

Safety Aspects in Unattended Train Operation (UTO)

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Introduction Wiener Linien





Overview grades of automation^{*}

7		Grade of automation	Mode of operation	Ensure safe movement of train	Drive the train	Supervise guideway	Supervise passenger transfer	Ensure detection and management of emergency situations
Tramway		GoA0	TOS On-sight Train Operation	Operator System	Operator	Operator	Operator	Operator
	U6	GoA1	NTO Non-automated Train Operation	System	Operator System	Operator	Operator	Operator
U1 U2 U3 U4		GoA2	STO Semi-automatic Train Operation	System	System	Operator System	Operator	Operator
		GoA3	DTO Driverless Train Operation	System	System	System	Operator System	Operator
Under construction	U5	GoA4	UTO Unattended Train Operation	System	System	System	System	Operator System

*table based on EN 62267: "Railway applications – Automated urban guided transport (AUGT) - Safety requirements"







Safety factors to be considered for UTO 1/2

Ensure safe movement of the train

- The train must be safe to move
- The track must be safe for operation

• Operation Control Centre (OCC)

- Must be equipped with **necessary personnel** \rightarrow Driverless train
- Needs safe and reliable ways of communication to the staff on site and passengers on the train
- Must be in control of the track access in case of maintenance

• Safe door operation

- Are the doors safe for the passenger exchange e.g. "sensitive edges"
- Detection of unauthorised door opening
- **Detection** of **passengers in critical areas** (e.g. between train and PSD)



Safety factors to be considered for UTO 2/2

Operational procedures

- To ensure a safe train operation, solid operational procedures are a must
- All necessary Safety Related Application Conditions (SRACs) from the suppliers must be considered



Driverless ≠ Humanless

• Handling of Emergencies

- Wiener Linien uses several measures to ensure proper handling of emergencies – e.g. Operators who are constantly "patrolling" within the line
- Closed Circuit Television (CCTV)
- Training of staff





Safety depends on all factors together

From the beginning, an interdisciplinary team is needed to be dedicated to GoA4:

<u>Team of experts in:</u> Civil engineering, electrical engineering, control systems, operations, rollingstock

Station building, PSD, traction, low voltage supply, interlocking, trains, staff, OCC



Team consists of experts in their field and a **dedicated system engineer**

