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# MODURBAN

## FP6 Project:

EC Contract n° 516380

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## MODACCESS SUBPROJECT

### – DELIVERABLE REPORT –

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Deliverable ID:	<b>D49</b>
Deliverable Title:	<b>Passenger related functions in degraded modes, passenger emergency functions</b>
Responsible partner:	<b>Frensystemi srl</b>
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## Document Information

**Document Name:** Passenger related functions in degraded modes, passenger emergency functions  
**Document ID:** DEL\_MODACCESS\_WP13\_D49\_V2\_080212.doc  
**Revision:** Final  
**Revision Date:** 12<sup>th</sup> February 2008  
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**Security:** MODURBAN Consortium only

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## Documents history

Revision	Date	Modification	Author
V0	24/10/2007	First Draft	Frensystemi
V1	07/01/2008	Second Draft	Frensystemi
V2	12/02/2008	Final changes due to comments by RATP from Feb. 5 <sup>th</sup> 08	Frensystemi

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## SECTION I – DELIVERABLE SUMMARY

Deliverable Title	
<b>Deliverable ID , associated WP &amp; Subproject</b>	DEL_MODACCESS-D49v2_Frensistemi_WP13_120208.doc MODACCESS / WP13
<b>Type of Deliverable</b>	Report
<b>Input / Starting stage</b>	<i>Previous Deliverables Others MODURBAN Subproject WP13 Main European Urban Transport Operators</i>
<b>Output / Final stage</b>	<i>PIS functionalities in emergency situations and in degraded mode</i>

<b>Lead partner(s)</b>	
<b>Achievement to date (%)</b>	100 %
<b>Expected date of achievement</b>	
<b>Type of exploitation</b>	
<b>Exploitation potential</b>	
<b>Expected budget</b>	<i>See relevant table (WP13 costs)</i>
<b>Actual costs</b>	<i>See relevant table (WP13 costs)</i>
<b>Expected costs to completion</b>	
<b>Protection</b>	<i>Not Relevant</i>
<b>Protection date</b>	<i>Not Relevant</i>

<b>IP's</b>	<b>Partners, (type, identification, date)</b>
<b>Pre-existing Know-How</b>	Not Relevant
<b>Exploitation Rights</b>	Not Relevant

<b>Associated Risk analysis</b>	<b>Type, solution envisaged, action, actors</b>	<b>Actual Reduction</b>
<b>Before start</b>		
<b>During task implementation</b>		



Deliverable Title
<p><b><u>Deliverable Abstract</u></b></p> <p>Starting from the results of the previous analysis carried out by MODACCESS during the MODURBAN project, in this document there are listed the PIS functionalities in degraded mode and in a set of standard emergency events, with the related involved PIS devices. On the base of these functionalities the document identify clearly also the functions for onboard PIS and those for the wayside PIS on platform, in case of emergency or degraded mode for driverless or not driverless system.</p>
<p><b><u>Associated Milestone (if relevant):</u></b></p>

Contribution to MODURBAN Objectives as mentioned in the Description of Work		
<b>Objective Definition</b>	<b>Comments</b>	<b>Quantification</b>
Objective 1 -		
Objective 2 –		
Objective 3 ...		
Objective 4 ...		



## SECTION 2 – DELIVERABLE DETAILED DESCRIPTION

### Glossary

DCS	Data Communications System
EAP	Emergency Alarm for Passenger
EEDe	Emergency Egress Device
Ext	External Teams
GOA	Grade Of Automation
	GOA4: Unattended train operation
HMI	Human Machine Interface
OCC	Operations Control Centre
PA	Public Address
PIS	Passenger Information System
PRM	Person with Reduced Mobility
PTT	Push To Talk
TCP/IP	Transmission Control Protocol / Internet Protocol



## **1 Basic Set of Emergency Events**

To establish the functionalities of the PIS in emergency situations, first of all a basic set of emergency events that can occur during normal metro service need to be defined.

