No.:

2337VZT

Version:

210709

System / Product :

MIREL VZT System

Title:

VZT.4 Operating and Maintenance Manual

Further source- and enclosed files:

File	Description	Pages / Conn.
1		
2		
3		

List of document versions:

Version	Description	Compiled by	Validated by	Approved by
170720	Document introduction	Ing. Praščák	Ing. Surányiová	Ing. Michalec
190228	Cancellation of WSR reducers list	Ing. Výrost	Ing. Adamec	Ing. Michalec
191024	Amendment of a new functional property	Ing. Surányiová	Ing. Jasenčák	Ing. Michalec
200512	Change the method of switching off the device	Ing. Surányiová	Ing. Jasenčák	Ing. Michalec
200626	Removal of KS.0, PPKS	Ing. Sučan	Ing. Žilinec	Ing. Michalec
200720	Additional information concerning need of 2pcs of KSPD	Ing. Michalec	Ing. Michalec	Ing. Michalec
210709	Supplementing of KS.0 and PPKS.1.10	Ing. Žilinec	Ing. Žilinec	Ing. Michalec

Contents

1 Purpose of the Document

The document specifies the method and conditions for operation and maintenance of VZT.4 device.

The document follows up and refers to documentation stated below:

No	Version	Title
[1] 2338VZT	200626	VZT.4 Catalogue Sheet
[2] 2339VZT	200515	VZT.4 Technical Conditions
[3] 2418MAP	200710	VZTUI User Manual

The document is intended for personnel of:

- MIREL systems producer, who provide for tests, final inspection, installation and activation, warranty and post-warranty service as well as periodical MIREL systems maintenance. Personnel must be traceably appointed for this activity and trained by the MIREL Systems Producer.
- Operator, who provide for operating maintenance, diagnostics as well as operational repairs of MIREL systems. Personnel must be traceably appointed for this activity and trained by the Operator.

2 Specification of Document Changes

Version 170720

Document introduction.

Version 190228

Cancellation of WSR reducers list, reference to.

Version 191024

Functional property amendment concerning selection of generated signal phase shift 0/180°.

Version 200512

Change the method of switching off the device.

Version 200626

Removal of KS.0, PPKS, balancing coil verification procedure, small adjustments in connector description and in set of units. Implementation of terminology „VZT.4 control electronics“.

Version 200720

Additional information concerning need of 2pcs of KSPD.1.1 for KSP fastening to MIREL SHPA antenna.

Version 210709

Supplementing of KS.0 and PPKS.1.10 to optional accessories for VZT.4.
Added description of supplemented optional accessories.
Supplemented chapter concerning calibration of VZT.4 test device

3 Applied Designation and Terminology

ATM	communication interface accessories with computer
D1, D2, D3, D4	levels of diagnostics
D-sub	connector type
EM	electromagnetic
ELF	Extra Low Frequency
EVM	train protection specification for operation in Hungary
HDV	driving rail vehicle
IRC	incremental axle speed sensor
KSV	transmitter accessories of simulated rail currents
KSP	simulation accessories for SHP infrastructure
LS	train protection specification for operation in Slovakia and Czech
MÁV	Hungarian railway company
MiniCon	type of cylindrical industrial connector with latch
MIREL MAP	MIREL Application Manager
MIREL RM1	MIREL registration speedometer, type RM1
MIREL RM2	MIREL integrated on-board system, type RM2
MIREL VZ1	MIREL train protection, type VZ1
MIREL SN	code sensor
PBUSB	accessories of mobile power supply source – PowerBank
PC	personal computer
QuickLock	Type of D-sub connector and quick release latch
RS 485	type of double-conductor SIO
S1, S2	service repair levels
SHP	train protection specification for operation in Poland
SIO	serial communication line
SW	software
USB	Universal Serial Bus – serial bus-bar type
VZTUI	MIREL MAP module – user interface for MIREL VZT.4
WAGO	industrial connector type
XLR	type of cylindrical industrial connector with latch

4 General Characteristics

Systems tester MIREL VZT is a mobile test device from product line of MIREL systems. It has been primarily designed for testing of device types MIREL VZ1, MIREL RM1 and MIREL RM2.

Basic functions provided by the device MIREL VZT, type VZT.4 are simulations of incremental axle speed sensor (simulation of speed and travel direction) as well as simulation of line infrastructure code currents of line type train protection (including modulation for LS and EVM infrastructures).

Apart from that, the test device allows also simulation of a point type train protection of SHP infrastructure, signalling simulation via analogue current loops of u 4-20 mA type, automated run of test scripts, integrity check of connected accessories and more.

A detailed description of functional system properties, as well as its technical specification are contained in the document 2339VZT Technical Conditions.

