SLOVENSKI STANDARD
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Vesoljska tehnika - Zahteve vmesnika za električno napajanje

Space engineering - Interface requirements for electrical power

Raumfahrttechnik - Anforderungen an Schnittstellen für elektrische Leistung

Space engineering - Interface requirements for electrical power

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Space engineering - Interface requirements for electrical power

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Raumfahrtechnik - Anforderungen an Schnittstellen für elektrische Leistung

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European foreword

This document (prEN 16603-20-20:2016) has been prepared by Technical Committee CEN-CENELEC/TC 5 “Space”, the secretariat of which is held by DIN.

This document (prEN 16603-20-20:2016) originates from ECSS-E-ST-20-20C DIR1.

This document is currently submitted to the CEN Enquiry.

This document has been developed to cover specifically space systems and will the-refore have precedence over any EN covering the same scope but with a wider do-main of applicability (e.g. : aerospace).

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association

Introduction

This standard identifies the requirements needed to specify, procure or develop a space power distribution based on Latching Current Limiters, both from source and load perspective.

For a reference architecture description, it is possible to refer to ECSS-E-HB-20-20.

ECSS-E-HB-20-20 includes a clarification of the principles of operation of a power distribution based on LCL's, identifies important issues related to LCL's and explains the requirements of the present standard.

1
Scope

The target applications covered by this standard are all missions traditionally provided with power distribution and protection by LCLs/RLCLs (science, earth observation, navigation) with exclusion of telecom applications which are traditionally provided with power distribution and protection by fuses.

The present standard applies to power distribution by LCLs/RLCLs for power systems, and in general for satellites, required to be Single Point Failure Free.

The present standard document applies exclusively to the main bus power distribution by LCLs/RLCLs to external satellite loads.

Internal power system protections of LCLs/RLCLs are not covered.

Paralleling of LCLs to increase power supply line reliability is not covered by the present standard, since this choice does not appreciably change the reliability of the overall function (i.e. LCL plus load).

In fact, a typical reliability figure of the LCL (limited to the loss of its switch ON capability) is 20 FIT or less.

If the load to be connected to the LCL line has a substantial higher failure rate than this, it is not necessary to duplicate the LCL to supply that load.

2
Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this ECSS Standard. For dated references, subsequent amendments to, or revision of any of these publications do not apply. However, parties to agreements based on this ECSS Standard are encouraged to investigate the possibility of applying the more recent editions of the normative documents indicated below. For undated references, the latest edition of the publication referred to applies.

EN reference	Reference in text	Title
EN 16601-00-01	ECSS-S-ST-00-01	ECSS system - Glossary of terms
EN 16603-20	ECSS-E-ST-20	Space engineering - Electrical and electronic

3
Terms, definitions and abbreviated terms

3.1 Terms from other standards

a. For the purpose of this Standard, the terms and definitions from ECSS-S-ST-00-01 apply, in particular for the following terms:

1. redundancy
2. active redundancy
3. hot redundancy
4. cold redundancy
5. fault
6. fault tolerance

3.2 Terms specific to the present standard

3.2.1 centralised

feature that serves a number of elementary functions in a system

3.2.2 current overshoot decay time

maximum time constant decay time from current overshoot peak to actual limitation current after an over-current event, under the assumption that the decay time is modelled by an exponential law

NOTE See Figure 3-1.

3.2.3 fault current emission

maximum current emission of a given circuit at external interface under abnormal conditions

NOTE Abnormal in this context can cover fault condition or operator error.

3.2.4 fault current tolerance

minimum abnormal interface current that a circuit can sustain indefinitely without being damaged

3.2.5 fault voltage emission

maximum voltage emission of a given circuit at external interface under abnormal conditions

NOTE Abnormal condition can cover fault condition or operator error.

3.2.6 fault voltage tolerance

minimum abnormal interface voltage that a circuit can sustain indefinitely without being damaged

3.2.7 feature

part of a function to which a specific requirement refers

3.2.8 input filter charge time

time required for the LCL to charge the load input filter

NOTE See Figure 3-2.

