Long Term Development Statement (LTDS)

Appendix 5: Short Circuit Results Profile

Publication date:	29 August 2023	**Team:**	Digitalisation and Decentralisation; Energy Systems Management and Security
		Email:	flexibility@ofgem.gov.uk

This document provides detail information on the LTDS Short Circuit Results Optional Profile that can be optionally used for the data exchanges of the proposed LTDS Common Information Model (CIM) revision.

Contents

1 Version information

1.1 LTDS Short Circuit Result profile

- Title: LTDS Short Circuit Result Vocabulary
- Keyword: SCR
- Description: This vocabulary is describing the LTDS Short Circuit Result profile.
- Version IRI: http://ofgem.gov.uk/ns/CIM/LTDS/ShortCircuitResult/1.0
- Version info: 1.0.0
- Prior version:
- Conforms to: urn:iso:std:iec:61970-600-2:ed-1|urn:iso:std:iec:61970-301:ed-7:amd1|file://CIM100v111_UK_LTDS.eap|urn:iso:std:iec:61970-401:draft:ed-1|urn:iso:std:iec:61970-501:draft:ed-2
- Identifier: urn:uuid:1f8f8c6f-1b69-499f-9738-904873cf96a5

2 LTDS Short Circuit Result Profile Specification

2.1 General

This profile represents the exchange of short circuit results for each node.

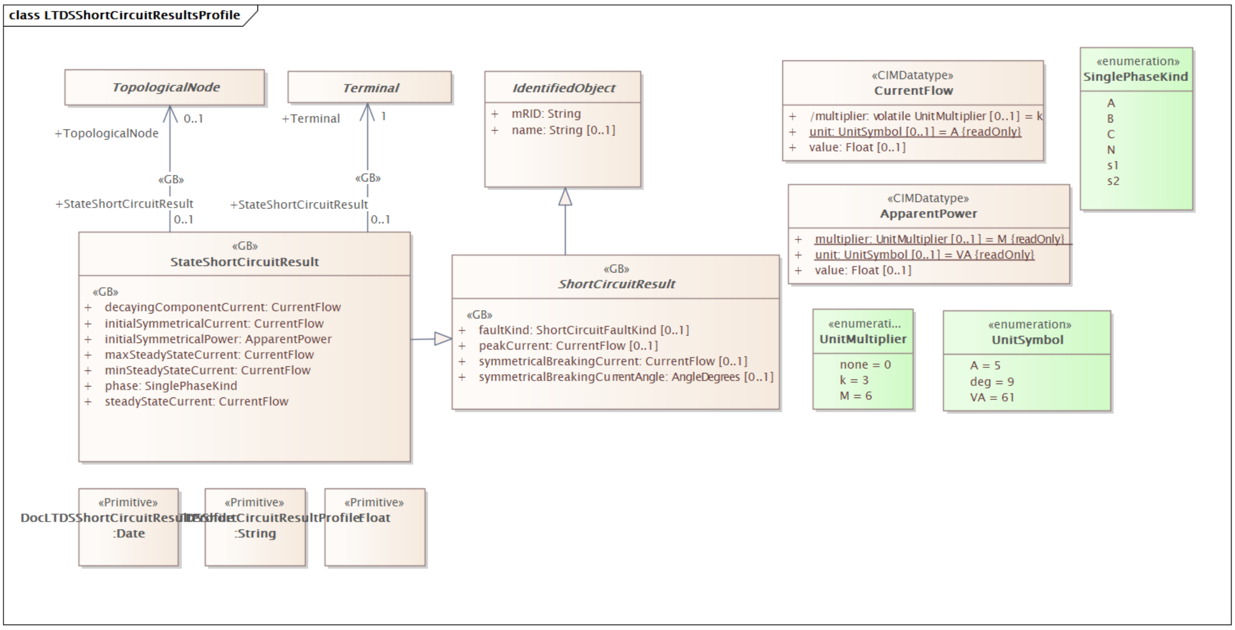

Figure 1 – Class diagram LTDSShortCircuitResultProfile::LTDSShortCircuitResultsProfile

Figure 1: The diagram illustrates the short circuit power results profile.

2.2 (abstract) IdentifiedObject root class

This is a root class to provide common identification for all classes needing identification and naming attributes.

2.3 (abstract,GB) ShortCircuitResult

Inheritance path = IdentifiedObject

Used to report on result of a short circuit calculation or an outcome of multiple calculations. Table 1 shows all attributes of ShortCircuitResult.

