# WAYSIDE ROLLING STOCK DIAGNOSTIC AND MONITORING AKRO





**AKRO** is a comprehensive solution for an intelligent rolling stock diagnostics and monitoring system

- Modular wayside diagnostic equipment (checkpoint and station equipment)
- Flexible and multi-level centralization for monitoring

HBD – Hot Box Detection
HWD – Hot Wheel Detection
DED – Dragging Equipment Detection
AVI – Automatic Vehicle Identification
WDD – Wheel Defect Detection
WIM – Weighing In Motion



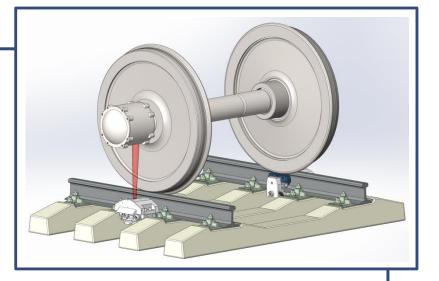
#### **AKRO basic function:** Hot Box Detection (HBD)



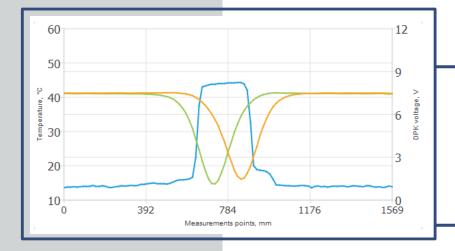
#### Hot Box Detection (HBD)

Bearing defects and brake system failures are the most common rolling stock failures. However, they are dangerous and can lead to derailment of the train.

Economic losses from such incidents can reach millions of euros.

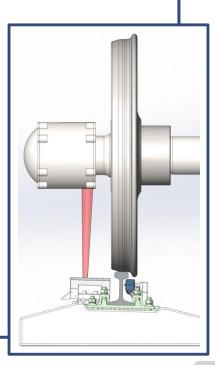


HBD function is used for checking the Axle Box heating due to bearing fail.



AKRO allows the operator to view the temperature profiles of each axle box\*. This feature helps to minimize the waste of resources on false positive alarms/warnings.

\*only temperature profiles where alarm or warning were recorded are stored on a long-term basis.



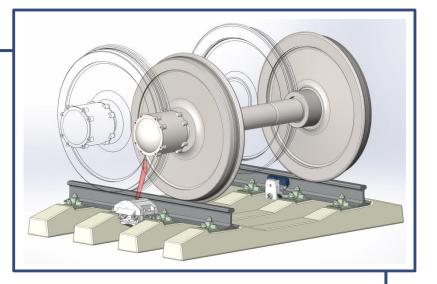
#### **AKRO basic function:** Hot Wheel Detection (HWD)



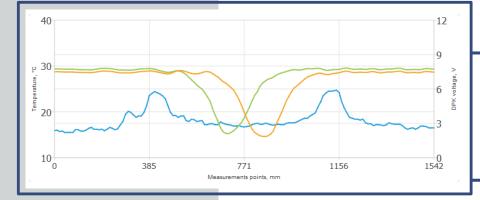
#### Hot Wheel Detection (HWD)

Another rolling stock issue is a brake system failure (jamming or wearing out of the pads). If the brake pads are jammed, they wear out quickly and increase fuel/energy consumption for traction. In some cases, significant heating of the wheel rim can be a fire hazard.

AKRO allows you to measure the temperature in the rim area, the area that heats up the most when the brakes are stuck.

