CM TO DM INTERFACE REQUIREMENTS DOCUMENT

DRL/DRD : ENG-27

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## CHANGE RECORDS

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<td>1</td>
<td>20-01-07</td>
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<td>P. Elia</td>
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<td>All : for BCR implementing RIDS SC0022, SC0023, SC0052, SC 0097 and SC0165</td>
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1. **SCOPE AND PURPOSE**

This document provides the requirements and the definitions for the interface between the Carrier Module (CM) and the Descent Module Composite (DMC). The requirements in this IRD shall be fulfilled both by the CM and DMC contractors in order to satisfy the overall Composite requirements.

1.1 **Structure of the Document**

The document is divided in the following sections:

Chapter 3 is not used as the description of the Exomars mission is provided in CM and DM the respective specifications.

Chapter 4 deals with the interface requirements.

Chapter 5 provides details of interface exchange.

1.2 **Acronyms**

2. **DOCUMENTS**

2.1 **Normative Documents**

The contents of the Normative Documents shall be considered part of the requirements of this Document.

In case of conflict between this Document and Normative Documents listed herein the conflict shall be brought to the attention of Prime for clarification.

2.1.1 **ESA Normative document**

[NR 01] N/A
[NR 02] N/A
[NR 03] N/A
[NR 04] N/A
[NR 05] N/A
[NR 06] N/A
[NR 07] N/A
[NR 08] N/A
[NR 09] N/A
[NR 010] N/A
[NR 011] N/A
[NR 012] N/A
Standards and Handbooks

[NR 026] ECSS E-10 Part 1B Requirements and Process
[NR 027] ECSS E-10 Part 6A Functional and Technical Specifications
[NR 028] ECSS E-10 Part 7A Product Data Exchange
[NR 029] Tailoring of ECSS E-10-2A for EXOMARS – Verification EXM-MS-RS-ESA-00018
[NR 031] ECSS E-10-04A Space Environment
[NR 032] ECSS E-10-05A Functional Analysis
[NR 034] ECSS-E-20-1A Multipaction design and test
[NR 035] Tailoring of the ECSS E-20-06 – Spacecraft Charging for ExoMars EXM-MS-RS-ESA-00014
[NR 036] ECSS-E20-08A : Photovoltaic assemblies and components
[NR 037] Tailoring of ECSS E30 Part1A Mechanical– Thermal Control for ExoMars EXM-MS-RS-ESA-00025
[NR 038] ECSS E30 Part3A Mechanical – Mechanisms
[NR 039] Tailoring of ECSS E30 Part5.1 Mechanical – Liquid and electric propulsion
[NR 040] Tailoring of ECSS E30 Part6A Pyrotechnics - Mechanisms
[NR 041] ECSS E30 Part 7A Mechanical Part
[NR 042] ECSS E30 Part 8A Materials
[NR 043] ECSS-E-30-01A : Fracture control
[NR 044] ECSS-E30-11A Modal Survey Assessment
[NR 046] Tailoring of the ECSS-E-32-02 : Structural Design and Verification of Pressurized Hardware EXM-MS-RS-ESA-00022
[NR 049] DELETED
[NR 050] Tailoring of ECSS E40 part 1B and 2B Software DRDs for EXOMARS EXM-MS-RS-ESA-00027
2.1.2 PRIME Normative Documents

MISSION

[NR 0100] N/A
[NR 0101] EXOMARS Mechanical and Thermal General Design and Interface Requirements - EXM-MS-SSR-AI-0003
[NR 0102] EXOMARS Electrical General Design and Interface Requirements - EXM-MS-SSR-AI-0001
[NR 0103] N/A
[NR 0104] EXOMARS EMC and Power Quality Requirements - EXM-MS-SSR-AI-0002
[NR 0105] N/A
2.2 Informative Documents

N/A

2.3 Acronyms and conventions

See [NR 0121]
2.4

3. EXOMARS MISSION AND SYSTEM DEFINITION

For the Exomars mission and system definition see chapter 3 of the Carrier (or DM) specification.
4. INTERFACE REQUIREMENTS

4.1 General

IRD-CM-DM-0005
The Carrier and Descent Modules design shall comply with:
- the cone adapter
- the CDMU
- the OBSW
as provided by the prime contractor.
The requirements for interfacing the above items are provided in this document.

