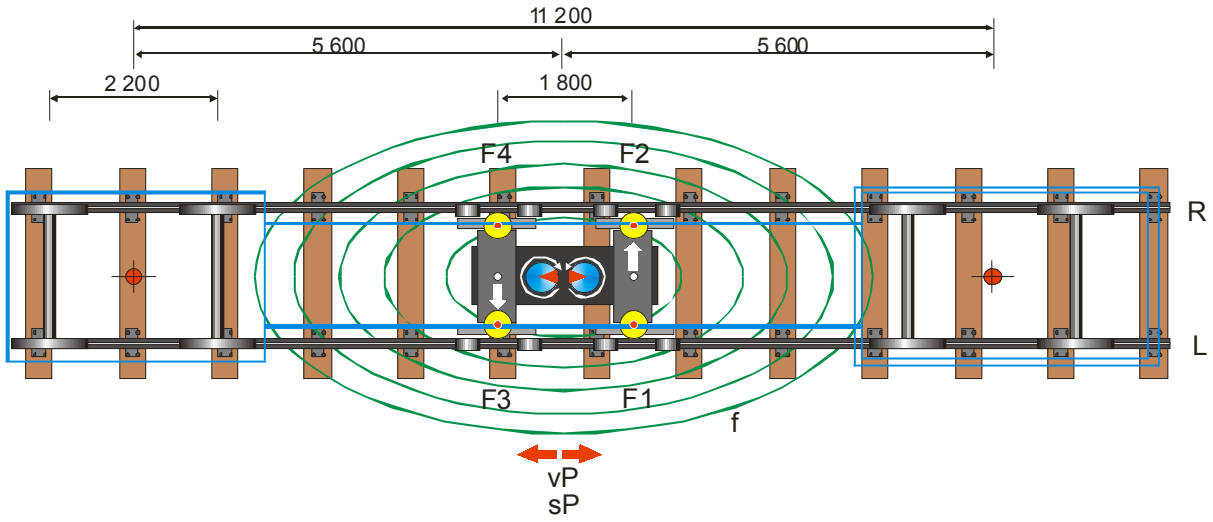
MS 404 In

OPERATION MANUAL

1/ Basic Dimensions and Relations of the Measuring System



rear cabin vibration bogie front cabin (working cabin)

Vehicle working speed	c	up to max. 3 km.h^{-1}
Working direction	sP	forwards / backwards
Vibration frequency	f	32 - 35 Hz
Total thrust	F = (F1+F2+F3+F4+Hp)	24 t
Orientation rule	view of the vibration bogie from the front cabin	left / right hand side (L); (R)

Vehicle working speed (c) is from the MS 404 Measuring System point of view indirectly controlled by means of the travel frequency converters. The speed is set by a potenciometer in the JSP working desk.

Working direction (sP) is set by the operator. The sense of the working direction is understood as the movement of the vibration bogie to the front either heading the front (working) cabin (**Forwards)** or the rear cabin (**Backwards).**

Vibration frequency (f) is set by the operator and its value is set by means of a potenciometer in the JSP working desk. The working frequency rise is carried out in cooperation of the vehicle moving off and the revolution increase up to the nominal values is considered as a indeterminate state of the frequency spectrum transfer.

Thrust (F) is adjusted by means of the proportional distributors servosystem, which enables gradual rise of the thrust and its maintaining in an appropriate working mode. It is fully under the electronic system control.
The resulting thrust is determined by a sum of all the force values acting in points of application F1 – F4 and the vibration bogie weight [Hp].

1/ Working Modes Instruction

Start up of the Vehicle Work in the Automatic Mode

1.1/ Setting up and winding up of the vibration bogie is done manually only.

1.2/ The MS 404 Measuring System is activated by switching over the main switch on the Computer Monitor from position “0” to position “1”.

1.3/ The programme start up to iPC takes approx. 120 to 160 seconds.

1.4/ By switching over the “Control” function to the “Automat” position the automatic control functions of the system are connected to the governors and to the proportional valves of the thrust cylinders subsequently.

1.5/ The working mode function must by set on the computer monitor (see point 2/) and the push-button „Start“ must by tripped subsequently.

1.6/ The monitor is automatically switched to the main programme window.

1.7/ The basic preparatory works are finished and the system is awaiting to the vehicle start running.

1.8/ The vehicle running and the vibration frequency are manually controlled in the JSP working desk.

Meeting Instructions as per point 1/ is valid for all the modes of the automatic control of the work operations.

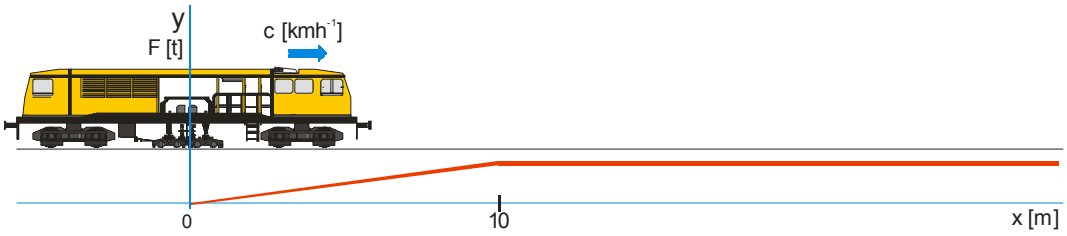
2/ Working mode selection

function	*programme icon*
2.1/ Stabilizing with the maximum thrust	
2.2/ Stabilizing with the lowered thrust	
2.3/ Stabilizing with the limited drop of level	

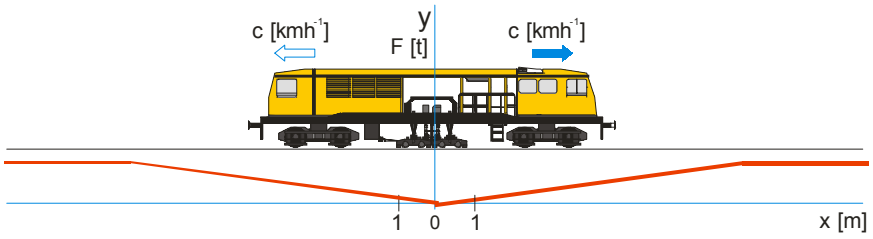
Working mode selection

The working mode selection is based on the stabilized track assessment as per the following conditions:

a) All the modes work with the both sides ramp of the thrust rise to the vibration bogie for each rail separately. The ramp is pre-set to the constant length of 10 m and it is related to the starting point of the fixed coordinate system, which is created of the length coordinate in the “x” axis and the force coordinate in the “y” axis.

