



Factory Acceptance Tests of the robuRIDE Vehicles

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1 Introduction

This document presents the Robosoft internal Factory Acceptance tests for the 2 robuRIDE vehicles to be deployed at the ROME demonstration Fiera di Roma.

The following results are based on hardware performances and on tests described in "RobuRIDE_Security_Tests_V2.doc" document.

2 robuRIDE #1 validation table

robuRIDE CITYMOBIL vehicle Specifications			Validation on vehicle
Mechanical features and dimensions			
External dimensions	5,69 x 2,75 x 1,93m	L x h x w	
Weight of the vehicle	2,9 T	Without passengers	
N° of passengers	30	19 seats	
Total weight	Maximum 5 T	With passengers	
Suspensions	No	Compliant silent-blocs mounted on front axle and rear wheels Flexible chassis (torsion)	
Type of motions	Forward, Steering	Backwards in manual mode	
Motors	4 Brusless motors		
Tires	Inflatable, diam about 430 mm	Maximum pressure on the road: 10 kg/cm ²	
Brakes	Calibrated parking brakes on each motor)	Electronic control of speed	
Batteries	360 V, 110 Ah	1,2 T lead batteries	
Autonomy	About 60-70 km		
Recharging time	About 10 h		
Lights	External position lights	Only used to show vehicle presence.	
Performances			
Speed	Up to 24 km/h		
Acceleration	Limited to 0,5 m/s ²		
Breaking	2m/s ² . Comfort deceleration: 0.5 m/s ² .	Breaking distance @24km/h = 12m	
Emergency deceleration	2,2 m/s ² for 1 second then 1,5 m/s ²	When emergency stop button pushed or bumper hit	
Turn radius	6,8m at low speed 10 m for civil works	Front axle: +- 0,45 rad	
Turn speed	Front axle: 0,5 rad/s		
Slopes	3 %		
Motions control			
Manual control	Yes, using a wireless	Also semi-automatic: automatic	

	gamepad	trajectory following control with speed controlled manually	
Operating modes	Scheduled Shuttle through supervision management		
Localization system	Hybrid: Differential GPS + gyroscope + odometry		
Guiding system	Software control for path following.		
Accuracy path following	2 to 10 cm	Depends on the speed	
Vehicle Passengers Comfort			
Handles and bars	For standing passengers		
User interfaces	Destination panel, user information screen & non security vocal messages, destination selection panel	For trip information	
Inside light spots	Automatic On/Off by a light sensor		
Operator interfaces	Operator panel, Gamepad and Wireless Emergency Stop		
Temperature management	Windows and thermostat controlled ventilation		
Security			
Anti-collision	Front laser scanner Safety bumpers front and rear	Size of speed reduction zone: 12x3m. Size of stopping zone: 2x2,2m	
Vehicle Door	Can be opened manually in case of emergency. Buzzer before door closing.		
Fire extinguisher	In the cabin		
Passenger security	Surveillance camera with vocal interaction with security manager		
Safety speed and vehicle supervised stop	In case of problem on the track (track station or emergency door opened, problem on other vehicle), the supervision system can request a vehicle to move at a maximum safety speed of 3,6 km/h or to stop.		
Communications			
Data	Wireless LAN through onboard 3G router.		

Video and voice	Using the onboard surveillance camera, and through the wireless communication.		
Others			
Control software	robuBOX-CTS	Proprietary ROBOSOFT's middleware, based on Microsoft Robotics Studio	
Supervision system			
Supervision management interface and software	PC with screen and software for time-based shuttle mode fleet management.		
Surveillance cameras and voice	PC with vehicles cameras visualization and vocal interactions with passengers.		
Stations management	Operation of station doors and status management.	Through Serial Modbus communication with stations.	
Database management	The database logs all events related to the vehicle operation		

