

INTERNATIONAL STANDARD

**Industrial communication networks – Fieldbus specifications –
Part 5-26: Application layer service definition – Type 26 elements**





THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2023 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.



IEC 61158-5-26

Edition 2.0 2023-03

INTERNATIONAL STANDARD

**Industrial communication networks – Fieldbus specifications –
Part 5-26: Application layer service definition – Type 26 elements**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 25.040.40; 35.100.70; 35.110

ISBN 978-2-8322-6581-9

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
1.1 General.....	8
1.2 Specifications	9
1.3 Conformance	9
2 Normative references	9
3 Terms, definitions, symbols, abbreviated terms and conventions	11
3.1 Terms and definitions from other ISO/IEC standards.....	11
3.1.1 Terms and definitions from ISO/IEC 7498-1	11
3.1.2 Terms and definitions from ISO/IEC 8822	11
3.1.3 Terms and definitions from ISO/IEC 9545	11
3.1.4 Terms and definitions from ISO/IEC 8824-1	12
3.2 Fieldbus application layer Type 26-specific definitions	12
3.3 Abbreviated terms and symbols	18
3.4 Conventions.....	20
3.4.1 Overview	20
3.4.2 General conventions	20
3.4.3 Conventions for class definitions	21
3.4.4 Conventions for service definitions	22
4 Concepts	23
5 Data type ASE	23
5.1 Overview.....	23
5.2 Formal definition of data type objects.....	24
5.2.1 Data type class definitions	24
5.2.2 Attributes	25
5.3 FAL defined data types	26
5.3.1 Fixed length types	26
5.3.2 String types	32
5.4 Data type ASE service specification.....	33
6 Communication model specification	33
6.1 General.....	33
6.2 Protocol stack for Type 26 fieldbus	33
6.3 Overview of Type 26 communication model	34
6.4 Cyclic data communication service with Common-memory	35
6.4.1 Overview	35
6.4.2 Common–memory: allocation to each node.....	36
6.4.3 Data sharing among nodes with the CM.....	37
6.4.4 CM data type	39
6.5 ASEs	39
6.5.1 Overview of Type 26 ASEs	39
6.5.2 Type 26 specific conventions for FAL service common parameters	40
6.5.3 Cyclic-data ASE.....	41
6.5.4 Message data ASE	47
6.5.5 Load measurement ASE	77
6.5.6 Network management ASE	83

- 6.5.7 General purpose command server ASE 97
- 6.5.8 AR ASE 100
- 6.5.9 FAL ASE summary 113
- Bibliography..... 116

- Figure 1 – Protocol stack for Type 26 fieldbus 34
- Figure 2 – Unconfirmed Push-Publisher/Subscriber type interaction..... 35
- Figure 3 – Unconfirmed/Confirmed Client/Server type interaction..... 35
- Figure 4 – Common memory allocation 37
- Figure 5 – Data sharing with the CM 38
- Figure 6 – Node #01 for reception only 38
- Figure 7 – Node #01 without the CM 39
- Figure 8 – Data sharing among nodes with and without CM3 39
- Figure 9 – The structure of ASEs for Type 26 FAL 40
- Figure 10 – Virtual-address-space for Byte block 52
- Figure 11 – Virtual-address-space for Word block 54
- Figure 12 – AR ASE internal architecture 101
- Figure 13 – Structure of IP address 111

- Table 1 – Write service parameters..... 44
- Table 2 – Send-CM service parameters 45
- Table 3 – Read service parameters..... 45
- Table 4 – Update memory service parameters 46
- Table 5 – Get- buffer service parameters 47
- Table 6 – Byte block read service parameters..... 52
- Table 7 – Byte block write service parameters 53
- Table 8 – Word block read service parameters 54
- Table 9 – Word block write service parameters 55
- Table 10 – Network parameter read service parameters 56
- Table 11 – Extended network parameter read service parameters 57
- Table 12 – Network parameter write service parameters 58
- Table 13 – Extended network parameter write service parameters 59
- Table 14 – Stop command service parameters..... 60
- Table 15 – Operation command service parameters..... 60
- Table 16 – profile read service parameters 61
- Table 17 – Transparent message service parameters 63
- Table 18 – Log data read service parameters 64
- Table 19 – Log data items..... 64
- Table 20 – Log data clear service parameters..... 69
- Table 21 – Message return service parameters..... 70
- Table 22 – Vendor specific message service parameters 71
- Table 23 – Set remote node configuration parameter service parameters 72
- Table 24 – Data elements and Node configuration parameters..... 72

