BS EN IEC 61804-5:2020

BSI Standards Publication

Devices and intergration in enterprise systems — Function blocks (FB) for process control and electronic device description language (EDDL)

Part 5: EDDL Builtin library

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National foreword

This British Standard is the UK implementation of EN IEC 61804-5:2020. It is identical to IEC 61804-5:2020. It supersedes BS EN 61804-5:2015, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GEL/65/3, Industrial communications: process measurement and control, including fieldbus.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Supersedes EN 61804-5:2015 and all of its amendments and corrigenda (if any)

English Version

Devices and intergration in enterprise systems - Function blocks (FB) for process control and electronic device description language (EDDL) - Part 5: EDDL Builtin library (IEC 61804-5:2020)

Les dispositifs et leur intégration dans les systèmes de l'entreprise - Blocs fonctionnels (FB) pour les procédés industriels et le langage de description électronique de produit (EDDL) - Partie 5: Bibliothèque de Builtin EDDL (IEC 61804-5:2020)

Funktionsbausteine für die Prozessautomation und elektronische Gerätebeschreibungssprache - Teil 5: Bibliothek vorgefertigter Unterprogramme (IEC 61804-5:2020)

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The text of document 65E/634/CDV, future edition 2 of IEC 61804-5, prepared by SC 65E "Devices and integration in enterprise systems" of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61804-5:2020.

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- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-07-29

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 61804-3	2020	Devices and integration in enterprise systems - Function blocks (FB) for process control and electronic device description language (EDDL) - Part 3: EDDL syntax and semantics	EN IEC 61804-3	2020
ISO/IEC 9899	-	Information technology - Programming languages - C	-	-
IEEE 754	-	IEEE Standard for Floating-Point Arithmetic	-	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

DEVICES AND INTEGRATION IN ENTERPRISE SYSTEMS – FUNCTION BLOCKS (FB) FOR PROCESS CONTROL AND ELECTRONIC DEVICE DESCRIPTION LANGUAGE (EDDL) –

Part 5: EDDL Builtin library

FOREWORD

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International Standard IEC 61804-5 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

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This edition was developed by merging material from multiple variants of existing EDDL specifications including those from FieldComm Group (Foundation™ Fieldbus[1], HART®[2]), PROFIBUS™[3] Nutzerorganisation e.V. (PNO), and ISA100_Wireless™[4] Compliance Institute (ISA100 WCI). As a result, the formatting and numbering of this edition may be different from any of the individual specifications from which this edition was derived.

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

- Communication profiles ISA100 and GPE were added.
- The following builtins have been deprecated:
  - ABORT_ON_NO_DEVICE
  - IGNORE_NO_DEVICE
  - RETRY_ON_NO_DEVICE
  - XMTR_ABORT_ON_NO_DEVICE
  - XMTR_IGNORE_NO_DEVICE
  - XMTR_RETRY_ON_NO_DEVICE
  - get_status_code_string

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

CDV	Report on voting
65E/634/CDV	65E/691/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61804 series, published under the general title *Devices and integration in enterprise systems – Function blocks (FB) for process control and electronic device description language (EDDL)*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

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- replaced by a revised edition, or
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INTRODUCTION

This part of IEC 61804

- contains a list of builtins that can be used inside of EDDL methods;
- defines the functionality and parameters for each builtin;
- decribes how EDDL variables can be referenced from inside EDDL methods;

EDDL features are limited by profile for each of the communication technologies. The descriptions in this part of IEC 61804 refer to these features in a general sense and not all communication technologies will support all of the features described. The profile definitions in the overview of this part and in IEC 61804-3 are referred to in order to understand the features supported by each communication technology.

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DEVICES AND INTEGRATION IN ENTERPRISE SYSTEMS – FUNCTION BLOCKS (FB) FOR PROCESS CONTROL AND ELECTRONIC DEVICE DESCRIPTION LANGUAGE (EDDL) –

Part 5: EDDL Builtin library

1 Scope

This part of IEC 61804 specifies the EDDL builtin library and provides the profiles of the various fieldbuses.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61804-3:2020, *Devices and integration in enterprise systems – Function blocks (FB) for process control and electronic device description language (EDDL) – Part 3: EDDL syntax and semantics*

ISO/IEC 9899, *Information technology – Programming Languages – C*

IEEE 754, *IEEE Standard for Binary Floating-Point Arithmetic*

3 Terms, definitions, acronyms and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61804-3 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
method-variable
variable with scope within a method

3.2 Acronyms and abbreviated terms

CP	Communication Profile
CPF	Communication Profile Family
CS	Communication Server
DD	Device Description
EDD	Electronic Device Description
EDDL	Electronic Device Description Language

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FF	Foundation Fieldbus
GPE	Generic Protocol Extension
HART	HART® Communication Foundation
I/O	Input/output
ID	Identifier
ISA100	ISA100_Wireless™
PB	PROFIBUS
PI	PROFIBUS & PROFINET[3] International
PN	PROFINET
PNO	PROFIBUS Nutzerorganisation

4 Conventions for builtin descriptions

The following conventions apply for the builtin overview.

– Table 1 defines the format for the builtin overview table.
– Table 2 defines the contents of the columns of Table 1.
– EDDL basic constructs and attributes referenced in this document are written in upper case letters.

Table 1 – Format for the builtin overview table

Reference	Builtin	Communication profiles

Table 2 – Contents of the builtin overview table

Column	Text	Meaning
Reference		Reference to the respective subclause that specifies the builtin.
Builtin		Name of the builtin.
Communication profiles	✓	The builtin is supported by the respective Communication profile.
	x	The builtin is not supported by the respective Communication profile.
	d	The usage of the builtin is deprecated.

The following conventions apply for the builtin definitions.

– Table 3 defines the format for the builtins lexical element tables.
– Table 4 defines the contents of the columns of Table 3.
– EDDL basic constructs and attributes referenced in this document are written in upper case letters.

Table 3 – Format for the builtins lexical element tables

Parameter name	Type	Direction	Usage	Description

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Table 4 – Contents of the lexical element table

Column	Text	Meaning
Parameter name	<name>	The name of the formal parameter.
	“<return>”	The return value of the builtin.
Type	data type	Abstract data type (basic or derived) of the formal parameter.
Direction	I	An input parameter.
	O	An output parameter is implicitely passed by reference so that the called builtin function can modify the value. The return value of a builtin is passed by value, if any.
	I/O	An input output parameter is implicitely passed by reference so that the called builtin function can modify the value.
	—	There is no returned value (VOID).
Usage	m	Formal parameter is mandatory.
	o	Formal parameter is optional.
	c	Formal parameter is conditional.
	—	There is no returned value (VOID).
Description	<text>	Descriptive text for the parameter.
	—	There is no returned value (VOID).

