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# PYROLYSER GEN IV FURNACE SYSTEM

# Raddec furnace design

- Designs, tests and markets innovative radioanalytical technologies for extracting volatile radionuclides from diverse materials.
- Designed underpinned by detailed understanding of the technical issues and challenges faced by modern radioanalytical laboratories.



# Pyrolyser-Trio Furnace Systems

Analytical furnace system optimised for the quantitative extraction of volatile radionuclides, such as  $^3\text{H}$ ,  $^{14}\text{C}$ ,  $^{36}\text{Cl}$  and  $^{129}\text{I}$  from solid and liquid samples.

## Unique features of Pyrolyser

- Fully integrated system with 3-contiguous heating zones
- Can handle 0.1g up to 40g samples (depending on composition)
- simultaneous extraction of samples using 2, 4 or 6 worktubes
- designed and evaluated to provide a safe and efficient means of extracting volatile radionuclides from almost any type of sample (foodstuffs, biota, soil, sediment, concrete and other building materials, metals and bioassay samples)



# Evolution of the Pyrolyser



- 4/6-tube
- Dual zone
- Dual Eurotherm 2216e

1999

2004



- 4/6-tube
- Tri-zone (trio)
- Eurotherm 3504 and
- AGS

2009

2013

- 4/6-tube
- Tri-zone (trio)
- Dual Eurotherm 2216e



- 4/6-tube Tri-zone (trio)
- Eurotherm 3504 and Nanodac
- AGS



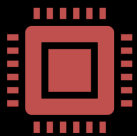
# Pyrolyser Gen IV

– the next generation of furnaces

# Pyrolyser Gen IV



The Pyrolyser-6 Trio Gen IV is the latest and most advanced version of the successful and class leading Pyrolyser series. This extends the flexibility of these robust multi-worktube, 3-zone furnaces.



The Gen IV integrates the latest in HMI-PLC technology with a user-friendly intuitive interface (touch-screen) to enable straightforward set-up of heating recipes by users.

# Pyrolyser-6 Trio Generation<sup>IV</sup>

The **Pyrolyser- Trio GenIV HMI-PLC** system :-

- 3 independently controllable furnace zones (with synchronized segments)
- Stores 20 editable heating programs
- Up to 15 segments per program
- The user can modify existing programs whilst the Pyrolyser is running a current program.
- A multi-level LOGIN system (Operator, Supervisor, Engineer)

Uses SIEMENS SIMATIC HMI-PLC with Raddec custom program interface

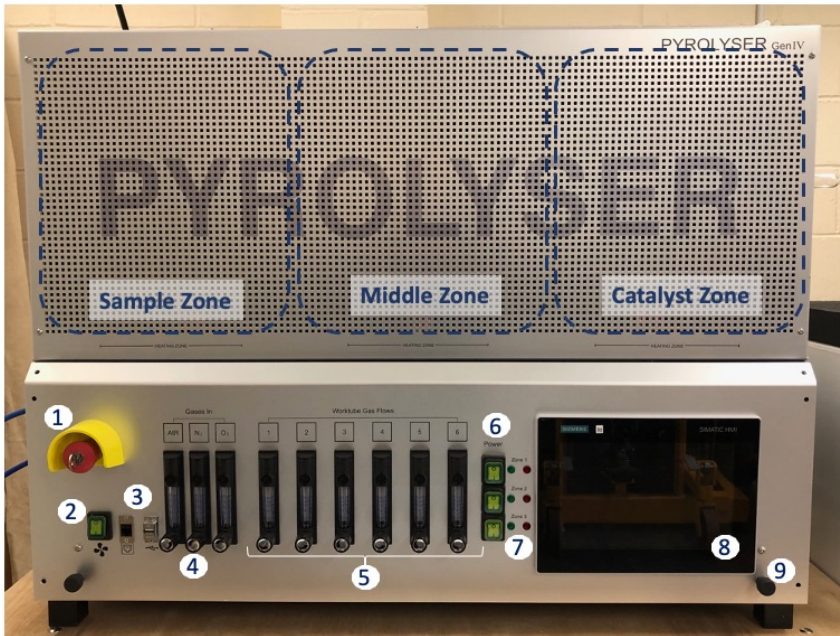
7" HMI (touch screen programming)

3 x EPC2000 O/T controllers

Sample and Mid-zone rapid cool down facility for rapid cycling (fan+chimney)