At the beginning of the MODURBAN project the definition of such a set was already addressed in the questionnaire that WP13 submitted to the public transport operators, to analyze which functionalities and PIS components were currently in use in Europe. Nine European operators with underground networks answered the questionnaire and while this obviously does not represent an exhaustive survey, the questionnaire can nonetheless give a sufficiently clear picture of what the basic set of emergencies are and which PIS devices are involved.

The European operators who answered the questionnaire are listed in Table 1.

**Table 1 List of Metro Operators Who Answered The WP13 questionnaire**

<b>Operator</b>	<b>City/Nation</b>	<b>Vehicle type (driver/driverless)</b>
CM – Copenhagen Metro	Copenhagen/Denmark	Driverless
ULASIM Istanbul Transportation Co.	Istanbul/Turkey	Driver
SPT – Strathclyde Passenger Transport	Glasgow/United Kingdom	Driver
ATM – Azienda Trasporti Milano	Milan/Italy	Driver
FMB – Ferrocarril Metropolità de Barcelona	Barcelona/Spain	Driver
ML – Metro Lisbon	Lisbon/Portugal	Driver
VAG – Verkehrs-Aktiengesellschaft	Nuremberg/Germany	Driver and driverless
RATP – Régie Autonome Transports Parisiens	Paris/France	Driver and driverless
MM – Metro Madrid	Madrid/Spain	Driver

From an analysis of the results of the questionnaire it was possible to identify the following set of basic emergencies for metros:

- Emergency Brake (or Egress) Activation
- Emergency Call Unit Activation
- Fire on Board
- Main Power Electric Failure
- Accident
- Train is blocked on the track

## **2 Basic Set of PIS Components**

The PIS is made up of devices and pictograms. The latter help the passenger to understand the use of the device itself. To define the functionalities of the PIS in emergency situations, it is necessary to define a basic set of PIS devices and pictograms common to the public transport operators in the various European cities.

### **2.1 Basic Set of PIS Devices On Board**

The results of the questionnaire submitted by WP13 made it possible to define a basic set of PIS devices common to all the operators who took part in the survey.

- External Display
- Internal Display
- PA Loudspeakers
- Driver Cab Intercom
- Passenger Alarm: Call Unit connected to the OCC
- Emergency Exit Device
- Passenger Alarm Emergency Brake
- Manual Fire Extinguisher
- Video Surveillance with live transmission to OCC
- Emergency Lighting System
- Bells or other Acoustic Alarms

## **2.2 Basic Set of PIS Pictograms On Board**

The results of the questionnaire submitted by WP13 made it possible to define a basic set of pictograms related to the PIS devices common to all the operators who took part in the survey.

- Emergency Exit Device
- Passenger Alarm Emergency Brake
- Fire Extinguisher

## **2.3 Basic Set of PIS Devices for Wayside**

On the base of the analysis of the PIS on Wayside actually used by the urban transport Operators in Europe, the basic set of the PIS devices is the following:

- Platform Display
- PA Loudspeakers on platform
- Passenger Alarm: Call Unit connected to the OCC (Operations Control Centre)
- Manual Fire Extinguisher (integrated or close to the Passenger Alarm)
- Emergency Exit
- Video Surveillance with live transmission to OCC
- Emergency Lighting System

## **3 PIS Devices Involved in Emergency Events**

From the survey carried out with the “*Questionnaire on Existing PIS Applications and Systems For Urban Guided Rail and Driverless Vehicles*”, at the start of the MODURBAN project, it emerged that in the possible emergency situations only some of the PIS devices are involved in helping passengers (table 2), namely:

- Video Surveillance
- Emergency Brake (or Egress) Handle
- Emergency Call Unit
- Internal Display
- PA Loudspeakers
- Manual Fire Extinguisher
- Emergency Lights



Table 2 List of involved PIS devices in emergency situations with related functionalities