4.2 Mechanical requirements

4.2.1 General

The CM and DM interface each other by means of an aluminium adapter which allows a simple CM structure based on a 1194 mm cylinder and a larger diameter I/F with the DM to reduce the loads.
All mechanical interfaces specified in this section must be designed in accordance with general mechanical and thermal design and interface requirements [NR 0101].

IRD-CM-DM-0010
The Carrier interface to the Adapter shall be according to drawing in Figure 4-1, compatible with the Adapter diameter of 1194 mm.

IRD-CM-DM-0020
The CM interface shall be designed to sustain the following loads (TBC 1):

- Total axial load = 184000 N (flight level, X axis)
- Total shear = 98000 N (flight level, Y axis)
- Total shear = 98000 N (flight level, Z axis)
- Axial load on each bolted joint = 17000 N (flight level)
- Lateral loads on each bolted joint = 31000 N (flight level).

\( C: \) the above values are obtained assuming M10 bolts, working by friction and by shear \( \rightarrow \) MoS > 1

4.2.2 Coordinate reference frames

Two reference frame systems can be used for specifying the CM/DMC interfaces depending on convenience.

IRD-CM-DM-0025
The Composite coordinate reference frame, shown in the following picture, shall be used.
Figure 4-2 Composite coordinate reference frame

C: it is proposed to use this frame also for all the Carrier mechanical specifications.

IRD-CM-DM-0030
The Adapter coordinate reference frame, shown in the following Figure 4-3, shall be used.

Figure 4-3 Adapter coordinate reference frame

IRD-CM-DM-0040.
The contact area between CM and Adapter shall be a ring of 0.130 (TBC 2) m² as shown in Figure 4-4:

Figure 4-4 Adapter lower ring (interface to Carrier)

IRD-CM-DM-0050
The CM/DMC separation mechanism shall be positioned in the DMC and in the upper side (large diameter side) of the Adapter.
C: practically this requirement applies to the DM only
4.2.3 Centre of Gravity and Mass Distribution

4.2.3.1 CoG

IRD-CM-DM-0060.
The CM and DMC shall be accommodated according to Figure 4-5.

![Figure 4-5 CM and DMC accommodation](image)

IRD-CM-DM-0070.
All analyses shall take into account the following Composite Centre of Gravity referred to the Composite coordinate reference frame:

<table>
<thead>
<tr>
<th>CoG</th>
<th>Wet Composite [mm]</th>
<th>Dry Composite [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>2230 ± 10</td>
<td>1870 ± 10</td>
</tr>
<tr>
<td>Y</td>
<td>0 ± 25</td>
<td>0 ± 25</td>
</tr>
<tr>
<td>Z</td>
<td>0 ± 25</td>
<td>0 ± 25</td>
</tr>
</tbody>
</table>

Table 4-1 Composite CoG

C: the computation of the Composite CoG is under the prime responsibility; the values above are based on the state of the art CM and DM.

While the X coordinate variation is dominated by the usage of the propellant all along the mission, the Y and Z coordinates are constrained by the SC balancing required by the launcher.

IRD-CM-DM-0080.
The Centre of Gravity of the CM, referred to the Carrier (Composite) coordinate reference frame, shall be:

<table>
<thead>
<tr>
<th>CoG</th>
<th>Wet CM CoG[mm]</th>
<th>Dry CM CoG[mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>TBD 1 ± 10</td>
<td>TBD 2 ± 10</td>
</tr>
<tr>
<td>Y</td>
<td>0 ± 10</td>
<td>0 ± 10</td>
</tr>
<tr>
<td>Z</td>
<td>0 ± 10</td>
<td>0 ± 10</td>
</tr>
</tbody>
</table>

Table 4-2 CM CoG
C: the computation of the CM CoG is under the CM contractor responsibility; the values in table above are TBD to allow the Contractor producing its own design; in the end they shall allow the Prime to meet the Composite value above in Table 4-1; actually they will be established in the B2 design phase and will become a binding requirement for the Carrier Contractor at the Carrier PDR IRD-CM-DM-0090.