5 Builtin categories

5.1 Overview

Table 5 provides an alphabetical overview of the EDDL builtin library and specify the profile per communication technology.

Table 5 – Builtin overview

Reference	Builtin	Communication profiles						
		CS	FF	GPE	HART	ISA100	PB	PN
6.17.1	_ERROR	✓	✓	✓	✓	✓	✓	✓
6.17.2	_TRACE	✓	✓	✓	✓	✓	✓	✓
6.17.3	_WARNING	✓	✓	✓	✓	✓	✓	✓
6.7.1	abort	✓	x	✓	✓	x	✓	✓
6.3.1	abort_on_all_comm_errors	x	✓	x	x	✓	x	x
6.3.2	ABORT_ON_ALL_COMM_STATUS	x	x	x	✓	x	x	x
6.3.3	ABORT_ON_ALL_DEVICE_STATUS	x	x	x	✓	x	x	x
6.3.4	ABORT_ON_ALL_RESPONSE_CODES	x	x	x	✓	x	x	x
6.3.5	abort_on_all_response_codes	x	✓	x	x	✓	x	x
6.3.6	ABORT_ON_COMM_ERROR	x	x	x	✓	x	x	x
6.3.7	abort_on_comm_error	x	✓	x	x	✓	x	x
6.3.8	ABORT_ON_COMM_STATUS	x	x	x	✓	x	x	x
6.3.9	ABORT_ON_DEVICE_STATUS	x	x	x	✓	x	x	x
6.3.10	ABORT_ON_NO_DEVICE (deprecated)	x	x	x	d	x	x	x

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Reference	Builtin	Communication profiles						
		CS	FF	GPE	HART	ISA100	PB	PN
6.3.11	ABORT_ON_RESPONSE_CODE	x	x	x	✓	x	x	x
6.3.12	abort_on_response_code	x	✓	x	x	✓	x	x
6.14.1	abortTransferPort	x	x	x	✓	x	x	x
6.11.1	abs	✓	✓	✓	✓	✓	✓	✓
6.2.1	ACKNOWLEDGE	✓	x	✓	✓	x	✓	✓
6.2.2	acknowledge	✓	x	✓	✓	x	✓	✓
6.11.2	acos	✓	✓	✓	✓	✓	✓	✓
6.7.2	add_abort_method (version A)	✓	x	✓	✓	x	✓	✓
6.7.3	add_abort_method (version B)	x	✓	x	x	✓	x	x
6.9.1	AddTime	✓	✓	✓	✓	✓	✓	✓
6.11.3	asin	✓	✓	✓	✓	✓	✓	✓
6.5.1	assign	x	✓	x	x	✓	x	x
6.5.2	assign_double	✓	x	✓	✓	x	✓	✓
6.5.3	assign_float	✓	x	✓	✓	x	✓	✓
6.5.4	assign_int	✓	x	✓	✓	x	✓	✓
6.5.5	assign_var	✓	x	✓	✓	x	✓	✓
6.5.6	assign2	x	✓	x	x	✓	x	x
6.11.4	atan	✓	✓	✓	✓	✓	✓	✓
6.8.1	atof	✓	x	✓	✓	x	✓	✓
6.8.2	atoi	✓	x	✓	✓	x	✓	✓
6.15.1	browseIdentity	x	x	x	✓	x	x	x
6.8.3	BUILD_MESSAGE	✓	✓	✓	✓	✓	✓	✓
6.11.5	ByteToDouble	✓	x	✓	x	x	✓	✓
6.11.6	ByteToFloat	✓	x	✓	x	x	✓	✓
6.11.7	ByteToLong	✓	x	✓	x	x	✓	✓
6.11.8	ByteToShort	✓	x	✓	x	x	✓	✓
6.11.9	cbrt	✓	✓	✓	✓	✓	✓	✓
6.11.10	ceil	✓	✓	✓	✓	✓	✓	✓
6.14.2	closeTransferPort	x	x	x	✓	x	x	x
6.11.11	cos	✓	✓	✓	✓	✓	✓	✓
6.11.12	cosh	✓	✓	✓	✓	✓	✓	✓
6.5.7	dassign	✓	x	✓	✓	x	✓	✓
6.9.2	DATE_AND_TIME_VALUE_to_string	✓	x	✓	✓	x	✓	✓
6.9.3	Date_to_DayOfMonth	✓	x	✓	✓	x	✓	✓
6.9.4	DATE_to_days	✓	x	✓	✓	x	✓	✓
6.9.5	Date_to_Month	✓	x	✓	✓	x	✓	✓
6.9.6	DATE_to_string	✓	x	✓	✓	x	✓	✓
6.9.7	Date_To_Time	✓	x	✓	✓	x	✓	✓
6.9.8	Date_to_Year	✓	x	✓	✓	x	✓	✓
6.9.9	days_to_DATE	✓	x	✓	✓	x	✓	✓

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Reference	Builtin	Communication profiles						
		CS	FF	GPE	HART	ISA100	PB	PN
6.2.3	DELAY	✓	x	✓	✓	x	✓	✓
6.2.4	delay	✓	x	✓	✓	x	✓	✓
6.9.10	DELAY_TIME	✓	x	✓	✓	x	✓	✓
6.2.5	delayfor	x	✓	x	x	✓	x	x
6.2.6	delayfor2	x	✓	x	x	✓	x	x
6.13.1	DICT_ID	x	✓	x	x	✓	x	x
6.8.4	dictionary_string	✓	x	✓	✓	x	✓	✓
6.9.11	DiffTime	✓	✓	✓	✓	✓	✓	✓
6.6.1	discard_on_exit	✓	✓	✓	✓	✓	✓	✓
6.2.7	DISPLAY	✓	x	✓	✓	x	✓	✓
6.2.8	display	✓	x	✓	✓	x	✓	✓
6.2.9	display_bitenum	✓	x	✓	x	x	✓	✓
6.2.10	display_builtin_error	x	✓	x	x	✓	x	x
6.2.11	display_comm_error	x	✓	x	x	✓	x	x
6.2.12	display_comm_status	x	x	x	✓	x	x	x
6.2.13	display_device_status	x	x	x	✓	x	x	x
6.2.14	display_dynamics	x	✓	x	x	✓	x	x
6.2.15	display_dynamics2	x	✓	x	x	✓	x	x
6.2.16	display_message	x	✓	x	x	✓	x	x
6.2.17	display_message2	x	✓	x	x	✓	x	x
6.2.18	display_response_code	x	✓	x	x	✓	x	x
6.2.19	display_response_status	x	x	x	✓	x	x	x
6.2.20	display_xmtr_status	x	x	x	✓	x	x	x
6.11.13	DoubleToByte	✓	x	✓	x	x	✓	✓
6.11.14	drand	✓	✓	✓	✓	✓	✓	✓
6.11.15	dseed	✓	✓	✓	✓	✓	✓	✓
6.2.21	edit_device_value	x	✓	x	x	✓	x	x
6.2.22	edit_device_value2	x	✓	x	x	✓	x	x
6.2.23	edit_local_value	x	✓	x	x	✓	x	x
6.2.24	edit_local_value2	x	✓	x	x	✓	x	x
6.11.16	exp	✓	✓	✓	✓	✓	✓	✓
6.3.13	ext_send_command	x	x	x	✓	x	x	x
6.3.14	ext_send_command_trans	x	x	x	✓	x	x	x
6.3.15	fail_on_all_comm_errors	x	✓	x	x	✓	x	x
6.3.16	fail_on_all_response_codes	x	✓	x	x	✓	x	x
6.3.17	fail_on_comm_error	x	✓	x	x	✓	x	x
6.3.18	fail_on_response_code	x	✓	x	x	✓	x	x
6.5.8	fassign	✓	x	✓	✓	x	✓	✓
6.14.2	fGetByte	x	x	x	✓	x	x	x
6.4.1	fgetval	✓	x	✓	✓	x	✓	✓

