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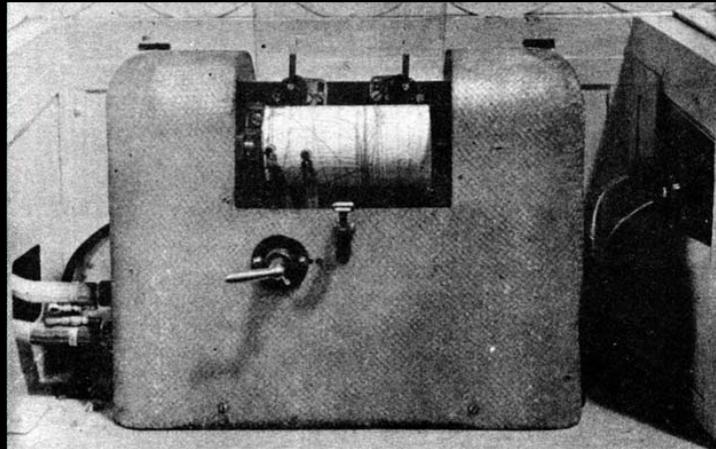
- production manager

- Strategy „1“
- Products for industrial use with an accuracy of 1%
- In agreement with the customer 0.5% or less
- Customized options and design modifications
- Cooperation with the customer on solution
- Put great emphasis on quality and reliability
- Competitive prices

# Applications in the transport industry

- **HAKAN**
- **Testing device for brakes and systems of rail vehicles**
- **Pressure transmitters for locos**
- **Sensors for pantograph control**
- **Management of water supply in passenger cars**
- **Pressure transmitters for public transport buses**
- **Service digital gauges**

# History of measuring pressure in the rail industry



**Mechanical recorder  
of the 60's the 20 century**



**Elektromechanical recorder  
of the 80's the 20 century**

# The first electronic brake tester CRESSTO



- Device MEGAN
- Developed for MSV Studenka in year 1998
- The predecessor of today's tester HAKAN3
- MS DOS platform
- Application Control Panel

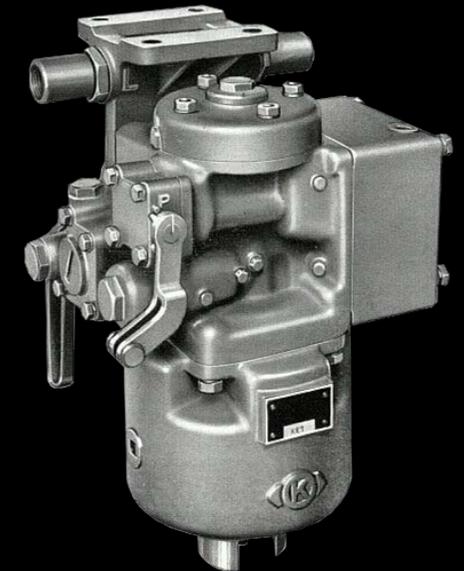
# System HAKAN

- Objective measurement and diagnostic of brake systems
- Open system
- Measurements on vehicles and on testing benches
- The central database of measured objects
- Central archiving of measured data
- Archiving and printing of protocols
- Sophisticated calibration
- Automatic recording of measurement conditions
- The system of access rights
- Guide for prescribed testing procedure.
- Cooperation with MS Excel and Access possibility
- Independent of the concrete PC
- Small dimensions, high mobility, power supply 12V possibility
- Modular conception

# System HAKAN

allows an objective measurement of:

- Distributor Knorr-Bremse, DAKO, Oerlikon, Westinghouse, Charmilles ...
- Relay valve R, D, DS, DSS, DSV...
- Air brake valve DAKO BP, BS2, BSE...



**Complete brakes on the cars until two separate pilot valves and three brake cylinders with automatic load braking.**

# HAKAN S

Aluminum case serves as a working and transport cart. It is designed to work standing person. Inside are located: measuring unit **HAKAN3**, simulator of air brake valve **ESB3**, set of pressure **sensors**, including cabling and connecting hoses, laptop. In bottom space can be placed UPS battery if it is necessary. Casters have tires with the dimensions 3.00 x 4 ".