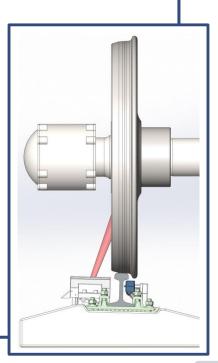


**HWD function** is used for checking Wheel Disk heating due to jammed brake pads.

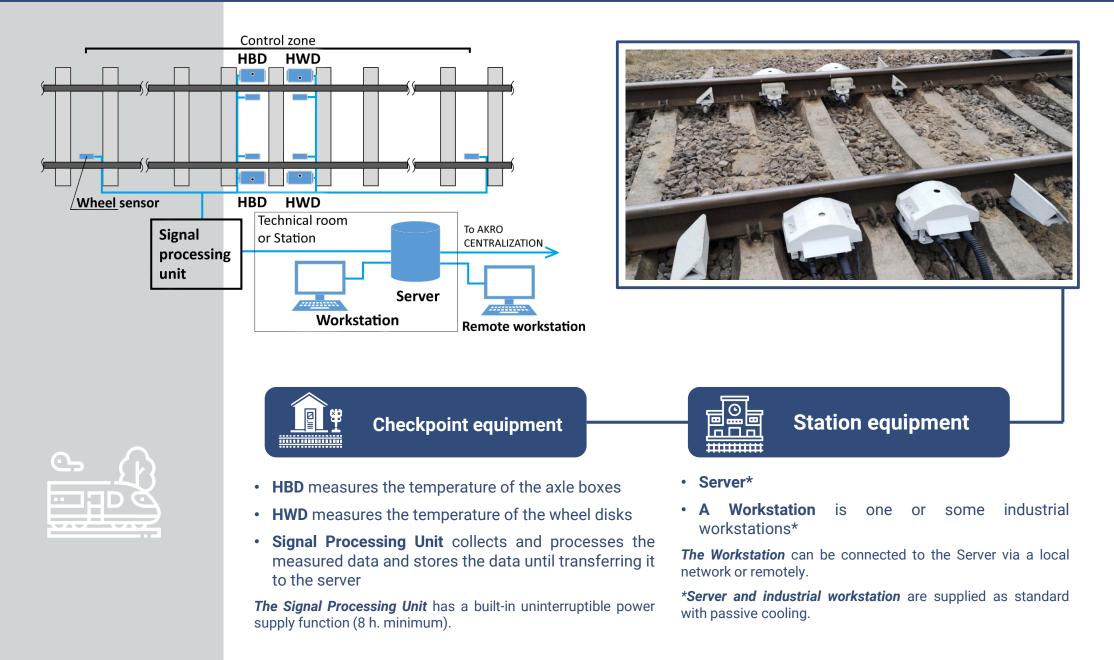


AKRO allows the operator to view the temperature profiles of each wheel disk\*. This feature helps to minimize the waste of resources on false positive alarms/warnings

\*only temperature profiles where alarm or warning were recorded are stored on a long-term basis.