Device control and user interface are Implemented by means of linking the device with PC using ATM accessories and USB interface. The use of device for simulation of individual functions is described in Chapter 5 Use of the VZT.4 Device. Use of VZT.4 Device. VZTUI user interface is described in document 2418MAP VZTUI User Manual.

Power supply of VZT.4 device is provided from mobile power source, which is an integral part of standard set (PBUSB accessories). Mentioned power supply sources are equipped with an integrated charge status monitoring and multiple protections ensuring a high safety level during operation.

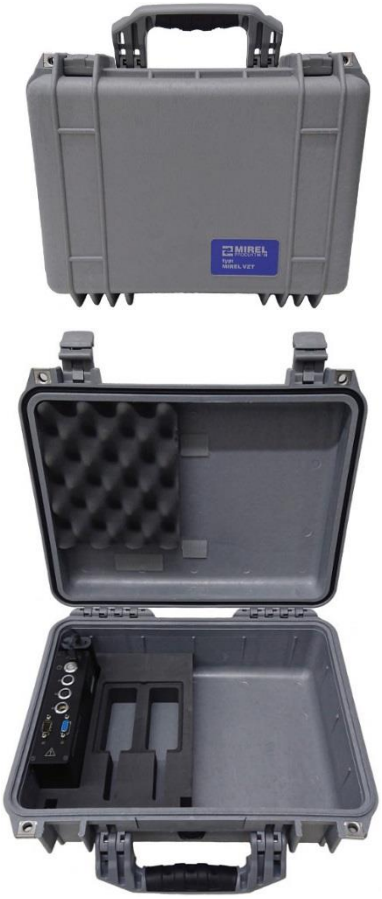
Device operation, except prophylactic inspection combined with calibration, is maintenance-free. The employed pool of parts meets demanding criteria of reliability and resistance.

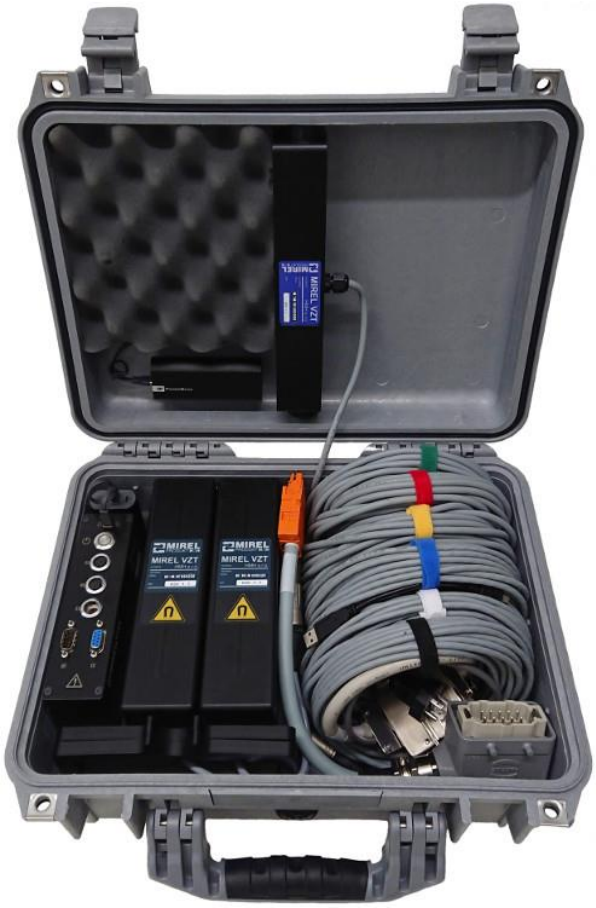
4.1 Device Nameplate Data

System designation	MIREL VZT
Producer	HMH s.r.o.
Year of production	specific individual detail
Serial No.	specific individual detail
Type	specific individual detail
Un	$5V_{DC}$

4.2 Device and Accessories Design

Physical test device design features a highly resistant plastic case, with embedded metal box of control electronics and connector pieces on its front panel. Apart from that, the accessories of standard composition pursuant Catalogue Sheet 2338VZT VZT.4 are stored in case. Individual components of a standard composition have their assigned places within the case in cavities of shaped foam padding, ensuring a safe component storage when transporting device. The internal case space has been dimensioned also under consideration to have the possibility to store also the optional accessories together with standard assembly.





Pictures above show the case design and partition of its internal space. Picture on the right shows an example of storage concerning individual accessories. Accessories cables have been produced from highly flexible and resistant cables intended for frequent stress and have been equipped with colour textile binds in order to achieve easy identification and enabling a better organizing within the case space.

