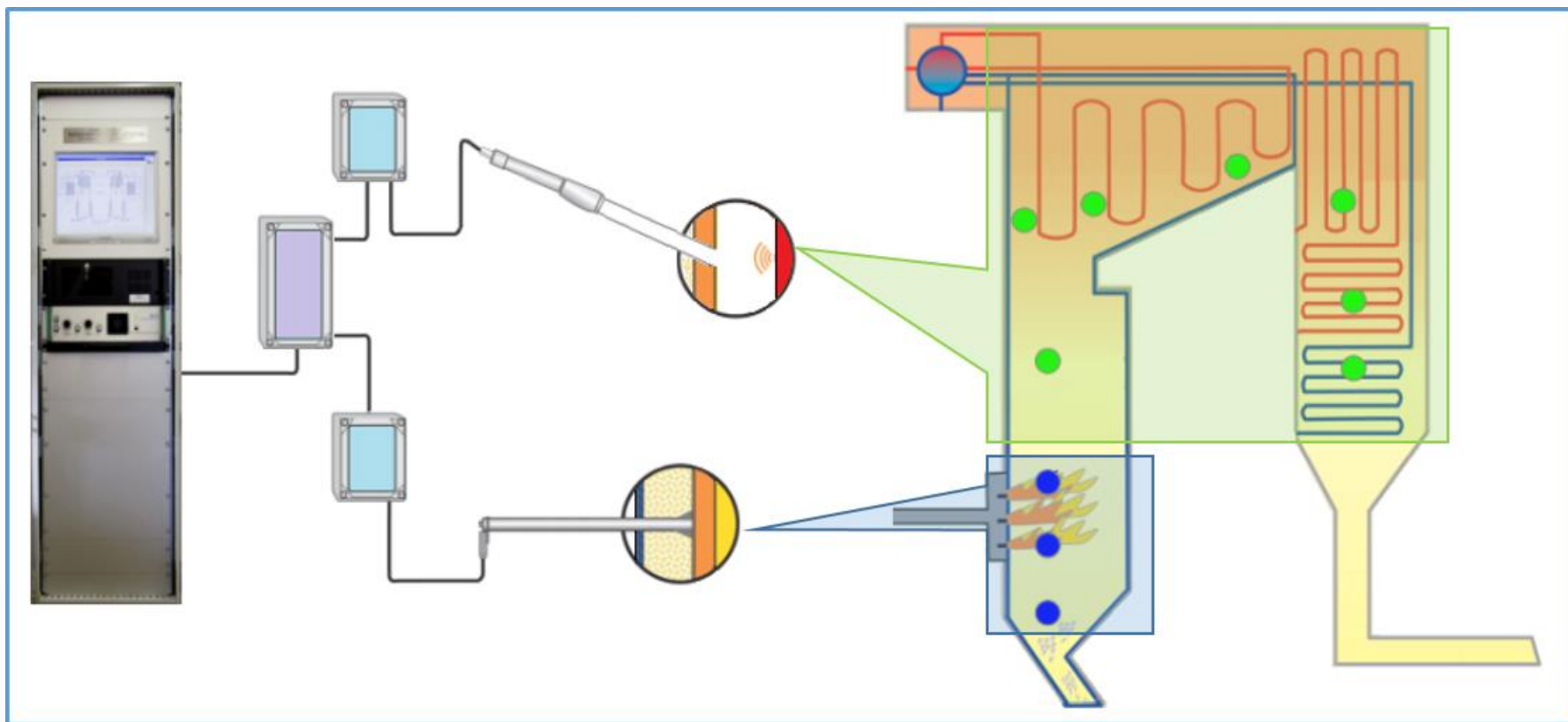


P E N T O L

PLDS - PENTOL LEAK DETECTION SYSTEM

THE SYSTEM FOR EARLY STAGE STEAM LEAK DETECTION IN POWER BOILERS

PENTOL LEAK DETECTION SYSTEM



What is the PLDS?

PLDS has been designed to detect leaks which occur on the walls of the power boilers.

This system comprises airborne acoustic and/or structure borne sensors. Their type and quantity depends on site conditions.

Supplier of the site equipment is **Procon Engineering LTD** - world leader in this kind of instruments.

Pentol-Enviro Polska Sp. z o.o. is an integrator of the system + supplies their own system for data acquisition and visualization.

WHAT DOES THE SYSTEM COMPRISE OF?



- **ACOUSTIC SENSORS AND WAVEGUIDES**
- **STRUCTURE BORNE SENSORS AND WAVEGUIDES**
- **HEAD AMPLIFIER FOR BOTH SENSOR TYPES**
- **JUNCTION BOX**
- **DATA ACQUISITION SYSTEM**
- **OPTIONAL REMOTE STATION**

WHAT DOES THE SYSTEM COMPRISE OF?



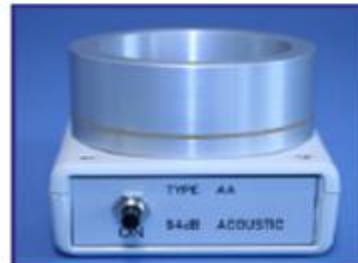
Air Borne (Microphone) Assembly



Structure Borne Assembly



Loudspeaker Unit

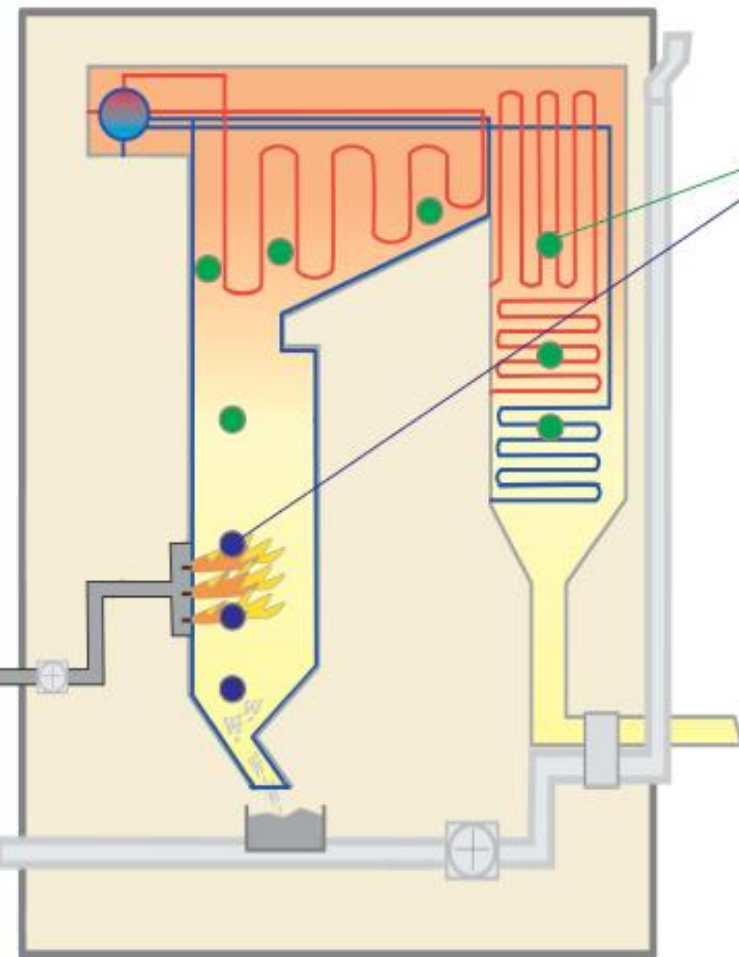


Portable Sensor Calibrator



PLDS Data Acquisition System

WHAT DOES THE SYSTEM COMPRISE OF?



Dots show typical sensor positions. Please note all our systems are designed specifically to meet your plant requirements



Airborne Sensor



Structure-borne Sensor



Airborne Sensor



Structure-borne Sensor



Data Acquisition System

WHAT WILL THE LEAK DETECTION SYSTEM TELL ME?