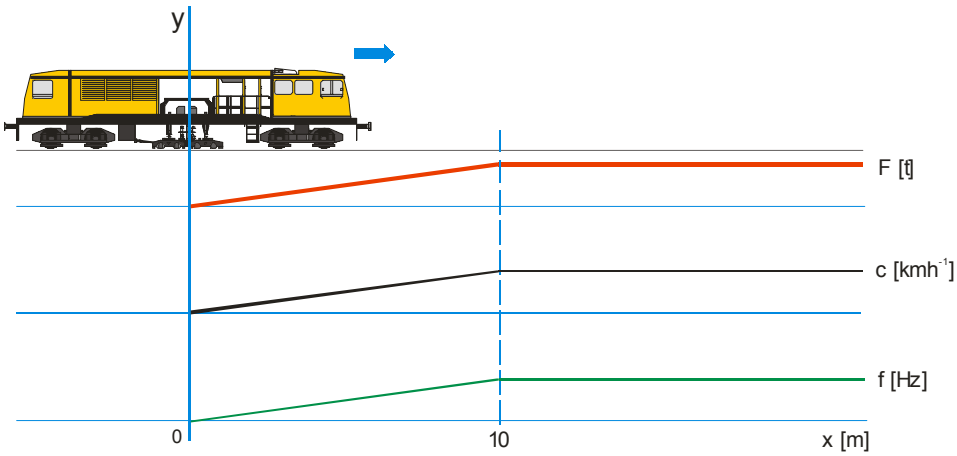


b) All the parameters are automatically set by means of the electronic system. Putting the vehicle into motion to the appropriate direction occurs a delay in the operation direction decision (approx. 1 m). Pressure release of the thrust system and a subsequent creation of the ramp is carried out automatically.



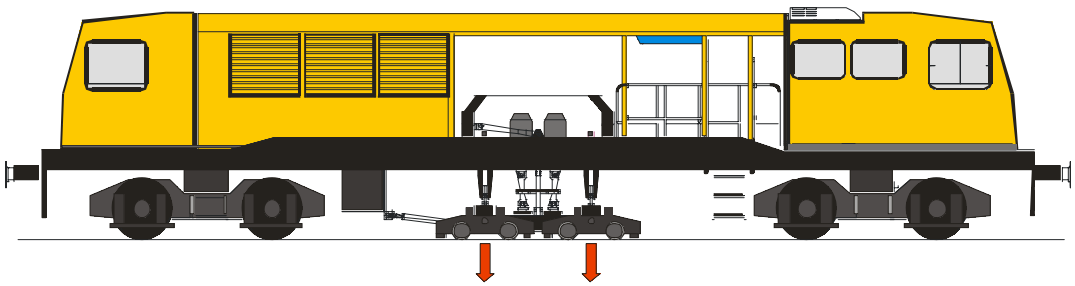
operation direction decision

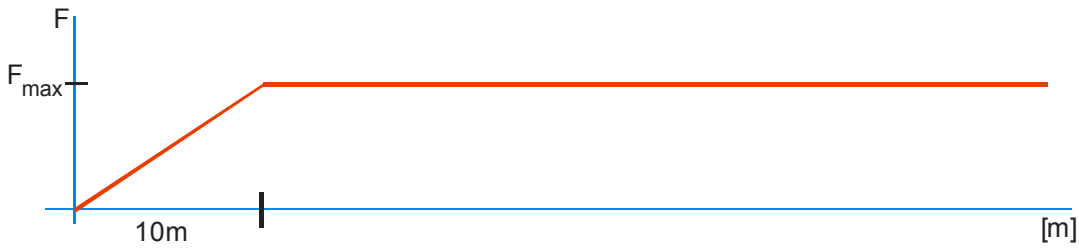
The bogie vibrations are connected contemporary and the vehicle working speed is reached. These parameters are set manually in the JSP working desk.



2.1 Working Mode

Stabilizing with the maximum thrust

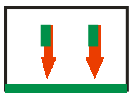




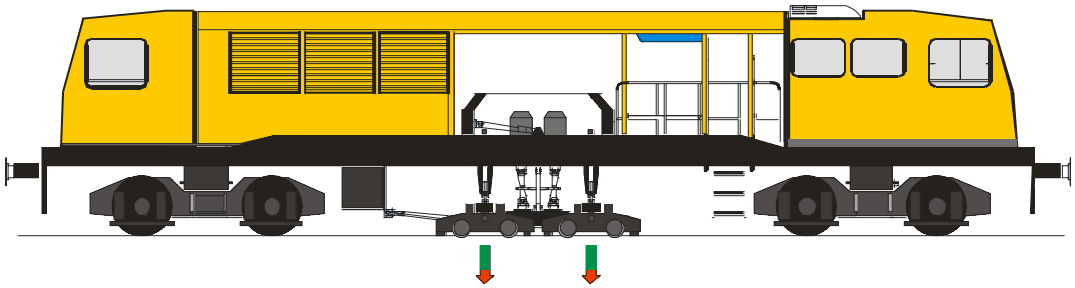
The 2.1 Working Mode is used for the stabilization of a track section which will be BCM treated subsequently. The thrust forces (F1 – 4) are applied on the both rails the same way. The thrust force value is created by the vibration bogie thrust to the track and is adequate to the basic pressure set in the hydraulic system.

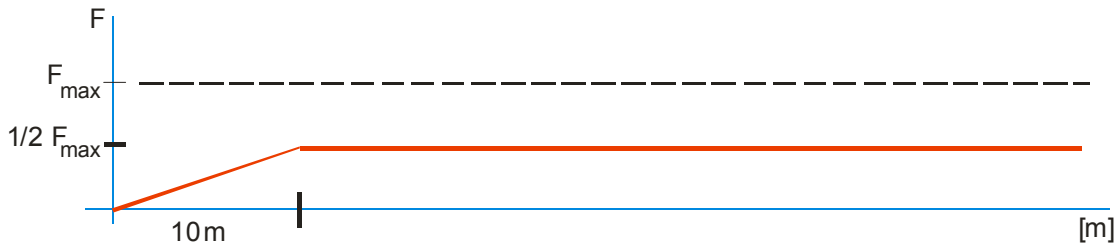
Note:
Due to the vehicle technological abilities a development of the local distortion deffects can occur. For these reasons a subsequent check done by the tamping machine is necessary. The stabilization effectivness is maximal in this working mode.

2.2 Working Mode



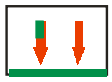
Stabilization with the lowered thrust



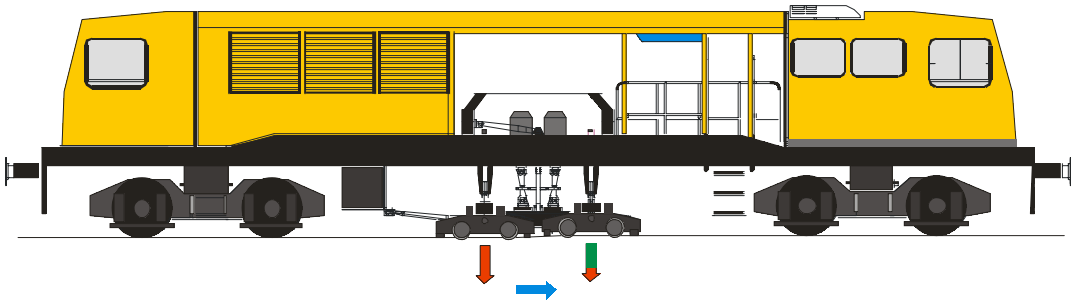


The 2.2 Working Mode is a complementary method working similarly as the mode 2.1, but the thrust is lowered to $^1/_2$ of the maximum value. This mode is used as a medium size maintenance of a track section or for movements over the railway structures.