4.2.1 Set of VZT.4 Test Device

The VZT.4 device is produced in a single version – VZT.4.01A. Standard assembly composition comprises:

Designation	Description	Count [pcs]
KSV.1.1	Simulated code transmitter of LS- and EVM infrastructures	2
PKSV.2.10	Connection conductor of simulated code transmitters – 10 m length	1
PIRC.1.8	Connecting conductor for speed sensor simulation – 8 m length	1
ATM.4.01B	Communication interface to computer – 15 m length	1
PBUSB.1.1	Portable power supply of control electronics	2
	Durable plastic case	1
	Operating and maintenance manual of MIREL VZT tester	1

Optional accessories for VZT.4, which is not part of standard set:

Designation	Description	Notes
KS.0	Code simulation loop	
PPKS.1.10	PPKS.1.10 Extension conductor of code simulation loop – 10 m length	
KSP.1.1	Simulator of SHP rail line infrastructure – 8 m length	
KSPD.1.1	KSP accessories holder for MIREL SHPA antennas	1)
PPIRC.1.12	Extension cable for speed sensor simulation –12 m length	
PPIRC.1.20	Extension cable for speed sensor simulation – 20 m length	
PST.1.8	Connecting conductor for pressure sensor simulation – 8 m length	
WSR.0.x	Reducer pieces WSR.0.x, see	
WSR.1.x	Reducer pieces WSR.1.x, see	
WSRR.1.0	Adapter piece for connection of reducers WSR.0.x	

1) 2pcs of KSPD.1.1 holders are required for fastening of KSP accessories to MIREL SHPA antenna.

4.2.2 Device Calibration

The aim of regular VZT.4 test device calibration and of its accessories is to tune the whole measurement set of devices as a single unit, for purposes of critical parameters verification for device to be tested.

Calibration goals are represented by verification and setting of

- instantaneous speed generation, with an accuracy of ±1%
- excitation current generation for KS.0, with an accuracy of ±2%
- generation of transfer from rail line infrastructure, with an accuracy of ±3%

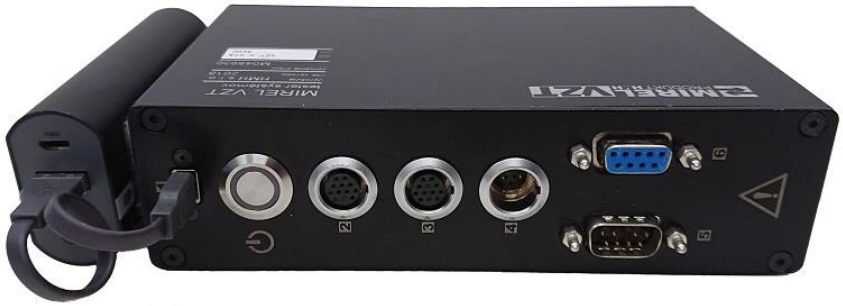
Calibration of transfer generation from rail line infrastructure represents a technology calibration aimed for tuning together the pair of KSV.1 simulated code transmitters with VZT.4 test device, in order to achieve reproducible and mutually verifiable measurements and verifications of code sensor fitting.

Calibration validity has been defined in length of 24 months, the calibration must be repeated afterwards.

Part of VZT.4 test device prophylactic inspection is device calibration proper

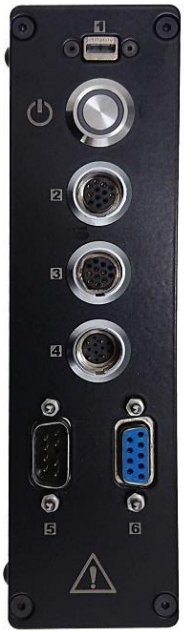
4.2.3 VZT.4 Control Electronics

VZT.4 control electronics is represented by a metal instrument box, which is tightly embedded in case interior, in an allotted space. At front device panel, there is a pushbutton with colour backlit annular ring for indication of device status as well as all connectors of individual accessories. Connectors are numbered and their meaning is explained below. Pushbutton bears the symbol ⏻.



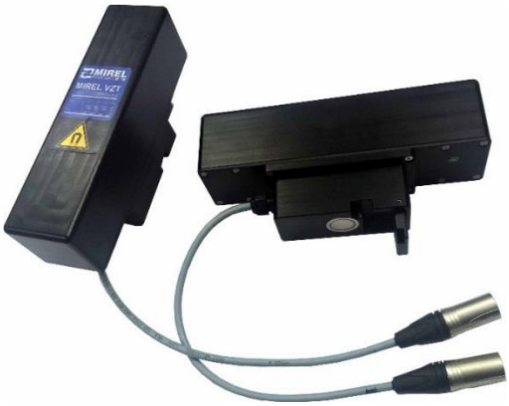
VZT.4 control electronics can be taken out from protective case and used separately. The lateral side of instrument box is for this purpose equipped with an option to fasten the accessories of PBUSB mobile power supply source by means of a detachable joint, in order to get a single separate unit. Box of VZT.4 control electronics is on one side equipped with antiskid instrument legs.

