

Nokia TPS 64

Teleprotection Signalling

Equipment

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The TPS64 is suitable for both new installations and the replacement of obsolescent voice frequency teleprotection signalling equipment.

Digital teleprotection
The digital telecommunication networks of power companies have opened new perspectives to

Teleprotection Signalling Equipment TPS64 for Power

TPS64 equipment

The TPS64 is a new approach to teleprotection signalling. The 4 or 8 command channels are encoded into a 64 kbit/s standard digital data channel. The highly reliable

error-control method of the TPS64 provides excellent performance characteristics to meet the most demanding security and dependability requirements for teleprotection.

teleprotection signalling. The strict security, dependability and operation time requirements can be met with a digital encoding technique.

The telecommunication channel of the TPS64 is in accordance with the ITU-T Recommendation G.703 and thus the TPS64 can be connected to any standard digital network. In other words, there is no need to build dedicated channels and the transmission route can be separated from the power system.

Application areas

Due to high performance reached by encoding the command channels directly into the digital transmission channel, the TPS64 can be used in all the following teleprotecting application schemes

- permissive
- blocking
- intertripping

The TPS64 is currently being used by many power companies and has passed advanced field trials in demanding transmission conditions, including several consecutive radio link hops and a transmission route of almost 1000 km.

Main Features

- Fast operation
- High security and dependability
- Advanced error-control technique
- 4 or 8 bi-directional command channels in 64 kbit/s G.703 digital channel
- Alarm outputs for equipment status
- Event recording
- Output for external event recorder
- No dependence on the protected power line
- 64kbit/s signal duplication for route protection
- Easy expandability from 4 to 8 command channels
- Operating time not affected by simultaneous commands
- Equipment control with Service Terminal or Nokia Network Management System (NMS)

TPS64 basic concept

The TPS64 equipment consists of two different units plugged into a 20T cartridge. The basic configuration comprises one control unit to perform the main functions of the teleprotection signalling and one channel unit for interfacing the equipment to the protection relay logic.

System Protection

In addition to this, one extra control can be used to offer hardware redundancy and a second 64 kbit/s signal interface for route protection. By adding a second channel unit the TPS64 offers 4 more, i.e. 8 command channels.

The equipment is connected to the station battery via a PIA (Power Interface Adapter) or a PSA (Power Supply Adapter).

Easy to use

Equipment settings can be read and changed by using the hand-held Service Terminal or Nokia Network Management System. Its menu structure is designed to effectively prevent incorrect operations. Unauthorized access to the settings is effectively prevented by means of a password.

Changing the settings remotely is possible, but can also be disabled by means of installation settings.

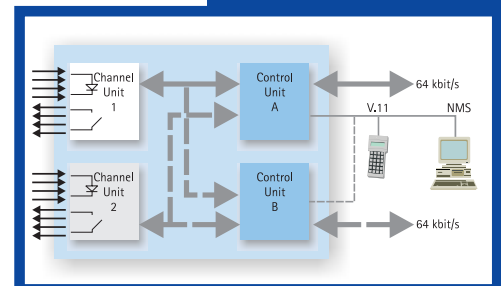
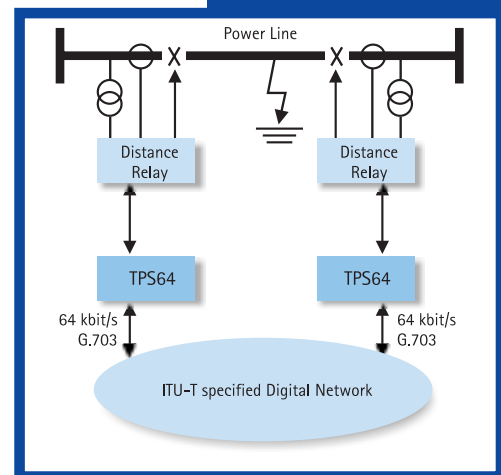
The remote equipment is accessible via the data channel provided in the TPS64 frame structure. The available facilities include

- accurate alarm indication
- selection of installation specific error-control codes