Emergency Event	Involved PIS Device	Provided Information
<b>Emergency Brake (or Egress) Activation</b>	Emergency Brake Handle or Emergency Egress Handle	Acoustic Alarm
	Emergency Call Unit for passenger	Voice communication with driver or with the OCC (Mandatory for GOA4)
	Video Surveillance	Visualization on the driver desk and / or on the OCC monitor of the related camera.
<b>Emergency Call Unit Activation</b>	Emergency Call Unit for passenger	Voice communication with driver or with the OCC (Mandatory for GOA4)
	Video Surveillance	Visualization on the driver desk and / or on the OCC monitor of the related camera.
<b>Fire on Board</b>	Manual fire extinguisher	Alarm sent to the driver and / or to the OCC
	Video Surveillance	Visualization on the driver desk and / or on the OCC monitor of the related camera.
<b>Main Power Electric Supply Failure</b>	Emergency lights	
	Emergency Call Unit for passenger	Voice communication with driver or with the OCC (Mandatory for GOA4)
<b>Accident</b>	Emergency Call Unit for passenger	Voice communication with driver or with the OCC (Mandatory for GOA4)
<b>Train is Blocked on the Track</b>	PA Loudspeakers	Audio Announces
	Internal Display	Pre-defined messages



**4 Main Functionalities of PIS Devices Involved in Emergency Events**

Thanks to the research already carried out and developed in the previous Deliverables by WP13, within the sphere of the MODURBAN project, it is possible to list the most important functionalities of the PIS devices involved in the emergency situations on board. For a better understanding of the functionalities they have been divided into:

- Passengers
- Driver
- OCC

The functionalities related to each PIS device as clearly only those involved in emergency situations.

**4.1 Video Surveillance**

The following table lists the main functionalities of the video surveillance in emergency events.

Table 3 List of the main functionalities of Video Surveillance in emergency events

<b>Main functionalities of Video Surveillance in emergency events</b>		
<b>In relation to the Passenger</b>	<b>In relation to the Driver</b>	<b>In relation to the OCC</b>
The camera shall be hidden to avoid vandalism	Real time full motion image transmission	Real Time full motion image transmission
The presence of video surveillance should be signed to discourage aggression or vandalism	It shall be possible to automatically visualize on the driver’s desk images with an alarm activation	Image visualization up to 0,1 lux
The presence of video surveillance should be signed to reassure passenger in case of emergency on board	It shall be possible to visualize on the driver’s desk images coming from a defined coach in real time	It shall be possible to visualize the image automatically with an alarm activation
		It shall be possible to visualize a defined metro in real time



**4.2 Emergency Brake (or Egress) Handle**

The following table lists the main functionalities of the emergency brake (or egress) handle in emergency events.

Table 4 List of the main functionalities of emergency brake (or egress) handle in emergency events

<b>Main functionalities of emergency brake (or egress) handle in emergency events</b>		
<b>In relation to the Passenger</b>	<b>In relation to the Driver</b>	<b>In relation to the OCC</b>
It shall be installed in a fixed position inside the coach close to the "emergency call unit"	An alarm shall be activated on the driver's desk when a passenger activates the emergency handle	It shall be activated an alarm in the OCC when a passenger active the emergency handle inside a coach
It shall be installed at a maximum height of 1600 mm from the floor level	Voice communication should be activated between the Driver and the passenger (by the emergency call unit) in the vehicle when an emergency egress handle is pulled	Voice communication should be activated between the OCC and the passenger (by the emergency call unit) in the vehicle when an emergency egress handle is pulled (Mandatory for GOA4)
It shall be possible to pull the handle applying a force of 150 N or 15 Nm	It should be possible to automatically activate the visualization (via the video surveillance) on the driver's desk of the images coming from the camera related to the activated emergency handle	It should be possible to automatically activate the visualization (via the video surveillance) on an HMI in the OCC of the images coming from the camera related to the activated emergency handle (Mandatory for GOA4)

#### 4.3 Emergency Call Unit

The following table lists the main functionalities of the emergency call unit in emergency events.