Table 25 – Service parameters of Read remote participating node management information parameter service.....	73
Table 26 – Participating node management information parameters.....	74
Table 27 – Read remote node management information parameter service parameters	75
Table 28 – Node management information parameters	76
Table 29 – Read remote node setting information parameter service parameters.....	77
Table 30 – Node setting information parameters	77
Table 31 – Start TK-holding-time measurement service parameters.....	79
Table 32 – Terminate TK-holding-time measurement service parameters.....	80
Table 33 – Token-holding-time measurement result	81
Table 34 – Start GP_Comm sender log service parameters	82
Table 35 – Terminate GP_Comm sender log service parameters	82
Table 36 – GP_Comm sender log measurement result.....	83
Table 37 – Service parameters for Set configuration parameter	87
Table 38 – Configuration parameters	87
Table 39 – Read node management information parameter service parameters.....	88
Table 40 – Node management information parameters	88
Table 41 – Service parameters for Read participating node mgt. information parameter	89
Table 42 – Participating node management information parameters.....	90
Table 43 – Service parameters for Read network management information parameter.....	90
Table 44 – Network management information parameters	91
Table 45 – Service parameters for Read message sequence number management information.....	91
Table 46 – Read message sequence number management information parameters	92
Table 47 – Read node status service parameters.....	92
Table 48 – Read node status parameters.....	93
Table 49 – Upper layer operating condition matrix	93
Table 50 – Reset node service parameters	94
Table 51 – Set network address service parameters	94
Table 52 – Register service parameters.....	95
Table 53 – Event service parameters	95
Table 54 – Activate/Deactivate measurement service parameters	96
Table 55 – Get log data service parameters.....	97
Table 56 – Send command service parameters.....	100
Table 57 – CT send service parameters.....	104
Table 58 – MT send service parameters	106
Table 59 – CS send service parameters.....	107
Table 60 – Notify state change service parameters.....	108
Table 61 – Control measurement service parameters.....	109
Table 62 – DLSAP assignments.....	110
Table 63 – DLS Primitives and parameters	112
Table 64 – Lower layer T-profile and the required standards.....	113
Table 65 – Summary of FAL ASEs	113

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –
FIELDBUS SPECIFICATIONS –****Part 5-26: Application layer service definition –
Type 26 elements**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

Attention is drawn to the fact that the use of the associated protocol type is restricted by its intellectual-property-right holders. In all cases, the commitment to limited release of intellectual-property-rights made by the holders of those rights permits a layer protocol type to be used with other layer protocols of the same type, or in other type combinations explicitly authorized by its intellectual-property-right holders.

NOTE Combinations of protocol types are specified in the IEC 61784-1 series and the IEC 61784-2 series.

IEC 61158-5-26 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This second edition cancels and replaces the first edition published in 2019. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) expand Common-memory-area as a new Common-memory-area-3 (CM3);
- b) add new services with expansion of Common-memory-area:
 - Extended-cyclic-data transfer service;
 - Extended-participation-request service;
 - Extended-network-parameter-read service;
 - Extended-network-parameter-write service.

The text of this International Standard is based on the following documents:

Draft	Report on voting
65C/1203/FDIS	65C/1244/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts of the IEC 61158 series, published under the general title *Industrial communication networks – Fieldbus specifications*, can be found on the IEC web site.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC web site under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

This document is one of a series produced to facilitate the interconnection of automation system components. It is related to other standards in the set as defined by the "three-layer" fieldbus reference model described in IEC 61158-1.

The application service is provided by the application protocol making use of the services available from the data-link or other immediately lower layer. This document defines the application service characteristics that fieldbus applications and/or system management can exploit.

Throughout the set of fieldbus standards, the term "service" refers to the abstract capability provided by one layer of the OSI Basic Reference Model to the layer immediately above. Thus, the application layer service defined in this document is a conceptual architectural service, independent of administrative and implementation divisions.

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 5-26: Application layer service definition – Type 26 elements

1 Scope

1.1 General

The fieldbus application layer (FAL) provides user programs with a means to access the Fieldbus communication environment. In this respect, the FAL can be viewed as a "window between corresponding application programs."

This part of IEC 61158 provides common elements for basic time-critical and non-time-critical messaging communications between application programs in an automation environment and material specific to Type 26 fieldbus. The term "time-critical" is used to represent the presence of a time-window, within which one or more specified actions are required to be completed with some defined level of certainty. Failure to complete specified actions within the time window risks failure of the applications requesting the actions, with attendant risk to equipment, plant and possibly human life.

This document defines in an abstract way the externally visible service provided by the Type26 fieldbus application layer in terms of:

- an abstract model for defining application resources (objects) capable of being manipulated by users via the use of the FAL service;
- the primitive actions and events of the service;
- the parameters associated with each primitive action and event, and the form which they take; and
- the interrelationship between these actions and events, and their valid sequences.

The purpose of this document is to define the services provided to:

- the FAL user at the boundary between the user and the Application Layer of the Fieldbus Reference Model, and
- Systems Management at the boundary between the Application Layer and Systems Management of the Fieldbus Reference Model.

This document specifies the structure and services of the Type 26 fieldbus application layer, in conformance with the OSI Basic Reference Model (see ISO/IEC 7498-1) and the OSI Application Layer Structure (see ISO/IEC 9545).

FAL services and protocols are provided by FAL application-entities (AE) contained within the application processes. The FAL AE is composed of a set of object-oriented Application Service Elements (ASEs) and a Layer Management Entity (LME) that manages the AE. The ASEs provide communication services that operate on a set of related application process object (APO) classes. One of the FAL ASEs is a management ASE that provides a common set of services for the management of the instances of FAL classes.