# Pyrolyser Gen IV layout

## Gen IV system



Available in 2 construction configurations

- Sample – Mid - Catalyst
- Catalyst - Mid - Sample

## Components

IDENTIFIER	FEATURE
1	Emergency Stop Switch
2	Chimney Cooling Fan Switch
3	Ethernet / USB Sockets
4	Air / N <sub>2</sub> / O <sub>2</sub> Inlet flow meters
5	Work tube supply flow meters (1-6)
6	Element Isolation switches
7	Element and Overtemperature LEDs
8	Siemens SIMATIC HMI
9	Drawer handles

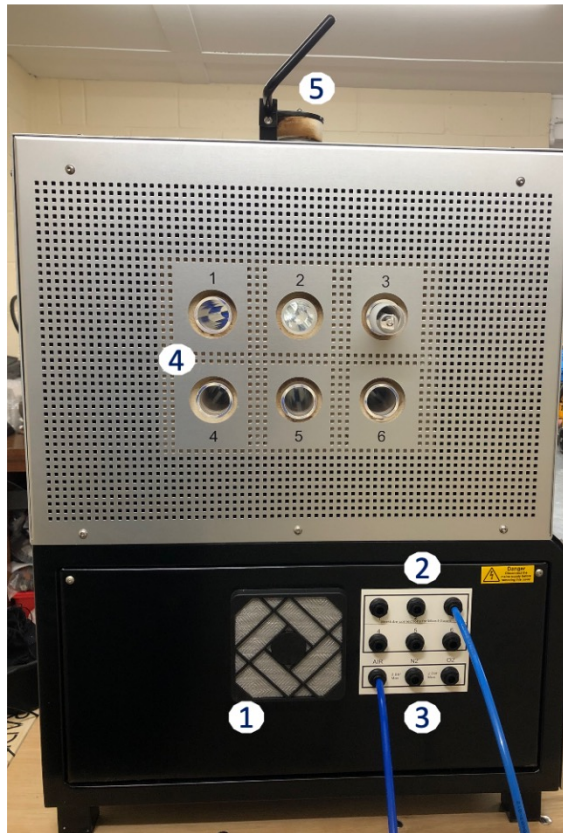


# Rear layout



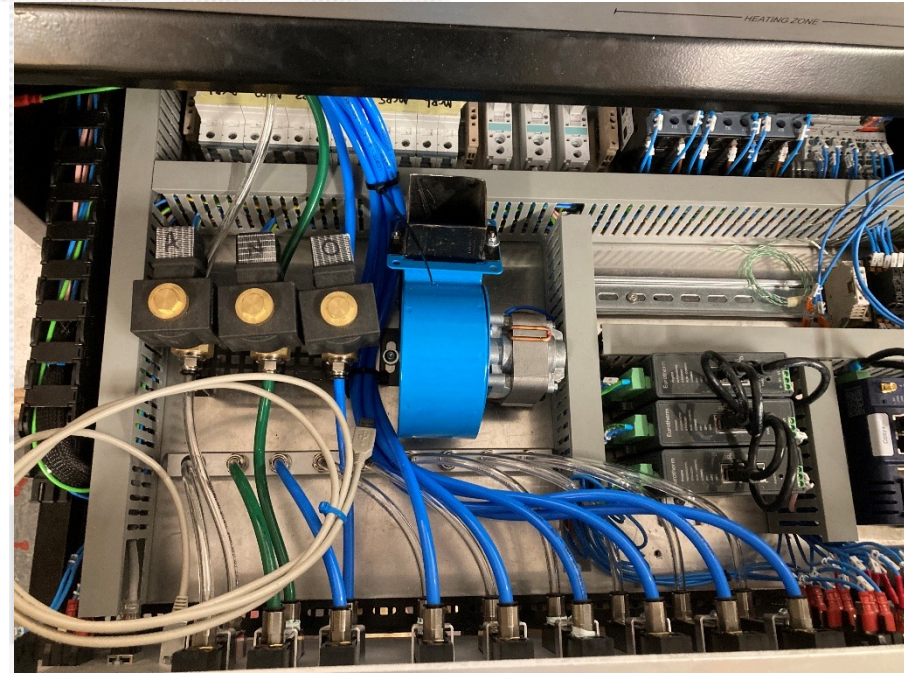
Identifier	Feature	Description
1	Rear RJ45 connector	Provides direct network connection to the internal EWON ** communications module used by Raddec for secure remote diagnostics / updates via the internet. If the unit requires a software update for example, the EWON allows temporary remote connection when approved by the Pyrolyserowner.
2	Power inlet	Main power inlet (nominally 230VAC, 32A)