- When you have an increase in noise level
- If that increase is actually a leak
- The rate at which the leak is getting bigger
- Where the leak may be located
- The true noise level of the leak
- It is an early warning system that alerts you as soon as the leak occurs

BENEFITS



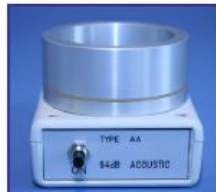
Air Borne (Microphone) Assembly



Structure Borne Assembly



Loudspeaker Unit



Portable Sensor Calibrator



T96XP Data Acquisition System

- Early warning of a small boiler tube leak can prevent expensive secondary damage and unscheduled outages.
- Increased availability, reduces repair time, and increases plant efficiency.
- Planned and scheduled orderly shutdown of a boiler at the most convenient time.
- An increase in boiler availability will significantly contribute to the ROI of a leak detection system.
- Safeguards large capital investments.
- Increased operating profits by reducing Financial Penalties.
- Contributes toward on site personnel safety

Other benefits include the detection of abnormal boiler operating conditions, for example: *the incorrect operation of soot blowers, inspection ports being left open, and steam leaks external to the boiler.*

HOW MANY SENSORS WOULD I NEED TO LISTEN TO MY BOILER?



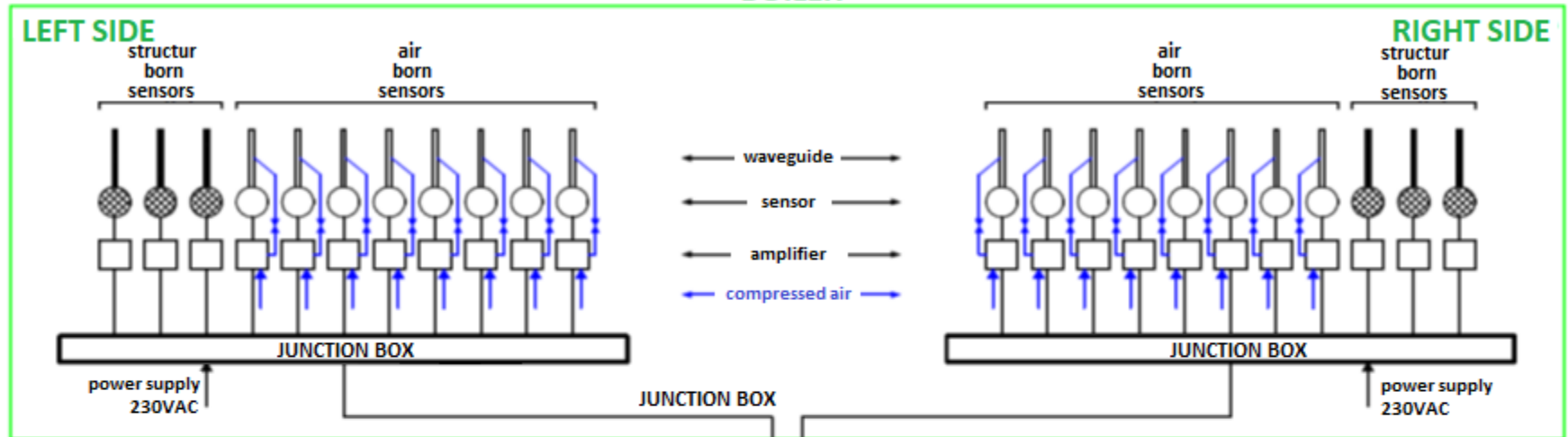
This will depend upon:

- The size of your boiler
- The type of boiler
- The internal construction
- The working parameters
- Where you have had known leaks
- Where you anticipate leaks 'may' occur

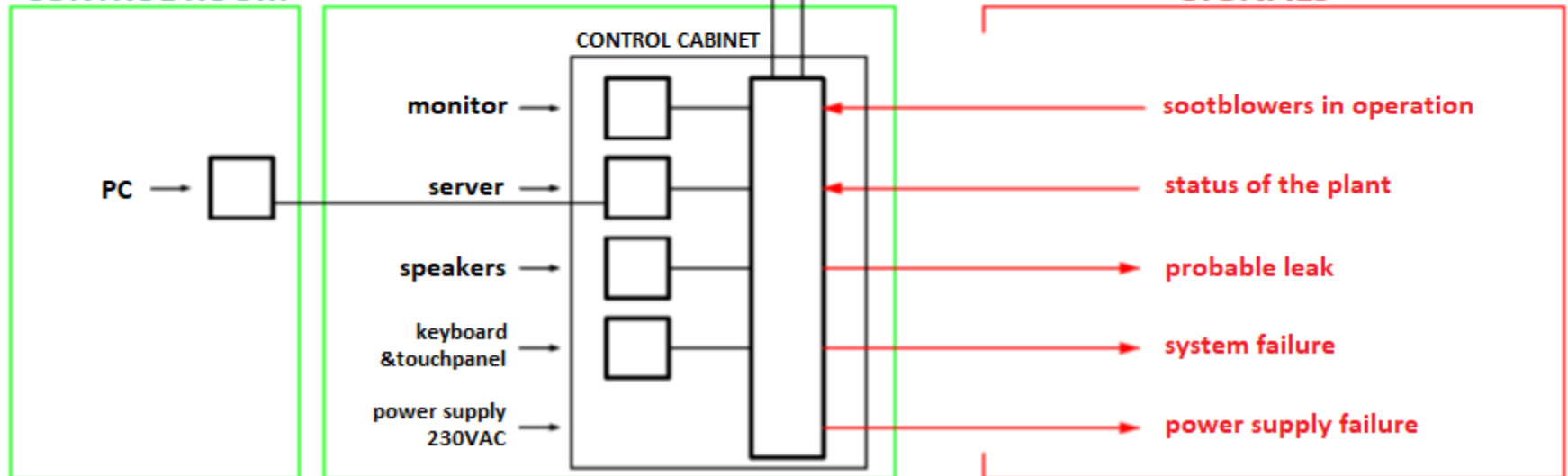
No worries, we will help you to select proper quantity!

TYPICAL APPLICATION - DIAGRAM

BOILER



CONTROL ROOM



AIRBORNE ACOUSTIC SENSORS



This type continuously monitors the internal noise of the boiler using a special microphone and signal process head amplifier.

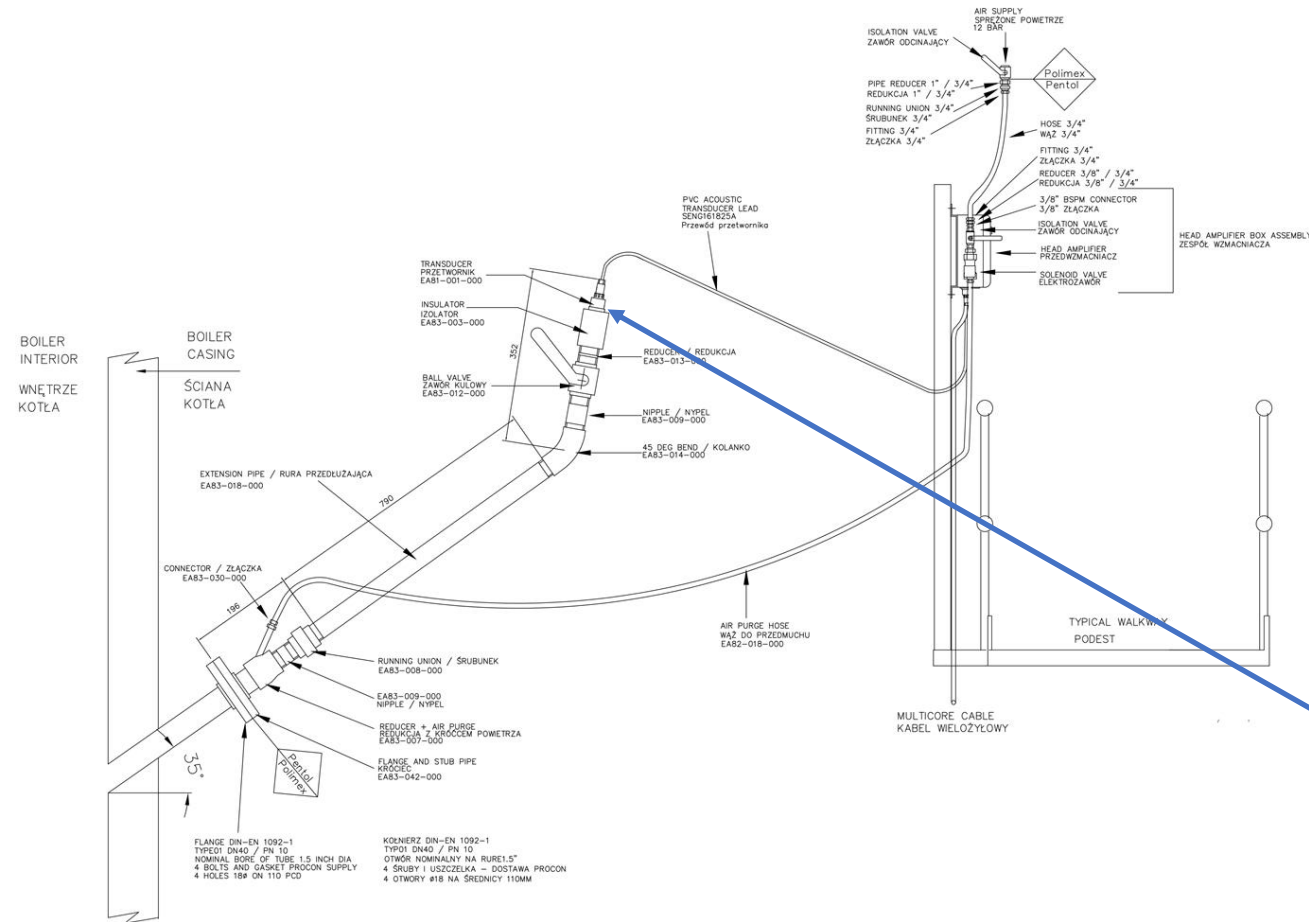
The system has a wide frequency band and when calibrated can provide both leak detection and leak location between similar channels.

