW AND LARGER FOR NORTH AMERICAN APPLICATION (AMENDMENTS TO IEEE STD 1566-2015)

DEP 33.66.05.32-Gen.

February 2018

DESIGN AND ENGINEERING PRACTICE



© 2018 Shell Group of companies

All rights reserved. No part of this document may be reproduced, stored in a retrieval system, published or transmitted, in any form or by any means, without the prior written permission of the copyright owner or Shell Global Solutions International BV.

PREFACE

DEP (Design and Engineering Practice) publications reflect the views, at the time of publication, of Shell Global Solutions International B.V. (Shell GSI) and, in some cases, of other Shell Companies.

These views are based on the experience acquired during involvement with the design, construction, operation and maintenance of processing units and facilities. Where deemed appropriate DEPs are based on, or reference international, regional, national and industry standards.

The objective is to set the standard for good design and engineering practice to be applied by Shell companies in oil and gas production, oil refining, gas handling, gasification, chemical processing, or any other such facility, and thereby to help achieve maximum technical and economic benefit from standardization.

The information set forth in these publications is provided to Shell companies for their consideration and decision to implement. This is of particular importance where DEPs may not cover every requirement or diversity of condition at each locality. The system of DEPs is expected to be sufficiently flexible to allow individual Operating Units to adapt the information set forth in DEPs to their own environment and requirements.

When Contractors or Manufacturers/Suppliers use DEPs, they shall be solely responsible for such use, including the quality of their work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, the Principal will typically expect them to follow those design and engineering practices that will achieve at least the same level of integrity as reflected in the DEPs. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the Principal.

The right to obtain and to use DEPs is restricted, and is typically granted by Shell GSI (and in some cases by other Shell Companies) under a Service Agreement or a License Agreement. This right is granted primarily to Shell companies and other companies receiving technical advice and services from Shell GSI or another Shell Company. Consequently, three categories of users of DEPs can be distinguished:

- 1) Operating Units having a Service Agreement with Shell GSI or another Shell Company. The use of DEPs by these Operating Units is subject in all respects to the terms and conditions of the relevant Service Agreement.
- 2) Other parties who are authorised to use DEPs subject to appropriate contractual arrangements (whether as part of a Service Agreement or otherwise).
- 3) Contractors/subcontractors and Manufacturers/Suppliers under a contract with users referred to under 1) or 2) which requires that tenders for projects, materials supplied or - generally - work performed on behalf of the said users comply with the relevant standards.

Subject to any particular terms and conditions as may be set forth in specific agreements with users, Shell GSI disclaims any liability of whatsoever nature for any damage (including injury or death) suffered by any company or person whomsoever as a result of or in connection with the use, application or implementation of any DEP, combination of DEPs or any part thereof, even if it is wholly or partly caused by negligence on the part of Shell GSI or other Shell Company. The benefit of this disclaimer shall inure in all respects to Shell GSI and/or any Shell Company, or companies affiliated to these companies, that may issue DEPs or advise or require the use of DEPs.

Without prejudice to any specific terms in respect of confidentiality under relevant contractual arrangements, DEPs shall not, without the prior written consent of Shell GSI, be disclosed by users to any company or person whomsoever and the DEPs shall be used exclusively for the purpose for which they have been provided to the user. They shall be returned after use, including any copies which shall only be made by users with the express prior written consent of Shell GSI. The copyright of DEPs vests in Shell Group of companies. Users shall arrange for DEPs to be held in safe custody and Shell GSI may at any time require information satisfactory to them in order to ascertain how users implement this requirement.

All administrative queries should be directed to the DEP Administrator in Shell GSI.

TABLE OF CONTENTS

PART I	INTRODUCTION	5
1.1	SCOPE	5
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS	5
1.3	DEFINITIONS	5
1.4	CROSS-REFERENCES	6
1.5	SUMMARY OF MAIN CHANGES.....	6
1.6	COMMENTS ON THIS DEP	7
1.7	DUAL UNITS.....	7
1.8	NON NORMATIVE TEXT (COMMENTARY).....	7
PART II	GENERAL REQUIREMENTS	8
1.1	GENERAL	8
1.2	DATA SHEETS	8
1.3	SYMBOLS.....	8
1.4	APPROVALS	8
PART III	AMENDMENTS/SUPPLEMENTS TO IEEE STD 1566-2015	9
1	Overview	9
1.3	Application	9
2	Normative references	9
4	Safety	9
4.2	ASD construction requirements	9
5	Unit construction	10
5.1	ASD structure.....	10
5.2	Insulation.....	11
5.3	Nameplate.....	11
5.4	Rectifier	11
5.5	DC link	11
5.6	Inverter	12
6	Adjustable speed operation.....	12
6.7	Transient over-voltages	12
6.10	Loss of voltage.....	12
6.19	Drive efficiency.....	12
7	Control	12
7.1	General	12
7.2	Local control.....	13
7.4	Bypass operation	13
8	Input transformer or reactor	13
8.1	Transformer	13
8.2	Reactor	13
9	Motor	13
9.1	Specification.....	13
10	Switchgear and starters	14
10.1	Requirements.....	14
10.2	Switchgear supply.....	14
11	Cooling system	14
11.2	Air cooling	14
11.3	Liquid cooling	14
14	Inspection and factory tests	15
14.2	Test plan	15
14.4	System test	15

15	Shipping, handling and storage requirements	15
PART IV	DOCUMENTATION REQUIREMENTS.....	16
4.1	GENERAL	16
4.2	DRAWING AND DATA REQUIREMENTS	16
PART V	REFERENCES	17

PART I INTRODUCTION

1.1 SCOPE

This DEP specifies basic requirements for alternating current (AC) adjustable speed drive (ASD) controllers rated over 375 kW (470 hp) and above 750 V supplied to Shell companies in North America.

The ASD controllers are hereinafter referred to as drives.

It applies to drives that are arranged in a group, are attached to switchgear or other control gear, or that stand alone.

This DEP is based on IEEE Std 1566:2015. (Part III) of this DEP amends, supplements and deletes various clauses of IEEE Std 1566.

This DEP is a revision of the DEP of the same number dated February 2013; see (1.5) regarding the changes.

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. Any authorised access to DEPs does not for that reason constitute an authorisation to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied to other similar facilities.

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 could 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.

In IEEE Std 1566, the term **Vendor** is used. In this DEP, the term **Vendor** shall be understood to mean the Manufacturer/Supplier.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorized to act for, and on behalf of, the Principal.

In IEEE Std 1566, the term **Purchaser** is used. In this DEP, the term Purchaser shall be understood to mean the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Abbreviations

Term	Definition
ACO	Accredited Certification Organization
NRTL	Nationally Recognized Testing Laboratory
USCG	United States Coast Guard

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 (Part V).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated February 2013. The following are the main non-editorial changes.

Section/Clause	Change
Part I, 1.3.2	Removed definition of Electrical Technical Authority.
Part II	Updated.
Part III: 1.3	UL 347A standard added.
Part III: 4.2.2	Clause removed.
Part III: 6.1	Clause removed.
Part III: 6.19	Removed efficiency cost factor calculation.
Part III: 7.1	Removed requirement for 86 lock out device.
Part III: 15.2	Clause removed.
Part V	Removed, shipping requirements incorporated in Part III.