

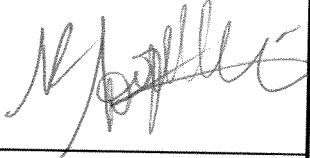




SEVIRI FM4 USER MANUAL

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Document type	Nb WBS	Keywords :
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DOCUMENT CHANGE LOG

Issue/ Revision	Date	Modification Nb	Modified pages	Observations
01	14/02/06			Original issue
02	13/02/14		39 29	Update of annex 3 scan mapping following DU exchange Modification of mechanical IF and screw torque information
03	06/06/14		39	Update of annex 3 scan mapping after tests with FCU at S/L level
03/1	27/06/14		3, 29, 48	Addition Annex 6

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1 INTRODUCTION

1.1 Purpose

This manual provides information and requirements, which have to be observed for handling and on-ground operations of the SEVIRI FM4.

1.2 Scope

This document covers only the on-ground operation of the SEVIRI instrument. It addresses the following aspects:

- General precautions
- Unpacking and operations to be done after mounting into the spacecraft
- Handling, transportation, storage
- On-ground operation procedures
- On-ground operational constraints
- Technical characteristics
- Cleanliness
- MLI repair

This document is not an Operational Manual. The In-orbit operational constraints are described in the document Flight Operation Manual (AD-1)

2 DOCUMENTS

2.1 Applicable documents

- AD-1 Flight Operation Manual
MSG-MMT-SE-MA-1092, Issue 4
- AD-2 SEVIRI DPS
MSG-MMT-SE-DS-0104, Issue 5 rev B
- AD-3a Deliverable Items List
MSG-MMT-SE-LI-3357, Issue 1
- AD-3b Loose Deliverable Items List
MSG-MMT-SE-LI-3355, Issue 1
- AD-4 Instrument MTICD
MSG-MMT-SE-ID-0380, Issue 5 Rev A
- AD-5 EICD of FPCA harness
MSG MMT SE ID 0338, Issue 5
- AD-6 EICD of TSA harness
MSG MMT SE ID 0337, Issue 3
- AD-7 EICD of SYSTHAR
MSG-MMT-SE-ID-1290, Issue 1
- AD-8 EICD of BASHAR
MSG MMT SE ID 1298, Issue 1 Rev A
- AD-9 TM/TC ICD
MSG MMT SE ID 0240, Issue 10
- AD-10 Detection chain settings SEVIRI FM4
MSG-MMT-SE-TN-3379, Issue 1 (in annex 1 of the present document)
- AD-11 Emballage/déballage instrument SEVIRI
MSG-MMT-SE-PR-1421, Issue 2 rev E
- AD-12 Satellite and Units Environmental and test specifications
MSG ASC SA SP 0057, Issue 5 rev B

AD-13 Opération de l'enregistreur Testoterm pour les mesures de température et Humidité ITTC
MSG MMT SE PR 2175, Issue 1 (document in annex of AD-11)

AD-14 Configuration à la livraison
MSG-MMT-SE-TN-3356, Issue 3

AD-15 SEVIRI FM4: TM/TC Transfer functions
MSG-MMT-SE-TN-3261, Issue 3rev1

2.2 Support documents

RD-1 Sunshield User manual
MSG-FOK-SE-PR-0186, Issue 3

RD-2 SEVIRI Storage / De-storage Plan
MSG-MMT-SE-TN-2480, Issue 3

RD-3 SEVIRI FM4: Power measurements
MSG-MMT-SE-TN-3380, Issue 1

3 GENERAL PRECAUTIONS

3.1 Personnel

Unauthorised personnel must be prevented from approaching and handling the hardware and all personnel must comply with the rules specified in the ALCATEL AIT plan.

3.2 Safety

A responsible engineer shall be nominated for all handling operations. He will be responsible for ensuring that all safety precautions, those specific to the operations being conducted and the general company precautions, shall be adhered at all times during the operation.

4 UNPACKING AND OPERATIONS AFTER MOUNTING

4.1 Containers

SEVIRI instrument is packed in 3 containers (see AD-3) :

- one container dedicated to the Main Unit & PU mounted on DUPF1 transportation, the Instrument & TSA Transport Container (ITTC)
- one container dedicated to the Sunshield transportation
- one container dedicated to DUPF extension including MDU & FCU

4.1.1 Description of the Main Unit Container (ITTC)

The Instrument & TSA Transport Container (ITTC) consists of the following main parts :

- A base frame made out from steel in welded construction
- A pressure vessel to allow a 20 mbar overpressure, fixed to the base frame via a shock isolation system
- GN2-system pressurisation unit which provides a positive over pressure of dry nitrogen gas against ambient during ground transport and storage. This system flow diagram allows initial purging and afterwards maintenance of the differential pressure. The system is connected to the container via quick connects (type swage lock). The unit is installed within a watertight compartment, which contains the RS-232 I/F of the humidity recorder and the ON/OFF switch and battery of the shock recorder.
- Environmental control device

It consists of three independent working units:

- Temperature and humidity recorder: the values can be loaded and analysed by a computer via RS 232 I/F without opening the container. Detection thresholds are respectively 0.1 K and 1%.
- Shock recorder: the GEMM 33E Shock Recorder can be switch ON/OFF from the electrical panel. The detection threshold is 0.5g.
- Pressure gauge : it shows the over pressure vessel
- Lifting Slings
To allow handling of the container, a dedicated lifting device is provided. It is stored on the back side of the ITTC.
- Soft cover
To protect the container during transport and storage from pollution, a dedicated soft cover is provided, manufactured from reinforced plastic foil.

The ITLD is not part of the container, but is used for removing the vessel lid during packing and unpacking operations of the instrument.

The ITLD has been already shipped to ALCATEL.

Item characteristics

Dimensions

Overall length	6440 mm
Overall width	2500 mm
Height	3250 mm

Weight

Overall without Flight H/W 3920 kg

4.1.2 Sunshield container description

The Sunshield container is made in a lid/tub type construction. The container will be kept over-pressure to avoid ingress of moisture, dirt etc. It is a stainless steel container with inside diameter of 1.8 m.

The tub has the following provisions:

- Two rectangular tubes for lifting by forklift
- Four wheels for moving around facilities
- Four eyes for towing down during transport
- Interface to the sunshield via shock dampers
- Interface to the lid with seal and (removable) guide pins

The lid has the following provisions:

- Three lugs for lifting by crane
- Five support studs on the edge of interface flange for storing the upper hay on facility floor
- Document container and tooling box
- GN2 purge/flushing system

4.2 Unpacking environment

The environmental conditions for removing the Main Unit & Sunshield from their container shall be as specified in AD-12

Temperature	22°C +/-3 °C
Pressure	970 to 1050 mbar
Relative humidity	50 +/- 10%
Cleanliness	class 100 000 or better

4.3 Unpacking procedure

The unpacking procedure “Emballage/déballage instrument SEVIRI” (AD-11), describes the different activities steps to be executed during instrument unpacking; these activities are:

- MGSE preparation
- Instrument unpacking
- Instrument installation
- Sunshield unpacking
- DUPF unpacking

The document AD-11 also covers the following items :

- Program for ITTC Humidity & Temperature Recorder
- SEVIRI lifting brackets
- Radiator cover
- Integration handling brackets
- PU simulator bracket

4.4 Operations after mounting

The following operations shall be performed after mounting of the instrument into the spacecraft:

Mounting of satellite bonding straps and securisation with glue points

In order to facilitate the installation of the satellite bonding strap, the FCU removable strap is not secured with glue points at delivery. This shall therefore be done at spacecraft level after integration of the FCU into the satellite.