This type of detector may require a hole in the water-wall web, dependant on installation.

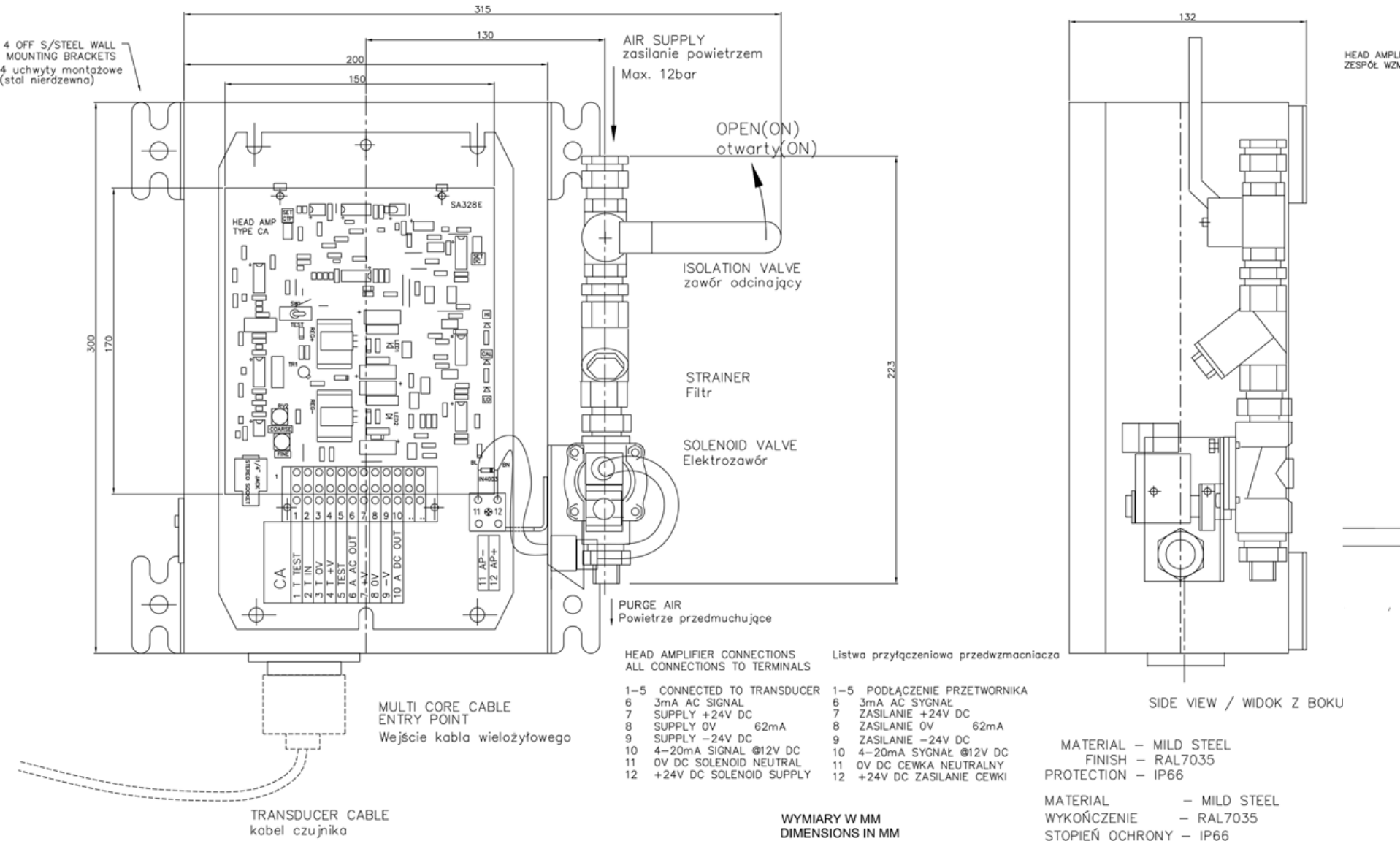
This version consists of the following components:

- **Tubular Waveguide with Heat Insulator**
- **Can be supplied with or without air purge**
- **Transducer and Lead**
- **Head Amplifier**
- **The output is 4 to 20mA dc covering the range of 54 to 114dB (1000:1 ratio).**