# HAKAN S

Hakan in train repair factory



# HAKAN 3

The basic unit HAKAN3 serves as an interface between pressure sensors and control computer. It is powered from an external source 230V/50Hz. Communication with the PC running WinXP or newer system is realized via USB serial port. The computer does not need any special hardware, it can be a standard laptop with installed application, based on development environment Control Web. HAKAN3 has 10 inputs with pressure range of 0 - 10bar. The sensors are connected using shielded cables optional length with the option of extension up to 20m. Pressure connections are addressed individually, usually by quick couplings. At the same time is recording the ambient temperature and barometric pressure. Sampling frequency is standardly 15bit with 10Hz resolution. Is it possible to connect other types of sensors, pressure sensors, e.g. sensor contact force, etc.

In this basic configuration can be tested air brake valves or braking systems on locomotives with its own control valve. Other systems must be supplemented by manual or manual or air brake valve.



# HAKAN 3

## BASIC TECHNICAL INFORMATION

▪ number of pressure inputs	10
▪ nominal pressure range	10 bar
▪ max. overpressure	20 bar
▪ accuracy	< 0,03 bar
▪ resolution	0,01 bar
▪ precision measuring time	0,1 s
▪ barometric pressure measuring range	800÷1200 mbar
▪ operating temperature range	0 ÷ +45°C
▪ supply voltage	230V/50Hz
▪ power requirement	max. 25VA
▪ protection	0,25A
▪ operated position	arbitrary
▪ protection	min. IP 2x
▪ dimensions	450 x 280 x 150 mm
▪ weight	ca 4 kg

# ESB 3

Electronic simulator of air brake valve ESB3 does not simulate just braking but it has two fully independent pressure outputs controlled by software. The first output generates pressures for the main brake pipe. This output can stabilize the pressure during changeable flow rate, create a rapid pressure changes, create linear pressure change with programmable steepness or create a stepped waveforms etc. There is a solenoid valve used for closing pipe during leak tests. The second pressure output serves mainly as simulator for braking under load, but may be also used for other applications. User has 2 independent relay contacts for his applications. Communication is again implemented via the USB interface. It is possible to use an internal USB hub, which is part of HAKAN3 unit. Without USB connection can operate this unit as a manually controlled double pressure source.

ESB3 is powered by 230V/50Hz and clean compressed air with a maximum pressure of 10 bar. All pressure connections are accomplished by quick couplings.

ESB3 does not need any software. It is automatically detected after connection to HAKAN3 unit and the main software controls output pressures in accordance with preprogrammed procedures.



# ESB 3

## BASIC TECHNICAL INFORMATION

▪ number of pressure outputs	2
▪ nominal pressure range	10 bar
▪ operating temperature range	0 ÷ +45°C
▪ supply voltage	230V/50Hz
▪ power requirement	max. 80VA
▪ protection	0,7A
▪ operating position	horizontal
▪ protection	min. IP 2x
▪ dimensions	450 x 320 x 150 mm
▪ weight	ca 11 kg

# CALIBRATOR

## System calibrator PMI-K 1000

Hakan device is fully software calibratable. Application software contains all necessary routines for calibration. The most effective method is to perform calibration using system calibrator PMI-K 1000. This independent device is calibrated in external certified laboratory and its accuracy is "transferred", directly in the workplace, to every pressure sensor. Calibration pressures are generated by ESB3 and computer reads the current value from the connected PMI-1000K and automatically converts all calibration constants. Whole calibration process and takes only a few tens of minutes.

On the top side of calibrator, is placed quick-coupling for pressure connection of a calibrated transmitter. Calibration protocol is automatically generated after finishing calibration.



# HAKAN M

## Fully mobile version

Hakan-M is a fully mobile interface that allows connection up to 8 pressure transmitters. These transmitters may be from the basic facilities HAKAN3 tester. The device connects via USB to a laptop and interface and all transmitters are powered from laptop battery! This HakanM operates with the same software as Hakan3, it means that operator need not to learn anything new.