# Side view



Identifier	Feature
1	Cooling Fan (one per side)
2	Gas Outlets for Work Tubes
3	Supply gas inlets
4	Work Tube positions
5	Chimney lever

# Gen IV instrument draw system



# Enhanced system building and servicing using an instrument drawer system

Enhanced electrical build to meet CSA standard

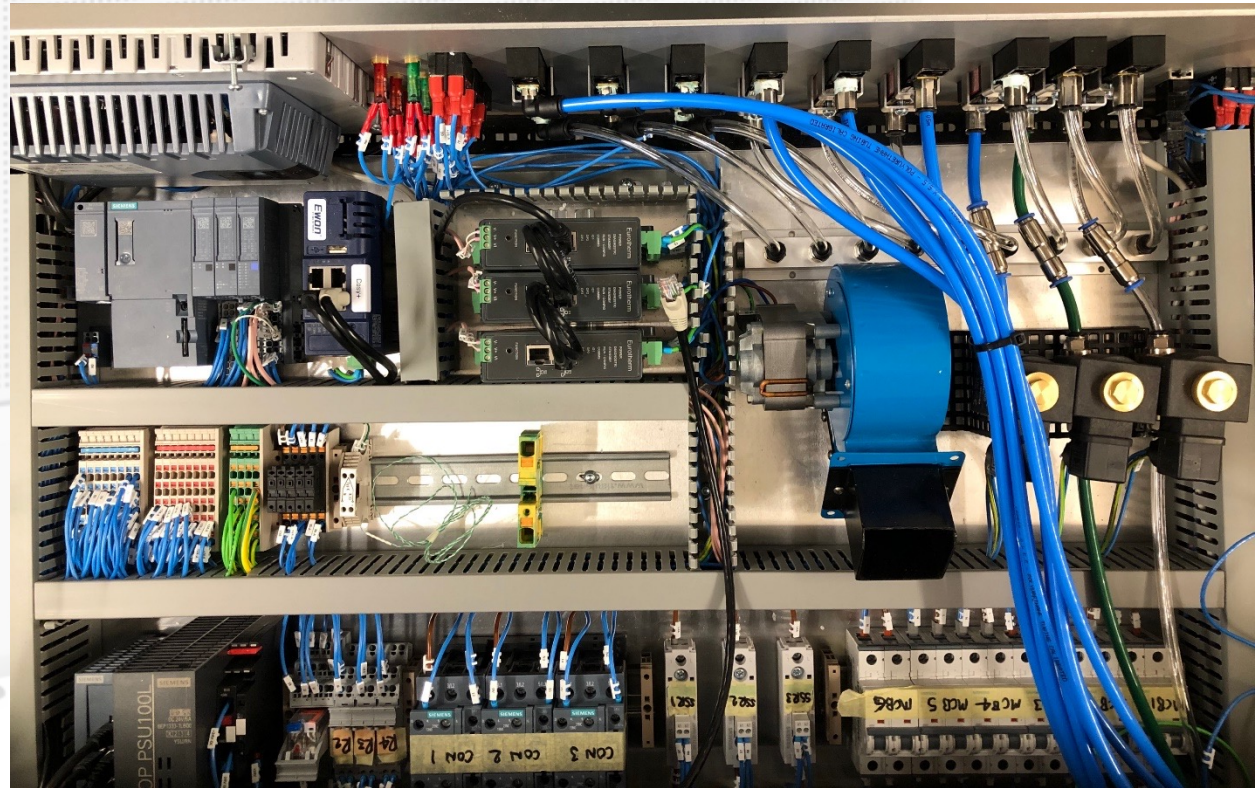
Siemens SIMATIC HMI-PLC

24 Volt DC components for enhanced safety

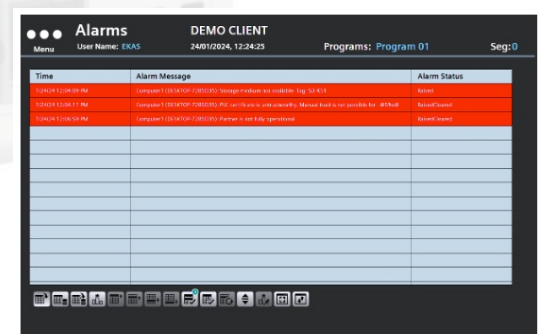
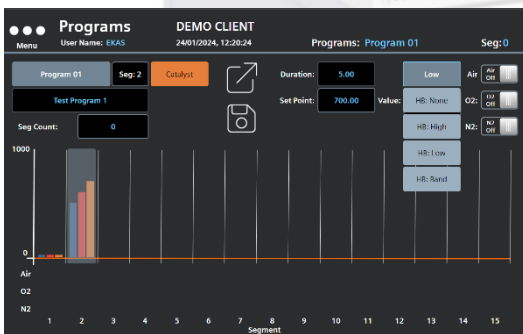
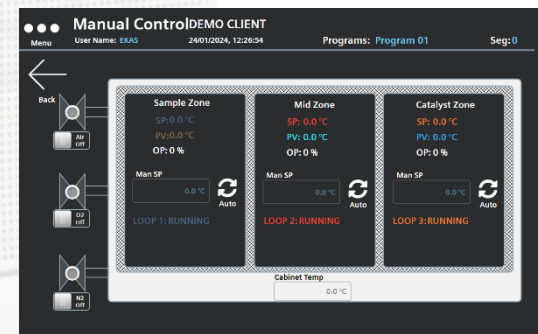
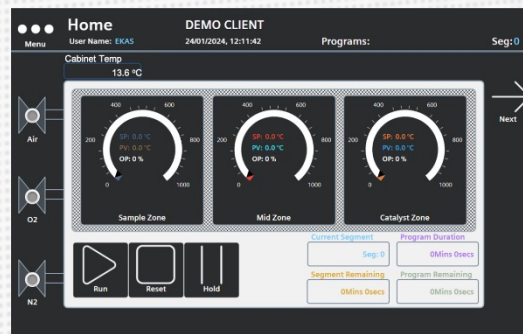
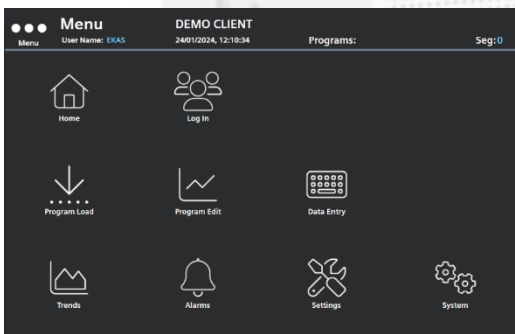
Single centrifugal fan with manifold to cool two zones