AIRBORNE ACOUSTIC SENSORS WAVE GUIDES WITH AIR PURGE



AIRBORNE ACOUSTIC HEAD AMPLIFIER WITH AIR PURGE



STRUCTURE BORNE SENSORS

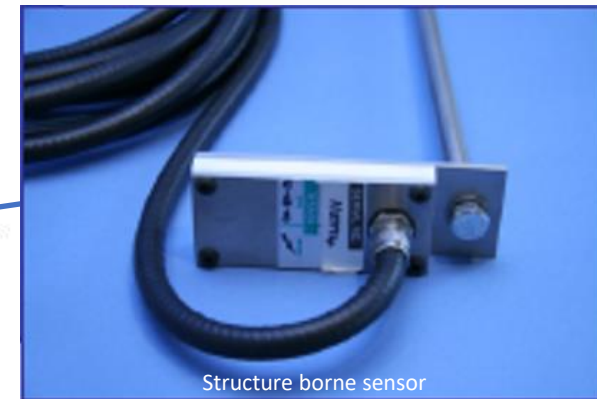
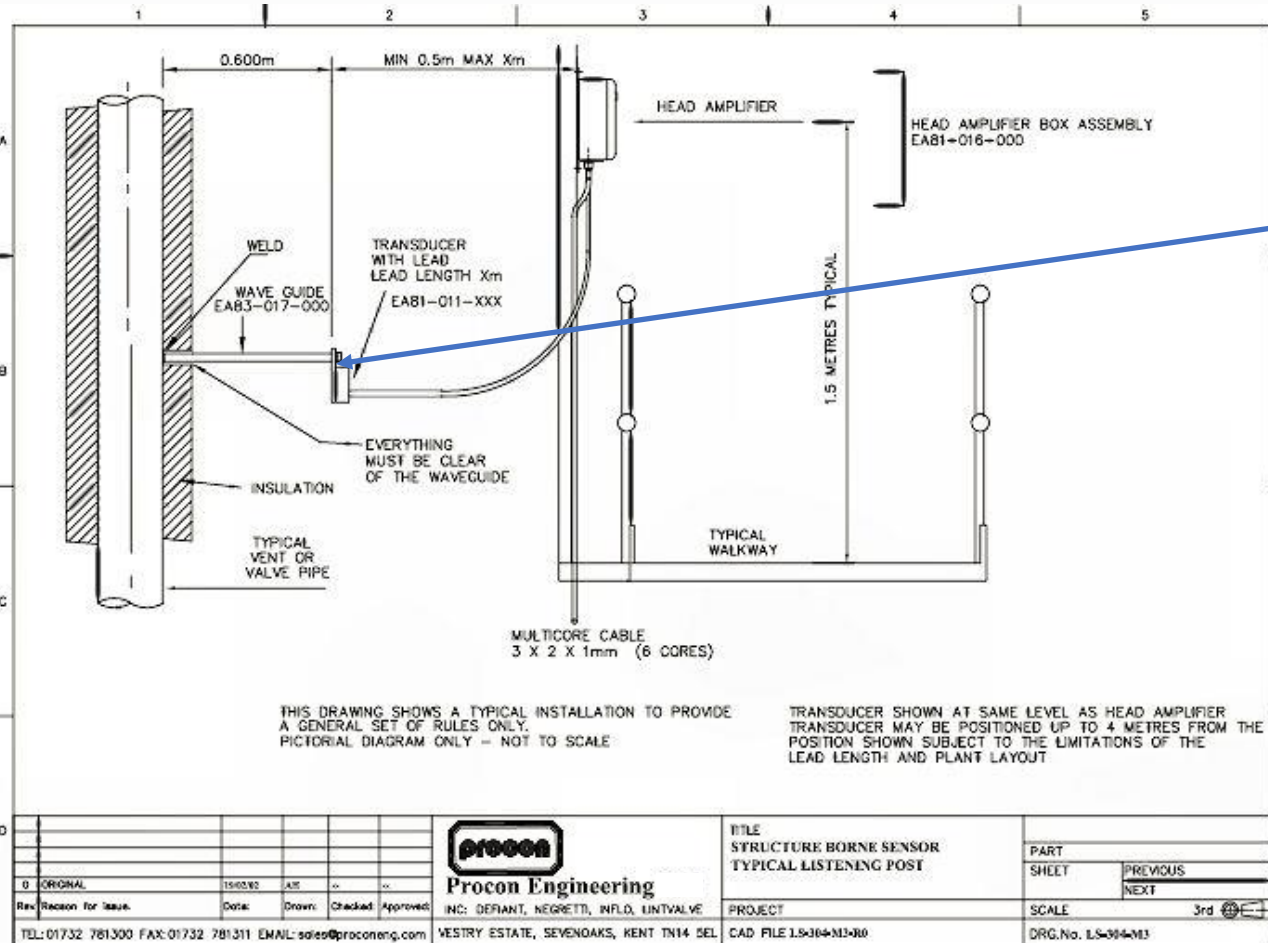


This type continuously monitors the vibration in the structure of the boiler that is created by a leak within the boiler. It uses a special transducer and signal processing head amplifier, and is easy to fit to the outside of a water-wall.

This version consists of the following components:

- **Solid Waveguide attached to the outside of the boiler**
- **Transducer and Lead**
- **Head Amplifier**
- **The output is 4 to 20mA dc covering a nominal range of 40dB (100:1 ratio).**

STRUCTURE BORNE SENSORS



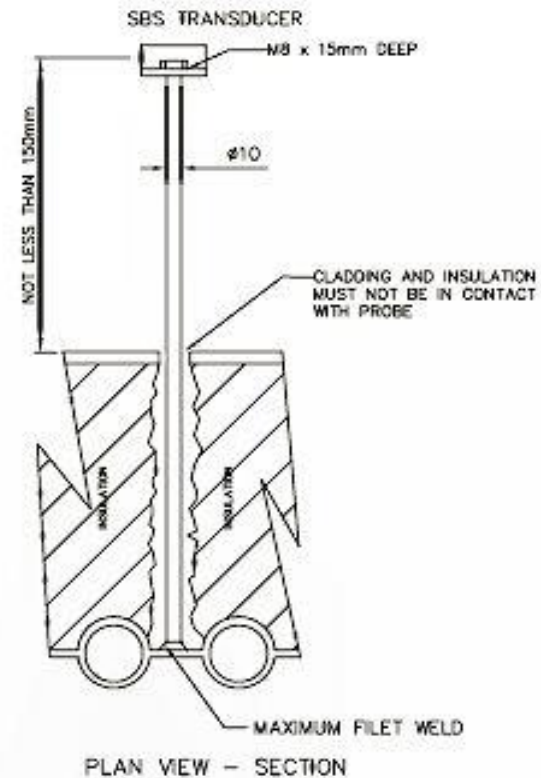
STRUCTURE BORNE SENSORS INSTALLATION GUIDE

STRUCTURE BORNE WAVEGUIDE INSTALLATION

1. Remove boiler metal cladding (sheathing) and insulation as required. This will clear an area of about 200 mm x 200 mm.
2. Grind weld preparation area as necessary.
3. Pre-heat weld preparation area to 150°C
4. Attach waveguide with a FULL PENETRATION weld using E182 (stick) or ER82 (TIG) rods.
NOTE: Lack of fusion in the weld will cause severe signal attenuation.
5. Minimise weld fillet diameter to a maximum 12mm to avoid the need for post weld heat treatment.
6. Re-install insulation & cladding so that they DO NOT TOUCH THE WAVEGUIDE.

7. NOTES

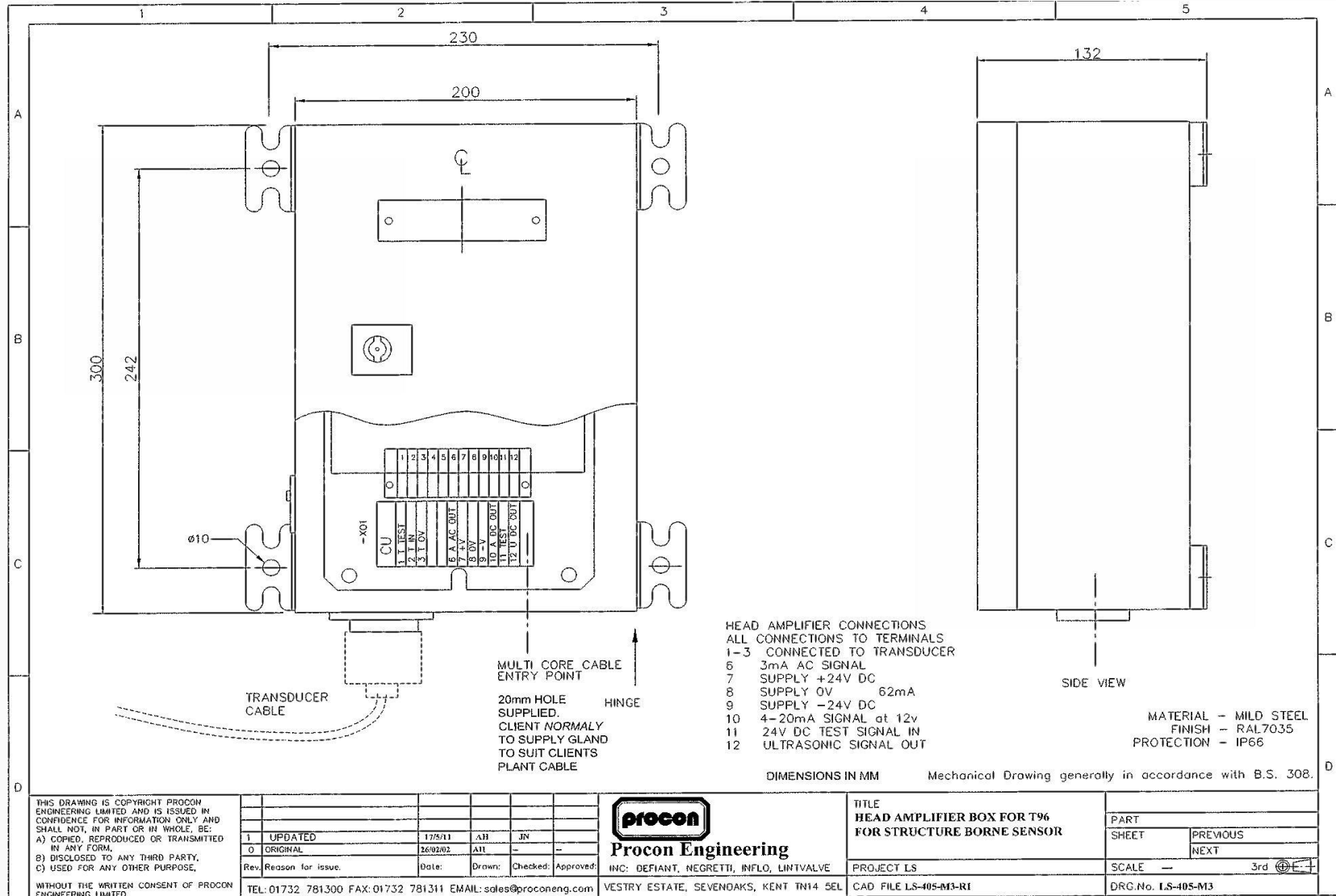
- 7.1 The structure borne waveguide detailed in drawing A4-0168 is normally made from 316 stainless steel, 304 Stainless may also be used. The tip of the waveguide is cut with a taper to enable fillet welding.
- 7.2 The waveguide may be manufactured from the same alloy as the steam pipes if desirable to optimise welding.
- 7.3 This procedure is a guideline only and does not supersede welding practices already in effect at client site.