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Reference	Builtin	Communication profiles						
		CS	FF	GPE	HART	ISA100	PB	PN
6.5.9	float_value	✓	x	✓	✓	x	✓	✓
6.11.17	FloatToByte	✓	x	✓	x	x	✓	✓
6.11.18	floor	✓	✓	✓	✓	✓	✓	✓
6.11.19	fmod	✓	✓	✓	✓	✓	✓	✓
6.11.20	fpclassify	✓	✓	✓	✓	✓	✓	✓
6.9.12	From_DATE_AND_TIME_VALUE	✓	x	✓	✓	x	✓	✓
6.9.13	From_TIME_VALUE	✓	x	✓	✓	x	✓	✓
6.4.2	fsetval	✓	x	✓	✓	x	✓	✓
6.8.5	ftoa	✓	x	✓	x	x	✓	✓
6.5.10	fvar_value	✓	x	✓	✓	x	✓	✓
6.2.25	get_acknowledgement	x	✓	x	x	✓	x	x
6.2.26	get_acknowledgement2	x	✓	x	x	✓	x	x
6.13.2	get_block_instance_by_object_index	x	✓	x	x	✓	x	x
6.13.3	get_block_instance_by_tag	x	✓	x	x	✓	x	x
6.13.4	get_block_instance_count	x	✓	x	x	✓	x	x
6.10.1	get_comm_error	x	✓	x	x	✓	x	x
6.8.6	get_comm_error_string	x	✓	x	x	✓	x	x
6.4.3	get_date	x	✓	x	x	✓	x	x
6.12.1	get_date_lelem	x	✓	x	x	✓	x	x
6.12.2	get_date_lelem2	x	✓	x	x	✓	x	x
6.5.11	get_date_value	x	✓	x	x	✓	x	x
6.5.12	get_date_value2	x	✓	x	x	✓	x	x
6.16.1	GET_DD_REVISION	✓	x	✓	x	x	✓	✓
6.10.2	get_dds_error	x	✓	x	x	✓	x	x
6.2.27	GET_DEV_VAR_VALUE	✓	x	✓	✓	x	✓	✓
6.2.28	get_dev_var_value	✓	x	✓	✓	x	✓	✓
6.16.2	GET_DEVICE_REVISION	✓	x	✓	x	x	✓	✓
6.16.3	GET_DEVICE_TYPE	✓	x	✓	x	x	✓	✓
6.8.7	get_dictionary_string	✓	x	✓	✓	x	✓	✓
6.4.4	get_double	x	✓	x	x	✓	x	x
6.12.3	get_double_lelem	x	✓	x	x	✓	x	x
6.12.4	get_double_lelem2	x	✓	x	x	✓	x	x
6.5.13	get_double_value	x	✓	x	x	✓	x	x
6.5.14	get_double_value2	x	✓	x	x	✓	x	x
6.8.8	get_enum_string	✓	x	✓	✓	x	✓	✓
6.4.5	get_float	x	✓	x	x	✓	x	x
6.12.5	get_float_lelem	x	✓	x	x	✓	x	x
6.12.6	get_float_lelem2	x	✓	x	x	✓	x	x
6.5.15	get_float_value	x	✓	x	x	✓	x	x
6.5.16	get_float_value2	x	✓	x	x	✓	x	x

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Reference	Builtin	Communication profiles						
		CS	FF	GPE	HART	ISA100	PB	PN
6.2.29	GET_LOCAL_VAR_VALUE	✓	x	✓	✓	x	✓	✓
6.2.30	get_local_var_value	✓	x	✓	✓	x	✓	✓
6.16.4	GET_MANUFACTURER	✓	x	✓	✓	x	✓	✓
6.3.19	get_more_status	x	x	x	✓	x	x	x
6.13.5	get_resolve_status	x	✓	x	x	✓	x	x
6.10.3	get_response_code	x	✓	x	x	✓	x	x
6.8.9	get_response_code_string	x	✓	x	x	✓	x	x
6.8.10	get_rspcode_string	x	x	x	✓	x	x	x
6.8.11	get_rspcode_string_by_id	✓	x	✓	x	x	✓	✓
6.4.6	get_signed	x	✓	x	x	✓	x	x
6.12.7	get_signed_lelem	x	✓	x	x	✓	x	x
6.12.8	get_signed_lelem2	x	✓	x	x	✓	x	x
6.5.17	get_signed_value	x	✓	x	x	✓	x	x
6.5.18	get_signed_value2	x	✓	x	x	✓	x	x
6.8.12	get_status_code_string(deprecated)	x	x	x	d	x	x	x
6.8.13	get_status_string	x	✓	x	x	✓	x	x
6.8.14	get_stddict_string	x	✓	x	x	✓	x	x
6.4.7	get_string	x	✓	x	x	✓	x	x
6.12.9	get_string_lelem	x	✓	x	x	✓	x	x
6.12.10	get_string_lelem2	x	✓	x	x	✓	x	x
6.5.19	get_string_value	x	✓	x	x	✓	x	x
6.5.20	get_string_value2	x	✓	x	x	✓	x	x
6.9.17	GET_TICK_COUNT	✓	x	✓	x	x	✓	✓
6.14.4	get_transfer_status	x	x	x	✓	x	x	x
6.4.8	get_unsigned	x	✓	x	x	✓	x	x
6.12.11	get_unsigned_lelem	x	✓	x	x	✓	x	x
6.12.12	get_unsigned_lelem2	x	✓	x	x	✓	x	x
6.5.21	get_unsigned_value	x	✓	x	x	✓	x	x
6.5.22	get_unsigned_value2	x	✓	x	x	✓	x	x
6.8.15	get_variable_string	✓	x	✓	x	x	✓	✓
6.9.14	GetCurrentDate	✓	✓	✓	x	✓	✓	✓
6.9.15	GetCurrentDateAndTime	✓	✓	✓	x	✓	✓	✓
6.9.16	GetCurrentTime	✓	✓	✓	✓	✓	✓	✓
6.5.23	iassign	✓	x	✓	✓	x	✓	✓
6.4.9	igetval	✓	x	✓	✓	x	✓	✓
6.3.20	IGNORE_ALL_COMM_STATUS	x	x	x	✓	x	x	x
6.3.21	IGNORE_ALL_DEVICE_STATUS	x	x	x	✓	x	x	x
6.3.22	IGNORE_ALL_RESPONSE_CODES	x	x	x	✓	x	x	x
6.3.23	IGNORE_COMM_ERROR	x	x	x	✓	x	x	x
6.3.24	IGNORE_COMM_STATUS	x	x	x	✓	x	x	x

