



SCMT train protection – Italy

Sistema di controllo dalla marcia del treno





“The indicator in the driver’s console satisfies the SIL 2 safety standard and thus contributes towards achieving SIL 4 in the train protection system. – We would be pleased to make suggestions for project-specific solutions.”

Richard Durand, DEUTA

Innovation

Consultation

The project:

Train protection in Italy

Trenitalia has been innovating the signalling system of the core network on Italian routes since 2002. In 2008, the train protection system SCMT (Sistema di controllo della marcia del treno) will be launched on a route network of roughly 11,000 km.

9,200 trains transport an average of approx. 1.4 million passengers and 220,000 tons of goods each day.

The task:

Maximum functional safety with the highest possible availability

DEUTA is involved in this project with the DF 16 pulse generator and the SIL 2 ESG 14 indicator device. Roughly 4,000 trains have been retrofitted up to now. As few pulse generator variants as possible should be deployed for all of the different locomotive types. This was a challenge for the Deuta constructing engineers. The high SIL 2 safety requirements were linked to the indicator in the driver’s console to achieve SIL 4 in the train protection system.

The individual development stages were defined here in close co-ordination with the customer.

Creativity in the construction reduces diversity

To measure the vehicle speed, the DF 16 pulse generator was adapted to the specific requirements of SCMT. Concretely, the electronics and the housing construction were changed. Because of the constructive adaptation, it was possible to reduce the variant diversity for the entire fleet to 2 basic constructions. All vehicle types were optionally equipped with a two-channel or four-channel design.

The DF 16 generates output frequencies that are proportional to the speed. The vehicle electronics evaluates the frequencies. The channels guarantee redundancy and make it possible to determine the driving direction. The four-channel pulse generator permits the simultaneous operation of SCMT and DIS – the equally safety-related Driver Information System.

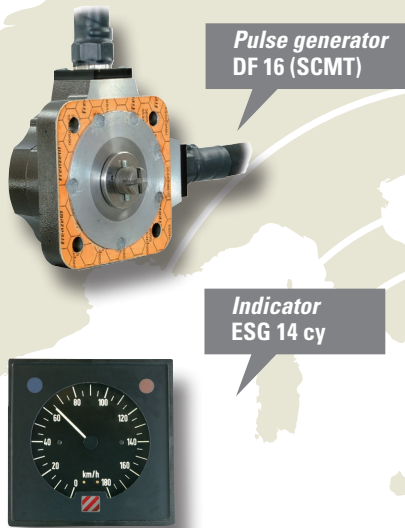
More safety through integrated monitoring

To visualise the speed in the driver’s console, DEUTA chose the ESG 14 electric stepper motor indicator. A special feature of the ESG 14 is its integrated monitoring system which always informs the user about the functionality of the device. A control element specifically for the SCMT application was integrated beneath the speed indicator. This element monitors the functionality of the indicator and checks whether information about the speed is available. If there is no error, the SCU (speed computing unit) supplies the control element with current so that the indicator is dark. The train driver recognises an error, or misinformation, by the red-white signal.



DF 16 – The optoelectronic pulse generator

- Compact structure and primarily maintenance free
- Specifically designed for rough use on railway vehicles
- Pulse part with optoelectronic fork light barriers
- With up to four electronic pulse generator channels – different mutual phase relationships are possible
- Two-track system can realise two different resolutions
- Galvanically isolated channels
- Switch box or hinged cable
- The output frequency rises in proportion to the speed
- Pulse evaluation and level monitoring occur in the vehicle electronics
- The phase offset enables the recognition of the driving direction



ESG 14 – The Electric Indicator

- Analogue display of diverse types of measuring sizes
- For input change, tracks the pointer without noticeable, disrupting stages
- Its adjustment speed corresponds to that of a conventional indicator device
- Pointers and scales are created according to the latest ergonomic findings
- The point position is continuously monitored by an autarkic system

DF 16

Working principle	1 to 4 channel pulse generator
Pulses per revolution per channel (1 to 128)	upon request
Supply voltage	10V DC to 30V DC
Current consumption per channel	max. 50 mA
Load current	max. 100 mA (with external R _L)
Phase shift K1 - K2 - K3 - K4	upon request
Pulse duty factor	0.5 to ± 0.2
U high	10V DC to 30V DC
U low	< 2V for monitoring purposes
Operating temperature	-40 to +70°C
Rotational speed range	0 to 2,000 min ⁻¹
Insulation channel/housing	1,500V, 50 Hz, 1 min
Protection category housing	IP66
Protection category drive side	IP54
Weight without plug and drive	approx. 2.3 kg
Vibration testing	in accordance with EN 61373
Device definition	EN 50155, EN 50121-3-2
Drive/ Drive version	a: Cross-slotted ac: Drive fork ad: Driving tongue af: Driving disc

ESG 14 cy

Panel cutout	ø 138 ⁺¹ x 138 ⁺¹ mm
Installation depth	approx. 140 mm incl. plug
Weight	approx. 1 kg
Mounting	Tensioning elements at the housing
Installation position	0 – 90 – 180°
Protection category front face	IP 54
Protection category plug	IP 41
Connection	2 x D-Sub 15-pole
Lighting	Internal with LED
Operating voltage	24V DC ±30 %
Control	RS 485 protocol
Feedback	RS 485 protocol
Error message	LCD
Pointer deflection	max. 320°
Accuracy class	0,6 %
Adjustment speed	60° \leq second
Temperature range	-25°C to +70°C
Test voltage	1,000V _{eff} 50 Hz, 1 min
Vibration testing	in accordance with EN 61373
Device definition	EN 50155, EN 50121-3-2
Housing	Aluminium, black lacquer
Additional indicator	2 signal lamps, 1 error detector



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