PICTORIAL DIAGRAM ONLY - NOT TO SCALE

					 Procon Engineering INC: DEFIANT, NEGRETTI, INFLO, UNIVALE VESTRY ESTATE, SEVENDOKS, KENT TN14 5EL	TITLE WAVE GUIDE INSTALLATION FOR STRUCTURE BORNE SENSORS PROJECT IS CAD FILE LS-665-M3-RJ	PART	
1	MATERIAL NOTE UPDATED	28/10/10	AM				SHEET	PREVIOUS
0	ORIGINAL	4/3/92	AS	--		NEXT		
Rev	Reason for issue	Date	Drawn	Checked	Approved	SCALE	--	3rd
TEL: 01732 781300 FAX: 01732 781311 EMAIL: sales@proconeng.com						DRG.No. LS-665-M3		

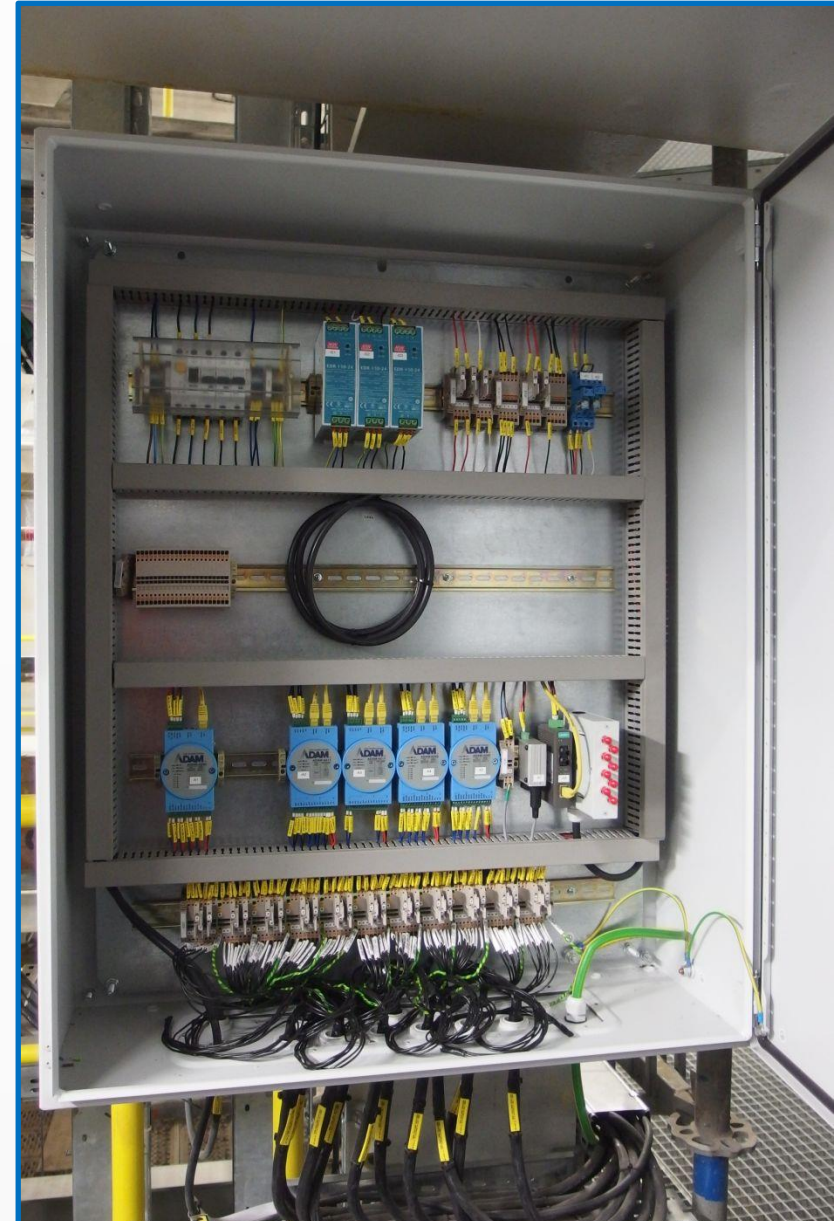
STRUCTURE BORNE SENSORS HEAD APLIFIER



JUNCTION BOX



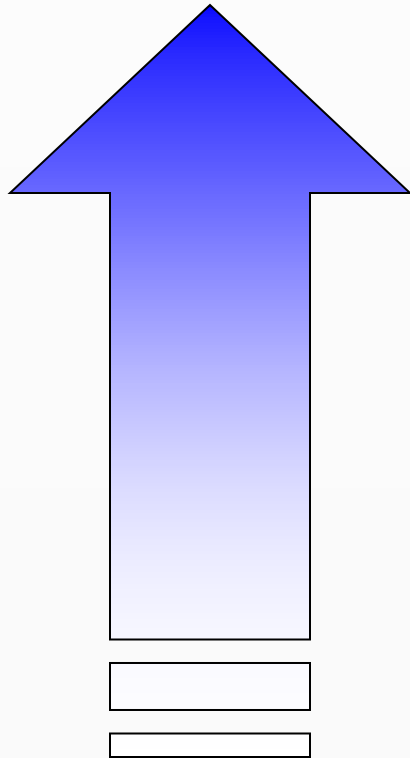
Junction box installed in Opole Power Station,
power unit 5 and 6 (2 x 900 MW)



FEATURES OF THE PLDS

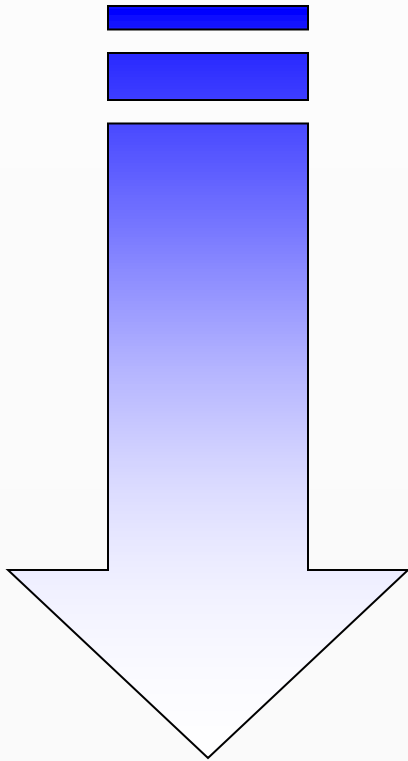
- **High sensitivity – shock and vibration resistant** (30 – 50 Times more sensitive than piezoelectric microphones)
- Type and quantity **selected for individual boiler**
- Airborne sensors comes with **air purge unit** – preventing „ash clogging” of wave guides
- Suitable for **application on CFB boilers**
- **On-line audio signal** from airborne sensors
- **Software in English and other languages** (option on demand)
- **Remote diagnostic** from Pentol’s Office (option)
- **Alarms blockage** during soot blowers operation
- Possible digital transmission between central unit (DAS) and plant DCS
- Central unit (DAS) can handle sensors from one or more boilers simultaneously
- Two stages of possible leak and low strength signal
- **Calibration of sensors on-site**
- System can be delivered on **turnkey** basis

WHY SHOULD I INSTALL A BOILER LEAK DETECTION SYSTEM?