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Reference	Builtin	Communication profiles						
		CS	FF	GPE	HART	ISA100	PB	PN
6.3.25	IGNORE_DEVICE_STATUS	x	x	x	✓	x	x	x
6.3.26	IGNORE_NO_DEVICE (deprecated)	x	x	x	d	x	x	x
6.3.27	IGNORE_RESPONSE_CODE	x	x	x	✓	x	x	x
6.5.24	int_value	✓	x	✓	✓	x	✓	✓
6.11.21	is_NaN	✓	✓	✓	x	✓	✓	✓
6.4.10	isetval	✓	x	✓	✓	x	✓	✓
6.4.11	isOffline	✓	✓	✓	✓	✓	✓	✓
6.13.6	ITEM_ID	x	✓	x	x	✓	x	x
6.8.16	itoa (version A)	✓	x	✓	x	x	✓	✓
6.8.17	itoa (version B)	x	x	x	✓	x	x	x
6.5.25	ivar_value	✓	x	✓	✓	x	✓	✓
6.5.26	lassign	✓	x	✓	x	x	✓	✓
6.4.12	lgetval	✓	x	✓	x	x	✓	✓
6.12.13	ListDeleteElementAt (version A)	✓	x	✓	✓	x	✓	✓
6.12.14	ListDeleteElementAt (version B)	x	✓	x	x	✓	x	x
6.12.15	ListDeleteElementAt2	x	✓	x	x	✓	x	x
6.12.16	ListInsert (version A)	✓	x	✓	✓	x	✓	✓
6.12.17	ListInsert (version B)	x	✓	x	x	✓	x	x
6.12.18	ListInsert2	x	✓	x	x	✓	x	x
6.11.22	log	✓	✓	✓	✓	✓	✓	✓
6.17.4	LOG_MESSAGE	✓	x	✓	✓	x	✓	✓
6.11.23	log10	✓	✓	✓	✓	✓	✓	✓
6.11.24	log2	✓	✓	✓	✓	✓	✓	✓
6.5.27	long_value	✓	x	✓	x	x	✓	✓
6.11.25	LongToByte	✓	x	✓	x	x	✓	✓
6.4.13	lsetval	✓	x	✓	x	x	✓	✓
6.5.28	lvar_value	✓	x	✓	x	x	✓	✓
6.9.18	Make_Time	✓	✓	✓	✓	✓	✓	✓
6.13.7	MEMBER_ID	x	✓	x	x	✓	x	x
6.2.31	Menu	✓	x	✓	✓	x	✓	✓
6.2.32	MenuDisplay (version A)	✓	x	✓	✓	x	✓	✓
6.2.33	MenuDisplay (version B)	x	✓	x	x	✓	x	x
6.7.4	method_abort	x	✓	x	x	✓	x	x
6.11.26	nan	✓	✓	✓	✓	✓	✓	✓
6.11.27	NaN_value	✓	✓	✓	x	✓	✓	✓
6.11.28	nanf	✓	✓	✓	✓	✓	✓	✓
6.13.8	ObjectReference	✓	x	✓	x	x	✓	✓
6.14.5	openTransferPort	x	x	x	✓	x	x	x
6.7.5	pop_abort_method	✓	x	✓	✓	x	✓	✓
6.11.29	pow	✓	✓	✓	✓	✓	✓	✓

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Reference	Builtin	Communication profiles						
		CS	FF	GPE	HART	ISA100	PB	PN
6.7.6	process_abort	✓	x	✓	✓	x	✓	✓
6.7.7	push_abort_method	✓	x	✓	✓	x	✓	✓
6.4.14	put_date	x	✓	x	x	✓	x	x
6.5.29	put_date_value	x	✓	x	x	✓	x	x
6.5.30	put_date_value2	x	✓	x	x	✓	x	x
6.4.15	put_double	x	✓	x	x	✓	x	x
6.5.31	put_double_value	x	✓	x	x	✓	x	x
6.5.32	put_double_value2	x	✓	x	x	✓	x	x
6.4.16	put_float	x	✓	x	x	✓	x	x
6.5.33	put_float_value	x	✓	x	x	✓	x	x
6.5.34	put_float_value2	x	✓	x	x	✓	x	x
6.2.34	PUT_MESSAGE	✓	x	✓	✓	x	✓	✓
6.2.35	put_message	✓	x	✓	✓	x	✓	✓
6.4.17	put_signed	x	✓	x	x	✓	x	x
6.5.35	put_signed_value	x	✓	x	x	✓	x	x
6.5.36	put_signed_value2	x	✓	x	x	✓	x	x
6.4.18	put_string	x	✓	x	x	✓	x	x
6.5.37	put_string_value	x	✓	x	x	✓	x	x
6.5.38	put_string_value2	x	✓	x	x	✓	x	x
6.4.19	put_unsigned	x	✓	x	x	✓	x	x
6.5.39	put_unsigned_value	x	✓	x	x	✓	x	x
6.5.40	put_unsigned_value2	x	✓	x	x	✓	x	x
6.15.2	re_read_file	x	x	x	✓	x	x	x
6.15.3	re_write_file	x	x	x	✓	x	x	x
6.3.28	read_value	x	✓	x	x	✓	x	x
6.3.29	read_value2	x	✓	x	x	✓	x	x
6.3.30	ReadCommand	✓	x	✓	x	x	✓	✓
6.14.6	readItemFromDevice	x	x	x	✓	x	x	x
6.7.8	remove_abort_method (version A)	✓	x	✓	✓	x	✓	✓
6.7.9	remove_abort_method (version B)	x	✓	x	x	✓	x	x
6.7.10	remove_all_abort_methods	✓	✓	✓	✓	✓	✓	✓
6.13.9	resolve_array_ref	x	✓	x	x	✓	x	x
6.13.10	resolve_array_ref2	x	✓	x	x	✓	x	x
6.13.11	resolve_block_ref	x	✓	x	x	✓	x	x
6.13.12	resolve_block_ref2	x	✓	x	x	✓	x	x
6.13.13	resolve_list_ref	x	✓	x	x	✓	x	x
6.13.14	resolve_local_ref	x	✓	x	x	✓	x	x
6.13.15	resolve_local_ref2	x	✓	x	x	✓	x	x
6.13.16	resolve_param_list_ref	x	✓	x	x	✓	x	x
6.13.17	resolve_param_ref	x	✓	x	x	✓	x	x