The satellite bonding straps shall be fixed to the SEVIRI Electronics (FCU, MDU, PU) according to AD-4. In addition, it is recommended to secure with glue points (EC2216) all the satellite strap fixation screws at the electronics level.

Mounting of EMC cap on FPCA test connector

An EMC cap shall be mounted on the FPCA test connector 111 12 J01 as soon as this test connector is not used any more at Spacecraft level.

The EMC cap to be mounted is delivered with its screw locks as Loose Item with the Instrument (see AD-3b).

The screw torque to apply is 0.34 Nm. The screws shall be secured with glue points (EC2216).

It is also recommended to add a kapton scotch tape inside the cap to provide an additional protection between the connector sockets and the metallic cap.

5 TRANSPORTATION, HANDLING, STORAGE

This section deals with specific constraints, which require to be followed during transportation, handling and storage phases.

5.1 Transport

5.1.1 Environment

The environmental conditions for transportation shall be as specified in AD-12:

Pressure 200 to 1050 mbar
 Temperature -10°C to 45°C (1)(2)
 Relative humidity < 60 %
 Cleanliness class 100 000 or better

- (1) the cumulated time above 30°C shall be lower than 3 months (RFW MMT SE RW 28 on IR detectors)
- (2) Max temperature for transport is 45°C justified by 5 °C margin on the 50°C not to be exceeded on Scan Assembly because it has been qualified at this temperature (see RFW MMT 079).

Before transport, it is required to verify that shock and humidity recorders are working properly. This is respectively described in annex 4 of AD-11 and in AD-13.

5.1.2 Scan Mirror locking

To transport the SEVIRI Main Unit, it is required to lock the Scan Mirror, the locking operation is achieved by executing the following sequence ; note that **REDUNDANT commands** are defined in **ITALIC character** :

1. Check that Scan is in operating range defined by the status NO of the Limit Switch 1, 2, 3, 4

Limit swiches indicator	Telemetry reference	Status
Limit switch 1	S1 154 X	NO
Limit switch 2	S1 155 X	NO
Limit switch 3	S1 156 X	NO
Limit switch 4	S1 157 X	NO

2. Command the Scan Mirror to lower electrical Limit Switch 3 or 4 (scanning direction) with execution of the following FCU commands
 - Overriding of sequence manager by execution of command **213S1M** (*241SIM*) putting bit **B15=1**
 - Check status of TM n°**S1130 X** (*I138X*) equal to YES
 - Repeat canning command **129S1C** (*I32SIC*) up to change of status of :

Limit switch 3 TM n°**S1156X** (*S1173X*) from NO to YES

or

Limit Switch 4 **TM n°S1157X** (*S1174X*) from NO to YES

- Check that step counter TM n°**S1123X (I124X)** increases after execution of each command **129S1C (I32S1C)**
- 3. Overriding of Limit Switch 3 and 4
 - execution of command **215S1M (216SIM)** putting bit **B9=1** and bit **B10=1**
 - check that TM status is the following :
 - TM n°**S1161X (S1177X)** = **INHIB**
 - TM n°**S1160X (S1178X)** = **INHIB**
- 4. Command the Scan motor further into scan direction up to the Launch Locking Position Indicators
 - Repeat scanning command **129S1C (I32S1C)** up to change of status of **both** Nominal and Redundant Launch Position Indicators (TM n° **S1543Z** and n° **S1550 Z**) from NO to YES.
Note : Change of status shall occur before Limit Switch 4 (or 3) + 33 lines.
- 5. Command the Scan Motor **6** lines further, line by line with **6 sequential** executions of the scanning function **129S1C (I32S1C) (1 line scanning)**
 - De-inhibition of the Limit switch 3 and 4 with execution of command **215S1M (216SIM)** putting bit **B9=0** and bit **B10=0**
 - check that TM status is the following :
 - TM n°**S1161X (S1177X)** = **ENABLE**
 - TM n°**S1160X (S1178X)** = **ENABLE**
- 6. Send command **213S1M (214SIM)** putting bit **B15=0**
Check status of TM n°**S1130X (S1138X)** equal to **NO**
- 7. Locking of the LLD according to section 6.4.

Caution : The locking position (with or without LLD locked) shall not be maintained over a period longer than 3 months, without relief via a SCAN/RETRACE cycle.

5.2 Handling

5.2.1 Environment

The environmental conditions for handling shall be as specified in AD-12

Pressure	970 to 1050 mbar
Temperature	22 +/- 3°C
Relative humidity	50 +/- 10%
Cleanliness	class 100 000 or better

5.2.2 Scan Mirror position

For activities where the Instrument accelerations are limited to 1 g in all directions (e.g. only change of Instrument orientation), the recommended Scan Mirror position is 45 deg.

For activities where it can be guaranteed by the user that the accelerations will be limited to 3 g in all directions, the recommended Scan Mirror position is the locking position but the LLD may remain open (i.e. locking procedure of §5.1.2 shall be followed except step 7).

For any other operations, the Scan Mirror shall be locked according to 5.1.2.

As a general rule, integration shall be performed with slow running. The use of Hydraset is recommended. In any case, the Instrument accelerations shall never exceed the values specified in AD-12.

5.3 Storage

5.3.1 Storage environment

The environmental conditions storage shall be as specified in AD-12

Pressure	970 to 1050 mbar
Temperature	20 +/-10°C
Relative humidity	< 60 %
Cleanliness	class 100 000 or better

5.3.2 Scan Mirror position

In case of long term storage (period higher than 3 months), the SEVIRI shall be stored with the Scan Mirror in nadir pointing (45°) position (see also RD-2).

This position is achieved by executing the following sequence :

1. Overriding of sequence manager by execution of command **213S1M** putting **bit B15=1**
Check status of TM n°**S1130 X** is equal to YES.
2. Move to Limit Switch 1 or 2 by execution of command **131S1C**
Check status of Limit Switch 1 (TM n° **S1154X**) or Limit switch 2 (TM n°**S1155X**) is **YES**.
3. Command 764+N lines in scan direction by successive (764 +N) repetition of scanning command **129S1C** up to step counter (TM n°**S1123X**) equal to (764+N)
The integer value N is defined through the scan mapping table defined in annex 3 as :
N = (begin of scan range) - L1.
Caution : This value is specific for each model.
4. Disable overriding sequence by command **213S1M** with **B15=0**

The Scan Assembly Angle versus switch position is defined in Annex 3.

5.4 Preparations for vibrations test

To prepare the SEVIRI Main Unit for vibration testing, it is required to lock the Scan Mirror; the locking operation is achieved by executing the following sequence:

1. Execute **step 1 to 4** identified in section **5.1.2**
2. Command the Scan Motor further, step by step (slowly) with execution of the scanning function **129S1C**, with check of both potentiometers (S1118X and S1120X) after each command, up to the mechanical end stop, i.e. until the values of **both** potentiometers vary by less than 200 Ohms after scan actuation. The mechanical end stop shall be reached before 16 scan actuations.
 - Command the Scan Motor **2** lines backwards, step by step (slowly) with **2 x** execution of the scanning function **130S1C**, with check of both potentiometers (S1118X and S1120X) after each command.
 - De-inhibition of the Limit switch 3 and 4 with execution of command **215S1M** putting bit **B9=0** and bit **B10=0**
 - Check that TM status is the following :
 - TM n°**S1161X** = **ENABLE**
 - TM n°**S1160X** = **ENABLE**
3. Locking of the Launch Locking Device according to section 6.4
4. Powering of Scan Motor winding according to section 6.5
5. Calibration Unit motor short-circuiting according to section 6.6
6. Refocusing mechanism in mid term travel position according to section 7.3.1

6 ON-GROUND OPERATION PROCEDURES

6.1 Instrument initialisation

The switch OFF/ON and ON/OFF procedures of the Instrument are described in section 6.7 of AD-1.