- Increases operating profit
- Increases availability
- Increases tube life
- Increases personnel safety

WHY SHOULD I INSTALL A BOILER LEAK DETECTION SYSTEM?



- Reduces repair costs
- Reduces secondary damage
- Reduces outage time
- Reduces financial penalties
- Reduces insurance costs

WHY CHOOSE A PENTOL SYSTEM?



- Well proven and reliable system comprising of Procom Engineering (30 years experience on the market) site equipment and Pentol data acquisition system
- Committed to ongoing investment and development of the product
- Significant reference sites throughout the World (Procom)
- Strong relationships with boiler manufacturers
- Well supported and cost effective solution

SOFTWARE

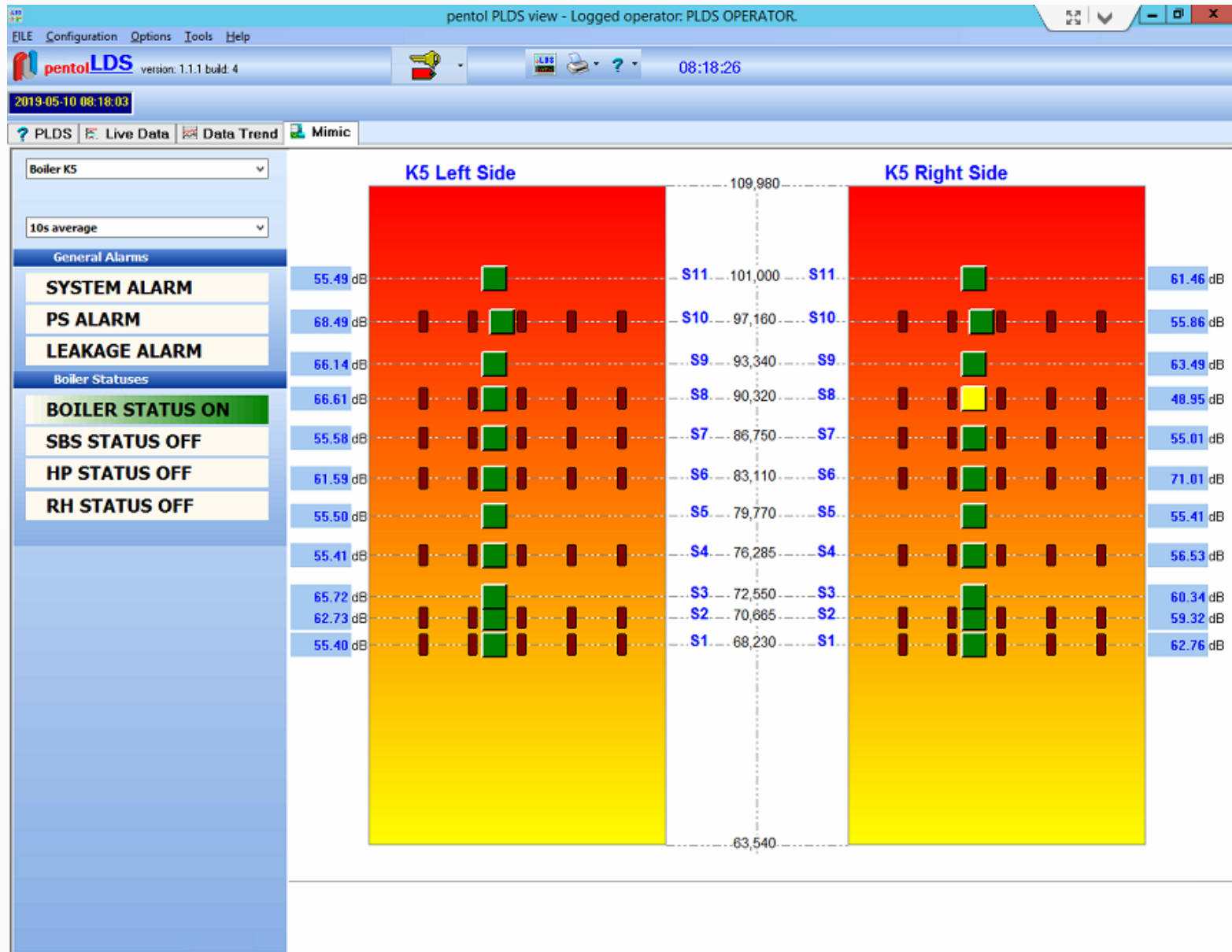
- Mimic diagram
- Bar diagrams (current data)
- Trend charts (historical data)
- Alarms thresholds
- Spectral analysis
- Audio signal



Central unit (ELCHO)