Programmable AIR, OXYGEN and NITROGEN supplies

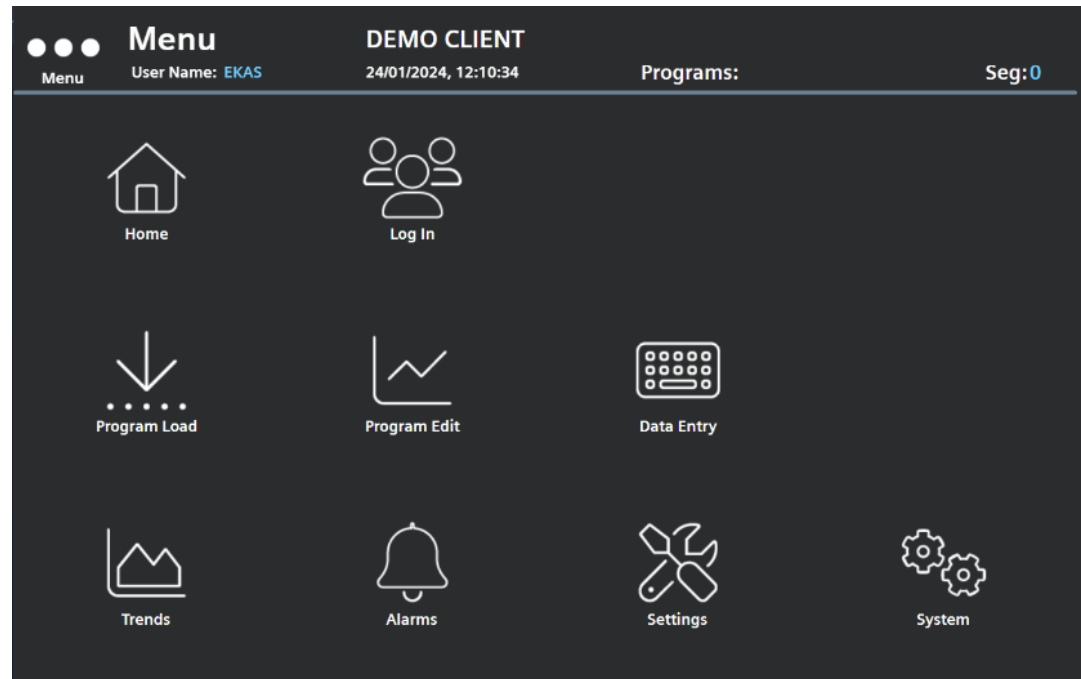
Single gas distribution manifold system



The **Pyrolyser- Trio GenIV HMI-PLC** system stores 20 editable programs; each program offers up to 15 segments. The user can modify existing programs whilst the Pyrolyser is