The Centre of Gravity of the DMC (i.e including the Rover module) referred to the Adapter coordinate reference frame shall be:

<table>
<thead>
<tr>
<th>DM CoG [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
</tr>
<tr>
<td>Y</td>
</tr>
<tr>
<td>Z</td>
</tr>
</tbody>
</table>

Table 4-3 DMC CoG

C: the computation of the DMC CoG is under the Prime responsibility; note that only one DMC configuration (Beginning of Mission propellant load) is of interest for the purpose of this IRD.

4.2.3.2 Mass distribution

The mass distribution is given by specifying the diagonal and non-diagonal terms of the Inertia Matrix; to this purpose, note that the non-diagonal terms of the tables below already include the – sign, i.e:

\[ I_{xy} = - \int xy \, dm \]

IRD-CM-DM-0100.

All analyses shall take into account the following Composite Matrix of Inertia terms, referred to the Composite coordinate reference frame and in the Composite CoG:

<table>
<thead>
<tr>
<th>Dry Composite</th>
<th>Diagonal terms [Kgm²]</th>
<th>Non diagonal terms (*) [Kgm²]</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_{xx} = TBD 3</td>
<td>I_{yy} ≤ TBD 4</td>
<td></td>
</tr>
<tr>
<td>I_{xy} = TBD 5</td>
<td>I_{xz} ≤ TBD 6</td>
<td></td>
</tr>
<tr>
<td>I_{xz} = TBD 7</td>
<td>I_{yz} ≤ TBD 8</td>
<td></td>
</tr>
</tbody>
</table>

Table 4-4 Dry Composite MOI

<table>
<thead>
<tr>
<th>Wet Composite</th>
<th>Diagonal terms [Kgm²]</th>
<th>Non diagonal terms (*) [Kgm²]</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_{xx} = TBD 9</td>
<td>I_{yy} ≤ TBD 10</td>
<td></td>
</tr>
<tr>
<td>I_{yy} = TBD 11</td>
<td>I_{xz} ≤ TBD 12</td>
<td></td>
</tr>
<tr>
<td>I_{xz} = TBD 13</td>
<td>I_{yz} ≤ TBD 14</td>
<td></td>
</tr>
</tbody>
</table>

Table 4-5 Wet Composite MOI

(*) absolute value
C: the computation of the Composite matrix of inertia is under the prime responsibility; these values are indicative of the current mass distribution and clearly also depends on the Carrier design

IRD-CM-DM-0110.
The Carrier Module Matrix of Inertia terms, referred to the Carrier (Composite) coordinate reference frame and in the CM CoG, shall be:

<table>
<thead>
<tr>
<th>Dry CM MoI</th>
<th>Diagonal terms [Kgm$^2$]</th>
<th>Non diagonal terms (*) [Kgm$^2$]</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{xx}$ = TBD 15</td>
<td>$I_{xy} &lt;$ TBD 16</td>
<td></td>
</tr>
<tr>
<td>$I_{yy}$ = TBD 17</td>
<td>$I_{xz} &lt;$ TBD 18</td>
<td></td>
</tr>
<tr>
<td>$I_{zz}$ = TBD 19</td>
<td>$I_{yz} &lt;$ TBD 20</td>
<td></td>
</tr>
</tbody>
</table>

Table 4-6 Dry CM MOI

<table>
<thead>
<tr>
<th>Wet CM MoI</th>
<th>Diagonal terms [Kgm$^2$]</th>
<th>Non diagonal terms (*) [Kgm$^2$]</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{xx}$ = TBD 21</td>
<td>$I_{xy} &lt;$ TBD 22</td>
<td></td>
</tr>
<tr>
<td>$I_{yy}$ = TBD 23</td>
<td>$I_{xz} &lt;$ TBD 24</td>
<td></td>
</tr>
<tr>
<td>$I_{zz}$ = TBD 25</td>
<td>$I_{yz} &lt;$ TBD 26</td>
<td></td>
</tr>
</tbody>
</table>