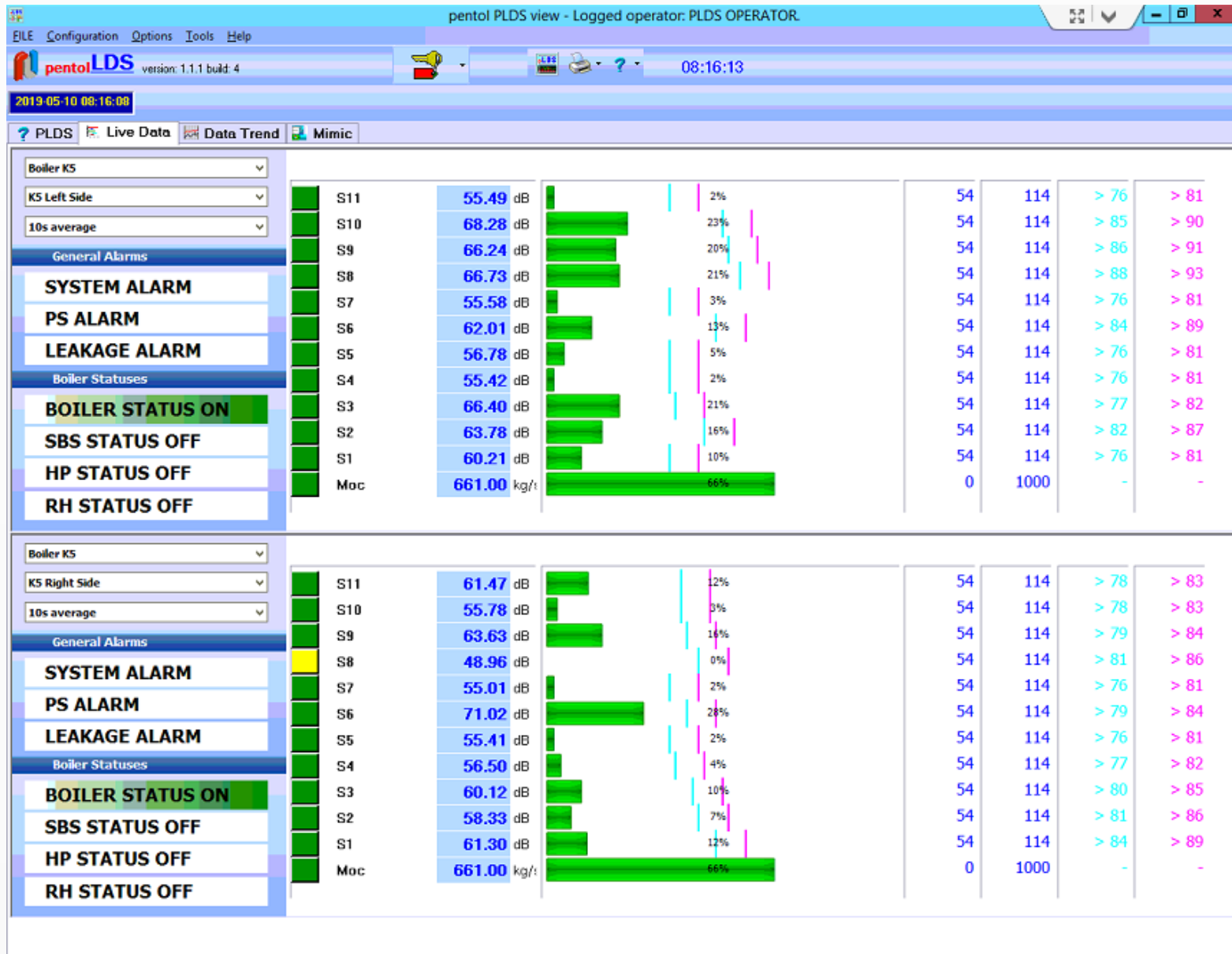
MIMIC DIAGRAM

BOILER SHAPE WITH SENSOR LAYOUT



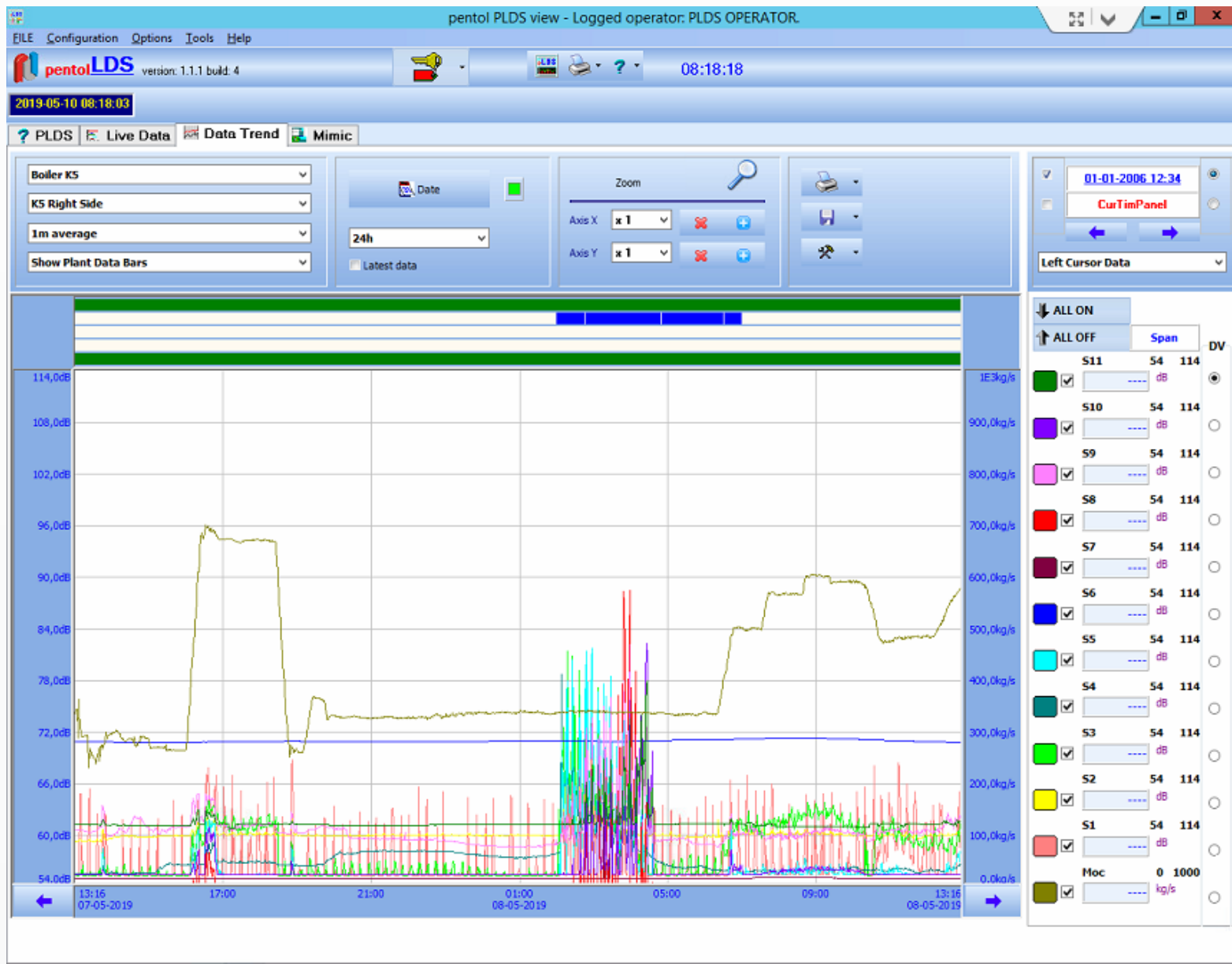
BAR DIAGRAM

CURRENT DATA



TREND CHARTS

HISTORICAL DATA



SPECTRAL ANALYSIS



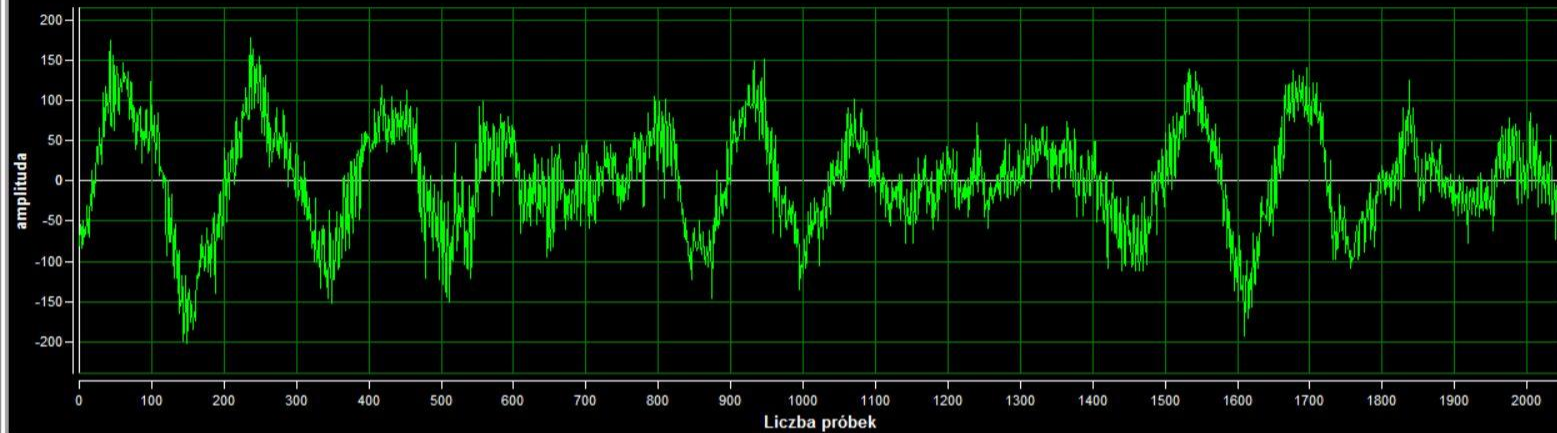
pentol PLDS spectrum - zalogowany operator Marek Szczepańczyk.

Plik Konfiguracja Opcje Narzędzia Pomoc

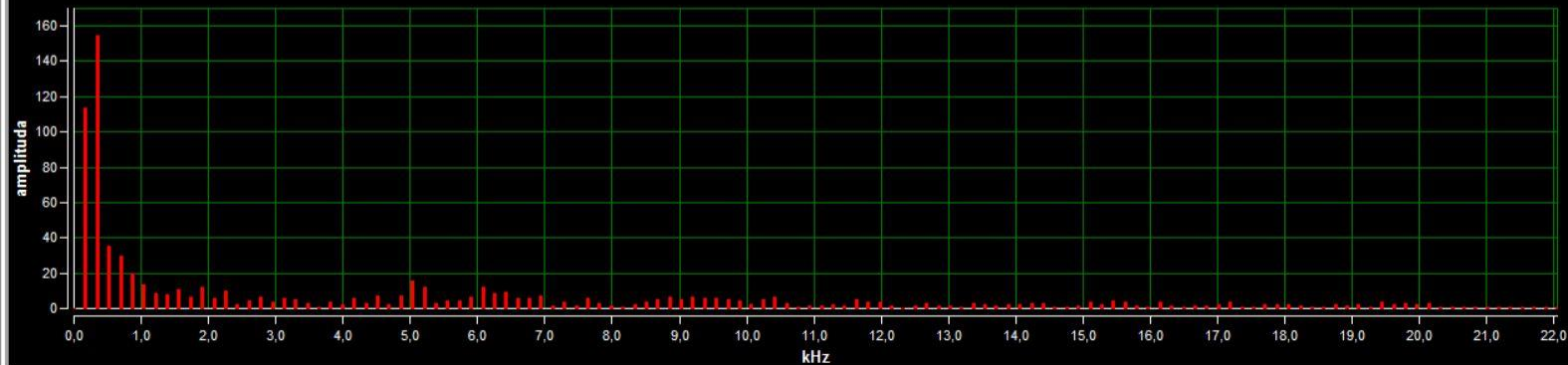
pentolLDS version: 1.1.1 build: 2

22:32:49

OSCYLOSKOP



ANALIZA WIDMOWA (FFT)