6.2 Instrument operations

For execution of the procedures relative to :

- Hardware configuration setting
- Sequence Manager configuration
- Detection parameter loading
- SEVIRI modes transition

The User shall refer to section 6.4 of AD-1.

6.3 Detection parameters setting

The detection parameters settings (gain, offset, bias, image delay...) at ambient and in cold operating cases are defined in AD-10 also included in annex 1.

Procedure for parameters determination is also defined in AD-10.

6.4 LLD Locking procedure

6.4.1 Scope

This procedure describes the locking of the LLD using the Membrane Pump supplied as GSE with the Scan Assembly.

6.4.2 Hardware

The locking can be performed under ambient or TV environmental conditions. The pressure line of the LLD must be accessible. For the supply of pressurised gas the Membrane Pump shall be used. Alternatively, facility provided N₂ may be used if the pressure can be controlled in the range 1 bar to 3 bars and occurrence of overpressure can be excluded. The configuration of the pump with the pressure line and connectors is shown in figure 6.3-1.

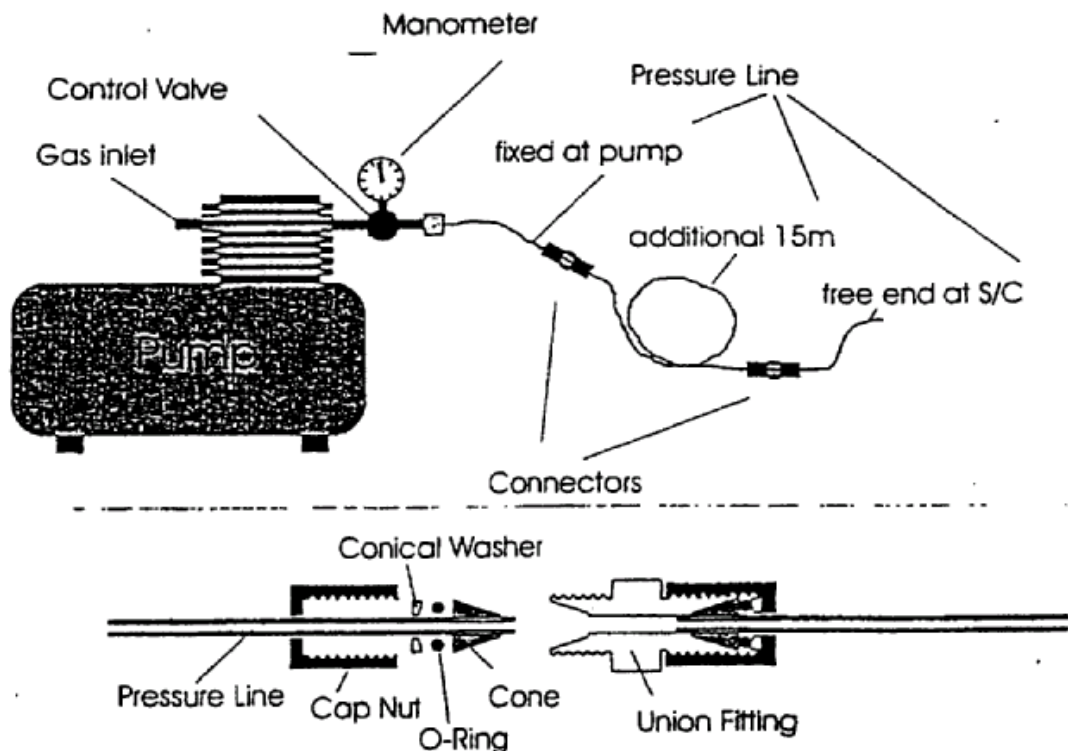


Figure 6.3-1 : GSE used for LLD locking (Using Membrane Pump)

The membrane Pump is equipped with a pressure regulator with a manometer. The pressure control is achieved with a by-pass valve. Thus for an open valve the pressure will be close to zero and will increase while slowly closing the valve.

Caution : While connected to the LLD, a pressure of **3 bars** shall not be exceeded.

6.4.3 Description of the Release and locking process

LOCK process

Starting from the Release position (LLD3, LLD4) , and the SCAN has been placed in the LAUNCH position (See LLP search sequence) :

At $t_0 = 0$, the LLD is heated and reaches the Intermediate position (LLD5, LLD6) within a 12 min duration (lock time duration).

At $t_0 + T_1$: The switch OFF of the heater is performed either after the Lock time duration is elapsed or if the limit switch event LLD5 or LLD6 for Lock is detected including a S/W reaction time of 30 sec.

At $t_0 + T_2$: After a small retraction of the actuator, LLD5 and LLD6 switch OFF (open status).

At $t_0 + T_3$: The Release indicator (LLD3, LLD4) switches go back to OFF position.

Then a "WAIT TIME" has to be performed.

After the WAIT TIME is elapsed, a pressure has to be applied to the pneumatic device. When the pressure level is sufficient (level defined in the On ground procedure), then LLD1 and LLD2 switch ON (closed status) and the SCAN is considered as LOCKED. Both switches status (LLD1 and LLD2) will be checked in order to verify the LOCKED position.

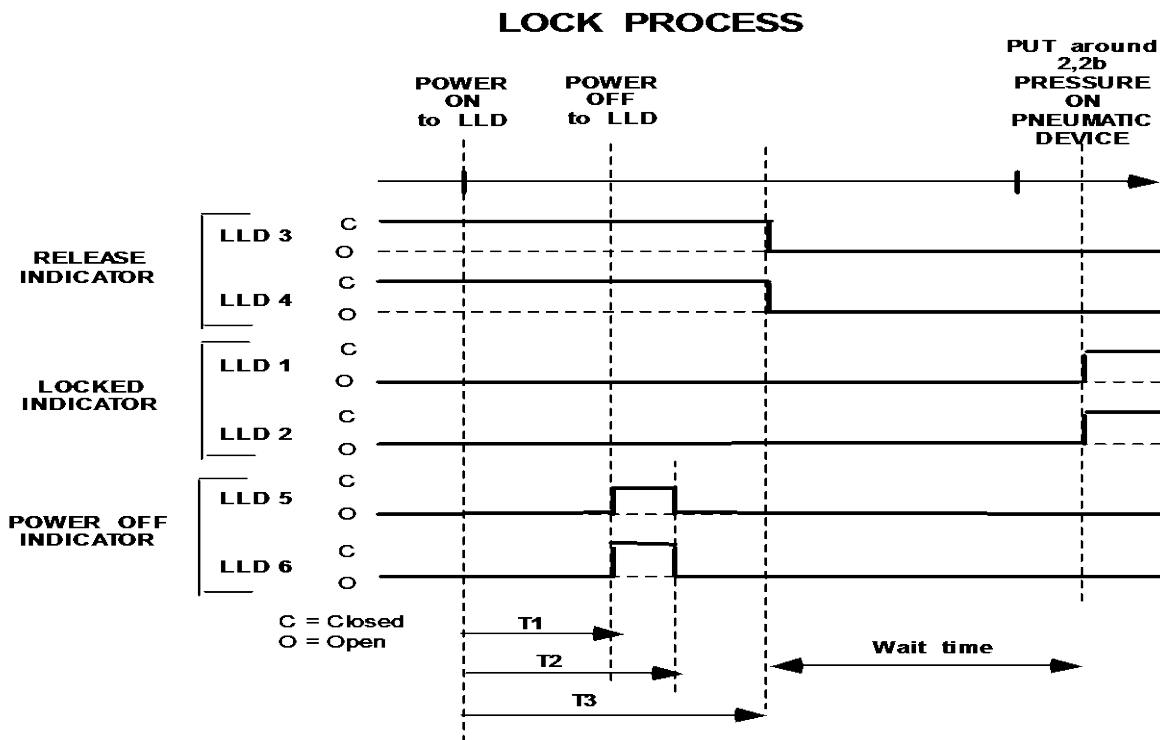


Figure 6.3.3-1 : LLD switch behaviour during LOCK process

Values for T1, T2, T3 & T4 are defined in section 6.4.4.2 and 6.4.4.3.