Description of VZT.4 control electronics front panel connectors:



Connector no.	Description
1.	Industrial version of microUSB panel connector. Serves as power supply connector, into which the PBUSB accessories are connected.
2.	Circular industrial connector MRF12, MiniCon type. Serves for connection of KSV accessories (by means of PKSV).
3.	Cylindrical industrial connector MRF12 of MiniCon type. Serves for connection of KSP or KS (by means of PPKS) accessories.
4.	Circular industrial connector MRF12, MiniCon type. Serves for connection of PST accessories
5.	Panel D-sub M connector, QuickLock type. Serves for connection of PIRC accessories.
6.	Panel D-sub F connector, QuickLock type. Serves for connection of ATM accessories.

4.2.4 KSV

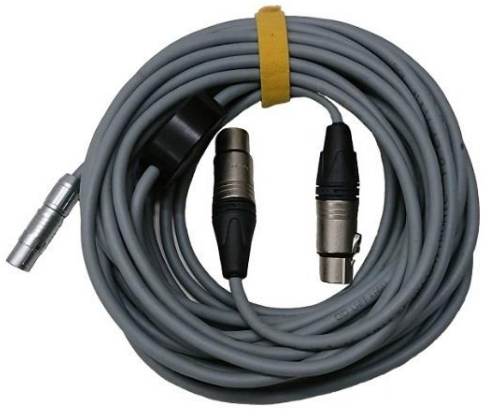


Accessories, simulated code transmitter are situated below the code sensor of MIREL SN type directly on rail. Correct positioning on rail is supported by swivel stop on bottom side. Position is fixed by a permanent magnet in the KSV leg. Placing happens always pairwise and below pair of sensors. PKSV accessories serve for their wiring to control electronics. Standard set comprises two KSV transmitters.

WARNING!

When working with KSV accessories, it´s necessary to comply with safety instructions provided in Chapter 5 Use of the VZT.4 Device.

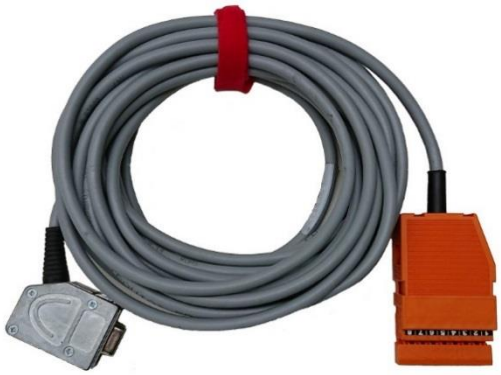
4.2.5 PKSV



Accessories, connection cable for simulated code transmitters serves for interconnection of KSV transmitters with VZT.4 control electronics. Its length is 10 meters, at one end terminated with MSCM connector of MiniCon type (on left picture), which serves for connection of VZT.4 control electronics(connector No.2). At the other end, the conductor is tees and at both ends it´s terminated by connectors of XLR type (in picture centre), which serve for connection of KSV accessories.

PKSV accessories are equipped with a yellow textile band textile bind in order to achieve easy identification and enabling of storage within case space.

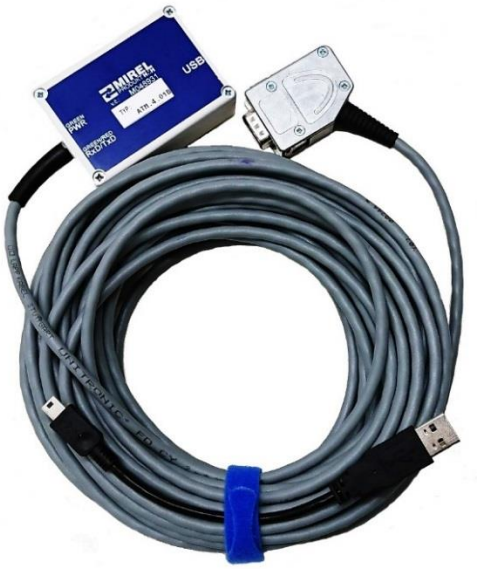
4.2.6 PIRC



Accessories, connection cable for axle speed sensor simulation serves for connection of VZT.4 control electronics with terminal plate of axle speed sensor on HDV axle. Its length is 8 metres. At side of VZT.4 control electronics (connector No.5) connected by D-sub female connector (left picture side), at the side of HDV terminal plate, the conductor is connected by WAGO – M connector (right picture side).

The PIRC accessories are equipped with a red colour textile binder.