### **AKRO checkpoint and station equipment**





AKRO-B software - an intelligent diagnostic tool

**AKRO-B** allows the station dispatcher to operate up to 4 sets of AKRO checkpoint equipment at one workstation



AKRO-C software - an intelligent monitoring (centralization) tool

**AKRO-C** allows you to build a centralization system for servicing a railway section, regional or national railway



#### **AKRO-B software for stations**

LPK-	7 km Ozł	nidiv - Krasne		LPK-2	1420 km Zo	lochiv-Krasne-Kozł	hanka-Pop	LP	<b>K-3</b> 143	37 km Zadv	virya - Kras	sne
15.07.2024 50 km/h	16:34:1	15	0 °C freight	15.07.202	4 1	6:06:44	0 °C	15.07.202 57 km/h	24	16:34:16		0 °C freight
2+53			Waiting for the train			2+51			Al-1 <sup>A</sup>			
										52 5 10 <b>2</b>	0	
Information				Information > Train	E № 21* (2+51)			Information > Trai	in: NP 86* (2+51)			
Time Nº * Ur	its Type	Alarm	5	Information	Summary Speed chi		Wheel discs	Information	Summary Sp	eed chart Diagno		
5.07 15:11 24* 24	53 freight						Show only faulty units					Show only faulty
5.07 15:39 45* 24				52 PI	atform 13-266, 13-292,	13-4085-хк, 13-5001, 13 АІ-	1 🔺	52 P	latform 13-266, 13	8-292, 13-4085-xx, 1	3-5001, 13 🚺	N-1
5.07 16:06 65* 24				Axis	Left	Right		Axis	Left		Right	
5.07 16:34 85* 24	-			1	23.1 °C	22.5 °C		1	23.1 °C		22.5 °C	
5.07 10.54 65" 24	55 Height			2	28.3 °C 20.1 °C	44.2 °C Al-1 18.5 °C		2	28.3 °C 20.1 °C		44.2 *C AI-1 18.5 *C	
				4	20.6 °C	18.9 °C		4	20.1 °C		18.9 °C	_
				5 PI		13-4085-xx, 13-5001, 13 Al-		5 P		-292, 13-4085-xx, 1		N-0
				Axis	Left	Right		Axis	latform 13-200, 13	-292, 13-4085-XX, 1	Right	-0
				1	24.9 °C	20.9 °C		1	24.9 °C		20.9 °C	_
				2	44.1 *C AI-0	25.4 °C		2	44.1 °C A	.I-O	25.4 °C	
				3	22.9 °C	22.4 °C		3	22.9 °C		22.4 °C	
				4	25.0 °C	45.3 *C AI-0		4	25.0 °C		45.3 °C AI-0	
				10 PI	atform 13-266, 13-292,	13-4085-хх, 13-5001, 13 🚺	0	10 P	latform 13-266, 13	I-292, 13-4085-xx, 1	3-5001, 13 🚺	N-0
UDIT-1.1	KIR UDIT-2.1 KI	R		Axis	Left	Right	_		UDIT-1.1 KIR	UDIT-2.1 KIR		
DPK NZ 1 UDIT-1.1	DPK UDIT-2.1 DF	K DPK KZ 1	UNO	1	34.3 °C 45.3 °C AI-0	39.9 °C 34.7 °C	-	DPK NZ 1	UDIT-1.1 DPK	UDIT-2.1 DPK	OPK KZ 1	UNO
		_		2	45.3 C AI-0 22.1 °C	34.7 °C	-					4
DPK NZ 2 UDIT-1.2	UDIT-2.2 DF	VK DPK KZ 2		4	23.6 °C	22.3 °C		DPK NZ 2	UDIT-1.2 DPK	UDIT-2.2 DPK	DPK KZ 2	
UDIT-1.2		R	LOC	20 0	atform 12 266 12 202	13-4085-yy 13-5001 13.	•			UDIT-2.2 KIR		LOC
			;= @ =		10/10/11.70x 11.707	18 <del>4</del>		· · · · · · · · · · · · · · · · · · ·		·	12	

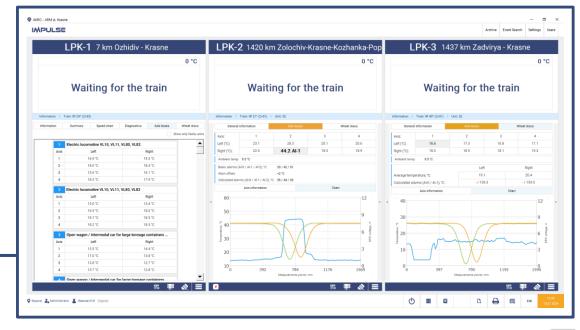
AKRO-B allows the operator to get:

- Information about trains (in real time or those that have passed earlier):
- Status of check-point equipment.

Possibility to view all measured temperature profiles (axle boxes and wheel disks).

Temperature profiles include both temperature data and signals from wheel sensors. This combination allows to quickly and adequately evaluate the primary measurement data if necessary.





### **AKRO-C centralization software**

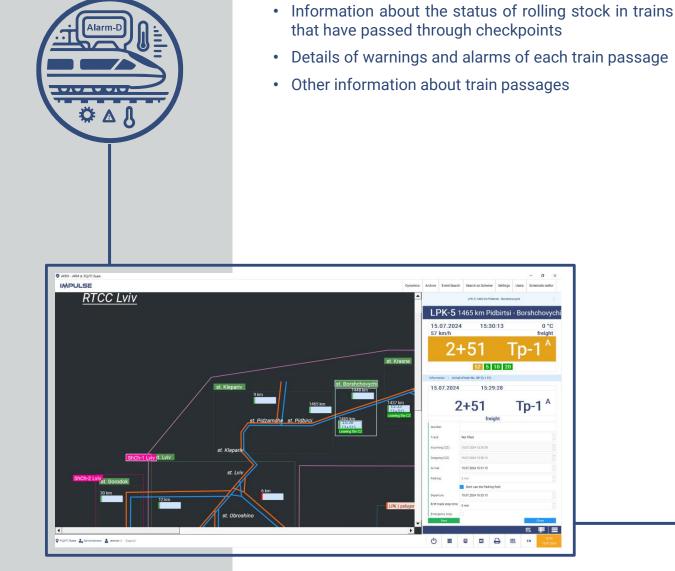
about

the

situation,

information

notifications of warnings and alarms:



Operational

	LPK-5 1465 km Pidbirtsi - Borshch	novychi >				
LPK-5 1465 km Pidbirtsi - Borshchovych						
15.07.2024 15:30:13 0 57 km/h freig						
2-	+51 7	<b>Гр-1</b> <sup>^</sup>				
	52 5 10 20					
Information > Arriva	l of train No. 38* (2 + 51)					
15.07.2024 15:29:28						
2+51 Tp-1 <sup>A</sup>						
-	freight	i Pi				
Number:						
		·P ·				
Number:	freight					
Number: Track:	freight Not filled					
Number: Track: Incoming (CZ):	freight Not filled 15.07.2024 15:29:28					
Number: Track: Incoming (CZ): Outgoing (CZ):	freight           Not filled           15.07.2024 15:29:28           15.07.2024 15:30:13					
Number: Track: Incoming (CZ): Outgoing (CZ): Arrival:	freight           Not filled           15.07.2024 15:29:28           15.07.2024 15:30:13           15.07.2024 15:31:13					
Number: Track: Incoming (CZ): Outgoing (CZ): Arrival:	freight           Not filled           15.07.2024 15:29:28           15.07.2024 15:30:13           15.07.2024 15:31:13           2 min					
Number: Track: Incoming (CZ): Outgoing (CZ): Arrival: Parking:	freight           Not filled           15.07.2024 15:29:28           15.07.2024 15:30:13           15.07.2024 15:31:13           2 min           Don't use the Parking field					
Number: Track: Incoming (CZ): Outgoing (CZ): Arrival: Parking: Departure:	freight         Not filled         15.07.2024 15:29:28         15.07.2024 15:30:13         15.07.2024 15:31:13         2 min         Don't use the Parking field         15.07.2024 15:33:13					

### **AKRO-C centralization software**

		Dy	namics				
> Search filters							
Time	LPK	Train number	Туре	*	Number (in train)	Δ	•
15.07.2024 14:56:42	12 km Mshana	15*	Platf 13-266,	Al-1(A:1)	52	0.00/0.00	
15.07.2024 14:56:42	12 km Mshana	15*	Platf 13-266,	AI-0(A:1)	20	0.00/0.00	
15.07.2024 14:56:42	12 km Mshana	15*	Platf 13-266,	AI-0(A:1)	10	0.00/0.00	
15.07.2024 14:56:42	12 km Mshana	15*	Platf 13-266,	AI-0(A:2)	5	0.00/0.00	
15.07.2024 14:59:42	1465 km Pidbir	17*	Platf 13-266,	AI-0(A:2)	5	0.00/0.00	
15.07.2024 14:59:42	1465 km Pidbir	17*	Platf 13-266,	Al-1(A:1)	52	0.00/0.00	
15.07.2024 14:59:42	1465 km Pidbir	17*	Platf 13-266,	AI-0(A:1)	20	0.00/0.00	
15.07.2024 14:59:42	1465 km Pidbir	17*	Platf 13-266,	AI-0(A:1)	10	0.00/0.00	
15.07.2024 15:02:42	1437 km Zadvir	19*	Platf 13-266,	Al-1(A:1)	52	0.00/0.00	
15.07.2024 15:02:42	1437 km Zadvir	19*	Platf 13-266,	AI-0(A:1)	20	0.00/0.00	
15.07.2024 15:02:42	1437 km Zadvir	19*	Platf 13-266,	AI-0(A:1)	10	0.00/0.00	
15.07.2024 15:02:42	1437 km Zadvir	19*	Platf 13-266,	AI-0(A:2)	5	0.00/0.00	
15.07.2024 15:08:42	9 km Krasne	23*	Platf 13-266,	Al-1(A:1)	52	0.00/0.00	
15.07.2024 15:08:42	9 km Krasne	23*	Platf 13-266,	AI-0(A:1)	20	0.00/0.00	
15.07.2024 15:08:42	9 km Krasne	23*	Platf 13-266,	AI-0(A:1)	10	0.00/0.00	
15.07.2024 15:08:42	9 km Krasne	23*	Platf 13-266,	AI-0(A:2)	5	0.00/0.00	
15.07.2024 15:11:42	36 km Zabolo	25*	Platf 13-266,	AI-0(A:1)	10	0.00/0.00	_
15.07.2024 15:11:42	36 km Zabolo	25*	Platf 13-266,	AI-0(A:2)	5	0.00/0.00	
15.07.2024 15:11:42	36 km Zabolo	25*	Platf 13-266,	AI-1(A:1)	52	0.00/0.00	
15.07.2024 15:11:42	36 km Zabolo	25*	Platf 13-266,	AI-0(A:1)	20	0.00/0.00	
15.07.2024 15:14:42	68 km Radiv	27*	Platf 13-266,	AI-1(A:1)	52	0.00/0.00	
15.07.2024 15:14:42	68 km Radiv	27*	Platf 13-266,	AI-0(A:1)	20	0.00/0.00	
15.07.2024 15:14:42	68 km Rodiv	27*	Platf	AI-0(A:1)	10	0.00/0.00	•
Previous		1		2		Next	