RELEASE process

Starting from the Lock position (LLD1, LLD2) :

At $t_0 = 0$, the LLD is heated and reaches the Intermediate position (LLD5, LLD6) within a 12 min duration (lock time duration).

At $t_0 + T_1$: The Lock indicator (LLD1, LLD2) switches go back to OFF position.

At $t_0 + T_2$: The Release indicator (LLD3, LLD4) switches go to ON position.

At $t_0 + T_3$: The switch OFF of the heater is performed either after the Lock time duration is elapsed or if the limit switch event LLD5 or LLD6 for Lock is detected including a S/W reaction time of 30 sec.

At $t_0 + T_4$: The Power Off indicator (LLD5, LLD6) switches go back to OFF position.

Then a "WAIT TIME" has to be performed.

After the WAIT TIME is elapsed, the SCAN is considered as RELEASED.

Then a specific procedure has to be applied in order to move the SCAN from the LLP position up to the operating range (limit switches L1, L2, L3 and L4 are not switched ON).

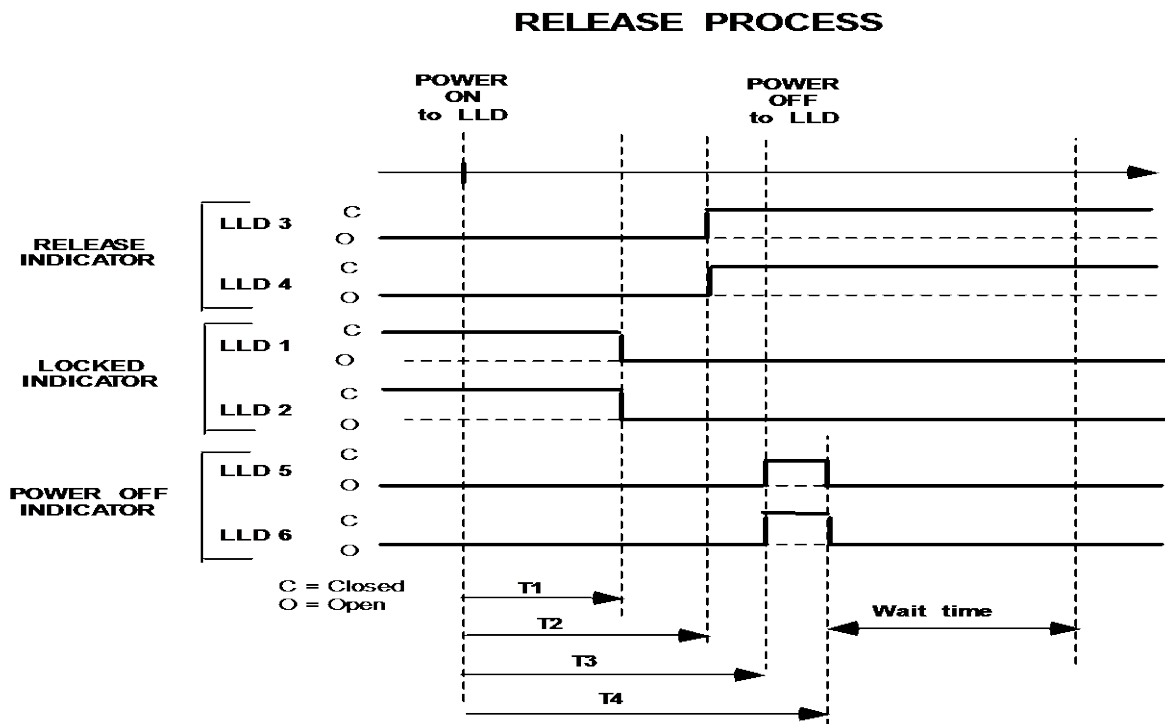


Figure 6.3.3-2: LLD switch behaviour during RELEASE process

6.4.4 Step by Step procedure

The synoptic of the Scan Mechanism with identification of commands and telemetry's reference can be found in annex 4 of AD-1.

6.4.4.1 Preparation

1. The LLD pressure line has to be connected to the Membrane Pump. In order to ensure proper valve position, a test run as described as follows shall be done. The pump shall be switched-on before connecting the line.
2. While closing the outlet with the tip of a finger, the valve shall be slowly closed and the resulting pressure increase observed. With open valve (screw handle rotated outwards by 2 rotations) the pressure will be less than 0.5 bar. The pressure will start to increase on the last quarter of rotation towards valve closure. From this point on, a pressure of 2 bar is reached within about the next 90° of rotation.
3. The valve shall be set to opened position (2 rotations), the pressure with closed outlet shall be less than 0.5 bar and the pump shall then be switched off.
4. The pressure line shall be connected using the fitting according to figure 6.3-1.
5. The Scan Mirror has to be brought in the locking position.

6.4.4.2 Locking

Note that **REDUNDANT commands** are defined in **ITALIC characters**.

1. Check that the status of position indicators is the following (Pin puller in latched position) :

Main position indicators status

Position indicator	Telemetry reference	Status
Locking position (Main)	S1543Z	YES
Limit switch LLD3 & LLD4	S1546Z & S1547Z	YES
Limit switch LLD1 & LLD2	S1544Z & S1545Z	NO
Limit switch LLD5 & LLD6	S1083Z & S1085Z	OPEN

Redundant position indicators status

Position indicator	Telemetry reference	Status
Locking position (Redund)	S1550 Z	YES
Limit switch LLD3 & LLD4	S1553 Z & S1554Z	YES
Limit switch LLD1 & LLD2	S1551Z & S1552Z	NO
Limit switch LLD5 & LLD6	S1084Z & S1086Z	OPEN

2. Activation of the pin puller (Switch ON)

Execute the command **033S1C (035S1C)** ; check status of TM **S1015Z (S1026Z)** is CLOSED

Execute the command **063S1C (119S1C)** ; check status of TM **S1015Z (S1513Z)** is CLOSED

Verify courant > 0.4 A - TM n° **S1367C (S1368C)**

3. Switch-OFF power immediately upon the limit switches LLD5 & LLD6 which indicate power-off (TM n°**S1083Z** & n°**S1085Z**) change state to CLOSED by activating the 2 command in serial **034S1C (120S1C)** & **064S1C (036S1C)**.

