INSTITUTE OF PETROLEUM

PETROLEUM MEASUREMENT MANUAL

PART XIII
Fidelity and Security of Measurement Data Transmission Systems

SECTION 1

ELECTRICAL AND/OR ELECTRONIC PULSED DATA CABLED TRANSMISSION FOR FLUID METERING SYSTEMS

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FOREWORD

Measurement accuracy is essential for the sale, purchase and handling of petroleum products. It reduces the likelihood of disputes between buyer and seller and facilitates control of losses. Accurate measurement demands the use of standard equipment and procedures.

The Petroleum Measurement Committee of the Institute of Petroleum is responsible for the production and maintenance of standards and guides covering the various aspects of static and dynamic measurement of petroleum. These are issued as separate Parts and Sections of the Institute's Petroleum Measurement Manual, which was first published in 1952.

Membership of the IP working panels is made up of experts from the oil industry, equipment manufacturers, cargo surveyors and government authorities. Liaison is maintained with parallel working groups of the Committee on Petroleum Measurement of the American Petroleum Institute, and is extended as necessary to embrace other organizations concerned with quantitative measurement in other countries and in other industries.

Users are invited to send comments, suggestions, or details of experience with this issue to:

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The Petroleum Measurement Manual is widely used by the petroleum industry and has received recognition in many countries by consumers and the authorities. In order to promote their wide adoption internationally, it is the policy to submit selected standards through the British Standards Institution to Technical Committee TC 28 - Petroleum Products and Lubricants - of the International Organisation for Standardization (ISO/TC 28) as potential International Standards.

A full list of the Parts and Sections of the Petroleum Measurement Manual (PMM) is available on request from the Institute of Petroleum.

Note

The IP Petroleum Measurement Manual is recommended for general adoption but should be read and interpreted in conjunction with weights and measures, safety and other regulations in force in a particular country in which it is to be applied. Such regulatory requirements should have precedence over the corresponding clauses in the Manual except where the requirements of the Manual are more rigorous, when its use is recommended. The Institute disclaims responsibility for any personal injury or loss or damage to property, howsoever caused, arising from the use or abuse of any Part or Section of the Manual.

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INTRODUCTION

Petroleum Measurement Manual Part XIII, *Fidelity and security of measurement data*, was developed in three sections:

— Section 1: *Electric and/or electronic pulsed data cabled transmission for fluid metering systems*, first published in 1976 as IP 252/76;
— Section 2: *Electric and/or electronic data transmission for automatic tank gauging systems*, published in 1979;
— Section 3: *Electric and/or electronic data capture for flow metering*, published in 1985.

This new document replaces the previous Section 1, while Section 2 is now withdrawn. Section 3 remains current.

The scope of Section 1 encompasses the security and fidelity of transmitter signals and the transfer of data in metering; it excludes the meter internal processes. Whilst the first edition set good standards aimed fundamentally at 'real-time' pulsed data, its revision has been necessitated by advances in technology and changes in definition/application.

This revised edition has been written to include all existing types of meter and data. Its flexibility should ensure that it will remain valid even with further advances in technology.

The five security levels (A to E) in the original version have now been reduced to three: levels A, B and C. The application of basic principles of ensuring that the data are either sound (level C), can be identified as faulty (level B), or can be corrected (level A), has been applied throughout.

Technology changes since 1976 have been significant. There have been increases in the types of flow meter, the types of data and the ability to combine various types in a mixed system. All of this has led to confusion in applying the previous document. In some cases, equipment has been designed to satisfy the old specification giving rise to redundant and unnecessary additions.

In the intervening period, data handling has changed out of all recognition. For instance, it is possible that Level A could be achieved with a single data channel, provided the application allows time for the transmission of correction data as well as flow data, e.g. re-transmissions of flow data at the end of a period.

There are a number of significant factors of which the user should be aware and these are outlined below. These factors are dealt with in more detail in Chapter 3.

Data transmission error detection: The introduction of data transmission error detection means that all errors may be detectable. Errors caused by meter failure may affect the transfer of data and appear as data transfer errors.

Action on detection of an error: On detection of an error, the system should be alarmed and rectification of the fault carried out where possible or desirable.

Data transmission error correction: The minimum specification standard for data transmission error correction has been set to provide a level of protection against the effects of most interference. Functional equipment failures may also be corrected, but it should

be borne in mind that measurement accuracy may have changed.

Protection from interference: Compliance with relevant EMC standards provides the first level of defence against interference. The ability to correct most errors provides a second level (level A3.1.3).