



|                      |                 |
|----------------------|-----------------|
| <b>Document No.</b>  | GIS 12-503      |
| <b>Applicability</b> | Group           |
| <b>Date</b>          | 27 January 2003 |

# **Guidance on Practice for High Voltage A.C. Drives (IEC)**

**GIS 12-503**

**BP GROUP  
ENGINEERING TECHNICAL PRACTICES**

## Foreword

This is the first issue of Engineering Technical Practice (ETP) GIS 12-503. This Guidance on Industry Standard (GIS) is based on the following heritage documents from merged BP companies:

### Amoco (PTA)

PTA EL(IEC)-VFD-00-EElectrical AC Variable Frequency Drives Engineering Specification  
PTA EL(IEC)-VFD-00-G AC Variable Frequency Drives Guide  
PTA EL(IEC)-VFD-MV-P Electrical AC Variable Frequency Drives Medium Voltage Supply Specification

### British Petroleum

GS 112-15 Guidance for Specification 112-15 Electrical Requirements for Variable Speed Drives  
RP 12-12 Electrical System and Installations- Electrical Variable Speed Drives

### BP Chemical US.

CP 17-26-2 Adjustable Frequency Drives for Large Frame Induction Motors 300HP and Larger (4160V)

Copyright © 2004, BP Group. All rights reserved. The information contained in this document is subject to the terms and conditions of the agreement or contract under which the document was supplied to the recipient's organization. None of the information contained in this document shall be disclosed outside the recipient's own organization without the prior written permission of Manager, Standards, BP Group, unless the terms of such agreement or contract expressly allow.



## Table of Contents

|                                                            | Page |
|------------------------------------------------------------|------|
| Foreword .....                                             | 2    |
| 1. Scope .....                                             | 5    |
| 2. Normative references.....                               | 5    |
| 3. Terms and definitions.....                              | 5    |
| 4. Design .....                                            | 6    |
| 4.1. Service conditions.....                               | 6    |
| 4.2. Reliability and operational life.....                 | 6    |
| 4.3. Environmental protection .....                        | 6    |
| 4.4. Hazardous area certification .....                    | 6    |
| 4.5. Mode of operation .....                               | 7    |
| 4.6. Rating .....                                          | 7    |
| 4.7. Acoustic noise.....                                   | 7    |
| 4.8. Torsional effects .....                               | 8    |
| 4.9. Critical speeds .....                                 | 8    |
| 4.10. Speed range .....                                    | 8    |
| 4.11. Harmonics.....                                       | 8    |
| 4.12. Converter cooling.....                               | 9    |
| 4.13. System features .....                                | 9    |
| 4.14. Controls .....                                       | 9    |
| 4.15. Indicators .....                                     | 9    |
| 4.16. User I/O connections .....                           | 10   |
| 4.17. Protection .....                                     | 10   |
| 5. Main Components.....                                    | 10   |
| 5.1. Converter.....                                        | 10   |
| 5.2. Motors.....                                           | 10   |
| 5.3. Transformers and reactors.....                        | 11   |
| 6. Fabrication.....                                        | 11   |
| 6.1. General.....                                          | 11   |
| 6.2. Enclosure.....                                        | 11   |
| 6.3. Wiring and terminations .....                         | 12   |
| 6.4. Earthing .....                                        | 12   |
| 6.5. Nameplates.....                                       | 12   |
| 6.6. Special accessories .....                             | 13   |
| 7. Inspection and testing.....                             | 13   |
| 8. Documentation.....                                      | 13   |
| 8.1. Drawings.....                                         | 13   |
| 8.2. Recommended spare parts list.....                     | 13   |
| 8.3. Installation, operation, and maintenance manuals..... | 13   |



|                  |    |
|------------------|----|
| 9. Shipping..... | 14 |
|------------------|----|

Uncontrolled Copy



## 1. Scope

This GIS provides guidance on industry standard for design, material, fabrication, inspection, testing, documentation and shipping of high voltage AC drive systems suitable for operating from input line voltages of 1000V a.c. up to 35 kV.

## 2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

### Institute of Electrical and Electronic Engineers (IEEE)

|          |                                                                                        |
|----------|----------------------------------------------------------------------------------------|
| IEEE 519 | Recommended Practice and Requirements for Harmonic Control in Electrical Power Systems |
|----------|----------------------------------------------------------------------------------------|

### International Electrotechnical Commission (IEC)

|               |                                                                                                                                                                                                                            |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IEC 60146-1-1 | Semiconductor convertors – General requirement and line commutated convertors – Part 1-1: Specification of basic requirements                                                                                              |
| IEC 60146-1-2 | Semiconductor convertors – General requirement and line commutated convertors – Part 1-2: Application guide                                                                                                                |
| IEC 60146-1-3 | Semiconductor convertors – General requirement and line commutated convertors – Part 1-3: Transformers and reactors                                                                                                        |
| IEC 60529     | Degrees of protection provided by enclosures (IP code).                                                                                                                                                                    |
| IEC 61800-2   | Adjustable speed electrical power drive systems – Part 2: General requirements – Rating specifications for low voltage adjustable frequency a.c. power drive systems.                                                      |
| IEC 61800-3   | Adjustable speed electrical power drive systems – Part 3: General requirements – Rating specifications for low voltage adjustable frequency a.c. power drive systems EMC product standard including specific test methods. |
| IEC 61800-4   | Adjustable speed electrical power drive systems – Part 4: General requirements – Rating specifications for a.c. power drive systems above 1000V a.c. and not exceeding 35 kV.                                              |

## 3. Terms and definitions

For the purposes of this GIS the following term and definition applies:

### A.C. power drive system (PDS)

PDS consists of:

Power equipment – harmonic filters, input transformer, converter section, output transformer (if required),) and a motor with sensors which are mechanically coupled to the motor shaft (the driven equipment is not included).

Controls, protection, and auxiliaries