(*) absolute value

Table 4-7 Dry CM MOI

C: the computation of the CM matrix of inertia is under the CM contractor responsibility; the values in table above are TBD to allow the Contractor producing its own design; in the end they should match the Composite values; actually they will be established in the B2 design phase and will become a binding requirement for the Carrier Contractor at the Carrier PDR

IRD-CM-DM-0120.
The Descent Module Composite Matrix of Inertia terms, referred to an axes reference frame parallel to the DM axes reference frame but cantered in the DM CoG, shall be:

<table>
<thead>
<tr>
<th>Dry DM MoI</th>
<th>Diagonal terms [Kgm$^2$]</th>
<th>Non diagonal terms (*) [Kgm$^2$]</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{xx}$ = 980 ± 50</td>
<td>$I_{xy} = 0 ± 20$</td>
<td></td>
</tr>
<tr>
<td>$I_{yy}$ = 790 ± 50</td>
<td>$I_{xz} = 0 ± 20$</td>
<td></td>
</tr>
<tr>
<td>$I_{zz}$ = 640 ± 50</td>
<td>$I_{yz} = 0 ± 10$</td>
<td></td>
</tr>
</tbody>
</table>

(*) absolute value

Table 4-8 Wet DM MOI
C: the computation of the DMC matrix of inertia terms is under the prime responsibility

C: The DM mass properties must be treated very carefully as the DMC is not actively attitude-controlled during its spinning entry phase; an important constraint is given below:

\[ I_{xx} > 1.3 \ I_{yy} \]
\[ I_{xx} > 1.3 \ I_{zz} \]

4.2.4 Holding, Fixation Point and Connector identification

IRD-CM-DM-0130
The Carrier shall Interface with the Adapter aluminium flange fitted with 48 (TBC 3) holes for M10 (TBC 4) bolts.

IRD-CM-DM-0140
The Fixation Points shall be according to Figure 4-6

IRD-CM-DM-0150
The M10 bolts shall be provided by the Adapter and closed with a Torque of TBD 27 NM.

4.2.5 Electrical Connectors (Identification, Position, Type, Quantity)

IRD-CM-DM-0170
The electrical connection between DM and CM shall be ensured by 6 connectors (preliminary placed in correspondence to the separation points on the DMC).

IRD-CM-DM-0180
The harness from the CM to the above connectors shall be provided by the CM Contractor.

IRD-CM-DM-0190
The interface connectors shall be as shown in Figure 4-7
4.3 Thermal

4.3.1 Thermal Design assumptions

IRD-CM-DM-0200

All thermal interfaces specified in this section must be designed in accordance with general mechanical and thermal design and interface requirements [NR 0101].

IRD-CM-DM-0205
The CM TMM and GMM shall be done in accordance to NR[0303]

4.3.2 Conductive Interface

IRD-CM-DM-0210
Deleted

IRD-CM-DM-0220
The maximum flux between CM and DMC in both direction, shall be lower than 10 W (TBC 5 including harness connectors)
During flight the thermal conductive environment seen by the CM shall be, at the DMC/adapter interface adapter side:

\[ T_{\text{max}} = 60 \, ^\circ \text{C} \]
\[ T_{\text{min}} = -40 \, ^\circ \text{C} \]

Max temperature gradient = 5 °C

The thermo-optical properties (Alpha and Epsilon) of the DMC external coatings shall be:

\[ \alpha > 0.85 \]
\[ \varepsilon > 0.84 \]

C: Typical value to be used in the analysis are \( \alpha = 0.92 \) and \( \varepsilon > 0.88 \)

### 4.3.3 Radiative Interface

The thermo-optical properties to be used in the definition of the radiative Interface are specified in IRD-CM-DM-0240:

IRD-CM-DM-0255

The thermo-optical properties specified in IRD-CM-DM-0240 are referred to external interfaces of MLI blankets. For analysis purposes, relevant temperature can be calculated on the basis of geometrical configuration only assuming the MLI blankets behaving as an adiabatic surface.