running a current program. A multi-level LOGIN system is available to manage users at different levels (Operator, Supervisor, Engineer)

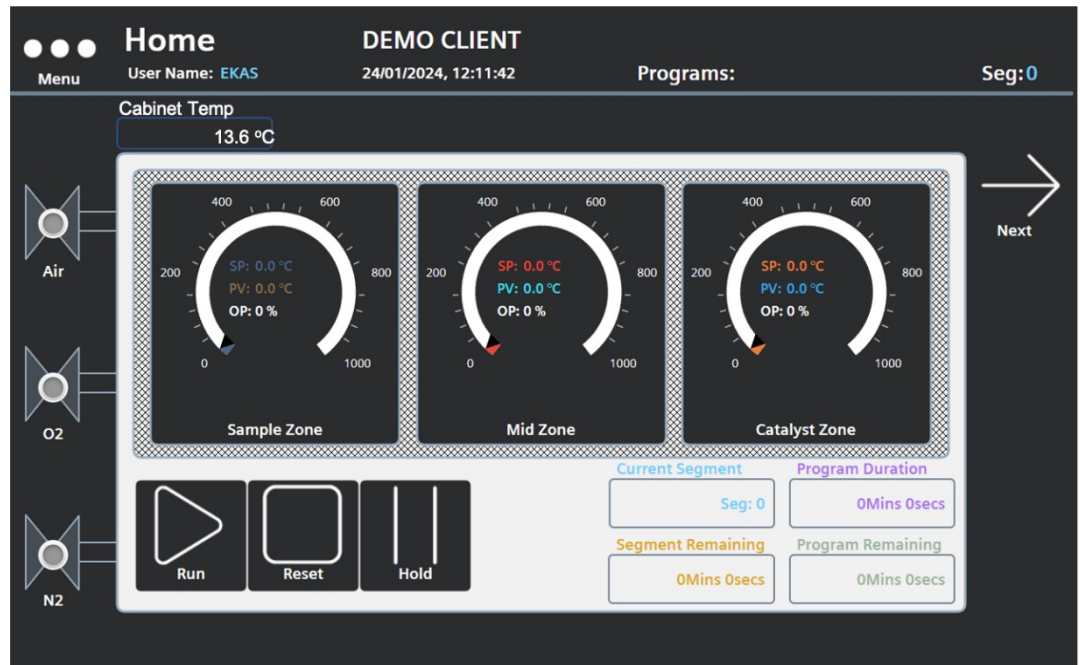


# Menu page



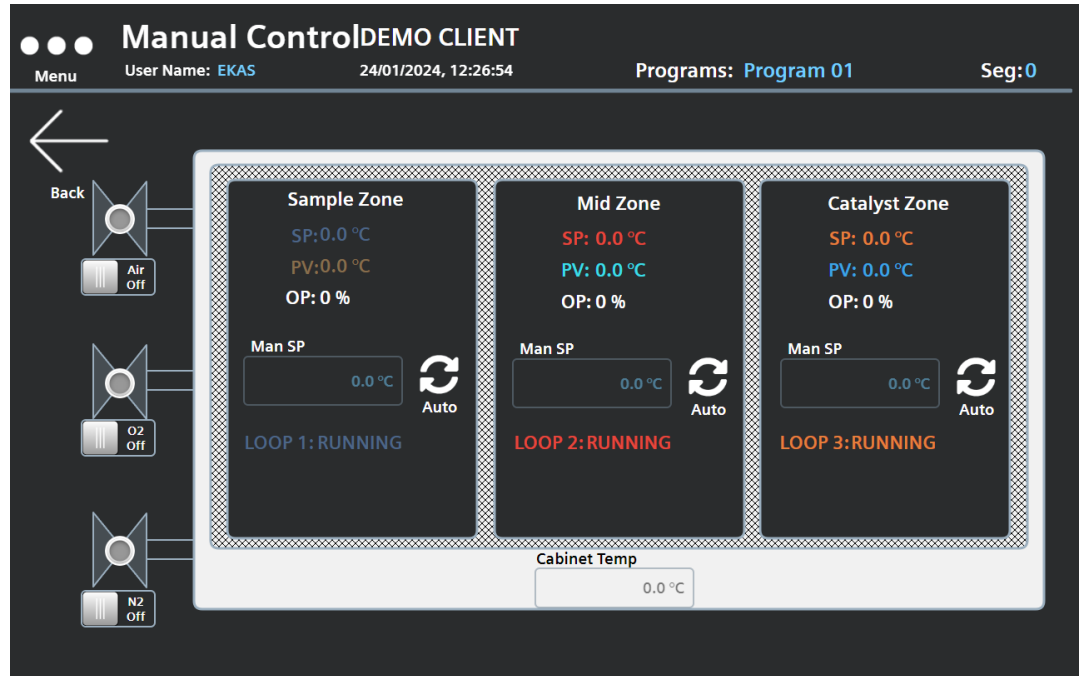
The *Menu* screen provides the access to all the sub screens on the HMI.