3.2.9 latching current limiter (LCL)

switchable and latching protection placed between a power source and the relevant load(s), causing a trip off after having achieved at its output an over-current limitation for a definite trip-off time

3.2.10 LCL class

maximum allowable current that can flow through the LCL itself, under given standard conditions

NOTE LCL classes are defined in Table 3-1.

3.2.11 LCL switch dissipative failure

failure corresponding to an equivalent gate to drain short circuit on a MOSFET

NOTE The voltage across is approximately 4V to 5V maximum.

3.2.12 repetitive overload

over-current event that repeats for a number of cycles or indefinitely

3.2.13 retriggerable latching current limiter (RLCL)

LCL that automatically attempts to switch ON when powered or after a retrigger interval when a trip off event occurred

3.2.14 retriggerability

characteristic of an RLCL protection to be able to restart automatically after being triggered

3.2.15 retrigger interval

time duration in high impedance state (i.e. OFF condition) of a RLCL after an permanent over-current event occurred and the relevant trip off time elapsed

NOTE See Figure 3-3.

3.2.16 RLCL class

maximum allowable current that can flow through the RLCL itself, under given standard conditions

NOTE RLCL classes are defined in Table 3-2.

3.2.17 sub-feature

sub-part of a function to which a specific requirement refers

NOTE

3.2.18 switch on capability

See "Switch on response time".

3.2.19 switch on response time

time needed to enable actual ON command reception, under specified conditions

3.2.20 switch off response time (under voltage protection)

time to achieve UVP action in dynamical conditions, when under-voltage excitation is achieved under standard conditions

NOTE The UVP action is the OFF of the relevant function.

3.2.21 time to current overshoot

maximum time from max limitation current to actual current overshoot peak after an over-current event

NOTE See Figure 3-1.

3.2.22 trip off

event occurring when a current protection latch flips and opens the protected distribution line after an over-current condition

NOTE To open a distribution line means to set the distribution line in high impedance status.

3.2.23 trip off time

time in between LCL crossing actual current limitation value and the trip off event, in permanent over-current condition.

NOTE See Figure 3-1.

3.2.24 under voltage protection

protection that is triggered when the voltage provided to a function falls below a predefined threshold

NOTE LCL and RLCL are examples of functions for which UVP is activated.