IRD-CM-DM-0265

The thermo-optical properties (Alpha and Epsilon) of the Carrier external coatings shall be:

\[ \alpha = \text{TBD} \]
\[ \varepsilon = \text{TBD} \]

C: *the numbers will be provided by the Carrier on the basis of their thermal design and analysis*

### 4.4 Electrical requirements

#### 4.4.1 Electrical architecture

In Figure 4-8 the CM to DM functional interface is reported. DM and CM internal connections have been reported only when the functionality is linked with DM to CM Interface, otherwise it is left to other documentation.
All electrical interfaces specified in this section must be designed in accordance with general electrical design and interface requirements [NR 0102] and EMC and power quality requirements [NR 0103].

Figure 4-8 DM to CM Functional Interface
4.4.2 DMC power consumption

IRD-CM-DM-0420

The DMC Power Consumption in the different Mission Phases shall be as for Figure 4-1

<table>
<thead>
<tr>
<th>Phase</th>
<th>Launch</th>
<th>Cruise (including manoeuvres fail-ops)</th>
<th>Rover &amp; GEP Check-Out</th>
<th>DMC Check-Out</th>
<th>Mars Orbit (Fail-safe*)</th>
<th>Eclipse</th>
<th>Charging</th>
<th>thermal Boost</th>
<th>Spin</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL Power</td>
<td>36</td>
<td>148</td>
<td>195</td>
<td>180</td>
<td>116</td>
<td>0</td>
<td>141</td>
<td>208</td>
<td>128</td>
</tr>
</tbody>
</table>

Figure 4-9 DMC power consumption

(*) the Mars Orbit and Cruise DMC power demand is the same. Therefore for special activities requiring the Fail-ops operations (i.e. the final targeting) the same cruise value has to be used.

4.4.3 Power

IRD-CM-DM-0270

Deleted

IRD-CM-DM-0280

The power supply lines shall meet general electrical design and interface requirements as specified in [NR 0102].

IRD-CM-DM-0285

The power supply lines shall meet EMC and power quality requirements as specified in [NR 0103].

4.4.4 Data bus

The nominal data exchange (analogue telemetry, unit status, etc etc) between the CM and the DMC is performed through the 1553 data bus. The signals are collected from the CM RTU and dispatched to the DMC CDMU.

IRD-CM-DM-0290

The DMC-CM data I/F shall be based on one fully redundant serial 1553 Bus between the DM CDMU and the CM.

IRD-CM-DM-0295

The data bus characteristics shall meet requirements of [NR 0102]

4.4.5 Additional monitors and commands

In addition to the power lines and data bus, other discrete and analogue lines are exchanged between the CM and the DMC and in this section the number and typology of these signals is given.
The high priority commands are generated by the DMC TC decoder, without SW intervention. The status are the ones needed even in case of 1553 deadlock. The analogue and thermistors are the signals needed for monitor the vital functions in the CM. Alarms are signals needed to trigger safe modes.

IRD-CM-DM-0300
18 TBC High Priority Commands (9 main and 9 redundant) from the DMC CDMU to the CM shall be available for CM units (re)-configuration.

IRD-CM-DM-0305
10 main and 10 redundant HPC shall be provided by the DMC to command directly the RF switches inside the CM (TBC 6)

IRD-CM-DM-0310
The High Priority Commands electrical characteristic shall be in accordance with [NR 0102]

IRD-CM-DM-0320
The CM shall provide to the DMC 5 main and 5 redundant (TBC 7) Discrete Status.

IRD-CM-DM-0325
The Discrete Status electrical characteristic shall be in accordance with [NR 0102]

IRD-CM-DM-0330
The CM shall provide 1 main and 1 redundant (TBC 8) Analogue signals to DMC

IRD-CM-DM-0335
The Analogue signals electrical characteristics shall be in accordance with [NR 0102]

IRD-CM-DM-0340
The CM shall provide 1 main and 1 redundant (TBC 9) Thermistor signals to DMC

IRD-CM-DM-0345
The Thermistor Signals electrical characteristics shall be in accordance with [NR 0102]

IRD-CM-DM-0350
The CM shall provide 2 main and 2 redundant (TBC 10) Alarm signals to DMC

IRD-CM-DM-0355
The Alarm signals electrical characteristics shall be in accordance with [NR 0102]

IRD-CM-DM-0360
Deleted

IRD-CM-DM-0365
Deleted

4.4.6 Separation signals

IRD-CM-DM-0370
3 Jumper connections on 3 out of the 6 interface connectors shall be implemented on both DMC and CM side to check the connection between CM and DMC.