2.3 Working Mode



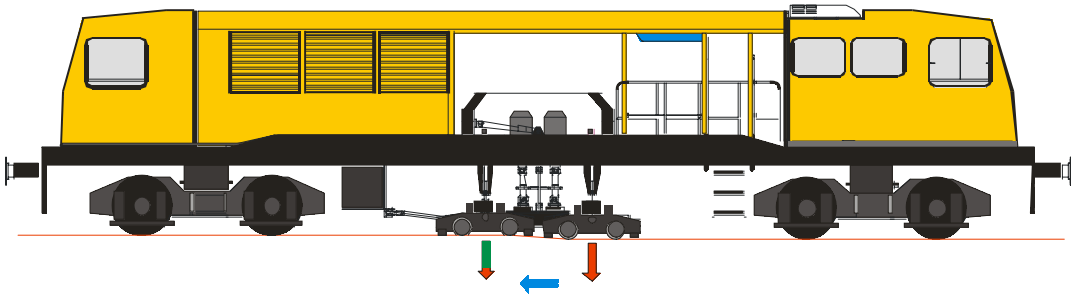
Stabilization with the limited drop of level



working direction ***"Forwards"***

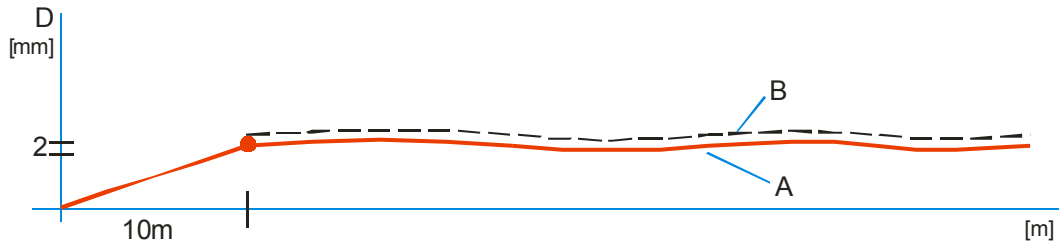
The 2.3 working mode is based on the measuring the mutual position of the front and rear wheels in the longitudinal direction as per the vehicle working movement. The front wheels are loaded only ¼ of the thrust force and the position of the thrust cylinders shift out is read. This position is monitored by the Measuring System and transfered to the rear wheels position with the added drop of 2 mm in a controlled way. To reach this forced position the control system uses the thrust up to the maximum value at the subsequent points of the thrust application. As far as the condition of the position difference is met the control system keeps the pre-set length of the created drop and does not allow to exceed it.

Drop in the reverse vehicle movement



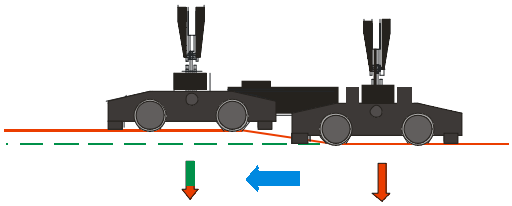
*working direction „****Backwards*** *"*

The control system differentiates the movement direction in the way to fulfil the condition of the correct orientation of the thrust forces in both of the working directions (*Forwards, Backwards)* to measure the track level line drop. The system evaluates movement direction and ensures the correct setting up of the thrust forces automatically.



level line drop

A – after stabilization
B – before stabilization

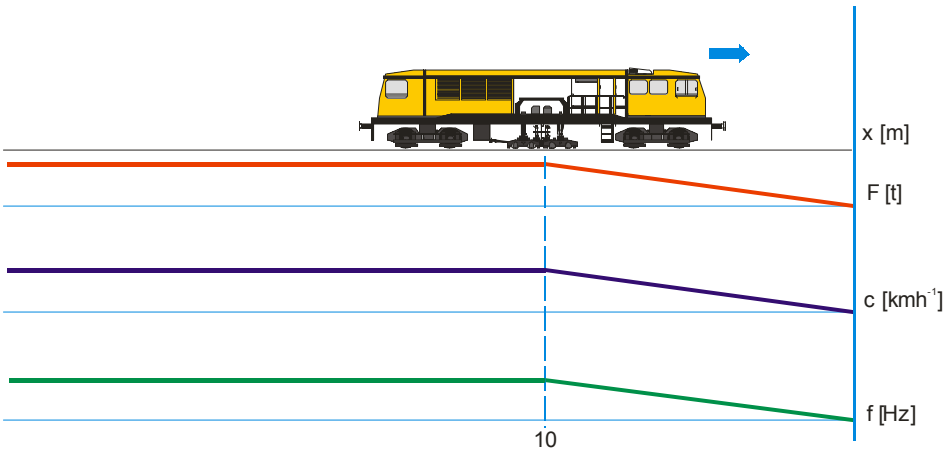


forces arrangement in the lowered drop mode

This mode is recommended to be used in a case of the final loading capacity working through, when the ballast bed is already homogenized enough and enables to form a working deflection of the rails.

3/ Work completion

The completion of the being stabilized section is carried out by the control system command which creates a run-out ramp. It is necessary to lower the vibration frequency to 0 simultaneously and to stop the vehicle movement then. After the run-out ramp is passed (10 m) the measurement is finished automatically and the control system switches over the main monitor to the former menu for a repeated activity selection as per point 2/ or enables the total work completion.



All the described working modes only effect in case of keeping the former maintenance of the stabilized section. If the track section is not got ready as per the valid instructions for the stabilization the vehicle impacts are restricted.

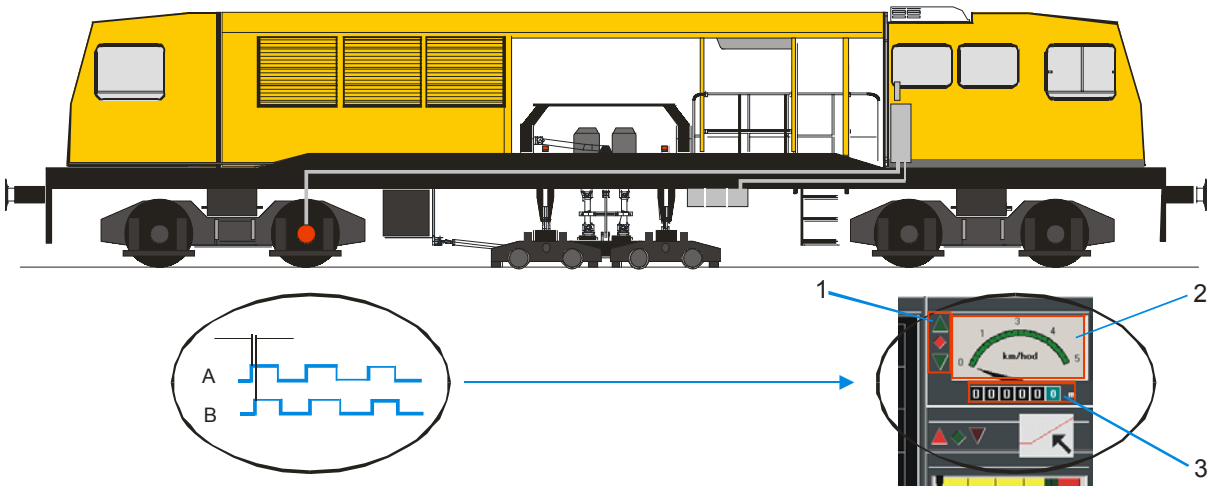
Printing the work record (line chart)

The print of working minutes is enabled for the 2.3 Working Mode Stabilization with the limited drop of level. The curve shows the position difference of the front and the rear wheel for separately for each rail. The curve height above the ZERO line represents the difference reached in the specific track point.