The TM status shall be the following :

S1015Z (1026Z) = OPEN

S1510Z (1513Z) = OPEN

The Nominal position indicators change state in following sequence :

Indicator identification	Indicator ref	Status	Switching duration at ambient	Switching duration in vacuum
LLD5 , LLD6 (T1)	S1 083 Z & S1 085 Z	OPEN to CLOSED	1'30'' < t < 4'20''	1'30'' < t < 5'00''
LLD5, LLD6 (T2)	S1 083 Z & S1 085 Z	CLOSED to OPEN	3'00'' < t < 6'00''	3'00'' < t < 7'30''
LLD3, LLD4 (T3)	S1 546 Z & S1 547 Z	YES to NO	5'00'' < t < 7'00''	5'00'' < t < 10'00''
LLD1, LLD2	S1 544 Z & S1 545 Z	NO, no change	-	-
Locking position	S1 543 Z	YES, no change	-	-

The Redundant position indicators change state in following sequence :

Indicator identification	Indicator ref	Status	Switching duration at ambient	Switching duration in vacuum
LLD5 , LLD6 (T1)	S1084Z & S1086 Z	OPEN to CLOSED	1'30'' < t < 4'20''	1'30'' < t < 5'00''
LLD5, LLD6 (T2)	S1084Z & S1086Z	CLOSED to OPEN	3'00'' < t < 6'00''	3'00'' < t < 7'30''
LLD3, LLD4 (T3)	S1 553 Z & S1 554 Z	YES to NO	5'00'' < t < 7'00''	5'00'' < t < 10'00''
LLD1, LLD2	S1 551 Z & S1 552 Z	NO, no change	-	-
Locking position	S1 550 Z	YES, no change	-	-

- After change of limit switches LLD3, LLD4 from CLOSED to OPEN, wait until full extension of Pin puller

Ambient temperature	at least 10 minutes waiting duration
Hot TV temperature	at least 60 minutes waiting duration

- Operation of Gas Actuator
- Check that the pressure control valve is still open and switch ON the pump
- Slowly (max pressure tare : 2 bars / min)**, close the pressure control valve and observe the manometer and the status of the indicators LLD1 & LLD2. At about 1.6 bars (ambient) respectively 0.6 bars (TV) the indicator status is expected to change from OPEN to CLOSED.

Note that for SEVIRI FM4, the required pressure (about 1.6 bars at ambient) is slightly lower than the pressure required for the previous SEVIRI models (about 2 bars).

- Open the pressure control valve and switch-OFF the pump.

Caution : Do not exceed a pressure of 3 bars (2 bars in TV condition)

- Check-reading of position indicators is the following :

Nominal position indicators

Position indicator	Telemetry reference	Status
Locking position (Main)	S1543Z	YES
LLD3 & LLD4	S1546Z, S1547Z	NO
LLD1 & LLD2	S1544Z & S1545Z	YES
LLD5 & LLD6	S1083Z & S1085Z	OPEN

Redundant position indicators

Position indicator	Telemetry reference	Status
Locking position (Redund)	S1550Z	YES
LLD3 & LLD4	S1553Z & S1554Z	NO
LLD1 & LLD2	S1551Z & S1552Z	YES
LLD5 & LLD6	S1084Z & S1086Z	OPEN

10. Disconnect the pressure line from the pump

6.4.4.3 Release

The release function is performed by operating the pin puller. After completion of release, the scan, mirror shall be put in its operational scan range by repetition of successive retrace command, and then switches of beginning of scan range are automatically achieved by activation of a specific command. All these operations are defined in the following sequence (note that **REDUNDANT commands** are defined in **ITALIC character**):

1. Verify that the FCU CORE section is switched ON with HTR&TM sections only connected.
2. Verify that the SCAN is in the locking position (S1543Z and S1550Z = OPEN) and LLD in Locking position (LLD1 and LLD2 CLOSED : S1544Z, S1545Z, S1551Z, S1552Z)
3. Switch ON the mechanism section and the relevant SCAN electronics (as defined in FOM procedures)
4. If pump is connected to the pressure line : disconnect it
5. Check that the position indicators status is the one defined in section 6.3.3.2 step 9.
6. Activation of the pin puller
 Execute the command **033S1C** (*035S1C*) ; check status of TM **S1015Z** (*S1026Z*) is CLOSED
 Execute the command **063S1C** (*019S1C*) ; check status of TM **S1510Z** (*S1513Z*) is CLOSED

 Verify courant > 0.4 A - TM n° **S1367C** (*S1368C*)
7. Switch OFF power immediately upon the limit switches LLD5 & LLD6 (TM n° **S1083 Z** & n° **S1085Z**) changes state to CLOSED by activating the 2 commands in serial **034S1C** (*120S1C*) & **064S1C** (*036S1C*).
8. Check that the position indicator position status change in the following sequence :

Nominal position indicators sequence

Indictor identification	Indicator ref	Status	Switching duration at ambient	Switching duration in vacuum
LLD1 , LLD2 (T1)	S1544Z & S1545Z	YES to NO	1'00'' < t < 2'30''	0'45'' < t < 2'45''
LLD3, LLD4 (T2)	S1546Z & S1547Z	NO to YES	2'30'' < t < 4'00''	2'00'' < t < 4'00''
LLD5, LLD6 (T3)	S1083Z & S1085Z	OPEN to CLOSED	3'00'' < t < 4'30''	2'15'' < t < 4'30''

LLD5, LLD6 (T4)	S1083Z & S1085Z	CLOSED to OPEN	4'30'' < t < 6'30''	4'30'' < t < 12'00''
Locking position	S1543Z	YES, no change	-	-

Redundant position indicators sequence

Indicator identification	Indicator ref	Status	Switching duration at ambient	Switching duration in vacuum
LLD1 , LLD2	S1551Z & S1552Z	YES to NO	1'00'' < t < 2'30''	0'45'' < t < 2'45''
LLD3, LLD4	S1 553 Z & S1554Z	NO to YES	2'30'' < t < 4'00''	2'00'' < t < 4'00''
LLD5, LLD6	S1084Z & S1086Z	OPEN to CLOSED	3'00'' < t < 4'30''	2'15'' < t < 4'30''
LLD5, LLD6	S1084Z & S1086Z	CLOSED to OPEN	4'30'' < t < 6'30''	4'30'' < t < 12'00''
Locking position	S1550Z	YES, no change	-	-

9. After change of status from NO to YES of LLD3 & LLD4, wait until extension of pin puller in its latched position :

Ambient temperature at least 5 minutes waiting time
 Hot TV temperature at least 30 minutes waiting time

10. Check reading of position indicators is the following

Main position indicators status

Position indicator	Telemetry reference	Status
Locking position (Main)	S1543Z	YES
LLD3 & LLD4	S1546Z & S1547Z	YES
LLD1 & LLD2	S1544Z & S1545Z	NO
LLD5 & LLD6	S1083Z & S1085Z	OPEN

Redundant position indicators status

Position indicator	Telemetry reference	Status
Locking position (Redund)	S1550Z	YES
LLD3 & LLD4	S1553Z & S1554Z	YES
LLD1 & LLD2	S1551Z & S1552Z	NO
LLD5 & LLD6	S1084Z & S1086Z	OPEN

11. Bring the Scan mirror within its operational scan range with the following sequence using overriding commands

- Send the ML command **213S1M** (*214SIM*) with the data “0001” h and check that **S1130X** (*S1138X*) changes from “NO” to “YES”.
- Repeat the retrace elementary command **130S1C** (*133S1C*) up to achievement of the Limit Switches status given here after; check that step counter value decreases from 1 at each command execution

Limit swiches indicator	Telemetry reference	Status
Limit switch 1	S1 154 X	NO
Limit switch 2	S1 155 X	NO
Limit switch 3	S1 156 X	NO
Limit switch 4	S1 157 X	NO

- Go to swith position 1 or 2 by execution of REFERENCE Overriding command **131S1C**.
- The activation stops automatically when S1154X or S1155X changes from NO to YES.
- Send the ML command **213S1M** with the data “0000” h and check that S1130X changes from “YES” to “NO”.