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Reference	Builtin	Communication profiles						
		CS	FF	GPE	HART	ISA100	PB	PN
6.13.18	resolve_param_ref2	x	✓	x	x	✓	x	x
6.13.19	resolve_record_ref	x	✓	x	x	✓	x	x
6.13.20	resolve_record_ref2	x	✓	x	x	✓	x	x
6.5.41	ret_double_value	x	✓	x	x	✓	x	x
6.5.42	ret_double_value2	x	✓	x	x	✓	x	x
6.5.43	ret_float_value	x	✓	x	x	✓	x	x
6.5.44	ret_float_value2	x	✓	x	x	✓	x	x
6.5.45	ret_signed_value	x	✓	x	x	✓	x	x
6.5.46	ret_signed_value2	x	✓	x	x	✓	x	x
6.5.47	ret_unsigned_value	x	✓	x	x	✓	x	x
6.5.48	ret_unsigned_value2	x	✓	x	x	✓	x	x
6.3.31	retry_on_all_comm_errors	x	✓	x	x	✓	x	x
6.3.32	RETRY_ON_ALL_COMM_STATUS	x	x	x	✓	x	x	x
6.3.33	RETRY_ON_ALL_DEVICE_STATUS	x	x	x	✓	x	x	x
6.3.34	RETRY_ON_ALL_RESPONSE_CODES	x	x	x	✓	x	x	x
6.3.35	retry_on_all_response_codes	x	✓	x	x	✓	x	x
6.3.36	RETRY_ON_COMM_ERROR	x	x	x	✓	x	x	x
6.3.37	retry_on_comm_error	x	✓	x	x	✓	x	x
6.3.38	RETRY_ON_COMM_STATUS	x	x	x	✓	x	x	x
6.3.39	RETRY_ON_DEVICE_STATUS	x	x	x	✓	x	x	x
6.3.40	RETRY_ON_NO_DEVICE (deprecated)	d	x	d	d	x	d	d
6.3.41	RETRY_ON_RESPONSE_CODE	x	x	x	✓	x	x	x
6.3.42	retry_on_response_code	x	✓	x	x	✓	x	x
6.11.30	round	✓	✓	✓	✓	✓	✓	✓
6.6.2	save_on_exit	✓	✓	✓	x	✓	✓	✓
6.6.3	save_values	✓	x	✓	✓	x	✓	✓
6.9.19	seconds_to_TIME_VALUE	✓	x	✓	✓	x	✓	✓
6.9.20	seconds_to_TIME_VALUE8	✓	✓	✓	x	✓	✓	✓
6.2.36	SELECT_FROM_LIST	✓	x	✓	✓	x	✓	✓
6.2.37	select_from_list	✓	x	✓	✓	x	✓	✓
6.2.38	select_from_menu	x	✓	x	x	✓	x	x
6.2.39	select_from_menu2	x	✓	x	x	✓	x	x
6.3.43	send	x	x	x	✓	x	x	x
6.3.44	send_all_values	x	✓	x	x	✓	x	x
6.3.45	send_command	x	x	x	✓	x	x	x
6.3.46	send_command_trans	x	x	x	✓	x	x	x
6.6.4	send_on_exit	✓	✓	✓	x	✓	✓	✓
6.3.47	send_trans	x	x	x	✓	x	x	x
6.3.48	send_value	x	✓	x	x	✓	x	x
6.3.49	send_value2	x	✓	x	x	✓	x	x

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Reference	Builtin	Communication profiles						
		CS	FF	GPE	HART	ISA100	PB	PN
6.3.50	SET_NUMBER_OF_RETRIES	✓	x	✓	✓	x	✓	✓
6.4.20	sgetval	✓	x	✓	✓	x	✓	✓
6.11.31	ShortToByte	✓	x	✓	x	x	✓	✓
6.11.32	sin	✓	✓	✓	✓	✓	✓	✓
6.11.33	sinh	✓	✓	✓	✓	✓	✓	✓
6.11.34	sqrt	✓	✓	✓	✓	✓	✓	✓
6.4.21	ssetval	✓	x	✓	✓	x	✓	✓
6.8.19	strcmp	✓	✓	✓	✓	✓	✓	✓
6.8.18	strleft	✓	✓	✓	x	✓	✓	✓
6.8.20	strlen	✓	✓	✓	✓	✓	✓	✓
6.8.21	strlwr	✓	✓	✓	✓	✓	✓	✓
6.8.22	strmid	✓	✓	✓	✓	✓	✓	✓
6.8.23	strright	✓	✓	✓	x	✓	✓	✓
6.8.24	strstr	✓	✓	✓	✓	✓	✓	✓
6.8.25	strtrim	✓	✓	✓	✓	✓	✓	✓
6.8.26	strupr	✓	✓	✓	✓	✓	✓	✓
6.11.35	tan	✓	✓	✓	✓	✓	✓	✓
6.11.36	tanh	✓	✓	✓	✓	✓	✓	✓
6.9.21	Time_To_Date	✓	x	✓	✓	x	✓	✓
6.9.22	TIME_VALUE_to_Hour	✓	✓	✓	✓	✓	✓	✓
6.9.23	TIME_VALUE_to_Minute	✓	✓	✓	✓	✓	✓	✓
6.9.24	TIME_VALUE_to_Second	✓	✓	✓	✓	✓	✓	✓
6.9.25	TIME_VALUE_to_seconds	✓	✓	✓	✓	✓	✓	✓
6.9.26	TIME_VALUE_to_string	✓	✓	✓	✓	✓	✓	✓
6.9.27	timet_to_string	✓	✓	✓	✓	✓	✓	✓
6.9.28	timet_to_TIME_VALUE	✓	x	✓	x	x	✓	✓
6.9.29	timet_To_TIME_VALUE	x	x	x	✓	x	x	x
6.9.30	timet_to_TIME_VALUE8	✓	✓	✓	x	✓	✓	✓
6.9.31	To_Date	✓	x	✓	✓	x	✓	✓
6.9.32	To_Date_and_Time	✓	x	✓	x	x	✓	✓
6.9.33	To_Time	✓	x	✓	✓	x	✓	✓
6.9.34	To_TIME_VALUE	✓	x	✓	✓	x	✓	✓
6.9.35	To_TIME_VALUE8	✓	✓	✓	x	✓	✓	✓
6.8.27	trunc	✓	✓	✓	✓	✓	✓	✓
6.13.21	VARID	✓	x	✓	✓	x	✓	✓
6.5.49	vassign	✓	x	✓	✓	x	✓	✓
6.3.51	WriteCommand	✓	x	✓	x	x	✓	✓
6.14.7	writeItemToDevice	x	x	x	✓	x	x	x
6.3.52	XMTR_ABORT_ON_ALL_COMM_STATUS	x	x	x	✓	x	x	x
6.3.53	XMTR_ABORT_ON_ALL_DATA	x	x	x	✓	x	x	x