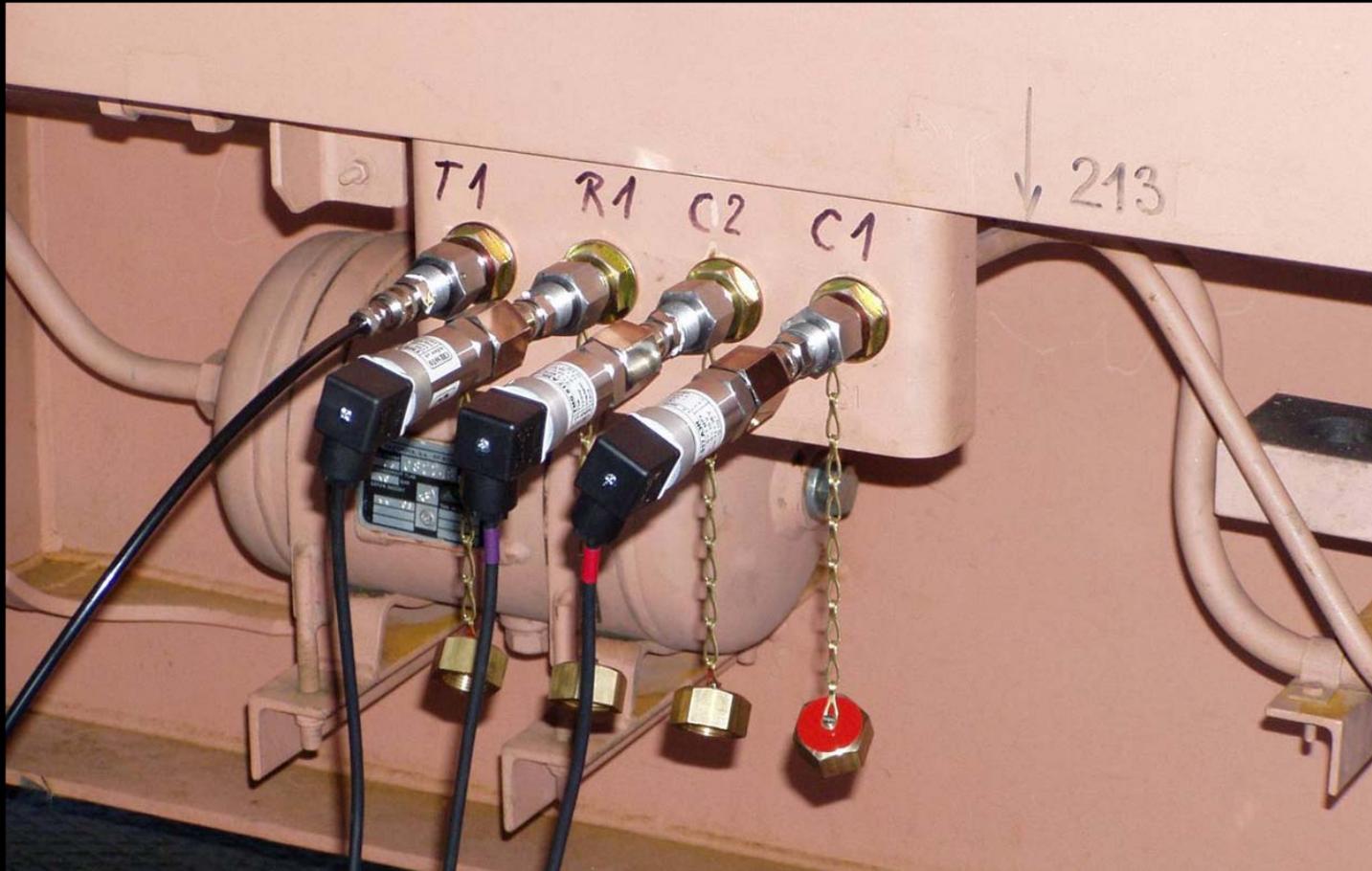
Aluminum case is an optional accessory.