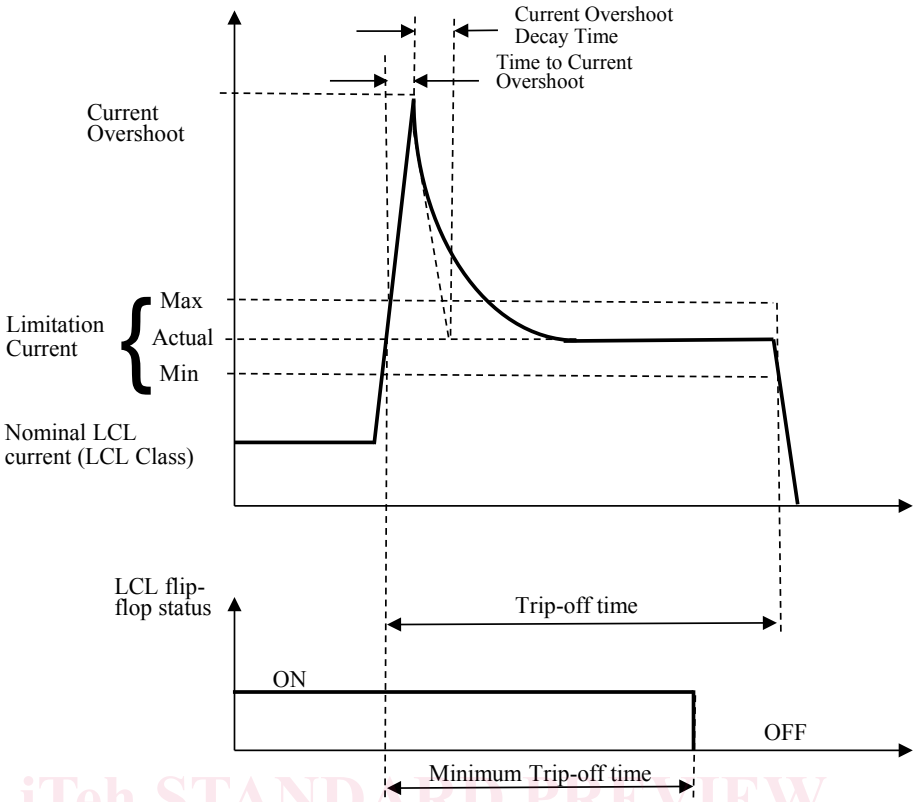

Figure 3-1: LCL overload timing diagram

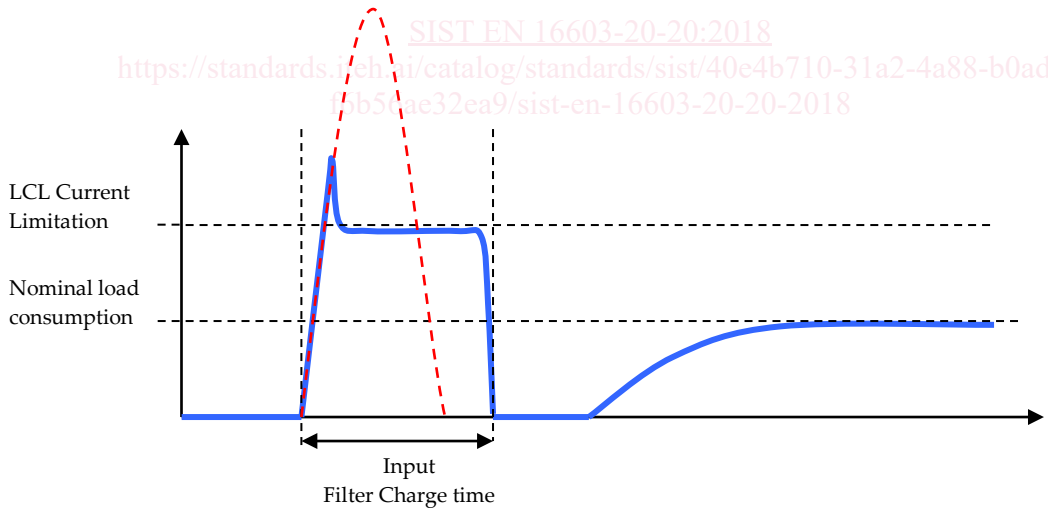

Figure 3-2: Typical start-up current profile of a DC/DC converter attached to a LCL

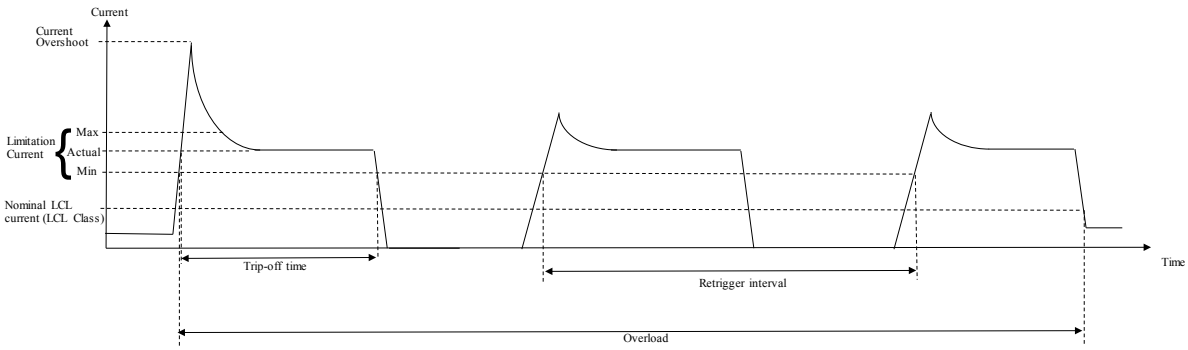

Figure 3-3: RLCL overload timing diagram