6.5 Scan powering during launch

6.5.1 Preparation for Launch configuration: Primary power towards SCAN winding

The sequence allows to apply the primary power towards the SCAN winding.
 The User shall refer to the procedure NPS 004 of AD-1.

6.5.2 Preparation for In orbit configuration: FCU Secondary power towards SCAN winding

The sequence allows applying the FCU Secondary power towards the SCAN winding.
 The User shall refer to the procedure NPS 220 of AD-1.

6.6 Calibration Unit motor short circuiting

The sequence allows to verify that the windings of the calibration unit are connected towards a short circuit located at FCU output. The way to do it is to verify that the ARMING relays are in the DISARM position. It is then necessary to switch ON the CALIBRATION electronics of the FCU.

The User shall refer to the procedure NPS 005 of AD-1.

6.7 Refocusing Mechanism positioning at Mid Term travel position

The REM Mid Travel Position (MTP) is achieved on the FM4 as follows :

$$POS_{MTP} = L1 + 781 \text{ steps} + \text{coeff} * (T - 21^{\circ}\text{C})$$

With L1 : position of low electrical endstop

$$\text{Coeff} = +0.40 \text{ step/K for FM4}$$

T : REM temperature (use either REM motor temperature telemetry (S1185K) or clean room temperature information or SEVIRI baseplate temperature telemetries (e.g. S1053K)).

Note : The REM MTP position corresponds to the expected best focus position in orbit (0g environment). It also corresponds to the REM position on ground, in 1g environment, used for the optical performance tests at SEVIRI FM4 level.

For the detailed procedure to set the REM to its MTP, the User shall refer to the procedure NPS 006 of AD-1.

7 ON GROUND OPERATIONAL CONSTRAINTS

This section exposes the SEVIRI on-ground operational constraints which concern the integration phase, configuration incompatibilities, ground monitoring necessity, mechanism actuation number limitation, etc.

7.1 General

Only one FCU Core section shall be ON at a time. The ON command of the FCU Core section Redundant is a critical TC (see section 5.5 of AD-1).

Only one MDU CV Core section shall be ON at a time. The ON command of the MDU CV Redundant is a critical TC (see section 5.5 of AD-1).

7.2 Sequence manager

Refer to section 4.5.3 of AD-1

7.3 Mechanisms

7.3.1 Mechanisms position at delivery

The position of mechanisms at delivery to ALCATEL is defined in AD-14 and is recalled here below:

- | | |
|------------------------|------------------------------------|
| - Calibration Unit | Rest position |
| - Scan mechanism | Mirror position at 39.2° , clamped |
| - Refocusing mechanism | Mid travel position |

7.3.2 Inhibition of switches

The inhibition of both the Nominal and Redundant limit switches are strictly forbidden : this applies to the Scan mechanism, the scan LLD, the refocusing mechanism and the Calibration Unit except for the Scan Mirror locking procedure (see section 5.1.2).

7.3.3 Arming of relays of Scan and Refocusing mechanism

There are 4 relays in order to connect the power stage of the electronics to the motor windings phase A and B of the Scan mechanism and of the Refocusing mechanism.

The arming commands and disarm commands to be followed by the User are described in section 4.5.2 of AD-1.

7.3.4 Calibration Unit

Maximum allowed actuation in nominal calibration mode on-ground

The maximum number of actuation during on-ground testing (ambient and vacuum) allowed after delivery to ALCATEL shall be limited to 200.

Maximum duration in calibration position

The nominal calibration operation duration is 3 to 5 seconds as defined in the Baseline Repeat Cycle of the DPS (AD-2).

In case the user intends to perform a longer calibration (for investigation purpose), the following constraints shall be followed:

- the maximum calibration duration in investigation mode shall be limited to 45 seconds.
- the time delay in between two consecutive calibrations in investigation mode shall be at least 30 minutes ; this is the time needed for the temperature achieved in the coil to drop to the temperature of the environment.

The case of the investigation mode in air has not been tested at Equipment or SEVIRI level. However due to the convection effect of the air, it is assumed as a conservative case ; therefore the approach previously defined for the operation in vacuum is also valid for the operation in air.

Simultaneous activation of Nominal and Redundant winding towards STORAGE position

In case of mechanism trouble shooting, it is possible to activate towards storage position both windings simultaneously to increase motor torque; the specific procedure allowing performing this operation is defined in AD-1 section 4.5.2.

This mode being an emergency mode it is recommended to verify it once only (there is an allocation of 5 actuations for ALCATEL).

7.3.5 Refocusing Mechanism

Maximum number of actuation on-ground

After delivery to ALCATEL, the maximum number of actuation during on-ground testing in ambient and in vacuum shall be limited to :

	Ambient	Vacuum
Full range	3	1
Focus search	8	2
Operation	40	10

Full range : twice the full stroke of 2.2mm (1570 elementary actuations in each direction)

Focus search : -300 µm / + 300 µm (215 elementary actuations in each direction)

Operation : 25 µm (18 elementary actuations)

Motor winding temperature limitation

Operational constraints exist for the REM in order to prevent the motor winding temperature exceeding the maximum allowable value of 120 °C.
The safe threshold for preventing overheating the windings is 50°C on the Nominal or Redundant thermistor.

Additional constraints exist depending on the type of REM activation : they are described hereafter.

There are 2 possible commands to operate the REM :

- * Continuous command [CC] : it moves continuously the REM in negative direction towards Reference position
- * Nominal command [NC] : it moves the REM (in positive or negative direction) with 1 elementary command each 600 msec. Considering that an elementary command has a 300 msec duration, it corresponds to a CC with a 50% duty cycle.

Over the range limited by Electrical end stops :

- with a CC, the maximum duration of a REM activation is 8 minutes.
- with a NC used in 1 direction (positive or negative), the maximum duration of a REM activation is 16 minutes

There are 2 ways to operate the REM and for each type of activation (Type A or Type B), the delay to wait before a new REM activation is provided below.

- a) Type A : To reach a defined position in the range from an unknown position
This is done by a CC up to Reference followed by NC Commands in positive direction.

After this sequence, a specific delay has to be elapsed :

- 30 minutes delay is requested before other Type A activation
- 15 minutes delay is requested before a Type B activation

- b) Type B : To perform NC to move the REM from one position to the other
This is done by NC commands in positive or negative direction.

The maximum allowed duration of such an activation is 1 hour.

After this sequence, a specific delay has to be elapsed :

- 30 minutes delay is requested before a Type A activation
- 30 minutes delay is requested before other Type B activation

In addition, in case of failure of electrical end stops, the maximum duration of a CC is limited by a FCU internal time out of 9 minutes. This event is observable by telemetry. In this specific failure case, a 30 minutes delay is requested before any other REM activation.

7.3.6 Scan mechanism

Warning

The use of the scan mechanism when still clamped is strictly forbidden.
The clamping of the scan mechanism in-orbit (after initial release) is strictly forbidden.
The LLP search sequence is strictly forbidden in-orbit.

Maximum number of actuation on-ground of the Scan motor

The maximum number of scan/retrace cycles during on-ground testing allowed after delivery to ALCATEL is 300.

Maximum number of actuation on-ground of the Launch locking mechanism

The maximum number of locking/release cycles on-ground allowed after delivery to ALCATEL is 30.