# PRESSURE CONNECTORS

Diagnostic connectors on new types of cars



# SOFTWARE HAKAN

## Basic screen

**Testování brzd**

**HAKAN 3** 6.32 **ESB** Datum **29. 3. 2005** Teplota **25.5 °C** Kal: 4.9.2004  
 Čas **13 : 01 : 17** Atm. tlak **1045.9 mbar** PV **00.0** sekundy **NULL** **bar**

Pracoviště	Cressto	Brzdový válec B	5	Brzdový válec A	4	Pomocný vzduchojem 1	3	Hlavní potrubí	2	Prívodní potrubí	1
Měřicí jednotka	7	<b>0.00</b>	Sn5	<b>0.00</b>	Sn4	<b>0.00</b>	Sn3	<b>0.00</b>	Sn2	<b>0.00</b>	Sn1
Pracovník	Korvičný	Brzdový válec C	6	Simulace ložení	7	Pomocný vzduchojem 2	8	Rídicí vzduchojem 1	9	Nevyužito	10
Předmět	Vůz nákladní	<b>0.00</b>	Sn6	<b>0.00</b>	Sn7	<b>0.00</b>	Sn8	<b>0.00</b>	Sn9	<b>0.00</b>	Sn10
Typ	Sggrss										
Specifikace	9-576.0										

Auto | Manuel | Diag

- Vyplnění hlaviček protokolu
- Zápis údajů
- Zápis přístrojů
- Identifikace vozu
- Identifikace přídavných ventilů
- Identifikace snímačů zatížení
- Identifikace brzdových válců
- Identifikace stavěcí zdrži
- Vizuální kontrola brzdy
- Přestavení přestavovače O-N
- Plnění brzdového systému
- Těsnost v odbrzděném stavu
- Těsnost v zabrzděném stavu
- Těsnost rozvod. vzduchojemu
- Kontrola stavěče zdrži
- Zdvih pístů BV
- Tlak od snímače ložení
- Brzdění osobní - prázdný
- Přestavení přestavovače O-N
- Brzdění nákladní - prázdný
- Brzdění nákladní - ložený
- Přestavení přestavovače O-N
- Brzdění osobní - ložený
- Zkouška samoč. odbrzďovače
- Zkouška odstranění přebíhání

P [bar]

6.0

4.0

2.0

0.0

0.0 10 20 30 40 50 t [s]

Schema Graf

Start Stop

Měření Grafy Protokol Kalibrace Návod

Tlačítkem START spustí celý test nebo stiskem CTRL + kliknutím na řádek v postupu spustí jeden úkon

CELKOVÉ HADNOCENÍ

CRESSTO

# SOFTWARE HAKAN

## Basic screen

The application program serves to measure, evaluate and conversion of input pressures and their time waveforms. Obtained data are compared with required values and then published in measuring reports. It is possible to archive only these reports or complete reports with tables include their graphical statement. All measured data are displayed on digital displays, some measurements results are presented on the graphical video display device and everything is visible on the screen of connected PC. The test procedure is controlled by the user "Program", which is defined by following the pre-programed parameters. These parameters are saved into the simple tables, stored in separated files, these can be prepared in another computer and than copy to other HAKAN testing devices. These are created in simple tables, stored in separate files that can be prepared on a different computer and then copied to all testing stations Hakan. Before the test begins, operator selects from drop-down menu the appropriate "program". Each task can be started independently, repeatedly, process of the test can be simulated on a computer without conected hardware. Preprogrammed operations like etc. braking, leakage, fulfilling, sensitivity, numbness etc. Qualified user can insert required operation into the table and it changes parameters - pressure, time, tolerance for assessment, binding to pattern protocol etc.. Pattern protocol can be create by user, values are inserting automaticly.