IRD-CM-DM-0375
The electrical jumper connection signals shall be acquired by the DMC CDMU.

IRD-CM-DM-0380
These jumpers shall be used to confirm DMC-CM de-mating after in-flight separation.

IRD-CM-DM-0385
The electrical Characteristics of the jumpers shall be in accordance with [NR 0102].

IRD-CM-DM-0386
Between the CM and the launcher a separation strap shall be implemented to monitor the Composite separation from the launcher.

IRD-CM-DM-0375
These signals shall be routed to the DMC CDMU.

4.4.7 EGSE signals

IRD-CM-DM-0390
A dedicated redundant I/F (8 signal RS422 and 2 spare signals) shall be implemented between CM and DMC to connect the DMC to the EGSE.

4.4.8 TT&C requirements

The X-band TT&C system for the Composite mission is provided by the CM and therefore no radiofrequency interface exists between the DM and the CM. However it’s necessary to command and control the TT&C equipment mounted inside the CM from the DM CDMU.

IRD-CM-DM-0420
The CM shall provide 4 main and 4 redundant (TBC 11) serial links (data, clock, lock and ground) with returns signals to DMC for the Transponder telecommand I/F.

IRD-CM-DM-0430
The CM shall provide 3 main and 3 redundant (TBC 12) serial links (data, clock, and ground) with returns signals to DMC for the Transponder telemetry I/F.

IRD-CM-DM-0435
The electrical characteristics of the serial links shall be in accordance with [NR 0102].
4.5 Software requirements

The Composite SW is one SW running in the DMC CDMU. It implements the algorithms for both the Cruise and Mars Orbit phase and the EDL (only relevant to the DMC) phase. There is no SW I/F between the CM and the DMC.

5. DETAILED INTERFACE REQUIREMENTS

This Chapter provides the formats that will be used for establishing the CM-DMC ICD.

5.1.1 Measurement and Command list

IRD-RM-DM-0430
The following table shall be agreed between CM contractor and Prime for Analogue Measurement Calibration

<table>
<thead>
<tr>
<th>Signal Typology</th>
<th>Curve, Coefficient</th>
<th>Accuracy (including sensor harness and sampling system)</th>
<th>Voltage Range</th>
<th>Physical Range</th>
<th>Physical Operative Range</th>
<th>Binary format maximum/minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IRD-CM-DM-0440
The following table shall be agreed between CM contractor and Prime for Discrete Status Acquisition/Telemetry

<table>
<thead>
<tr>
<th>Signal from/ to Carrier</th>
<th>Status definition</th>
<th>Physical Meaning</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1=Low/High Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0=Low/High Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IRD-CM-DM-0450
The following table shall be agreed between CM contractor and Prime for Command Definition

<table>
<thead>
<tr>
<th>Signal from/ to Carrier Module</th>
<th>Status definition</th>
<th>Physical Meaning</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1=Low/High Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0=Low/High Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The following table shall be agreed between CM contractor and Prime for EGSE Telemetry definition

<table>
<thead>
<tr>
<th>Signal</th>
<th>Typology</th>
<th>Status definition</th>
<th>Physical Meaning</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command from/ to Rover</td>
<td></td>
<td>1=Low/High Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0=Low/High Voltage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.1.2 CM to DM Flight Connector I/F
IRD-CM-DM-0470
DM and CM shall grant Flight Connectors I/F according to Figure 4-7

IRD-CM-DM-0480
The connection shall be 2 connectors each pair of fixation point located in the Adapter.