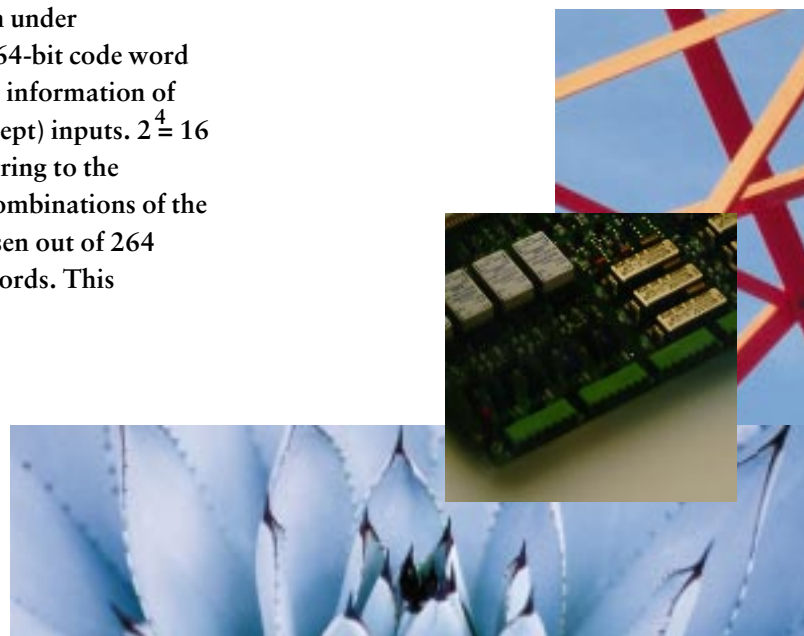
- identification of the equipment and its installation environment
- modifying command output's response to the incoming signal
- viewing event records indicating the starting times and duration of the commands
- entering equipment configuration to enable exact self-monitoring
- viewing incoming signal quality statistics
- setting of clock

Advanced error-control technique

To preserve the benefits of standard networks an innovative error-control technique has been developed for the TPS64 to protect the commands against any conceivable phenomenon causing signal corruption under transmission. A 64-bit code word carries the status information of the 4 (basic concept) inputs. $2^4 = 16$ code words referring to the possible status combinations of the 4 inputs are chosen out of 264 potential code words. This technique offers



- Minimum 32 bits distance between any code words
- Protection against slip and justification errors
- Individual codes to disable acceptance of signals not originating from the intended TPS64 transmitter
- Basing the frame alignment on the decoding results to enable extremely fast defection of the loss of frame



Main Characteristics	Number of command channels	4 (optionally 8)		
	Transmission bit rate	64 kbit/s		
	Equipment operating time	<6 ms (4 channels)		
		<7 ms (8 channels)		
	Mean time between unwanted commands (at tses <0.005% and tes <0.1%)	>100000 a		
	Probability of missing command Pmc (at BER <10 ⁻³)	<10 ⁻⁹		
	Error detection and correction:			
	Command encoding	Block coding		
	Code word length	64 bits		
	Minimum distance	32 bits		
Electrical Interfaces	TPS64 (CU 24202)	Command inputs:		
		Nominal operating voltage	24 VDC	
		Operating current	10 mA typical	
	TPS64 (CU 24203)	Wetting current	15 mA typical	
		Nominal operating voltage	32, 48, 110, 230 VDC	
		Operating current	20 mA typical	
		Command, monitoring and alarm outputs:		
		One mercury wetted change-over contact for each output		
		Nominal operating voltage	250 V AC or DC	
		Maximum switching power	100 VA	
		Maximum switching current	2 A	
		Digital transmission interface:		
		Recommendation	ITU-T G.703 co- and contradirectional 64 kbit/s (maintain octet integrity)	
		Maintenance interface	ITU-T V.11	
Power Supply	Battery voltage	20-72 VDC		
	Power consumption	10 W typical		
Voltage Withstand	All interfaces to the protection scheme meet the requirements of IEC 834-1 and IEC 255.			
Mechanical Dimensions	20T cartridge (2-4 plug-in units)	262 x 112 x 219 mm (height x width x depth)		
Environment	Operation		Transport and storage	
	Temperature	-10 to +50C	-40 - +70C	
	Humidity	95%	up to 98%	
Electromagnetic requirements	Complies with the following requirements: EN 50081-2 and EN 50082-2			



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