Maximum duration in position other than 45 deg

The Scan mechanism shall not be maintained over a period longer than 3 months in a position other than 45 deg (+/- 1 deg) without relief via a SCAN/RETRACE cycle. This includes in particular the locking position (see §5.1.2).

Maximum relative humidity constraint for operation

The Scan mechanism shall not be operated in air if the ambient relative humidity exceeds 55 %.

7.4 Detection chain

The nominal performances of the MDU are achieved within a maximum delay of 2 lines (1.2 sec) after TC. Constraints for Detection Switch ON (for correct reset of IR ADCs) are identified in section 4.5.5 of AD-1.

7.5 Heaters

7.5.1 Passive cooler decontamination heaters

Radiator Assembly

Radiator Assembly is equipped with 3 decontamination heating lines : 2 on the first stage of the Passive Cooler, the other on the second stage.

The Radiator assembly Second stage decontamination heater (line n°5) shall be switched ON after a delay wrt the switch ON of the 2 first stage decontamination heaters (line n°1 and line n°2) : this delay is between 30 and 45 minutes (see also §4.5.6 and NPS 106 or 108 of AD-1).

Once the 3 heater lines are ON, it is mandatory to check during decontamination heating sequence, the primary current of the thermal bus ; in order to check the proper functioning of the 3 lines simultaneously, the current shall be always higher than 5.5 A.

It is given through OBDH telemetry as follows:

$$S1\ 367\ C + S1\ 368\ C > 5.5\ A$$

Switching ON at ambient of Radiator Assembly decontamination heaters for functional checks shall be performed with the precaution associated to the first stage and second stage temperature, which shall not exceed 28°C.

Sunshield Assembly

Switching ON at ambient of Sunshield Assembly decontamination heaters for functional checks shall be performed with the precaution associated to sunshield temperature which shall not exceed 28°C.

7.5.2 PCA closed loop

For PCA closed loop performance, there are 2 relays involved. Both relays are managed by OBDH ON/OFF telecommands.

The first relay allows switching ON/OFF the temperature sensor.

The second allows switching ON/OFF the heater at PCA level.

In order to operate correctly the second heater and to have a valid relay status, the first relay has to be closed first in order to connect the temperature sensor to the PID algorithm.

7.5.3 Calibration Reference Source heating

For CRS heating, there are 2 relays in series. Both relays shall be closed in order to provide power to the CRS heater.

The first relay represents the “ARM” relay. It is managed by OBDH ON/OFF telecommands.

The second relay is managed by OBDH ON/OFF telecommands or by the sequencer during a cycle (switch ON at parameter Nca and switch OFF at parameter Ncb).

In order to operate correctly the second heater and to have a valid relay status, the “ARM” relay has to be closed first.

Switching ON at ambient of Calibration Reference Source heaters for functional checks shall be performed within a duration limited to 2 minutes maximum.

7.6 Thermal Vacuum Limitation

There is no Thermal Vacuum Constraints associated to temperature limitation during thermal vacuum test as far environmental conditions comply with AD-12.

8 SEVIRI TECHNICAL CHARACTERISTICS

8.1 Mechanical aspects

8.1.1 Interface Control Documents

The mechanical definition of the SEVIRI FM4 is defined in AD-4.
 A modification of the mechanical interface has been done. It consisted in enlarging some of the fixation holes.
 This modification is traced in MSG.MMT.FM4 ORM.00001 in application of TAS document TAS MSG-ASC-SA-TN-2313.

8.1.2 Torque to be applied

Values of torque to be applied on screws are defined in annex 6 of AD-11.
 Interface screws have been tested and can be used 50 times. See MSG.MMT.SE.SP.1498 and mail P. JUNG 11/02/2014 in annex 6

8.1.3 Interface control measurement

Z positions of radiator lower interface:
 (Quotation 768 on SEVIRI MICD 107098S sheet 2/6)

Z distances	Theory	Measured (AR 161/FM4)	Variation with respect to theoretical value
between SEVIRI to MSG I/F and cooler lower I/F (with nominal shim thickness 10mm)	768 mm	771 mm	+3 mm
between SEVIRI ISM and cooler lower I/F	778 mm	781 mm	+3 mm

8.1.4 Sunshield brackets

The Sunshield is delivered with 3 loose Mounting Plates and 3 loose I/F Ti-brackets with one pilot hole to the satellite. These brackets will be machined and used by ALCATEL for satellite mounting. These brackets are flight standard.

The procedure for installation is defined in RD-1 and can also be found in section 5 of the SA FM4 ADP, ref. MSG-FOK-SE-AD-0433.

The main constraints for brackets installation are :

- The M6 bolts used to fix the Ti- I/F brackets to the SA can be mate/demate to a maximum of **10 x**. At sunshield delivery to ALCATEL, those bolts have been used **4 x maximum** (depending on the bolt). A mate/demate logbook identifying all the operation already performed is given in annex 4.
- The bolts at SEVIRI FM4 delivery are new. They were only used for fit checking of all brackets at FOKKER level (see annex 4).

Therefore, it is not necessary to replace the current bolts by new ones to mount the flight brackets (on the contrary to the FM2).

- The bolts shall be mounted by using Vacuum Grease or Molykote. The flight standard I/F brackets have to be mounted on their dedicated location for a proper fit of the close tolerance bolts.
- These locations are identified in Drawing R10008 of RD-1 by positions 1, 2 and 3. The brackets are coded FM1 pos 1, FM1 pos 2 and FM1 pos 3.

8.1.5 Pump tube

Pump tube for LLD locking is described in AD-4.

The constraints for routing are the following:

- The maximum spacing between tube fixation points is 300 mm.
- The maximum free length at the end of the tube is 100 mm.
- The minimum allowable bending radius is 50 mm.

8.2 Electrical aspects

8.2.1 Interface Control Documents

The electrical definition of the SEVIRI FM4 is defined in the following documents: AD-5, AD-6, AD-7, AD-8 and AD-9.

8.2.2 Electrical typical consumption

The synthesis of the measured SEVIRI FM4 consumptions is given in RD-3.

The consumptions of the decontamination lines tested at 28.4 V are given hereafter (from MSG-MMT-SE-RP-3384, phase 6, test 6):

Decontamination lines	Current
1 st stage (line n°1)	2.64 A
1 st stage (line n°2)	2.11 A
2 nd stage line (line n°5)	1.76 A
Sunshield (line n°3)	2.29 A
Sunshield (line n°4)	2.34 A

The maximum consumptions of the heater lines are given hereafter (from MSG-MMT-SE-RP-3384) :

Regulation heater lines	Current	Data origin in RP-3384
CIRO nominal	43.44 mA	Phase 2 / test 2
CIRO redundant	43.44 mA	
VHRO nominal	83.94 mA	Phase 3 / test 2
VHRO redundant	84.36 mA	
CRS Heater nominal	873 mA	Phase 6 / test 6
CRS Heater redundant	863 mA	

8.2.3 Specific Calibration Curves

Calibration curves of instrument temperature sensors are identified in the flight Operational Manual (AD-1) and AD-15. This section is dedicated to sensors which are not used in-orbit, but implemented for testing purpose; they are:

Platinum sensor (PT500)

The table defines in annex 2 provides with the characteristics of the Platinum sensor implemented on the second stage of the Radiator Assembly

Accelerometer inside Passive Cooler

An accelerometer, type KISTLER 8792A500 is implemented on the second stage of the Radiator Assembly for testing purpose.

Data sheet are presented in annex 2.

The connector dedicated to Platinum sensor and accelerometer is the connector 11112-J01 identified in AD-5 (vertical connector on FPCA bracket).