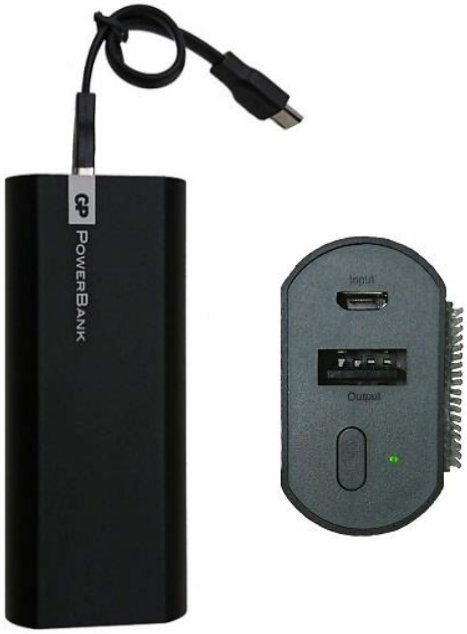
4.2.7 ATM



Accessories, communication interface with computer serves for connection of VZT.4 control electronics with VZTUI user interface software. At computer side terminated by interface electronics box (left picture side) and at side of VZT.4 control electronics (connector No 6) by D-sub M male connector (right picture side). On top side of electronics box there is a production label with type designation and serial No. Interface electronics are connected to computer on USB bus-bar by means of a short USB connection cable to miniUSB (in picture bottom), which is an integral part of accessories.

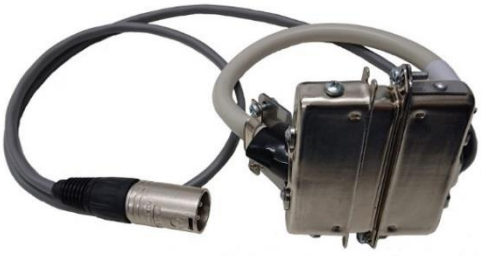
ATM accessories are equipped with a blue colour textile binder.

4.2.8 PBUSB



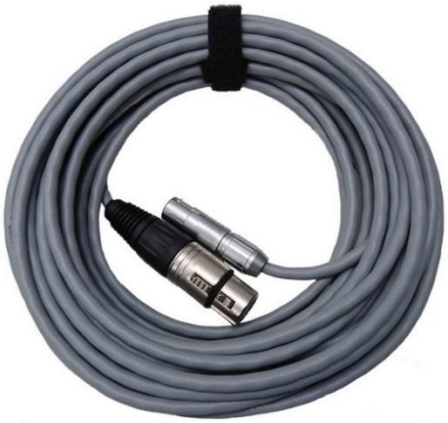
Accessories serve as portable power supply for VZT.4 control electronics. It is a standard, commercially available power bank with microUSB loading input connector (indicated as Input) and an output USB power supply connector (indicated as Output).There is a charge status test pushbutton under mentioned connectors and a multi-colour indication light next to pushbutton. A part of PBUSB accessories is also a short microUSB to USB cable, which serves for interconnection with VTZ.4 control electronics (connector No.1) as well as during PBUSB loading from external power source. Lateral side of PBUSB is equipped with a collapsible joint for fastening to VZT.4 control electronics box, as well as for fastening of second piece in case. Details concerning work with accessories, as well as instructions for a safe use, are provided in manual of power bank producer, which is supplied within package. As standard set contains also a second (identical) mobile power supply source.

4.2.9 KS



Code simulation loops are positioned on compensating coil of MIREL SN type. Code simulation loops are connected with XLR connector piece (Figure left) to accessories of PPKS extension cable.

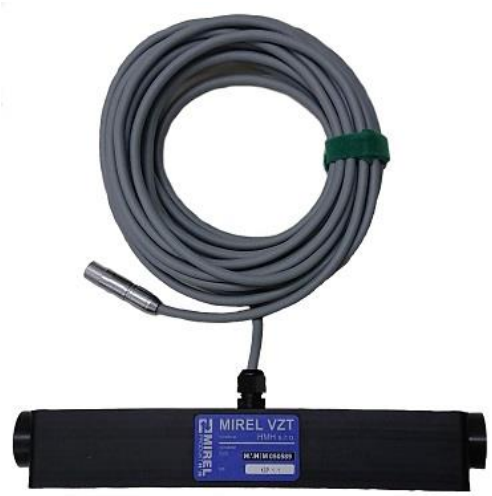
4.2.10 PPKS



Extension cable of code simulation loop serves for extension of conductor line to KS accessories. Cable has a length of 10 meters, at one end terminated with XLR connector for wiring to KS accessories, at the other end terminated with MiniCon MRM1 connector for wiring to VZT.4 device (connector No.3).

PPKS accessories are equipped with a textile cable fastener in black colour.