The other modes (2.1 and 2.2) enable only to print the headline which contains:

- date,
- time,
- length of work done in m,
- selected working mode

Synchronization in compliance with the length marks



1 – vehicle working direction [F/B]
2 – speedometer [kmh-1]
3 – run length [m]
A – generator track
B – generator track

The length marks are used for the vehicle functions cooperation. These marks are derived from the GEL type rotary transmitter attached to the trailing axle. The transmitter installed for MS 404 enables to divide the tread line to 2 500 parts. The generated pulse frequency serves for deriving the working speed and the vehicle run length from the work starting point in the specific track section. The transmitter is used for the automatic differentiation of the vehicle movement direction.

The length marks domain (dx) constitutes the basic axis for control and pattern cycles which enable to automize the vehicle work and influence actual work parameters via programme.

Besides the domain of the length marks the background of the control system also uses the time domain (dt) which provides the control instructions cycling regardless the vehicle working movement. The functions are as follows: the working speed calculation, the static pressure of the thrust cylinders, the diagnostics etc.

4/ MS404 Measuring System Control

It is carried out by means of the Touch Screen (hereinafter TS) which is installed on the industrial computer monitor placed in the working cabin. This appliance provides:

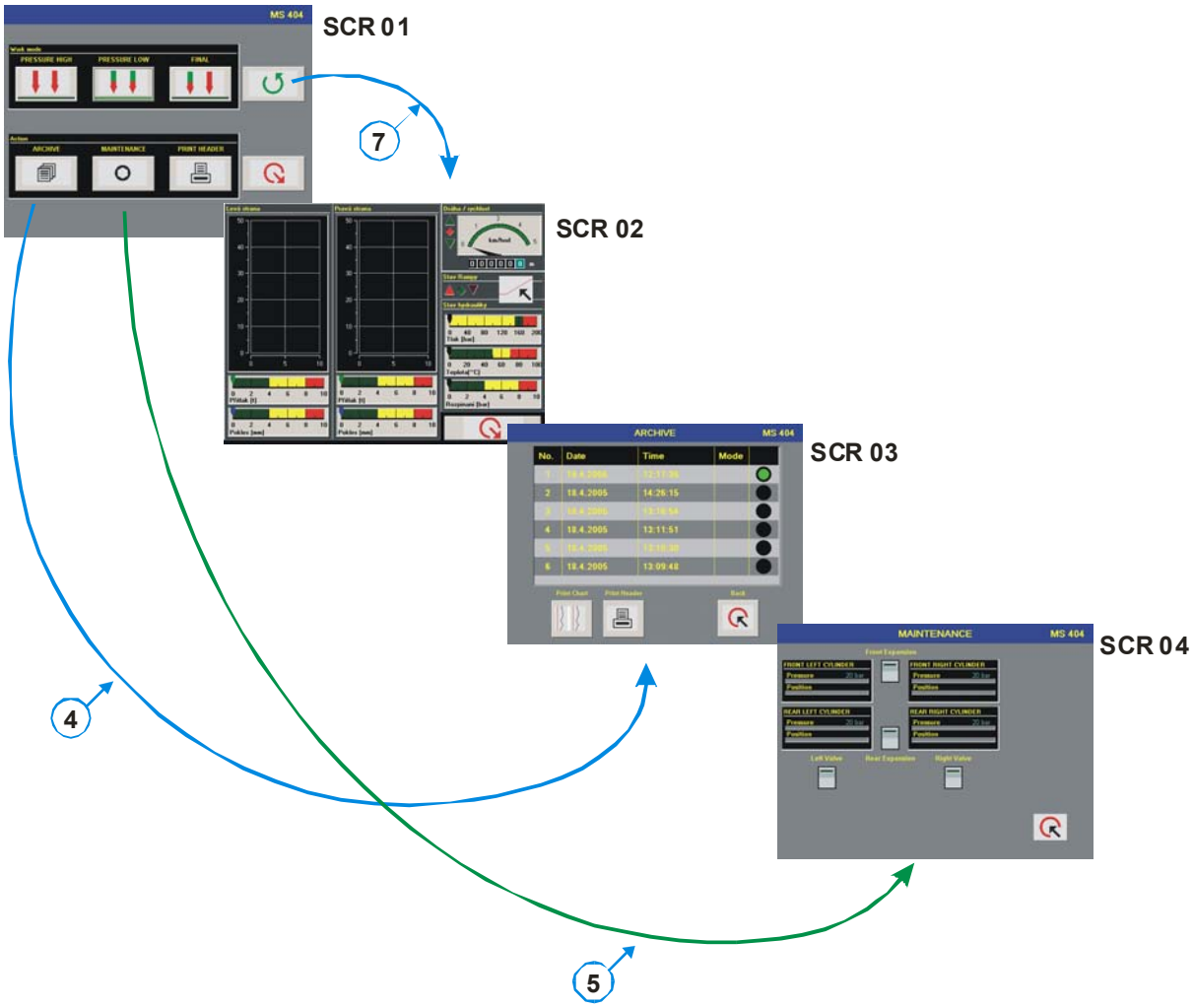
- setting the basic selection of the working mode
- main functions control during the vehicle work
- diagnostic services
- data files recording and printing.

Programme applications

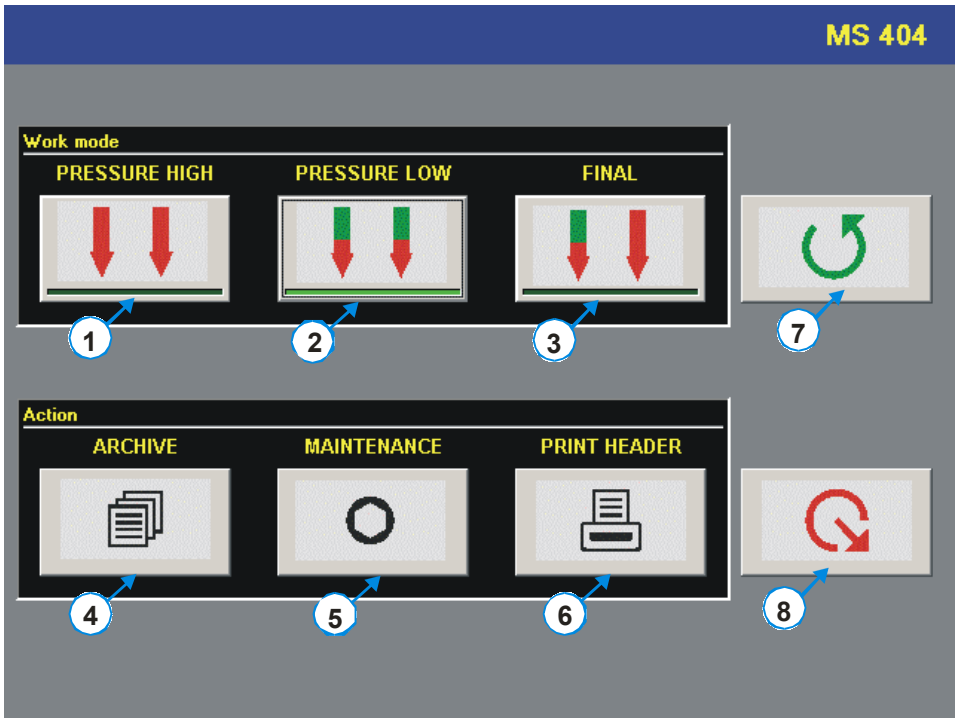
For the functioning of the whole control the MS404 Measuring system is equipped with the main programme application which is processed in the iPC (master). The subordinated progamme applications assure the routine execution of the vehicle instructions (slave) so-called short control couplings. These applications are located in the PLC ERCO 10 type control automats as the basic instruction files. The automats are installed for both the vehicle sides close to the control elements and their feedbacks. User´s control, calibration and vehicle functions diagnostics are made available through the main programme application via (SCR04) diagnostic window.