Table 5 List of the main functionalities of emergency call unit in emergency events

<b>Main functionalities of emergency call unit in emergency events</b>		
<b>In relation to the Passenger</b>	<b>In relation to the Driver</b>	<b>In relation to the OCC</b>
It shall be installed in a fixed position inside the coach close to the "emergency brake or egress handle"	An alarm shall be activated on the driver's desk when a passenger activates the emergency call unit	The activation of the voice communication with the OCC (via the emergency call unit) shall be connected with the activation of the emergency brake or egress handle (Mandatory for GOA4)
It shall be installed at a maximum height of 1600 mm from the floor level	A voice communication shall be activated on the driver's desk when a passenger activates the emergency call unit	It shall be possible to realize a voice communication in PTT with the OCC (Mandatory for GOA4)
It shall be possible to active voice communication by pulling a handle or pushing a button applying a force of 150 N or 15 Nm	It should be possible to automatically activate the visualization (via the video surveillance) on the driver's desk of the images coming from the camera related to the emergency call unit activated	It shall be possible the management of multiple calls activations by the OCC (Mandatory for GOA4)
	It should be possible to automatically active the voice communication in PTT mode when a passenger activates an emergency brake or egress handle	



**4.4 Manual Fire Extinguisher**

The following table lists the main functionalities of the manual fire extinguisher in emergency events.

Table 6 List of the main functionalities of manual fire extinguisher in emergency events

<b>Main functionalities of manual fire extinguisher in emergency events</b>		
<b>In relation to the Passenger</b>	<b>In relation to the Driver</b>	<b>In relation to the OCC</b>
It shall be installed in a fixed position inside the coach visible to the video surveillance	An alarm shall be activated on the driver's desk when a passenger unhooks a manual fire extinguisher	An alarm shall be activated in the OCC when a passenger unhooks a manual fire extinguisher inside a coach (Mandatory for GOA4)
It shall be possible to unhook the manual extinguisher applying a force of 150 N or 15 Nm	It should be possible to automatically activate on the driver's desk the visualization (via the video surveillance) of the images coming from the camera related to the unhooked manual fire extinguisher	It should be possible to automatically activate on an HMI inside the OCC the visualization (via the video surveillance) of the images coming from the camera related to the unhooked manual fire extinguisher (Mandatory for GOA4)

#### 4.5 Emergency Lights

The following table lists the main functionalities of emergency lights in emergency events.

Table 7 List of the main functionalities of emergency lights in emergency events

<b>Main functionalities of emergency lights in emergency events</b>		
<b>In relation to the Passenger</b>	<b>In relation to the Driver</b>	<b>In relation to the OCC</b>
---	An alarm shall be activated on the driver's desk upon activation of emergency lights inside a coach	An alarm shall be activated in the OCC upon activation of emergency lights inside a coach (Mandatory for GOA4)
---	It should be possible to automatically activate on the driver's desk the visualization (via the video surveillance) of the images coming from the camera related to the coach with the emergency lights activated	It should be possible to automatically activate on an HMI inside the OCC the visualization (via the video surveillance) of the images coming from the camera related to the coach with the emergency lights activated (Mandatory for GOA4)

#### 4.6 PA Loudspeakers

The following table lists the main functionalities of PA Loudspeakers in emergency events.

Table 8 List of the main functionalities of PA loudspeakers in emergency events

<b>Main Functionalities of PA loudspeakers in emergency Events</b>		
<b>In relation to the Passenger</b>	<b>In relation to the Driver</b>	<b>In relation to the OCC</b>
PA Loudspeakers have been installed inside the metro in the best possible way to provide audio announcements not covered by surrounding noises and interiors	It shall be possible to provide audio announcements in real voice or pre-defined in case of emergency	It shall be possible to provide audio announcements in real voice or pre-defined in case of emergency, in the metro related with the emergency

#### 4.7 Internal Display

The following table lists the main functionalities of internal display in emergency events.