# REMOTE CONTROL

## Remote control via smartphone

As an additional equipment to the system HAKAN is ready remote control using PDAs, smart phones or tablets with a WiFi interface. It is very helpful for vehicle repairs, at identification of problem or at testing brakes under the car. These procedures usually require two person, but with remote control only one. Remote control is also very effective at inserting identification entries about car and brake components in to the brake test protocol. Braking test can be also continuously monitored via remote control on its display.



# SIGNAL BEACON

## Beacon to signal the process status

The signal beacon is the complement of system Hakan, which increases measurement productivity and whole testing process comfort. The device connects via USB port independently. It informs operator, through changes colors of light, during the test or highlights the need for operators intervention. Thanks color light from beacon, which is visible from a long distance, the operator may not constantly keep an eye on screen and may also carry out other tasks.



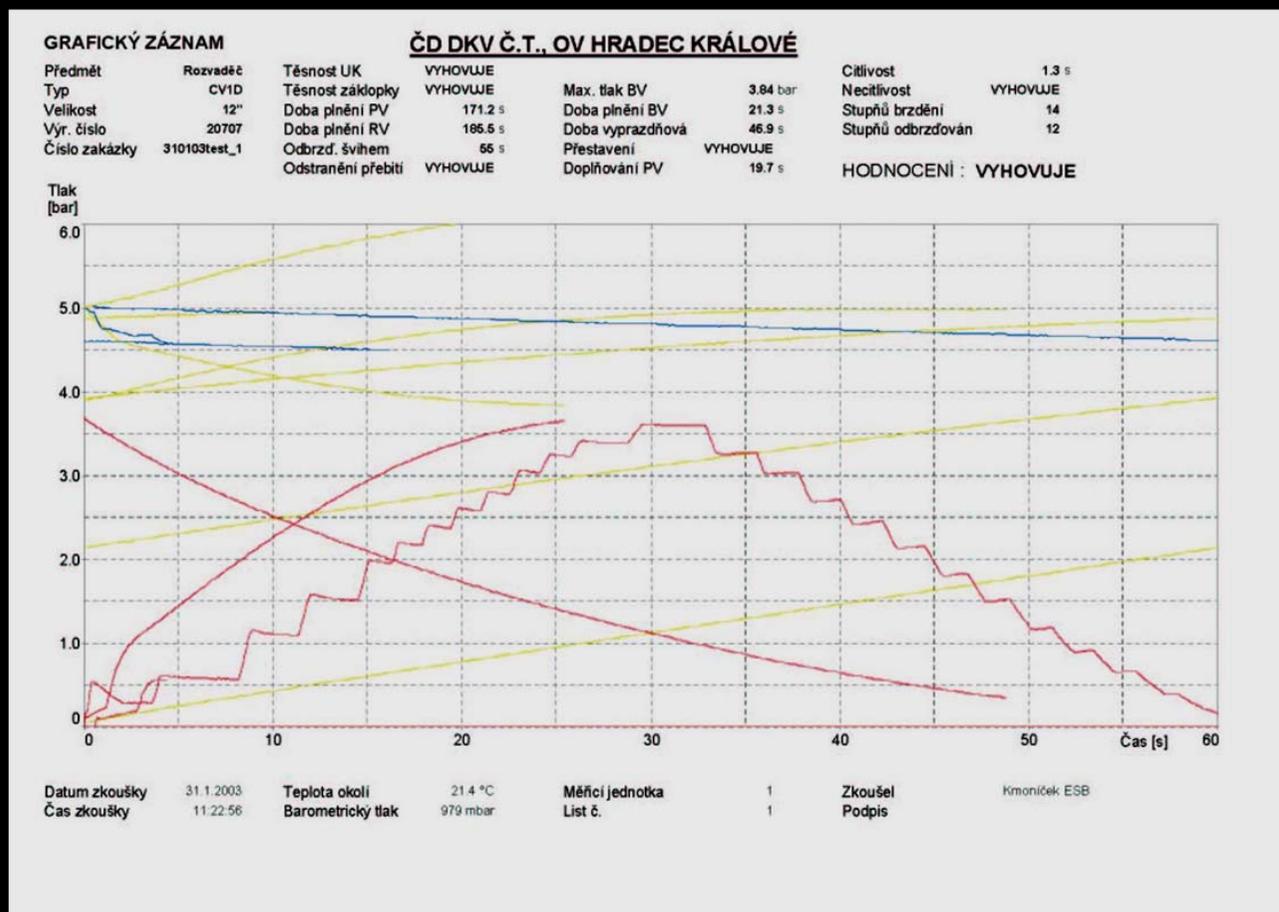
# SYSTEM HAKAN

## Example of protocol

						
Typ vagóna : Wagentyp:  <b>Sdggmrss</b>	<b>MERACÍ LIST BRZDY</b> <b>MESSBLATT BREMSE</b>			Číslo výkresu : Zeichnungsnummer :	<b>1816-0183</b>	
				List - Blatt :	<b>1/2</b>	
				Datum - Datum :	<b>03.09.24</b>	
Číslo vagóna : Wagennummer :	Kontrolný záznam (Dátum/Meno) : Kontrollvermerk (Datum/Name) :					
Kontrolór : Prüfer :	Zmocnenec kvality Tatravagónka : Qualitätssicherung Tatravagónka :					
Zmocnenec kvality Cideon : Qualitätssicherung Cideon :	Spracované : Freigabe :		<b>ing. J.Kubičko 03 09 24</b>			