Table 1: robuRIDE #1 FAT Table

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robuRIDE #2 validation table

robuRIDE CITYMOBIL vehicle Specifications			Validation on vehicle
Mechanical features and dimensions			
External dimensions	5,69 x 2,75 x 1,93m	L x h x w	
Weight of the vehicle	2,9 T	Without passengers	
N° of passengers	30	19 seats	
Total weight	Maximum 5 T	With passengers	
Suspensions	No	Compliant silent-blocs mounted on front axle and rear wheels Flexible chassis (torsion)	
Type of motions	Forward, Steering	Backwards in manual mode	
Motors	4 Brusless motors		
Tires	Inflatable, diam about 430 mm	Maximum pressure on the road: 10 kg/cm ²	
Brakes	Calibrated parking brakes on each motor)	Electronic control of speed	
Batteries	360 V, 110 Ah	1,2 T lead batteries	
Autonomy	About 60-70 km		
Recharging time	About 10 h		
Lights	External position lights	Only used to show vehicle presence.	
Performances			
Speed	Up to 24 km/h		
Acceleration	Limited to 0,5 m/s ²		
Breaking	2m/s ² . Comfort deceleration: 0.5 m/s ² .	Breaking distance @24km/h = 12m	
Emergency deceleration	2,2 m/s ² for 1 second then 1,5 m/s ²	When emergency stop button pushed or bumper hit	
Turn radius	6,8m at low speed 10 m for civil works	Front axle: +- 0,45 rad	
Turn speed	Front axle: 0,5 rad/s		
Slopes	3 %		
Motions control			
Manual control	Yes, using a wireless gamepad	Also semi-automatic: automatic trajectory following control with	

		speed controlled manually	
Operating modes	Scheduled Shuttle through supervision management		
Localization system	Hybrid: Differential GPS + gyroscope + odometry		
Guiding system	Software control for path following.		
Accuracy path following	2 to 10 cm	Depends on the speed	
Vehicle Passengers Comfort			
Handles and bars	For standing passengers		
User interfaces	Destination panel, user information screen & non security vocal messages, destination selection panel	For trip information	
Inside light spots	Automatic On/Off by a light sensor		
Operator interfaces	Operator panel, Gamepad and Wireless Emergency Stop		
Temperature management	Windows and thermostat controlled ventilation		
Security			
Anti-collision	Front laser scanner Safety bumpers front and rear	Size of speed reduction zone: 12x3m. Size of stopping zone: 2x2,2m	
Vehicle Door	Can be opened manually in case of emergency. Buzzer before door closing.		
Fire extinguisher	In the cabin		
Passenger security	Surveillance camera with vocal interaction with security manager		
Safety speed and vehicle supervised stop	In case of problem on the track (track station or emergency door opened, problem on other vehicle), the supervision system can request a vehicle to move at a maximum safety speed of 3,6 km/h or to stop.		
Communications			
Data	Wireless LAN through onboard 3G router.		
Video and voice	Using the onboard		

	surveillance camera, and through the wireless communication.		
Others			
Control software	robuBOX-CTS	Proprietary ROBOsoft's middleware, based on Microsoft Robotics Studio	
Supervision system			
Supervision management interface and software	PC with screen and software for time-based shuttle mode fleet management.		
Surveillance cameras and voice	PC with vehicles cameras visualization and vocal interactions with passengers.		
Stations management	Operation of station doors and status management.	Through Serial Modbus communication with stations.	
Database management	The database logs all events related to the vehicle operation		

Table 2: robuRIDE #2 FAT Table

4 Conclusion

The two vehicles have passed the Robosoft Factory Acceptance Tests.
All “Validation on vehicle” boxes were checked.

Moreover, they have been deeply tested during many weeks in locations close to Robosoft : Bayonne TechnoCité and Dax military base, as illustrated below

In those intensive testing phases, no major issues have occurred, except for ruts that have been appearing on the track due to the repetitive motion of the vehicles.
This point has been transmitted to the Rome partners that have stated that this issue was handled for the Fiera di Roma car park.



Figure 1: robuRIDE #1 intensive testing at Bayonne TechnoCité