Table 9 List of the main functionalities of internal display in emergency events

<b>Main functionalities of internal display in emergency events</b>		
<b>In relation to the Passenger</b>	<b>In relation to the Driver</b>	<b>In relation to the OCC</b>
It shall be installed in clearly visible position inside the coach	It shall be possible to provide pre-defined messages in the coach related to the emergency event	It shall be possible to provide pre-defined messages in the metro or in the coach related to the emergency event
It shall have the following features to provide clearly visible information: Active Area 50x800 mm (min.) Angle of View > +50° Max visibility range < 5 m Contrast > 0,8 Brightness 800 cd/m2 Resolution 4mm (min.) Graphic functionalities		

## 5 Conclusions

The basic functions of the PIS devices, both in emergency situations and in the event of operation in degraded conditions, have been divided by individual events. In the case of emergencies, the functions of each device are listed by distinct emergency, while in degraded operation they are divided by possible individual failures. To improve understanding of the conclusions, a colour has been assigned to each function and is related to its priority of use in the related individual event. The colours are related to the levels of priority of use listed hereunder.

*Priority*                      *PIS Function Priority Level*

### **Green**

#### **Necessary.**

The PIS device must be able to guarantee this functionality, both in emergency and in degraded modality, to safely deal with the emergency. The needed functions for driverless system are signed as “mandatory for GOA4”.

### **Red**

#### **Not Used**

The PIS device may not be able to broadcast safe information due to possible damage.

### **Blue**

#### **Optional**

The PIS device is not indispensable for dealing with the emergency but it could nonetheless be useful provided the broadcasting of safe information is guaranteed.

**5.1 PIS Basic Functions in Emergency Situations (on board and wayside)**

Table 10 (on board) and Table 11 (wayside) list the basic functions that the PIS must guarantee in single emergency situations in order to supply correct information to both passengers and operators (driver and OCC).

The functions, for which priority is indicated, are divided both by individual device and emergency event.

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**5.1.1 PIS Basic Functions in Emergency Events for On Board**

Table 10 - List of basic functions that the On Board PIS must guarantee in single emergency situations in order to provide correct information

PIS Device	PIS Basic Functions in Emergency Events for On Board					
	Emergency brake (or egress) activation	Emergency call unit activation	Fire on board	Main power electric supply failure	Accident	Train is blocked
<b>Emergency Brake (or Egress) Handle</b>	Acoustic Alarms	Not Involved (operative)	Not Involved (operative)	Not Involved (operative)	Not Involved (operative)	Not Involved (operative)
<b>Emergency Call Unit for passenger</b>	Voice communication with driver or with the OCC (Mandatory for GOA4)	Voice communication with driver or with the OCC (Mandatory for GOA4)	Not Involved (operative)	Voice communication with driver or with the OCC (Mandatory for GOA4)	Voice communication with driver or with the OCC (Mandatory for GOA4)	Not Involved (operative)
<b>PA Loudspeakers</b>	No automatic announcement provided	Not Involved (operative)	No automatic announcement provided	Not Working	No automatic announcement provided	Audio Announcements (pre-defined and /or real voice)
<b>Internal Display</b>	No automatic information provided	Not Involved (operative)	No automatic information provided	Not Working	No automatic information provided	Pre-defined messages
<b>Emergency Lights</b>	Not Involved (operative)	Not Involved (operative)	Not Involved (operative)	Activation of emergency lights	Activation of emergency lights	Not Involved (operative)
<b>Manual Fire Extinguisher</b>	Not Involved (operative)	Not Involved (operative)	The unhooking event sends an alarm to the driver and / or to the OCC	Not Involved (operative)	Not Involved (operative)	Not Involved (operative)
<b>Video Surveillance</b>	Visualization on the driver desk and / or on the OCC monitor of the related camera.	Visualization on the driver desk and / or on the OCC monitor of the related camera.	Visualization on the driver desk and / or on the OCC monitor of the related camera.	Not Working	Not Involved (operative)	Not Involved (operative)

**5.1.2 PIS Basic Functions in Emergency Events for Wayside**

Table 11 - List of basic functions that the Wayside PIS must guarantee in single emergency situations in order to provide correct information