Access to detailed information about the condition of the train and AKRO equipment at checkpoints:



Date and time of train passage



Number of rolling stock/axles in the train



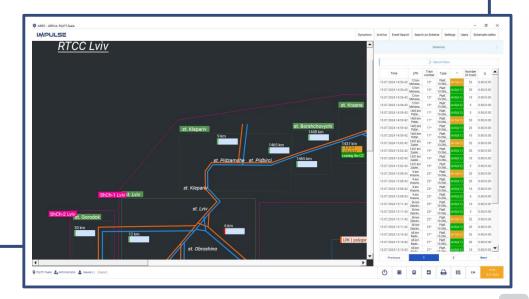
Train warnings and alarms



Condition of the AKRO checkpoint equipment

Online monitoring tool

Flexible train search filter: by date, by checkpoint, by specific warnings or alarms, etc.

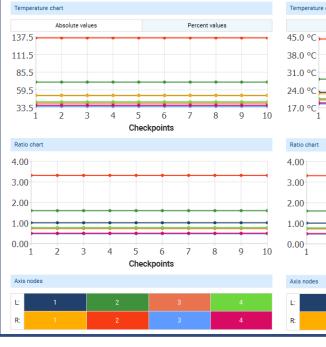


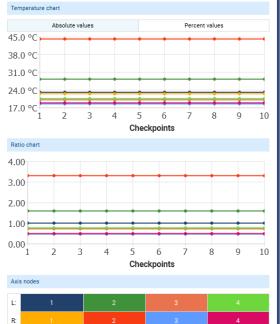


#### Monitoring of rolling stock condition changes in dynamics:

- · Computer-aided analysis of Axle Box heating
- · Computer-aided analysis of Wheel heating
- Computer-aided analysis of other parameters (programmable)

It allows you to visualize temperature changes in absolute values, percentages and coefficients in the form of graphs





#### **Technical specification:**

Train Speed	1 to 350 km/h
Bearing Temperature	up to +120°C
Wheel/Brake Temperature	up to +600°C
Temperature Measurement Accuracy:	
• Axle Box (Bearing)	±2°C
• Wheel/Brake	±2°C / 5%
IP Class of Sensors	IP53
Operating Temperature	-45 to +65°C (+55°C long-term operation)
Average Lifetime	15 years
Alarm Signaling time	5 sec. max





More than 40 sets of AKRO with HBD & HWD functions are operating on national public railways on the JSC "Ukrainian railways".



Another 180 AKRO's (HBD & HWD) have been contracted for installation by the end of 2025.



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