CCNR
CENTRAL COMMISSION
FOR THE NAVIGATION OF THE RHINE

	Level	Name	Vessel command (steering, propulsion, wheelhouse, …)	Monitoring and responding to navigational environment	Fallback performance of dynamic navigation tasks	Remote control
Helmsman performs part or all of the dynamic navigation tasks	0	**No automation** the full-time performance by the human helmsman of all aspects of the dynamic navigation tasks[1], even when enhanced by warning or intervention systems *E.g. navigation with support of radar installation*	Human	Human	Human	No
	1	**Steering assistance** the context-specific execution[2] by a steering automation system using information about the navigational environment [3] and with the expectation that the human helmsman performs all remaining aspects of the dynamic navigation tasks *E.g. rate-of-turn regulator* *E.g. trackpilot (track-keeping system for inland vessels along pre-defined guiding lines)*	Human	Human	Human	No
	2	**Partial automation** the context-specific execution by a navigation automation systems of both steering and propulsion using information about the navigational environment and with the expectation that the human helmsman performs all remaining aspects of the dynamic navigation tasks *E.g. navigation automation systems which are designed to reduce fuel consumption*	Human + System	Human	Human	Subject to context specific execution, remote control is possible. It may have an influence on crew requirements (number or qualification)
System performs the entire dynamic navigation tasks (when engaged)	3	**Conditional automation** the sustained context-specific performance by a navigation automation system of all dynamic navigation tasks, including collision avoidance[4], with the expectation that the human helmsman will be receptive to requests to intervene and to system failures and will respond appropriately	System	System	Human	
	4	**High automation** the sustained context-specific performance by a navigation automation system of all dynamic navigation tasks and fallback operation, without expecting a human helmsman responding to a request to intervene	System	System	System	
	5	**Full automation** the sustained and unconditional performance by a navigation automation system of all dynamic navigation tasks and fallback operation, without expecting a human helmsman will respond to a request to intervene	System	System	System	

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[1] "Dynamic navigation tasks" are understood as the set of tactical vessel operations, such as operation of rudder apparatus, propulsion, anchor winches or elevating wheelhouse.

[2] "Context-specific" is understood as confined navigational conditions such as navigation on specific river waterway sections or lock crossing, as well as vessel arrangements with convoys or platooning.

[3] "Navigational environment" is understood as fixed and dynamic conditions such as the waterways' shape, water level, weather, visibility, vessel crossing, …

[4] "Collision avoidance" is the critical task in responding to the environmental conditions (other vessels, bridges, …).