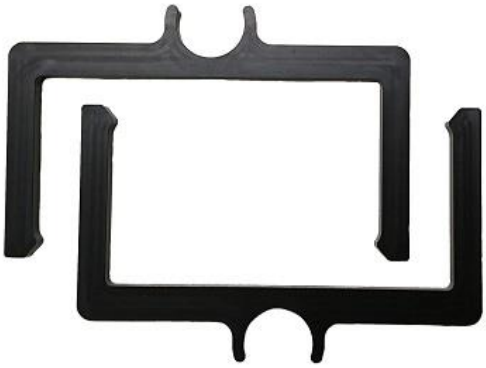
4.2.11 KSP



KSP accessories is a simulator of SHP rail line infrastructure. By means of KSPD holders positioned directly on the SHP antenna of DRV. For a correct functioning of SHP infrastructure simulation, it is necessary that the KSP is centred on SHP antenna of DRV. An 8m long cable serves for connection of VZT.4 control electronics (connector No.3), which forms an inseparable part of accessories and it terminated by MSCM connector of MiniCon type. Lateral side features a production label with type designation and serial No. The opposite side of accessories is equipped with two strips of a detachable joint, by means of which the accessories are clamped into case cover in order to enable a better organizing within the case space.

KSP accessories are equipped with a green colour textile binder.

4.2.12 KSPD



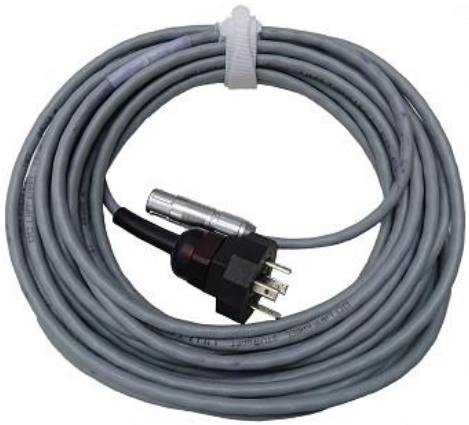
KSPD is holder of KSP antenna accessories. It serves for holding the KSP accessories during simulation of SHP infrastructure to antenna of MIREL SHPA type, part of MIREL SHP system.

2 pcs of KSPD.1.1 holders are required for fastening of KSP accessories to MIREL SHPA antenna

4.2.13 PPIRC

Extension cable for simulation of speed sensor simulation. Serves for connection extension in case, when the length of PIRC accessories isn´t sufficient. Used only exceptionally, at workplaces and in a situation, where there is a large distance between the speed sensor terminal box at axle and workplace, where the diagnostics are carried out. Terminated on both ends with WAGO connectors. Connector female piece is connected to PIRC conductor. Connector with pins is connected to IRC terminal box. Two versions are available, having a length of 12 and 20 metres.

4.2.14 PST



Connection cable accessories for pressure sensor simulation. Cable has a length of 8 meters, at one end terminated by MSCF connector of MiniCon type for connection with VZT.4 electronics (connector No.4), at the other end terminated by industrial circular connector of Type A 3P-PE for connection with connector intended for MIREL ST pressure sensor.

PST accessories are equipped with a white colour textile binder.

4.2.15 WSR Reducers and WSRR Adapter

WSR reducers serve for interconnection of WAGO connectors of PIRC accessories and various connector types at termination of IRC sensor supply connector in case, if there isn´t any possibility to connect directly to WAGO terminal board in distribution box. Reducers WSR.1.x use 8-conductor connection required for double-channel systems with electrically separated channels.

WSRR accessories serve as an adapter piece for reducers of WSR.0.x type with a 6- conductor connection.

5 Use of the VZT.4 Device

5.1 Safety Instructions

- Device can be operated only by a person instructed about safety at work with this system and must be demonstrably appointed and trained for this purpose as well as for work with MIREL systems.
- Each person performing diagnostics of MIREL systems must be instructed about safety at work, must be demonstrably trained for execution of such activities and must have a verifiable authorization for execution of individual levels of systems diagnostics.
- When working, manipulating and transporting the device, please adhere to general rules for safety at work.
- When working close to DRV and rail line, one must direct himself/herself by OHS instructions for this environment.
- The VZT.4 device can be used only for the intended purpose of use and technical conditions mentioned in document 2339VZT VZT.4 Technical Conditions must be complied with.
- Device can be transported only in closed condition and using external case handle in order to prevent an undesirable fall or injuries.
- The VZT.4 device is equipped with warning sign „Caution, danger“ (exclamation sign in a triangle). This sign indicates the necessity to study the entire manual prior putting the device into operation and to comply with instructions comprised in present manual concerning correct and safe device use.
- Sections in this manual with this symbol Caution, danger“ (exclamation sign in a triangle) indicate potential operation risks and instructions for their minimization.
- Use only device accessories approved by the Producer for work with the device.
- Connection of tester to device subject to diagnosis and to DRV is possible only with device accessories approved by the Producer.
- Please check regularly for eventual product damage or wear. Do not continue to use a damaged or worn product.