Table 1 – Attributes of LTDSShortCircuitResultProfile::ShortCircuitResult

name	mult	type	description
faultKind	0..1	ShortCircuitFaultKind	(GB)
peakCurrent	0..1	CurrentFlow	(GB) Peak short-circuit current. It is the maximum possible instantaneous value of prospective (available) short-circuit current. It is ip according to IEC 60909-0.
symmetricalBreakingCurrent	0..1	CurrentFlow	(GB) Symmetrical short-circuit breaking current. It is a root mean square value of an integral cycle of

name	mult	type	description
			the symmetrical alternate current component of the prospective short-circuit current at the instant of contact separation of the first pole to open of a switching device. It is Ib according to IEC 60909-0.
symmetricalBreakingCurrentAngle	0..1	AngleDegrees	(GB) Symmetrical short-circuit breaking current angle. It is the angle of a root mean square value of an integral cycle of the symmetrical alternate current component of the prospective short-circuit current at the instant of contact separation of the first pole to open of a switching device.

2.4 (GB) StateShortCircuitResult

Inheritance path = ShortCircuitResult : IdentifiedObject

Short-circuit result calculated on a power system state.

Table 2 shows all attributes of StateShortCircuitResult.

Table 2 – Attributes of LTDSShortCircuitResultProfile::StateShortCircuitResult

name	mult	type	description
initialSymmetricalCurrent	1..1	CurrentFlow	(GB) Initial symmetrical short-circuit current. It is a root mean square value of the alternate current symmetrical component of a prospective (available) short-circuit current, applicable at the instant of short circuit if the impedance remains at zero-time value. It is Ik" according to IEC 60909-0.
steadyStateCurrent	1..1	CurrentFlow	(GB) Steady state short-circuit current. It is a root mean square value of the short-circuit current

name	mult	type	description
			which remains after the decay of the transient phenomena. It is Ik according to IEC 60909-0.
initialSymmetricalPower	1..1	ApparentPower	(GB) Initial symmetrical short-circuit power. It is a fictitious value determined as a product of the initial symmetrical short-circuit current, the nominal system voltage and the factor square root of 3. It is Sk" according to IEC 60909-0.
decayingComponentCurrent	1..1	CurrentFlow	(GB) Decaying (aperiodic) component of short-circuit current. It is a mean value between the top and the bottom envelope of a short-circuit current decaying from an initial value to zero. It is idc according to IEC 60909-0.
maxSteadyStateCurrent	1..1	CurrentFlow	(GB) Maximum steady state short-circuit current. It is Ikmax according to IEC 60909-0.
minSteadyStateCurrent	1..1	CurrentFlow	(GB) Minimum steady state short-circuit current. It is Ikmin according to IEC 60909-0.
phase	1..1	SinglePhaseKind	(GB) The terminal phase at which the short-circuit information is valid. If missing, the information is assumed to be three phase.
faultKind	0..1	ShortCircuitFaultKind	(GB) inherited from: ShortCircuitResult
peakCurrent	0..1	CurrentFlow	(GB) inherited from: ShortCircuitResult
symmetricalBreakingCurrent	0..1	CurrentFlow	(GB) inherited from: ShortCircuitResult
symmetricalBreakingCurrentAngle	0..1	AngleDegrees	(GB) inherited from: ShortCircuitResult

Table 3 shows all association ends of StateShortCircuitResult with other classes.

Table 3 – Association ends of LTDSShortCircuitResultProfile::StateShortCircuitResult with other classes

mult from	name	mult to	type	description
0..1	TopologicalNode	0..1	TopologicalNode	(GB) The TopologicalNode on which the short-circuit information is reported.
0..1	Terminal	1..1	Terminal	(GB) The terminal to which the result is exchanged.

2.5 (abstract) Terminal root class

An AC electrical connection point to a piece of conducting equipment. Terminals are connected at physical connection points called connectivity nodes.

2.6 (abstract) TopologicalNode root class

For a detailed substation model a topological node is a set of connectivity nodes that, in the current network state, are connected together through any type of closed switches, including jumpers. Topological nodes change as the current network state changes (i.e., switches, breakers, etc. change state).
For a planning model, switch statuses are not used to form topological nodes. Instead they are manually created or deleted in a model builder tool. Topological nodes maintained this way are also called "busses".

2.7 (GB) ShortCircuitFaultKind enumeration

Short circuit fault kind.
Table 4 shows all literals of ShortCircuitFaultKind.

Table 4 – Literals of LTDSShortCircuitResultProfile::ShortCircuitFaultKind

literal	value	description
threePhase		Three phase short circuit fault.
singlePhase		Single phase short circuit fault.

2.8 SinglePhaseKind enumeration

Enumeration of single phase identifiers. Allows designation of single phases for both transmission and distribution equipment, circuits and loads.

Table 5 shows all literals of SinglePhaseKind.

Table 5 – Literals of LTDSShortCircuitResultProfile::SinglePhaseKind

literal	value	description
A		Phase A.
B		Phase B.
C		Phase C.
N		Neutral.
s1		Secondary phase 1.
s2		Secondary phase 2.