The main programme application has been created in the Pascal/Delphi programming language and works on the platform of the W98 operation system. The subordinate applications of the vehicle functions have been written in the Assembler programming language and they work on the platform of the xx51 type single chip processors.

THE PROGRAMME WORKING WINDOWS



Working screen No. 1
SCR 01

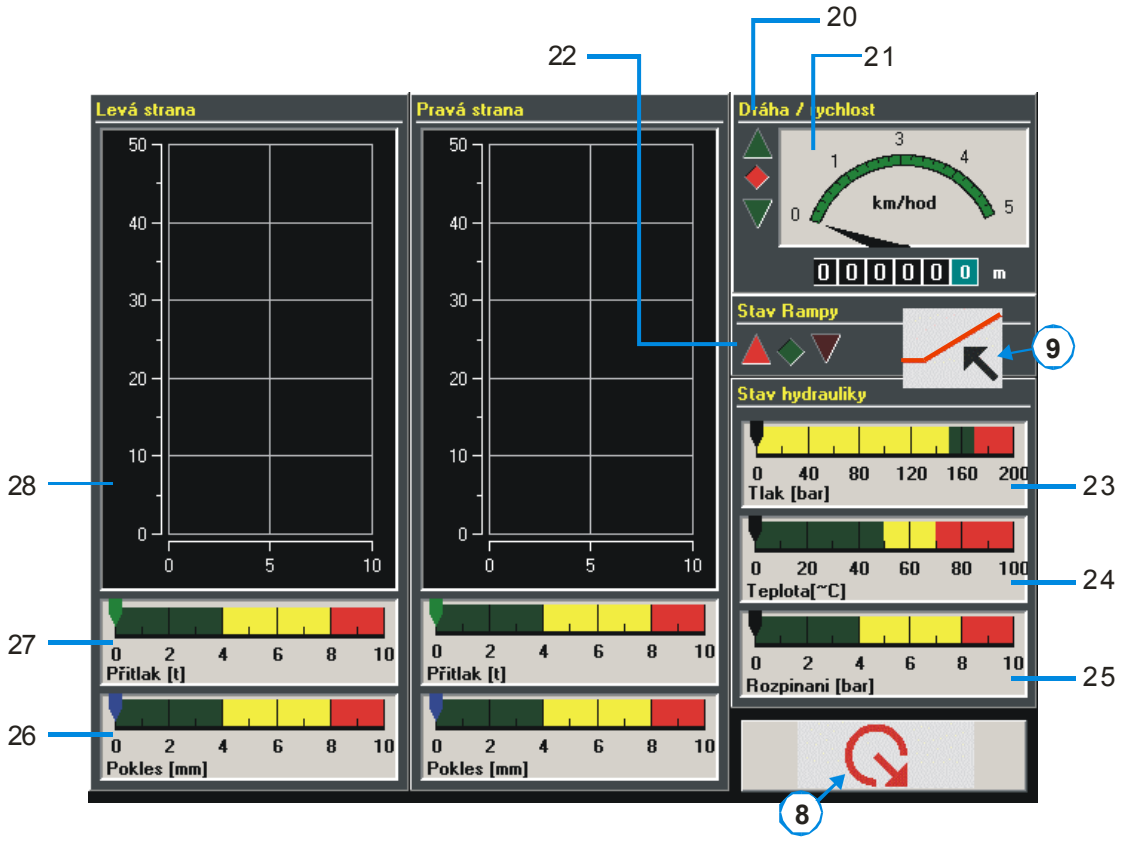


Working screen No. 1 serves for the basic selection of the vehicle operation. It is displayed automatically after switching on the (iCP) board computer and installation of the W98 operation system. The board computer is controlled by means of the main switch on the LCD computer box.

Symbolic icons (item 1 - 8) on the screen window are function push buttons for the preselection of the vehicle action. The selection is done by a click the appropriate icon and must be confirmed by a click No. 7 icon.
Clicking No. 7 icon the screen is switched over to the appropriate (subsequent) window.

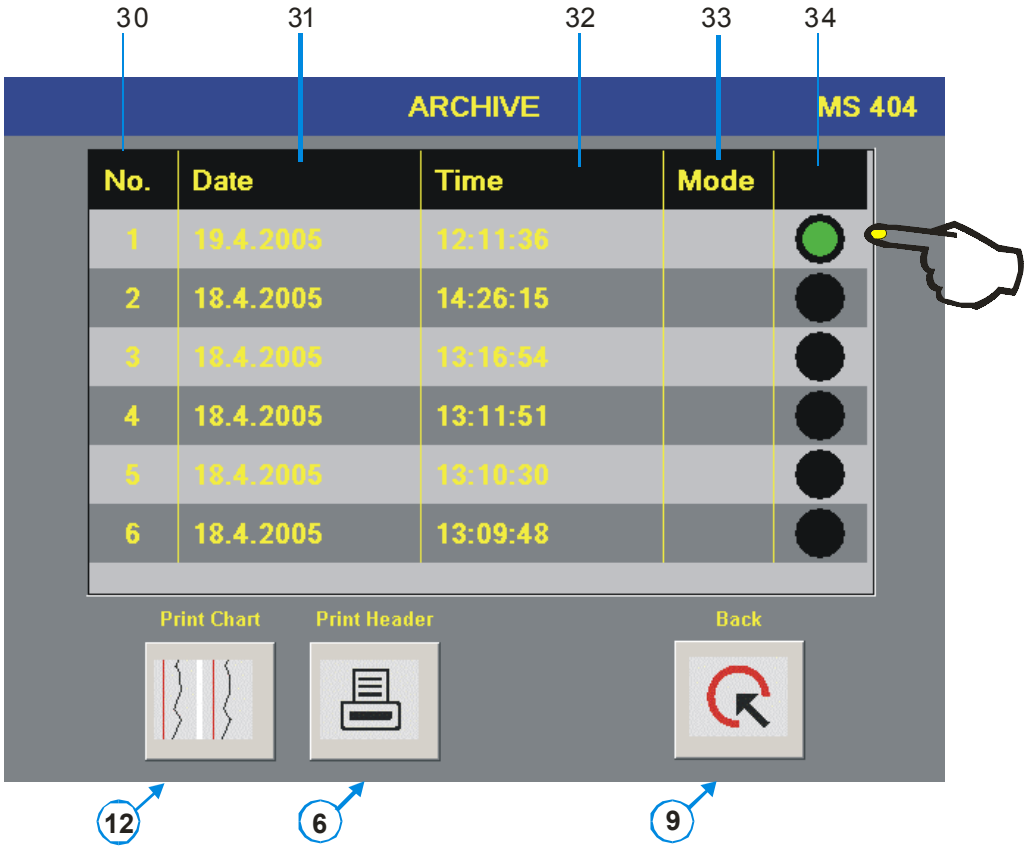
To escape the programme (so-called vehicle work completion) click No. 8 icon EXIT.