5.2 Connection to DRV of the Tested System

Concept of work with the VZT.4 device is based on device connection with use of accessories for simulation of individual functions with tested or diagnostics-subjected system at a DRV. Functions of VZT.4 tester are remote-operated from a computer connected to device by means of ATM accessories. User interface is composed by VZTUI program module of the MIREL MAP system. Method of user interaction with device in course of manual parameter entering and instrument control is described in document 2418MAP VZTUI User Manual.

Apart from manual control of individual functions and parameter simulations allows, for purposes of work simplification, also an automated testing with help of scripts of available in VZTUI menu, which execute a defined sequence of functional steps. Method of use, list and detailed description of individual scripts is available in document 2418MAP VZTUI User Manual.

5.3 Putting into Operation

VZT.4 is put into operation by switch the device on by means of a pushbutton on front panel. The ON pushbutton is marked by a symbol ⏻. The device is switched on by pressing and a brief keeping the

pushbutton pressed until the pushbutton gets backlit. Pushbutton backlighting serves as indicator of status and functionality.

Functional availability of VZT.4 is upon switching on indicated by colour and backlight status of ON pushbutton as provided below:

▪ Violet	ON-status indication. Serves as functionality test for red and blue backlighting. Duration time ca. 1 s.
▪ Red	Start-up. Waiting for communication with PC.
▪ Blue	Start-up completion. Under normal conditions, switching to operating status occurs immediately from this condition.
▪ Blue (flashes)	Operation. This status is standard operating mode during work with device. Flashing frequency is 1 Hz. Device remains in operating status also in case of communication loss with PC (e.g. in case of communication cable disconnection).
▪ Red (flashes)	Error. Error number is indicated on PC in VZTUI status line.

In case of communication loss between device and VZTUI, the device automatically switches off after expiry of a 5 minutes period. This function serves also as a protection against an undesirable PSUSB discharge in case of an accidental device start during its transport.

Upon switching on the VZT.4, the PBUSB accessories are started automatically and charge status indication lights up. This indication remains lighting under normal conditions and it shows the charging level by means of its colour. Should the charging level indication go out (e.g. after switching off the VZT.4), PBUSB still works and supplies power, but it means, that PBUSB has switched to saving modus and switches off automatically after a time period of roughly one minute (independently from power consumption). PBUSB returns to standard condition by means of operating the pushbutton of charging level check.

The device is switched off by holding down the power button until the backlight of the button goes out.

5.4 Simulation of IRC Functions

Simulation of instantaneous speed and travel direction is based on simulating the function of incremental axle speed sensor (IRC). The VZT.4 device is connected by means of PIRC accessory to terminal block under the DRV frame, in the place of IRC sensor connection. In case of a considerable distance, PIRC can be extended by using PPIRC accessories. If there isn´t any possibility to connect directly to terminal block, a suitable WSR reducer piece for the specific DRV type is used in order to connect to supply cable from IRC sensor.

For the purpose of proper speed simulation function it is necessary to set in the VZTUI user interface correct wheel diameter values of the scanned axle, as well as pulse count per revolution of the specific simulated IRC scanner.

The use method of user interface for speed and travel direction simulation, as well as additional detection functions of IRC power supply and IRC power consumption simulation is described in a separate document 2418MAP VZTUI User Manual.

5.5 Line Infrastructure Simulations

The VZT.4 allows simulation of train protection system line part. Supported are simulations of train protection rail line section for LS and EVM, as well as of line section of the point-type SHP train protection.

5.5.1 Line Transfer Simulation for LS and EVM Infrastructures

With a line-type train protection, the information transfer from rail line to drive vehicle is permanent during movement within the coded track section. Simulation of line information transfer with VZT.4 is based on excitation of electromagnetic field with help of KSV accessories located on rails under DRV scanning coils. KSV accessories are connected to VZT.4 by means of PKSV connecting cable. For proper operation it is necessary to connect both KSV transmitters. When positioning KSV transmitters under code scanners on rail, coincident orientation must be adhered to. They are positioned in such a way, that the stop on KSV provides for a correct position on rail and the coincident orientation is achieved with supply conductors directed outside from rail line. KSV transmitters must be positioned in the centre under the MIREL SN code sensor.

⚠ WARNING!

When testing code transfer with help of KSV transmitters you have to bear in mind, that the KSV transmitter emits electromagnetic field, which can, with maximum set currents, exceed hygienic standards within close KSV vicinity. For this reason it is necessary during testing not to hold the KSV or eventually avoid staying in the KSC close vicinity.

A safe distance is 20 cm from KSV in each direction.