Testy Bieżące Testy Historyczne

K5

K5 lewa

S1

Uruchom Test Zakończ Test

Zatrzymaj Test Wznów Test

☐ Powtarzaj test

09.02.2017 Pokaż testy

Czas	Tryb testu	Okres(s)
14: 51: 54	AUTOMAT	30
15: 47: 53	RĘCZNY	30
15: 48: 40	RĘCZNY	30
15: 49: 10	AUTOMAT	30
15: 52: 46	RĘCZNY	30
15: 53:	ID testu: 523	
15: 57:	Kanał: K5 lewa[S1]	
15: 57:	Data testu: 09.02.2017 15:52:46	
15: 57:	Okres testu: 30 sek	
15: 59:	Tryb ręczny	
15: 59:	Nazwa operatora: Marek Szczepańczyk	
16: 22:	Komentarz:	
16: 22: 49	AUTOMAT	30
16: 26: 20	RĘCZNY	30
16: 27: 08	RĘCZNY	30
16: 27: 54	RĘCZNY	30
16: 31: 01	RĘCZNY	30
16: 31: 57	RĘCZNY	30
16: 33: 11	RĘCZNY	30
16: 46: 46	RĘCZNY	30
16: 47: 21	AUTOMAT	30
16: 55: 41	RĘCZNY	30

0%

22:32

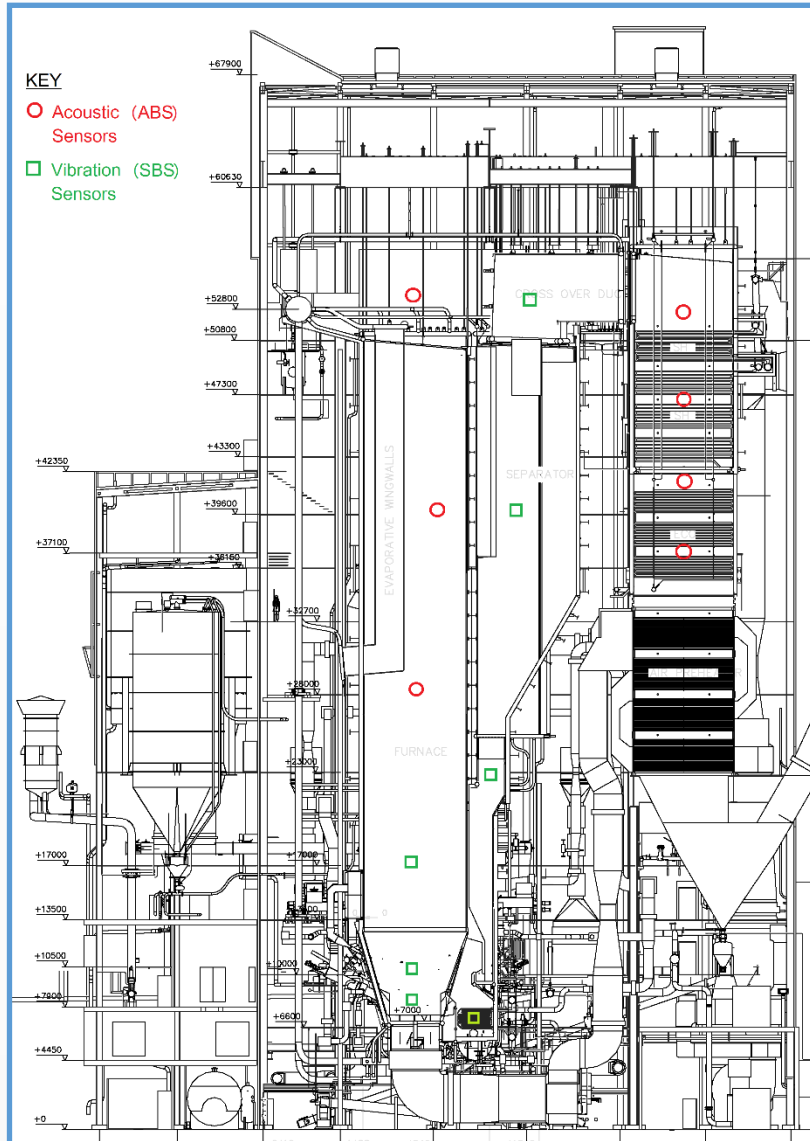
04.04.2017

PROJECTS

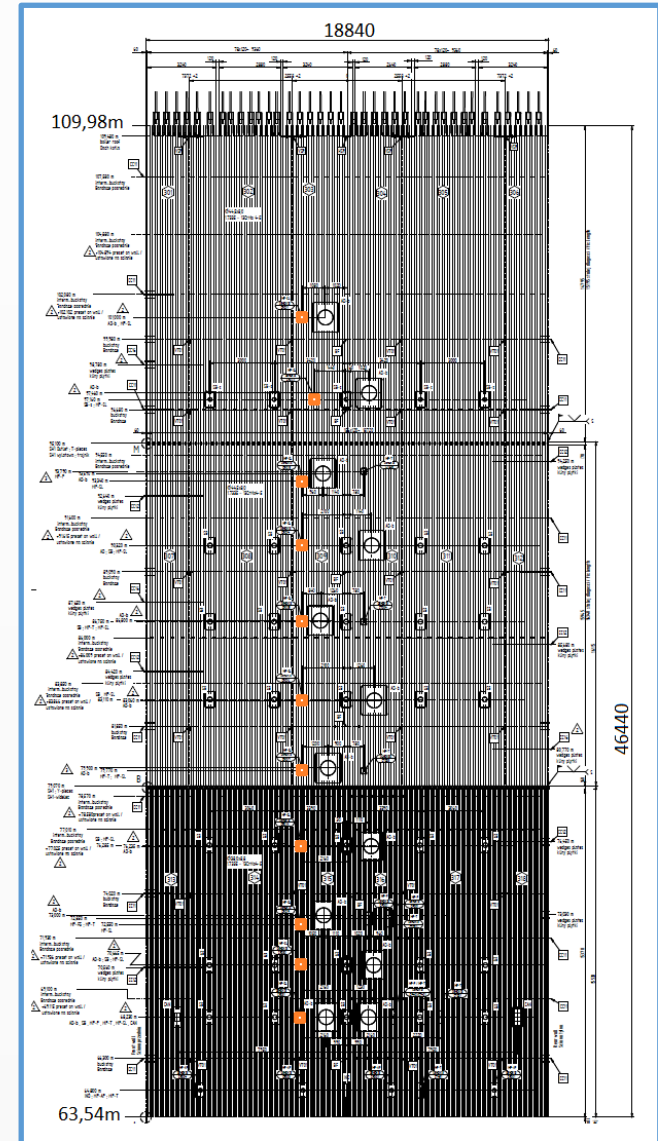
Status	Finalized	Ongoing
Plant:	CHP ELCHO	Power Station Opole (unit5 i 6)
Boilers:	2 x CFB	2 x pulverized coal boiler
Capacity:	2 x 420 t/h	2 x 2455 t/h
Total quantity of sensors:	30 pcs/boiler	22 pcs/boiler
-airborne:	14 pcs	22 pcs
-structure borne:	16 pcs	-
Qty of central units:	1 pc (common for 2 boilers)	2 pcs
Software:	Procon Engineering	Pentol
Stub pipes (in scope of):	Pentol	Boiler manufacturer (GE)
Range of steam detection:	Entire boiler interior	Area of superheater and ECO
Responsible for selection of sensors layout:	Procon/User/Pentol	Boiler manufacturer (GE)
Rezliazion:	Turnkey	Turnkey
Signing of the contract:	March 2014	August 2016
Start-up:	Bolier 2: June 2014 Boiler 1: August 2014	Unit 5: system commissioned and optimised Unit 6: system commissioned

EXAMPLES OF BOILERS WITH SENSORS LAYOUT

ELCHO



OPOLE





THANK YOU

www.pentol.pl