Accelerometer on Scan Mirror

None on SEVIRI FM4

9 CLEANLINESS

The instrument includes optical mirrors and passive cooler with very sensitive optical & thermo-optical coatings :

- under no circumstances should any optical surface of mirror and reflective surface of the passive cooler be touched (even with gloved hands) or cleaned,
- Under no circumstances the relative humidity should be above 65 % (the optical coatings could be degraded with direct impact on the Instrument performance).

The SEVIRI Main Unit is delivered with 3 specific covers (see AD-3) :

- One cover is dedicated to Telescope to protect optical entrance (soft cover),
- One cover is dedicated to the Radiator interface (soft cover),
- One cover is dedicated to the Radiator entrance (metallic cover).

Note : The sunshield is also delivered with 2 protective covers, one on the top side, the other on the lower side.

As soon as these protections will be removed, the contamination levels shall be monitored by ALCATEL in the environment class 100 000.

The levels of contamination induced on TSA, FPCA and Sunshield shall be in line with the cleanliness requirements applicable to ALCATEL ($2 \cdot 10^{-7}$ g/cm² and 500 ppm).

The instrument is also delivered with one optical witness.

Note on CFRP Samples

The instrument is delivered with Structure CFRP samples.

These samples placed in a bag have to follow SEVIRI in order to be kept representative of what SEVIRI structure and cone will be submitted to.

Nominally no operation is foreseen with them.

They may be used as representative samples in case of humidity problem at Instrument or Satellite level.

10 MLI REPAIR

This section contains recommendations applicable for repair of MLI blankets in general. Additional information for detailed repair methods is given in MSG-ORS-SE-PR-1004, Issue 02, rev A. These criteria shall be understood as recommendation.

10.1 Repair criteria/recommendation

Whenever a damaged layer of a blanket or a referred part (e.g. attachment provisions, electrical bonding provisions etc.) has to be repaired only repair material shall be used, which consist of a material similar to that of the material being repaired (never used Mylar foils for repair of Kapton foils!).

10.2 Replacement criteria/recommendation

In order to enable decision if a blanket can still be repaired or has to be re-manufactured, several criteria have to be taken into account.

In case of the following a blanket shall be re-manufactured:

- Tears in a damaged outer layer exceed length of 150 mm
- Holes in a damaged layer exceeds $\Phi 20$ mm
- Total area of repair material exceeds 10 % of total blanket area
- One or more layers are damaged in such a way, that the required mechanical/thermal/electrical properties cannot be reached, and the respective layers cannot be replaced
- Contamination level of blankets is that high, that local repair or cleaning is impossible
- Grounding point fails and required electrical properties of blanket cannot be kept by remaining grounding points (applicable only in case of more than 2 grounding points per blanket) or repair of grounding point is impossible

ANNEX 1**Detection parameters chains
settings**

Refer to document “Detection chain settings SEVIRI FM4”, MSG-MMT-SE-TN-3379, Issue 1, annexed hereafter.

ANNEX 2

PT500 calibration data &

Accelerometer data sheet

PT500 implemented on the second stage of the Radiator

$$(T(^{\circ}\text{C}) = 0.47975 * R(\text{Ohm}) - 241.74)$$

Temperature ($^{\circ}\text{C}$)	Resistance (Ω) [500 Ω at 0°C]
-220	45.3
-200	87.0
-180	128.7
-160	170.4
-140	212.1
-120	253.8
-100	295.4
-80	337.1
-60	378.8
-40	420.5
-20	462.2
0	503.9
20	545.6
40	587.3
60	629.0
80	670.6
100	712.3

Accelerometer data sheet

MSG.FOK.SE.AD.0590 (Issue 04) and 0595 (Issue 03)

ANNEX 3

Scan mapping

The following table provides the scan mapping of the SEVIRI FM4 with the Drive Unit FM5. At Airbus D&S level, only data acquired with the scan unit tester are available. The data below have been extracted from measurements done at MSG satellite level with the FCU.

<i>event</i>	<i>line number</i>	<i>P1(S1118X)</i>	<i>P2(S1120X)</i>
Upper mechanical end stop (*)	-53	8634	4586
Upper electrical end stop L2	-29	5480	1081
Upper electrical end stop L1	-22	8046	5174
Begin of scan range	0	4889	492
Reference line	1	5480	1081
Nadir pointing	764	4515	8673
End of scan range	1527	3119	1264
Lower electrical end stop L3	1545	3926	8305
Lower electrical end stop L4	1551	412	4786
LLPI	1575	3926	8305
Transport position	1581	412	4786
Launch position	1583	765	3607
Lower mechanical end stop	1585	1942	2432

(*) Extrapolated values. Not measured at instrument level.

- The associated angle values are defined through the Scan law characterisation (see FM4 Characterisation report MSG-MMT-SE-TN-3325)
- The reproducibility of L1 is +/- 2 lines
- After clamping an offset of +/- 1/3 line (i.e. about +/- 200 Ohms on P1 and P2) can be observed.

ANNEX 4

Mate / Demate

Sunshield M6 bolts for Ti I/F
brackets

See also :

- section 13 of SA FM4 ADP ref MSG-FOK-SE-AD-0590 and
- section 23 of SEVIRI FM4 ADP ref MSG-MMT-SE-AD-3350



MSG SEVIRI

Ref. : MSG-MMT-SE-MA-3381

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Ref. : MSG-MMT-SE-MA-3381

Issue: 03 Rev 1

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ANNEX 5

Mechanism actuation forms

REFOCUSING MECHANISM

Ambient test

Date	Actuation in Full range	Actuation in focus search	Actuation in Operation	Remark

TOTAL

(Max = 3)

(Max=8)

(Max=40)

Vacuum test

Date	Actuation in Full range	Actuation in focus search	Actuation in Operation	Remark

TOTAL

(Max = 1)

(Max=2)

(Max=10)

SCAN MOTOR**Scan / Retrace on-ground**

Date	Number of actuation	Remark

TOTAL**(Max = 300)**

LAUNCH LOCKING DEVICE**On-ground & in vacuum tests**

Date	Number of actuation	Remark

TOTAL**(Max=30)**

ANNEX 6**Interface screw torque**

De : JUNG, Philippe [<mailto:philippe.jung@astrium.eads.net>]

Envoyé : mardi 11 février 2014 14:41

À : LAPORTE Pierre

Cc : FAURE, Francois; Francois.Cave@esa.int; MONTET Denis; RIHET Patrick; PERRON Odile; BIANCHI - TAS CANNES Stephane; MICHEL Jean-Claude; CAPEL Emmanuel

Objet : Declined: MSG-4 vis pour fixation du SEVIRI

Date : mercredi 12 février 2014 09:00-09:30 (GMT+01:00) Brussels, Copenhagen, Madrid, Paris.

Où : Téléconférence

Bonjour,

Après un peu d'exploration, nous avons trouvé la réponse à votre question concernant les vis d'interface dans notre "Spécification technique de besoin d'intégration mécanique" (MSG.MT.SE.SP.1498. issue2) dont je joins la page concernée.

<<SP1498i2STBI.pdf>>

En clair,

- vous pouvez réutiliser les mêmes vis au même couple, compte tenu de la techno des vis (matériaux/lubrification) et des marges disponibles,
- vous conservez le couple que vous avez utilisé sur tous vos modèles,

Ceci répond à l'action MSG.ASC.SA.MN.3453-8. La réunion en référence ne nous semble pas nécessaire au niveau ADS.

Cordialement

Philippe JUNG