Working screen No. 2
SCR 02



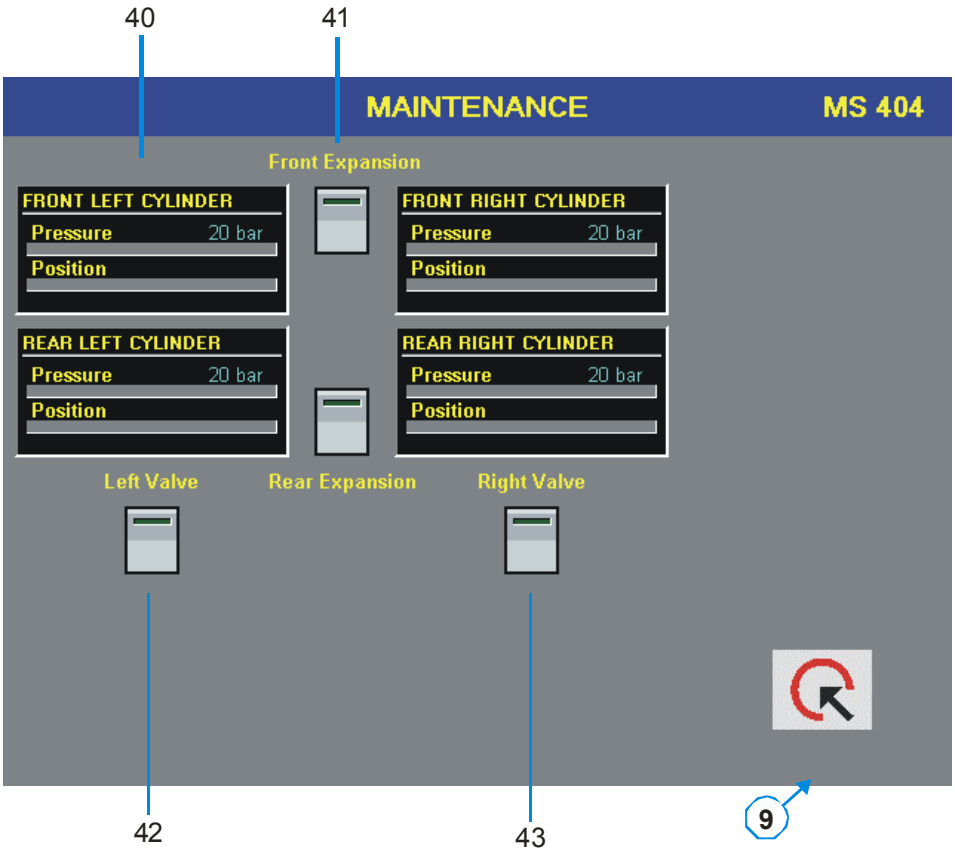
8	completion of carried out mode (after clicking this icon the system begins with run-out ramp creation)
20	indication the working movement direction
21	speedometer
22	condition of the ascending (descending) pressure ramp
23	main pressure indication
24	hydraulic oil temperature indication
25	expanding cylinders pressure
26	indication of the reached line level drop
27	thrust on the rail (L.H., R.H. separately)
28	drop line record

Working screen No. 3
SCR 03



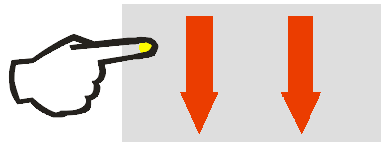
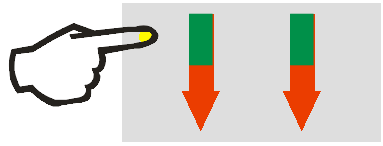
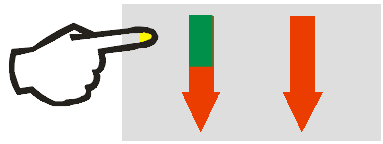
6	record headline print
9	back to the Working screen No. 2
12	line record print (for 2.3 mode only)
30	data file serial No.
31	date of the data file record
32	time of the data file record
33	working mode
34	icon for the topical file selection

Working screen No. 4
SCR 04



9 back to the Working screen No. 2
40 parameters of the thrust cylinders pressure and position
41 manual control of the expanding hydraulic cylinders (ON / OFF)
42 manual control of the saddle valves L.H.S.
43 manual control of the saddle valves R.H.S.

The Symbols

1)	
2)	
3)	
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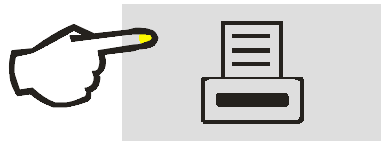
5)	
6)	
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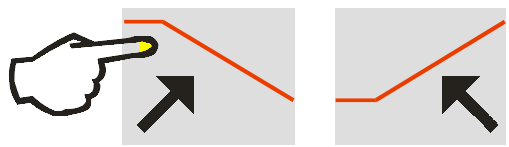
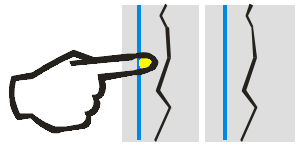
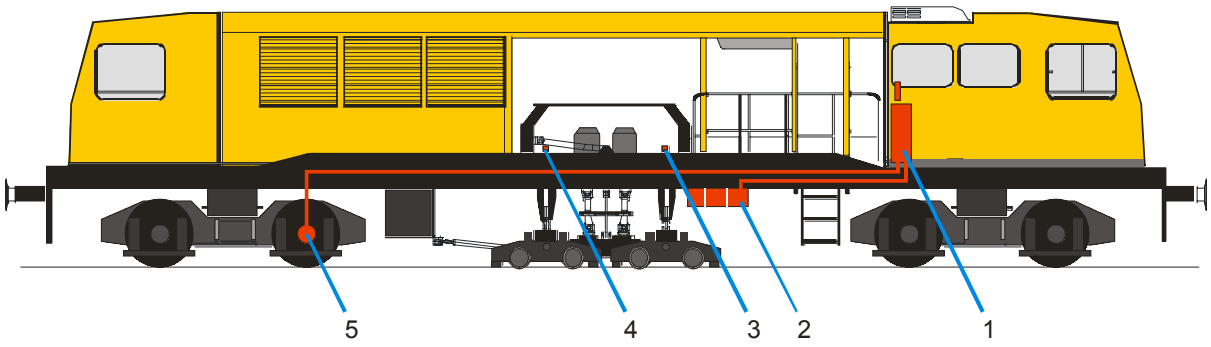
10), 11)	
12)	