PIS Device	PIS Basic Functions in Emergency Events for Wayside			
	Emergency Alarm activation	Emergency call unit activation	Fire on Platform	Accident
<b>Emergency Alarm Handle</b>	Acoustic Alarms	Not Involved (operative)	Not Involved (operative)	Not Involved (operative)
<b>Emergency Call Unit for passenger</b>	Voice communication with the OCC	Voice communication with the OCC	Not Involved (operative)	Voice communication with the OCC
<b>PA Loudspeakers</b>	No automatic announcement provided	Not Involved (operative)	No automatic announcement provided	No automatic announcement provided
<b>Emergency Lights</b>	Not Involved (operative)	Not Involved (operative)	Not Involved (operative)	Activation of emergency lights
<b>Manual Fire Extinguisher</b>	Not Involved (operative)	Not Involved (operative)	The unhooking event sends an alarm to the OCC	Not Involved (operative)
<b>Video Surveillance</b>	Visualization on the OCC monitor of the related camera.	Visualization on the OCC monitor of the related camera.	Visualization on the OCC monitor of the related camera.	Not Involved (operative)



**5.2 PIS Basic Functions in Degraded Mode (on board and wayside)**

Table 12 (on board) and Table 13 (wayside) list the basic functions that the PIS must guarantee in degraded mode to supply correct information both to passengers and Operators (driver and OCC).

The functions, for which priority is indicated, are divided both by individual device and emergency event.

**5.2.1 PIS Basic Functions in Degraded Mode for On Board**

Table 12 - List of basic functions that the On Board PIS must guarantee in degraded mode to provide correct information

PIS Device	PIS Basic Functions in Degraded Mode for On Board				
	PIS Backbone Fault	Single PIS Device in Failure	Main power electric supply failure	Accident	Train is blocked
<b>Emergency Brake (or Egress) Handle</b>	Operative	Not Working (only the device in failure)	Operative	Operative	Operative
<b>Emergency Call Unit for passenger</b>	Operative	Not Working (only the device in failure)	Voice communication with driver or with the OCC (Mandatory for GOA4)	Voice communication with driver or with the OCC (Mandatory for GOA4)	Operative
<b>PA Loudspeakers</b>	Not Working (no information provided)	Not Working (only the device in failure)	Not Working	Not Working (no information provided)	Audio Announcements (pre-defined and /or real voice)
<b>Internal Display</b>	Not Working (no information provided)	Not Working (only the device in failure)	Not Working	Not Working (no information provided)	Pre-defined messages
<b>Emergency Lights</b>	Operative	Not Working (only the single light in failure)	Activation of emergency lights	Activation of emergency lights	Operative
<b>Manual Fire Extinguisher</b>	Fire extinguisher alarm operative	Not Working (only the device in failure)	Fire extinguisher alarm operative	Fire extinguisher alarm operative	Fire extinguisher alarm operative
<b>Video Surveillance</b>	Operative (only in case of an embedded backbone)	Not Working (only the camera in failure)	Not Working	Operative (only in case of an embedded backbone)	Operative

**5.2.2 PIS Basic Functions in Degraded Mode for Wayside**

Table 13 - List of basic functions that the Wayside PIS must guarantee in degraded mode to provide correct information

PIS Device	PIS Basic Functions in Degraded Mode for Wayside		
	Wayside PIS Backbone Fault	Single Wayside PIS Device in Failure	Main power electric supply failure on platform
<b>Emergency Alarm Handle</b>	Operative	Not Working (only the device in failure)	Operative
<b>Emergency Call Unit for passenger</b>	Operative	Not Working (only the device in failure)	Voice communication with the OCC
<b>PA Loudspeakers</b>	Not Working (no information provided)	Not Working (only the device in failure)	Not Working
<b>Emergency Lights</b>	Operative	Not Working (only the single light in failure)	Activation of emergency lights
<b>Manual Fire Extinguisher</b>	Fire extinguisher alarm operative	Not Working (only the device in failure)	Fire extinguisher alarm operative
<b>Video Surveillance</b>	Operative (only in case of an embedded backbone)	Not Working (only the camera in failure)	Not Working