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Reference	Builtin	Communication profiles						
		CS	FF	GPE	HART	ISA100	PB	PN
6.3.54	XMTR_ABORT_ON_ALL_DEVICE_STATUS	x	x	x	✓	x	x	x
6.3.55	XMTR_ABORT_ON_ALL_RESPONSE_CODES	x	x	x	✓	x	x	x
6.3.56	XMTR_ABORT_ON_COMM_ERROR	x	x	x	✓	x	x	x
6.3.57	XMTR_ABORT_ON_COMM_STATUS	x	x	x	✓	x	x	x
6.3.58	XMTR_ABORT_ON_DATA	x	x	x	✓	x	x	x
6.3.59	XMTR_ABORT_ON_DEVICE_STATUS	x	x	x	✓	x	x	x
6.3.60	XMTR_ABORT_ON_NO_DEVICE (deprecated)	x	x	x	d	x	x	x
6.3.61	XMTR_ABORT_ON_RESPONSE_CODE	x	x	x	✓	x	x	x
6.3.62	XMTR_IGNORE_ALL_COMM_STATUS	x	x	x	✓	x	x	x
6.3.63	XMTR_IGNORE_ALL_DATA	x	x	x	✓	x	x	x
6.3.64	XMTR_IGNORE_ALL_DEVICE_STATUS	x	x	x	✓	x	x	x
6.3.65	XMTR_IGNORE_ALL_RESPONSE_CODES	x	x	x	✓	x	x	x
6.3.66	XMTR_IGNORE_COMM_ERROR	x	x	x	✓	x	x	x
6.3.67	XMTR_IGNORE_COMM_STATUS	x	x	x	✓	x	x	x
6.3.68	XMTR_IGNORE_DATA	x	x	x	✓	x	x	x
6.3.69	XMTR_IGNORE_DEVICE_STATUS	x	x	x	✓	x	x	x
6.3.70	XMTR_IGNORE_NO_DEVICE (deprecated)	x	x	x	d	x	x	x
6.3.71	XMTR_IGNORE_RESPONSE_CODE	x	x	x	✓	x	x	x
6.3.72	XMTR_RETRY_ON_ALL_COMM_STATUS	x	x	x	✓	x	x	x
6.3.73	XMTR_RETRY_ON_ALL_DATA	x	x	x	✓	x	x	x
6.3.74	XMTR_RETRY_ON_ALL_DEVICE_STATUS	x	x	x	✓	x	x	x
6.3.75	XMTR_RETRY_ON_ALL_RESPONSE_CODES	x	x	x	✓	x	x	x
6.3.76	XMTR_RETRY_ON_COMM_ERROR	x	x	x	✓	x	x	x
6.3.77	XMTR_RETRY_ON_COMM_STATUS	x	x	x	✓	x	x	x
6.3.78	XMTR_RETRY_ON_DATA	x	x	x	✓	x	x	x
6.3.79	XMTR_RETRY_ON_DEVICE_STATUS	x	x	x	✓	x	x	x
6.3.80	XMTR_RETRY_ON_NO_DEVICE (deprecated)	x	x	x	d	x	x	x
6.3.81	XMTR_RETRY_ON_RESPONSE_CODE	x	x	x	✓	x	x	x

There are the following special categories of builtins:

- User interface builtins;
- Communication builtins;
- Action builtins.

Table 6 shows restrictions to the usage of builtins, depending on their category.

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Table 6 – Usage of builtins

Builtin usage	User interface builtins	Communication builtins	Action builtins
Methods referenced in user interface menus	Allowed	Allowed	Not allowed
PRE_EDIT_ACTIONS	Allowed	Not recommended	Allowed [a]
POST_EDIT_ACTIONS	Allowed	Not recommended	Allowed [a]
REFRESH_ACTIONS	Not recommended	GRAPH and CHART: allowed Others: not recommended	Allowed [a]
PRE_READ_ACTIONS	Not recommended	Allowed	Allowed [a]
POST_READ_ACTIONS	Not recommended	Allowed	Allowed [a]
PRE_WRITE_ACTIONS	Not recommended	Allowed	Allowed [a]
POST_WRITE_ACTIONS	Not recommended	Allowed	Allowed [a]
INIT_ACTIONS	Not recommended	Allowed	Not allowed
EXIT_ACTIONS	Not recommended	Allowed	Not allowed
[a] Shall only be used for actions called from a VARIABLE.			

5.2 User interface builtins

User interface builtins display information and in addition some of them require interaction from the user. The list of user interface builtins are listed in Table 7.

Table 7 – User interface builtins

Builtin name
ACKNOWLEDGE
acknowledge
DELAY
delay
delayfor
delayfor2
DISPLAY
display
display_bitenum
display_builtin_error
display_comm_error
display_comm_status
display_device_status
display_dynamics
display_dynamics2
display_message
display_message2
display_response_code
display_response_status
display_xmtr_status
edit_device_value

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Builtin name
edit_device_value2
edit_local_value
edit_local_value2
get_acknowledgement2
get_acknowlegement
GET_DEV_VAR_VALUE
get_dev_var_value
GET_LOCAL_VAR_VALUE
get_local_var_value
Menu
MenuDisplay (version A)
MenuDisplay (version B)
PUT_MESSAGE
put_message
SELECT_FROM_LIST
select_from_list
select_from_menu
select_from_menu2

5.3 Communication builtins

The communication builtins allow methods to communicate with the device or to control the communication with the device. The list of communication builtins is listed in Table 8.