Legend:

1) Working mode with the “Maximum thrust“
2) Working mode with the “Lowered thrust“
3) Working mode with the “Limited drop of level“
4) Archive services
5) Service screen
6) Record print
7) Start of the working mode
8) Programme completion
9) „Back“ command (to SCR No. 2)
10) 11) Ramp of the local thrust drop / rise
12) Print of the “Limited drop level” line chart

5. Description of the Electric Equipment

Principal Parts

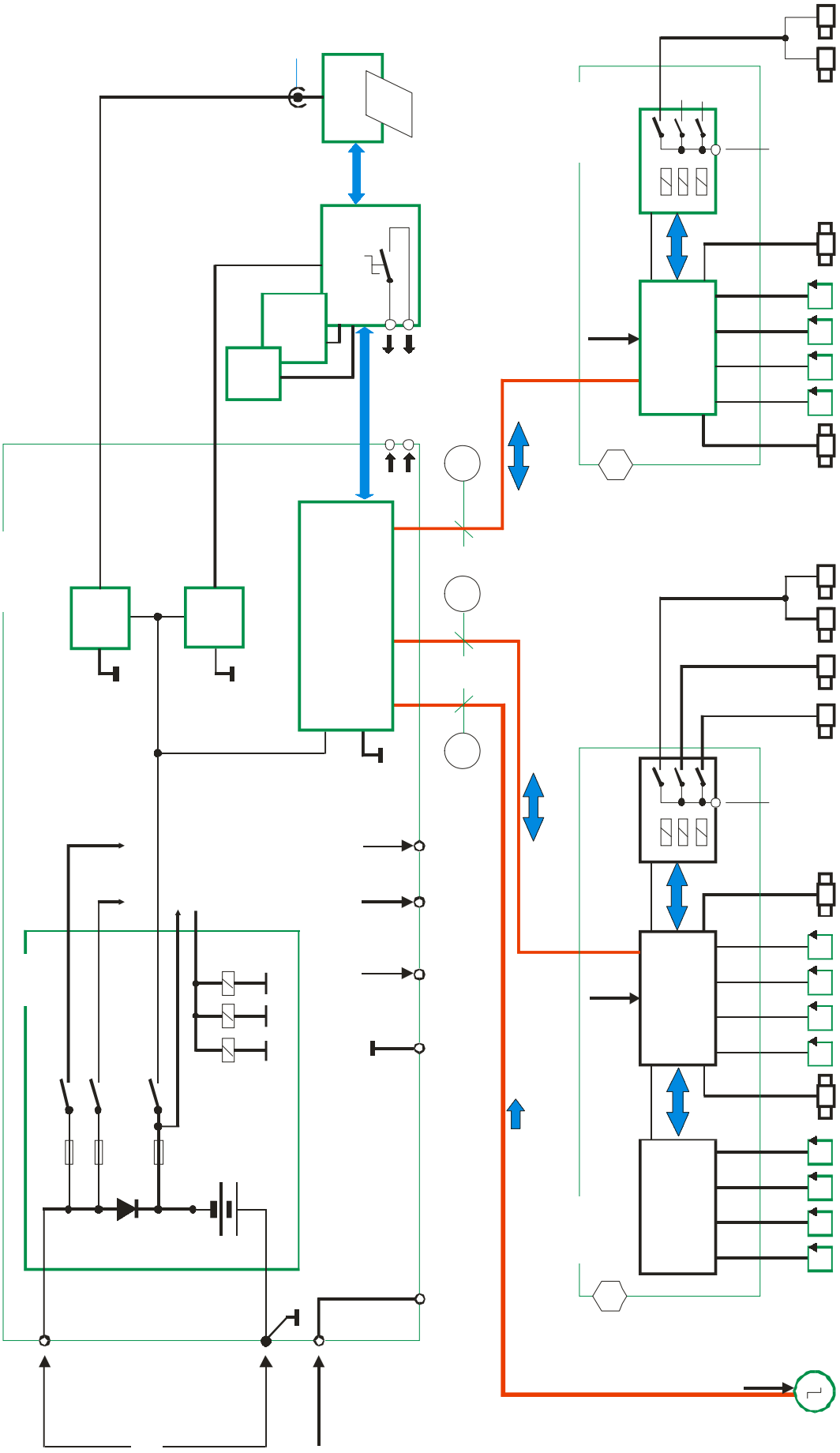


1	*main switchboard*	*HR 1*
2	*auxiliary switchboard*	*PR1, PR2*
3, 4	*position transmitter*	*inner measuring of the hydraulic cylinder piston rod*
5	*incremental sensor*	*length marks generator*

Data and supply wiring *(see Wiring diagram)*

20	dual optical line of the length A,B track transfer
21	dual series TX/RX line with the optical data transfer – vehicle L.H.S.
22	dual series TX/RX line with the optical data transfer – vehicle R.H.S.

The supply wiring is lead with the data line by means of the metal cables. Supply 24 V DC vehicle system only.



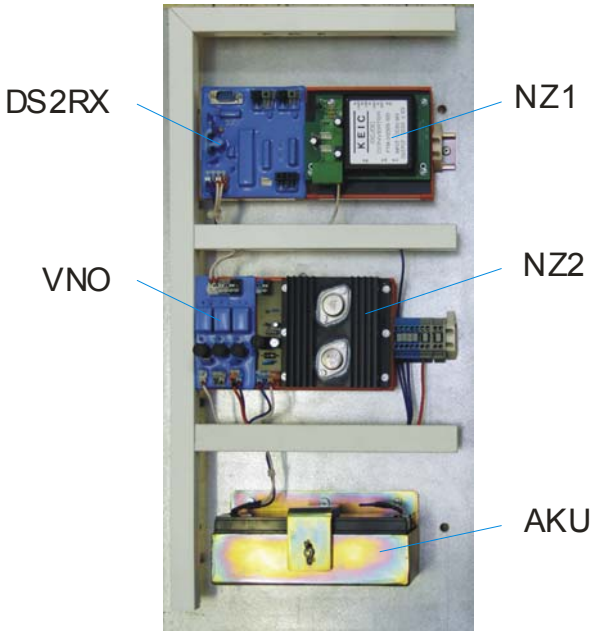
Working cabin equipment

***1**. CPU*

1.1 CPU iPC mini
1.2 LCD monitor 10,5“
1.3 Touch Screen

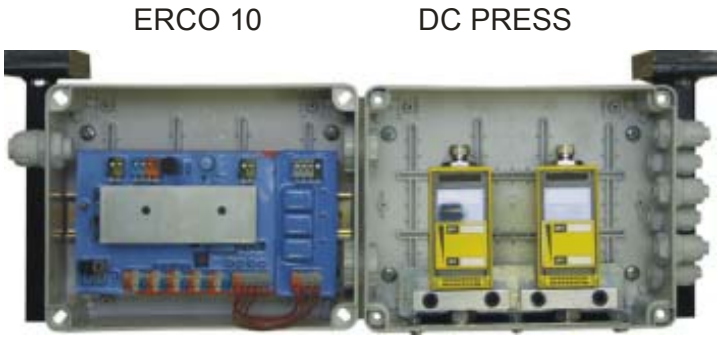
***2**. PRN Printer*

***3**. Elektronic switchboard HR1*



Auxiliary switchboards

auxiliary switchboard left (PR1)



auxiliary switchboard right (PR2)