2.9 UnitMultiplier enumeration

The unit multipliers defined for the CIM. When applied to unit symbols, the unit symbol is treated as a derived unit. Regardless of the contents of the unit symbol text, the unit symbol shall be treated as if it were a single-character unit symbol. Unit symbols should not contain multipliers, and it should be left to the multiplier to define the multiple for an entire data type.

For example, if a unit symbol is "m2Pers" and the multiplier is "k", then the value is k(m**2/s), and the multiplier applies to the entire final value, not to any individual part of the value. This can be conceptualized by substituting a derived unit symbol for the unit type. If one imagines that the symbol "Þ" represents the derived unit "m2Pers", then applying the multiplier "k" can be conceptualized simply as "kÞ".

For example, the SI unit for mass is "kg" and not "g". If the unit symbol is defined as "kg", then the multiplier is applied to "kg" as a whole and does not replace the "k" in front of the "g". In this case, the multiplier of "m" would be used with the unit symbol of "kg" to represent one gram. As a text string, this violates the instructions in IEC 80000-1. However, because the unit symbol in CIM is treated as a derived unit instead of as an SI unit, it makes more sense to conceptualize the "kg" as if it were replaced by one of the proposed replacements for the SI mass symbol. If one imagines that the "kg" were replaced by a symbol "Þ", then it is easier to conceptualize the multiplier "m" as creating the proper unit "mÞ", and not the forbidden unit "mkg".

Table 6 shows all literals of UnitMultiplier.

Table 6 – Literals of LTDSShortCircuitResultProfile::UnitMultiplier

literal	value	description
none	0	No multiplier or equivalently multiply by 1.
k	3	Kilo 10**3.
M	6	Mega 10**6.

2.10 UnitSymbol enumeration

The derived units defined for usage in the CIM. In some cases, the derived unit is equal to an SI unit. Whenever possible, the standard derived symbol is used instead of the formula for the derived unit. For example, the unit symbol Farad is defined as "F" instead of "CPerV". In cases where a standard symbol does not exist for a derived unit, the formula for the unit is used as the unit symbol. For example, density does not have a standard symbol and so it is represented as "kgPerm3". With the exception of the "kg", which is an SI unit, the unit symbols do not contain multipliers and therefore represent the base derived unit to which a multiplier can be applied as a whole.
Every unit symbol is treated as an unparseable text as if it were a single-letter symbol. The meaning of each unit symbol is defined by the accompanying descriptive text and not by the text contents of the unit symbol.
To allow the widest possible range of serializations without requiring special character handling, several substitutions are made which deviate from the format described in IEC 80000-1. The division symbol "/" is replaced by the letters "Per". Exponents are written in plain text after the unit as "m3" instead of being formatted as "m" with a superscript of 3 or introducing a symbol as in "m^3". The degree symbol "°" is replaced with the letters "deg". Any clarification of the meaning for a substitution is included in the description for the unit symbol.
Non-SI units are included in list of unit symbols to allow sources of data to be correctly labelled with their non-SI units (for example, a GPS sensor that is reporting numbers that represent feet instead of meters). This allows software to use the unit symbol information correctly convert and scale the raw data of those sources into SI-based units.
The integer values are used for harmonization with IEC 61850.
Table 7 shows all literals of UnitSymbol.

Table 7 – Literals of LTDSShortCircuitResultProfile::UnitSymbol

literal	value	description
A	5	Current in amperes.
deg	9	Plane angle in degrees.
VA	61	Apparent power in volt amperes. See also real power and reactive power.

2.11 AngleDegrees datatype

Measurement of angle in degrees.

Table 8 shows all attributes of AngleDegrees.

Table 8 – Attributes of LTDSShortCircuitResultProfile::AngleDegrees

name	mult	type	description
value	0..1	Float	
unit	0..1	UnitSymbol	(const=deg)
multiplier	0..1	UnitMultiplier	(const=none)

2.12 ApparentPower datatype

Product of the RMS value of the voltage and the RMS value of the current.

Table 9 shows all attributes of ApparentPower.

Table 9 – Attributes of LTDSShortCircuitResultProfile::ApparentPower

name	mult	type	description
multiplier	0..1	UnitMultiplier	(const=M)
unit	0..1	UnitSymbol	(const=VA)
value	0..1	Float	

2.13 CurrentFlow datatype

Electrical current with sign convention: positive flow is out of the conducting equipment into the connectivity node. Can be both AC and DC.

Table 10 shows all attributes of CurrentFlow.

Table 10 – Attributes of LTDSShortCircuitResultProfile::CurrentFlow

name	mult	type	description
multiplier	0..1	UnitMultiplier	(default=k)
unit	0..1	UnitSymbol	(const=A)
value	0..1	Float	

2.14 Float primitive

A floating point number. The range is unspecified and not limited.