			Článok A Wagen A	Článok B Wagen B		
Číslo rozvádzača : Nummer Steuerventil :						
			Podvozok A Drehgestell A	Podvozok B Drehgestell B	Podvozok C Drehgestell C	
Číslo prídavného ventilu : Nummer Regelbares Lastbremsventil :						
Číslo nastavovača z drži : Nummer Bremsgestangesteller :						
Číslo brzdového valca : Nummer Bremszylinder :						
Číslo pomocného vzduchojemu : Nummer Hilfsluftbehälter :	125	100	125	I		
<b>ČN</b>	<b>Pomenovanie</b>	<b>Benennung</b>	<b>Má byť</b>	<b>Soll</b>	<b>Je</b>	<b>Ist</b>
<b>1</b>	Úplnosť dielov brzdy	Vollständigkeit der Bremsstelle				

# SYSTEM HAKAN

## Example of graphic record



# SYSTEM HAKAN

## References

▪ <b>České dráhy Hradec Králové</b>	<b>CZ</b>	pilot valves, valves, freight cars
▪ <b>České dráhy Plzeň</b>	<b>CZ</b>	pilot valves
▪ <b>České dráhy Česká Třebová</b>	<b>CZ</b>	air brake valves
▪ <b>České dráhy Olomouc</b>	<b>CZ</b>	pilot valves, air brake valves, valves, cars
▪ <b>ČD Cargo Nymburk</b>	<b>CZ</b>	freight cars
▪ <b>ZSSK Cargo Bratislava</b>	<b>SK</b>	5x, freight cars
▪ <b>Ostravské opravny a strojírny</b>	<b>CZ</b>	4x, pilot valves, valves, cars
▪ <b>Ryko Děčín</b>	<b>CZ</b>	freight cars for DB, VPI, SNCF
▪ <b>Tatravagónka Poprad</b>	<b>SK</b>	2x, freight cars
▪ <b>Vagónka Trebišov</b>	<b>SK</b>	freight cars
▪ <b>Metrans Praha</b>	<b>CZ</b>	freight cars
▪ <b>Dyko Kolín</b>	<b>CZ</b>	2x, freight cars
▪ <b>SD kolejová doprava</b>	<b>CZ</b>	freight cars
▪ <b>CZ Loko Česká Třebová</b>	<b>CZ</b>	4x, locos
▪ <b>Legios Louny</b>	<b>CZ</b>	freight cars
▪ <b>KOS Krnov</b>	<b>CZ</b>	pilot valves, valves, cars
▪ <b>ČD Cargo Praha</b>	<b>CZ</b>	10x freight cars