5.1.3 I/F Connector Sizing and Position
IRD-CM-DM-0490
The Connectors at the interface shall comply with the allocations in the following Table 5-1

<table>
<thead>
<tr>
<th>CM side</th>
<th>DMC side</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>J101</td>
<td>P101</td>
<td>PWR I/F Main: Power to DM</td>
</tr>
<tr>
<td>J102</td>
<td>P102</td>
<td>PWR I/F Red: Power to DM</td>
</tr>
<tr>
<td>J103</td>
<td>P103</td>
<td>1553 MAIN (a-b)</td>
</tr>
<tr>
<td>J104</td>
<td>P104</td>
<td>1553 RED (a-b)</td>
</tr>
<tr>
<td>J105</td>
<td>P105</td>
<td>Analog, Discrete status and switch commands</td>
</tr>
<tr>
<td>J106</td>
<td>P106</td>
<td>Analog, Discrete status and switch commands</td>
</tr>
</tbody>
</table>

Table 5-1 Signal to connectors allocations

5.1.4 Connector definition and PIN assignment
IRD-CM-DM-0500
The Pin definition and assignment shall be provided in accordance with the following format.

<table>
<thead>
<tr>
<th>CM connector</th>
<th>DMC Connector</th>
<th>Pin Assignment</th>
<th>Signal Line</th>
<th>Remark</th>
</tr>
</thead>
</table>

5.1.5 EGSE connector
IRD-CM-DM-0510
Each EGSE Connector shall have a cap for flight and for when it is not used during ground activities.
6. LIST OF TBD

<table>
<thead>
<tr>
<th>TBD “N”</th>
<th>Pag</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBD 1 ± 10</td>
<td>15</td>
<td>The computation of the cm cog is under the CM contractor responsibility; the TBDs are left to allow the contractor producing its own design.</td>
</tr>
<tr>
<td>TBD 2 ± 10</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>from TBD 3</td>
<td>16</td>
<td>The computation of the composite matrix of inertia is under the prime responsibility; these values are indicative of the current mass distribution and clearly also depends on the carrier design. They will be removed when the CM design will be available.</td>
</tr>
<tr>
<td>Till TBD 14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>from TBD 15</td>
<td>17</td>
<td>The computation of the CM matrix of inertia is under the CM contractor responsibility; the TBDs are left to allow the contractor producing its own design.</td>
</tr>
<tr>
<td>till TBD 26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TORQUE OF TBD 27 NM</td>
<td>18</td>
<td>The torque will be defined when the structure of the Cone will be defined by the CM contractor.</td>
</tr>
<tr>
<td>α = TBD 28</td>
<td>20</td>
<td>α and ε of the CM will be defined when the CM thermal design will be available.</td>
</tr>
<tr>
<td>ε = TBD 29</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>
7. LIST OF TBC

<table>
<thead>
<tr>
<th>TBC “N”</th>
<th>Pag</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM LOADS (TBC 1) …</td>
<td>26</td>
<td>CM loads to be confirmed after Mechanical analysis with selected CM design</td>
</tr>
<tr>
<td>RING OF 0.130 (TBC 2) M² …</td>
<td>28</td>
<td>Surface to be confirmed after cone selection</td>
</tr>
<tr>
<td>48 (TBC 3) holes for …</td>
<td>31</td>
<td>Holes and bolts to be confirmed after cone selection</td>
</tr>
<tr>
<td>M10 (TBC 4) bolts ….</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>10 W (TBC 5) …</td>
<td>33</td>
<td>Flux between CM and DMC confirmed when CM design is available</td>
</tr>
<tr>
<td>28V +/- 1% (TBC 6) ………</td>
<td>35</td>
<td>Voltage to be confirmed when CM PCDU contractor will be selected</td>
</tr>
<tr>
<td>10M &amp; 10 R HPC (TBC 7) ……</td>
<td>36</td>
<td>Type and number of I/F between the CM and the DM will be confirmed when the CM contractor will be selected</td>
</tr>
<tr>
<td>5M &amp; 5 R DISCRETE (TBC 8)</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>1M &amp; 1 R ANALOG (TBC 9) …</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>1M &amp; 1 R THERMISTOR (TBC10)</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>2M &amp; 2 R ALARM (TBC 11) …</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>2M &amp; 2 R PULSE (TBC12) …</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>4M &amp; 4 R SERIAL TC (TBC 13)</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>3M &amp; 3 R SERIAL TM (TBC 14)</td>
<td>36</td>
<td></td>
</tr>
</tbody>
</table>

END OF DOCUMENT