Simulation parameters proper, as well as integrity check of connected accessories, are carried out via VZTUI as described in document 2418MAP VZTUI User Manual. VZT.4 simulation of line transfer supports frequency-type pulse code of LS type, as well as code telegrams of EVM type, where only one of LS or EVM infrastructures can be selected, or none of them. In order to enable the work, VZTUI offers pre-defined quick-choice pushbuttons of signal and speed command simulation for mentioned infrastructures.

5.5.2 Simulation of SHP Infrastructure

Apart from simulation of line-type infrastructures of LS/EVM type, the VZT.4 device allows also simulation of rail-line part of the point-type train protection pursuant SHP specification. With point-type train protection, the information transfer occurs at determined locations on rail line, by means of passing over a track point. Simulation of line infrastructure in case of point-type SHP train protection is based on simulating the passing over so-called rail line electromagnets with help of KSP accessories.

KSP accessory is positioned directly on DRV electromagnet HDV (SHP antenna) and simulates a time-variable event of passing over a rail line electromagnet. A pair of KSPD holders serves for fastening of KSP accessories to SHP antenna of MIREL SHPA type. Integrity and correct connection of KSP accessory is, after enabling the simulation of SHP infrastructure, continuously monitored and its status is displayed in VZTUI user interface. Control method of SHP infrastructure simulation via VZTUI is described in 2418MAP VZTUI User Manual.

5.6 Simulation of Analog Current Loop

VZT.4 disposes of two independent inputs for simulation of sensors intended for signalling, via industrial standard of analogue current loop, type 4-20 mA. MIREL systems use signalling via analogue current loop primarily for pressure scanning. VZT.4 user interface allows a signalling range selection between 4-20 mA, as well as mapping of this range for usually applied ranges of 0-6 bar and 0-10 bar with MIREL ST pressure sensors.

In order to simulate pressure scanner statuses, it is necessary to connect VZT.4 to connector of MIREL ST pressure scanner. PST accessory serves for this connection, its end being the counter-piece of pressure scanner industrial connector. User interface control when working with analogue current loop simulation is described in VZTUI user manual in document 2418MAP VZTUI User Manual.

6

6 Maintenance and Repairs

The employed assortment of parts meets demanding criteria of reliability and durability. The device operation is maintenance-free, with exception of obligatory prophylactic inspection in defined intervals.

The VZT.4 device has three diagnostic levels:

D1 – one-time self-diagnostic device test

D2 – continuous self-diagnostic device test

D4 – prophylactic inspection

First two levels (D1, D2) are handled by automatic execution of diagnostic test by the device proper. In case of error detection, the operator is notified about this fact. If the detected error doesn´t allow continuation of device operation, measures are taken to prevent its further operation. Operational repair (S1) of the device is required in case of error detection. In case of repeater error detection, a service repair (S2) is required.

Prophylactic inspection (D4) of the device is carried out regularly by the device producer, or by authorized and trained subject, regularly every 24 months (max. after 26 months). Apart from functional test execution, an in-depth inspection of the entire device is carried out (reading out of internal, condition inspection of I/O circuits). Inspection is carried out taking into considerations full functionality and wear condition. Prophylactic inspection comprises also device calibration. In case of error detection a service repair (S2) is necessary. The execution of prophylactic inspection directs itself with prescribed internal producer´s procedure for in-depth device inspection. Prophylactic inspection is considered to be accomplished only if executed in full extent.

The level of D3 diagnostics has been omitted for reason of compatibility with diagnostics of other MIREL system devices.

Each person carrying out VZT.4 diagnostics must be instructed about safety at work, must be traceably trained for execution of this activity and must have a verifiable authorization for execution of individual device diagnostics level.

Repairs of VZT.4 have two different levels.

S1 – Operational repair

S2 – Service repair

Operational repair (S1) is carried out by an Operator´s employee, trained by the Producer. Repair is carried out in case of an error detection in course of diagnostic inspection, or when detecting the error during device operation. The aim of operational repair is to clear errors emerged in cabling, power supply, device connection on drive rail vehicle, etc.. There aren´t any interventions to be carried out in the VZT.4 control electronics within the framework of operative repair process. In case of repeater error detection, a service repair (S2) is required.

Service repair (S2) is carried out by Producer or by a subject trained and authorized by him. Service repair is carried out in case, that an error can´t be cleared by means of operational repair (S1). As a rule, the service repair is done at device Producer´s premises. The aim of operational repair is to clear errors emerged in the device.

The extent of maintained documentation during VZT.4 diagnostics and maintenance is analogous like in course of maintenance and diagnostics of other MIREL systems.

Each person carrying out VZT.4 maintenance must be instructed about safety at work, must be traceably trained for execution of this activity and must have a verifiable authorization for execution of individual device maintenance level.