SPARE PARTS CATALOGUE

No	TYPE	
404-01	DS 2RX	
404-02	NZ1	
404-03	NZ2	
404-04	VNO	
404-05	ERCO 10	
404-06	DC PRESS	
404-07	GEL + GEL TX	

No	TYPE	
404-08	iPC *PCM - 4823* *ADVANTECH*	
404-09	PRN *DPU - 414* *Seiko Instruments Inc.*	

PCM - 4823

CPU	Onboard AMD DX5-133 processor (Rev. B1) Onboard Intel DX4-100 processor (Rev. C1)
2nd Cache Memory	
System Chipset	VIA 82C496G/82C416
BIOS AWARD	128 kbit Flash BIOS
System Memory	EDO/FPM SIMM x 1, Max. 32 MB
Power Management	
SSD	Supports DiskOnChip®
WatchDog Timer	Software enable/disable 1.6 sec.
Expansion Interface	PC/104
Battery Lithium	3 V/195 mAH

I/O	
I/O Interface	1 x EIDE, 1 x FDD, 1 x K/B, 1 x Mouse, 1 x RS-232/422/485, 1 x RS-232, 1 x LPT
USB	N/A
Audio	N/A
IrDA	115 kbps, IrDA 1.0 compliant
GPIO	N/A
Ethernet	(PCM-4823)
Chipset	RealTek 8019AS
Speed	10/100 Mbps (optional)
Interface	RJ45 by cable
Standard	IEEE 802.3i 10 Base-T Ethernet compatible Built-in boot ROM in Flash BIOS

Display	
Chipset	Asiliant (C&T) 65550
Memory Size	1 MB
Resolution	up to 1024 x 768 @ 8 bpp non-interlaced CRT and 1024 x 768 @ 8 bpp TFT LCD display
LCD Interface	Up to 24-bit TTL for Mono/STN/TFT LCD
TV	-out N/A
Dual Independent	N/A

Mechanical and Environmental	
Dimension	(L x W) 145 x 102 mm (5.7" x 4")
Weight	0.65 kg (weight of total package)
Operating Temperature	0 ~ 60° C (32 ~ 140° F)
Operating Humidity	0% ~ 90% Relative Humidity, noncondensing

Power	
Power Supply Voltage	+5 V ± 5%,
Power Consumption	Max. : 3 A @ +5 V
Typical:	1.8 A @ +5 V (for DX5-133 w/32 MB DRAM)

Jumpers

Label	Function	
J2	DOC® 2000	address setting
J3	LCD	power selector
J4	Clear	CMOS
J5	Audio AMP	power selector
J7	COM2	selector

Connectors

Label	Function	
CN1	Power connector	(-5 V, -12 V)
CN2	Floppy disk connector	
CN3	PC/104 connector	
CN4	Parallel port connector	
CN5	PC/104 connector	
CN6	Flat panel connector	
CN7	Hard disk connector	
CN8	IR connector (infrared)	
CN9	COM2 connector	
CN10	CD audio in connector	
CN11	Audio connector	
CN12	Power connector (+5 V, +12 V)	
CN13	COM1 connector	
CN14	PS/2 keyboard & PS/2 mouse connector	
CN15	CRT display connector	
J6	Reset switch	

Jumpers and Connectors Jumper Settings

J2: DOC® 2000 address setting

Pins Address

1-2	**3-4**	**5-6**	address setting
closed	closed	closed	C800
closed	closed	open	CC00
*closed	open	closed	D000
closed	open	open	D400
open	closed	closed	D800
open	closed	open	DC00
open	open	closed	E000
open	open	open	OFF

J3: LCD power

Closed pins	Voltage
1-2	3.3 V
*2-3	5 V

J4: Clear CMOS

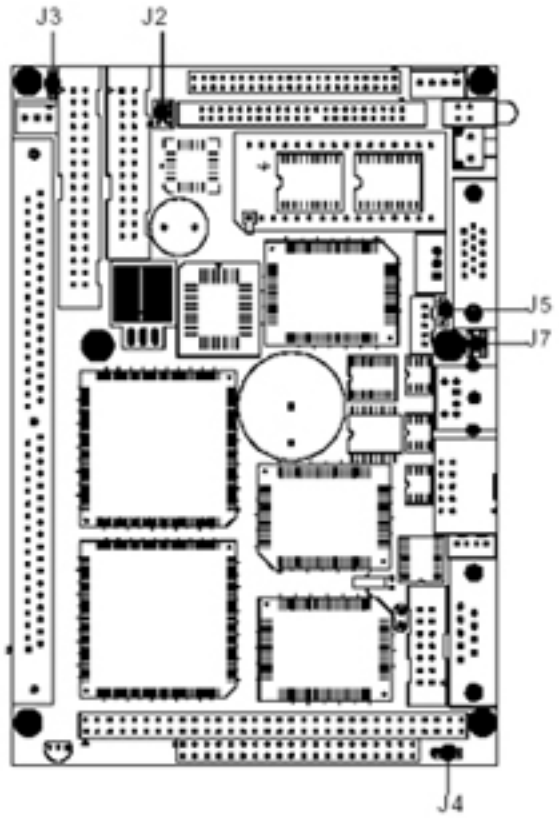
Closed pins	Result
1-2	Clear CMOS
*2-3	3.6 V battery

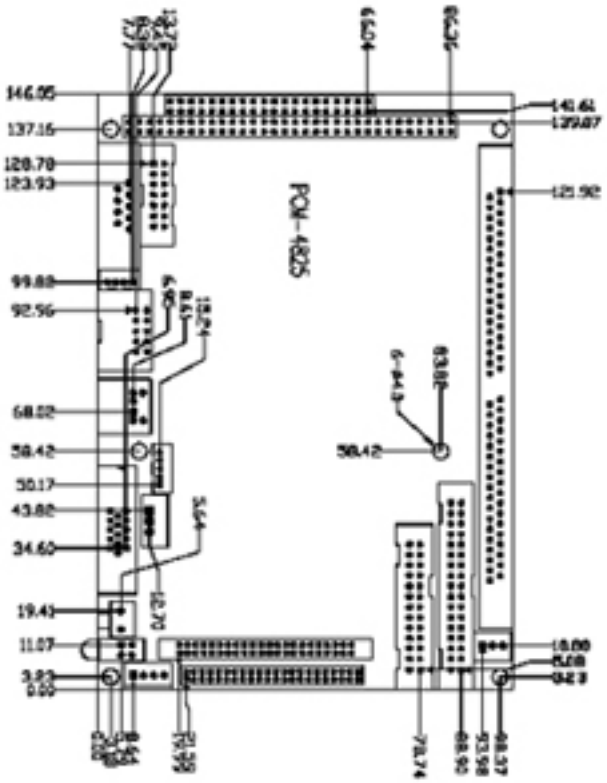
J5: Audio AMP power

Closed pins	Audio power
1-2	From main power (5 V)
*2-3	From 7805CT (5 V)

J7: COM2 selector

Closed pins	Result
*1-2	RS-232
3-4	RS-422





Locating Connectors