Table 8 – Communication builtins

Builtin name
abort_on_all_comm_errors
ABORT_ON_ALL_COMM_STATUS
ABORT_ON_ALL_DEVICE_STATUS
ABORT_ON_ALL_RESPONSE_CODES
abort_on_all_response_codes
ABORT_ON_COMM_ERROR
abort_on_comm_error
ABORT_ON_COMM_STATUS
ABORT_ON_DEVICE_STATUS
ABORT_ON_NO_DEVICE
ABORT_ON_RESPONSE_CODE
abort_on_response_code
ext_send_command
ext_send_command_trans
fail_on_all_comm_errors
fail_on_all_response_codes
fail_on_comm_error
fail_on_response_code

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Builtin name
get_more_status
IGNORE_ALL_COMM_STATUS
IGNORE_ALL_DEVICE_STATUS
IGNORE_ALL_RESPONSE_CODES
IGNORE_COMM_ERROR
IGNORE_COMM_STATUS
IGNORE_DEVICE_STATUS
IGNORE_NO_DEVICE
IGNORE_RESPONSE_CODE
read_value
read_value2
ReadCommand
retry_on_all_comm_errors
RETRY_ON_ALL_COMM_STATUS
RETRY_ON_ALL_DEVICE_STATUS
RETRY_ON_ALL_RESPONSE_CODES
retry_on_all_response_codes
RETRY_ON_COMM_ERROR
retry_on_comm_error
RETRY_ON_COMM_STATUS
RETRY_ON_DEVICE_STATUS
RETRY_ON_NO_DEVICE
RETRY_ON_RESPONSE_CODE
retry_on_response_code
send
send_all_values
send_command
send_command_trans
send_trans
send_value
send_value2
SET_NUMBER_OF_RETRIES
WriteCommand
XMTR_ABORT_ON_ALL_COMM_STATUS
XMTR_ABORT_ON_ALL_DATA
XMTR_ABORT_ON_ALL_DEVICE_STATUS
XMTR_ABORT_ON_ALL_RESPONSE_CODES
XMTR_ABORT_ON_COMM_ERROR
XMTR_ABORT_ON_COMM_STATUS
XMTR_ABORT_ON_DATA
XMTR_ABORT_ON_DEVICE_STATUS
XMTR_ABORT_ON_NO_DEVICE
XMTR_ABORT_ON_RESPONSE_CODE
XMTR_IGNORE_ALL_COMM_STATUS

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Builtin name
XMTR_IGNORE_ALL_DATA
XMTR_IGNORE_ALL_DEVICE_STATUS
XMTR_IGNORE_ALL_RESPONSE_CODES
XMTR_IGNORE_COMM_ERROR
XMTR_IGNORE_COMM_STATUS
XMTR_IGNORE_DATA
XMTR_IGNORE_DEVICE_STATUS
XMTR_IGNORE_NO_DEVICE
XMTR_IGNORE_RESPONSE_CODE
XMTR_RETRY_ON_ALL_COMM_STATUS
XMTR_RETRY_ON_ALL_DATA
XMTR_RETRY_ON_ALL_DEVICE_STATUS
XMTR_RETRY_ON_ALL_RESPONSE_CODE
XMTR_RETRY_ON_ALL_RESPONSE_CODES
XMTR_RETRY_ON_COMM_ERROR
XMTR_RETRY_ON_COMM_STATUS
XMTR_RETRY_ON_DATA
XMTR_RETRY_ON_DEVICE_STATUS
XMTR_RETRY_ON_NO_DEVICE
XMTR_RETRY_ON_RESPONSE_CODE

5.4 Action builtins

The action builtins shall only be used for actions called from a VARIABLE. They allow for accessing the value of the variable from which the action was called. The list of action builtins is listed in Table 9.

Table 9 – Action builtins

Reference	Builtin name	Allowed data type for action variable	Allowed actions from which the builtin can be called
6.4.1	fgetval	FLOAT, DOUBLE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS PRE_READ_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS POST_WRITE_ACTIONS REFRESH_ACTIONS POST_RQSTUPDATE_ACTIONS POST_USERCHANGE_ACTIONS

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Reference	Builtin name	Allowed data type for action variable	Allowed actions from which the builtin can be called
6.4.2	fsetval	FLOAT, DOUBLE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS PRE_READ_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS POST_WRITE_ACTIONS REFRESH_ACTIONS POST_RQSTUPDATE_ACTIONS POST_USERCHANGE_ACTIONS
6.4.3	get_date	DATE_AND_TIME, TIME_VALUE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS
6.4.4	get_double	DOUBLE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS
6.4.5	get_float	FLOAT	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS
6.4.6	get_signed	INTEGER	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS
6.4.7	get_string	ASCII, BITSTRING, BIT_ENUMERATED, ENUMERATED, EUC, INDEX, PASSWORD, VISIBLE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS
6.4.8	get_unsigned	BIT_ENUMERATED, BOOLEAN, ENUMERATED, INDEX, UNSIGNED_INTEGER	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS
6.4.9	igetval	BIT_ENUMERATED, BOOLEAN, ENUMERATED, INDEX, INTEGER, UNSIGNED_INTEGER, TIME_VALUE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS PRE_READ_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS POST_WRITE_ACTIONS REFRESH_ACTIONS POST_RQSTUPDATE_ACTIONS POST_USERCHANGE_ACTIONS

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Reference	Builtin name	Allowed data type for action variable	Allowed actions from which the builtin can be called
6.4.10	isetval	BIT_ENUMERATED, BOOLEAN, ENUMERATED, INDEX, INTEGER, UNSIGNED_INTEGER, TIME_VALUE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS PRE_READ_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS POST_WRITE_ACTIONS REFRESH_ACTIONS POST_RQSTUPDATE_ACTIONS POST_USERCHANGE_ACTIONS
6.4.12	lgetval	BIT_ENUMERATED, BOOLEAN, ENUMERATED, INDEX, INTEGER, UNSIGNED_INTEGER, TIME_VALUE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS PRE_READ_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS POST_WRITE_ACTIONS REFRESH_ACTIONS
6.4.13	lsetval	BIT_ENUMERATED, BOOLEAN, ENUMERATED, INDEX, INTEGER, UNSIGNED_INTEGER, TIME_VALUE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS PRE_READ_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS POST_WRITE_ACTIONS REFRESH_ACTIONS
6.4.14	put_date	DATE_AND_TIME, TIME_VALUE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS
6.4.15	put_double	DOUBLE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS
6.4.16	put_float	FLOAT	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS
6.4.17	put_signed	INTEGER	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS
6.4.18	put_string	ASCII, BITSTRING, BIT_ENUMERATED, ENUMERATED, EUC, INDEX, PASSWORD, VISIBLE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS

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Reference	Builtin name	Allowed data type for action variable	Allowed actions from which the builtin can be called
6.4.19	put_unsigned	BIT_ENUMERATED, BOOLEAN, ENUMERATED, INDEX, UNSIGNED_INTEGER	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS
6.4.20	sgetval	ASCII, BITSTRING, EUC, PACKED_ASCII, PASSWORD, VISIBLE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS PRE_READ_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS POST_WRITE_ACTIONS REFRESH_ACTIONS POST_RQSTUPDATE_ACTIONS POST_USERCHANGE_ACTIONS
6.4.21	ssetval	ASCII, BITSTRING, EUC, PACKED_ASCII, PASSWORD, VISIBLE	PRE_EDIT_ACTIONS POST_EDIT_ACTIONS PRE_READ_ACTIONS POST_READ_ACTIONS PRE_WRITE_ACTIONS POST_WRITE_ACTIONS REFRESH_ACTIONS POST_RQSTUPDATE_ACTIONS POST_USERCHANGE_ACTIONS

6 EDDL builtin library

6.1 General

Clause 6 describes builtin subroutines, which can be used in an EDD. The builtins support user or device interactions. Typical user interactions are, for example, user inputs of VARIABLE values or acknowledgments. Typical device interactions are, for example, send commands to the device or interpreting response codes and status bytes. This Clause 6 contains the library of builtins.

No other builtin functions are available and a compliant EDD shall only use the library functions defined in this specification. Requirements that all conforming EDD applications shall meet are defined in this specification. A conformant EDD application shall support all library functions found in this specifications that are applicable to the respective communication profile(s). A EDD application shall support all compliant EDDs without requiring any modifications to the compliant EDD and without any additional information beyond that found in the compliant EDD.

6.2 User interface builtins

6.2.1 Builtin ACKNOWLEDGE

Communication profiles: CS, GPE, HART, PB, PN

Purpose: Display message and wait for key press

The builtin ACKNOWLEDGE will display the prompt and wait for acknowledgment from the user.

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The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

Lexical structure

```
ACKNOWLEDGE(prompt)
```

The lexical elements of the builtin ACKNOWLEDGE are shown in Table 10.

Table 10 – Builtin ACKNOWLEDGE

Parameter name	Type	Direction	Usage	Description
prompt	DD_STRING	I	m	Message to be displayed (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).
<return>	int	O	m	One of the return codes specified in Table 377.

6.2.2 Builtin acknowledge

Communication profiles: CS, GPE, HART, PB, PN

Purpose: Display message and wait for key press

The builtin acknowledge will display the prompt and wait for acknowledgment from the user.

NOTE 1 New Device Descriptions can use the builtin ACKNOWLEDGE, which supports direct referencing of VARIABLEs. The lower case version of this function is maintained for backwards compatibility only.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 2 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 3 Some EDD applications will clear the display upon each call to this function.

Lexical structure

```
acknowledge(prompt, global_var_ids)
```

The lexical elements of the builtin acknowledge are shown in Table 11.

Table 11 – Builtin acknowledge

Parameter name	Type	Direction	Usage	Description
prompt	DD_STRING	I	m	Message to be displayed (see 6.2.35 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).
global_var_ids	Int[]	I	m	An array that contains unique identifiers of VARIABLE instances.
<return>	int	O	m	One of the return codes specified in Table 377.

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6.2.3 Builtin DELAY

Communication profiles: CS, GPE, HART, PB, PN

Purpose: Display a message and delay

The builtin DELAY will display a prompt message and pause for the specified number of seconds. The delay time shall be a positive number.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

Lexical structure

```
DELAY(delay_time, prompt)
```

The lexical elements of the builtin DELAY are shown in Table 12.

Table 12 – Builtin DELAY

Parameter name	Type	Direction	Usage	Description
delay_time	unsigned integer	I	m	The delay in number of seconds.
prompt	DD_STRING	I	m	A message to be displayed (see 6.2.40 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).
<return>	VOID	—	—	—

6.2.4 Builtin delay

Communication profiles: CS, GPE, HART, PB, PN

Purpose: Display a message and delay

The builtin delay will display a prompt message, and pause for the specified number of seconds. The delay time shall be a positive number.

The user has the opportunity to abort the method while method execution is halted waiting for this function to return.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

NOTE 3 New Device Descriptions can use DELAY, which supports direct referencing of VARIABLEs. The lower case version of this function is maintained for backwards compatibility only.

Lexical structure

```
delay(delay_time, prompt, global_var_ids)
```

The lexical elements of the builtin delay are shown in Table 13.

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Table 13 – Builtin delay

Parameter name	Type	Direction	Usage	Description
delay_time	unsigned integer	I	m	The delay in number of seconds.
prompt	DD_STRING	I	m	A message to be displayed (see 6.2.35 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).
global_var_ids	Int[]	I	m	An array which contains unique identifiers of VARIABLE instances.
<return>	VOID	—	—	—

6.2.5 Builtin delayfor

Communication profiles: FF, ISA100

Purpose: Display a message and wait the specified time

The builtin delayfor prints a string on the application display and waits for the allotted amount of time to expire.

NOTE 1 Previously displayed messages are not guaranteed to remain on the screen.

NOTE 2 Some EDD applications will clear the display upon each call to this function.

Lexical structure

```
delayfor(duration, prompt, ids, indices, id_count)
```

The lexical elements of the builtin delayfor are shown in Table 14.

Table 14 – Builtin delayfor

Parameter name	Type	Direction	Usage	Description
duration	long	I	m	The delay in number of seconds. This shall be a positive number.
prompt	DD_STRING	I	m	A message to be displayed (see 6.2.6 for syntax). String types that are not a DD_STRING may be also be used and will be automatically promoted to a DD_STRING (see 6.18.3).
ids	unsigned long[]	I	m	The item ids of a VARIABLE instance used in the prompt message.
indices	unsigned long[]	I	m	The member ids or array indices of the VARIABLEs used in the prompt message. Set to zero if there is no member id or array index.
id_count	long	I	m	The number of array elements in the arrays for ids and indices. Set to zero if the arrays for ids and indices are NULL.
<return>	long	O	m	One of the return codes specified in Table 376.

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