Home  
page



The **HOME** screen provides an overview of the Pyrolyser-6 Trio GenIV, it displays all the temperature and profile information. The 3 heating zones are visually displayed, indicating their current SP, PV & OP%. In the correct Log In Mode pressing on the centre any of the zones will take you to the relevant settings for this zone, see section 5.2 for more details on PID settings.

# Manual control



The *MANUAL Control* screen provides a similar overview to the *MAIN* screen, however it also provides the user with some manual options for operation of the Pyrolyser outside of a predefined programme.



# Programme load

**Program Load DEMO CLIENT**  
Menu User Name: EKAS 24/01/2024, 12:12:36 Programs: Seg:0

Program Selection

Program Duration

Sample Max TSP  Sample Max Time

Mid Max TSP  Mid Max Time

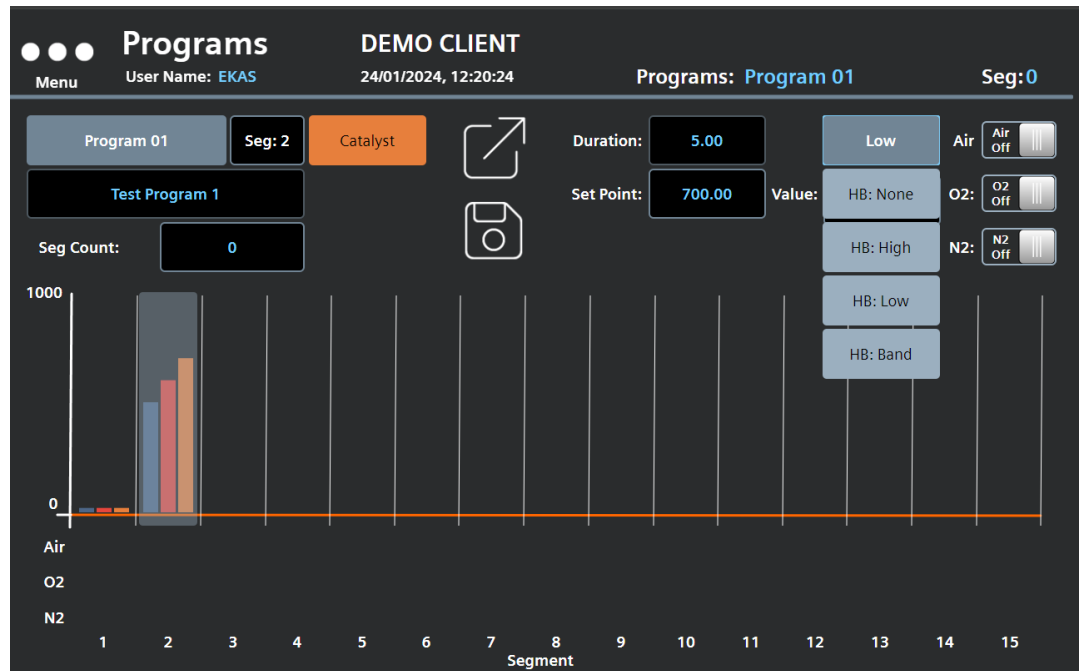
Catlyst Max TSP  Catlyst Max Time

↓  
.....  
Load Program

**Program Load DEMO CLIENT**  
Menu User Name: EKAS 24/01/2024, 12:13:20 Programs: Seg:0

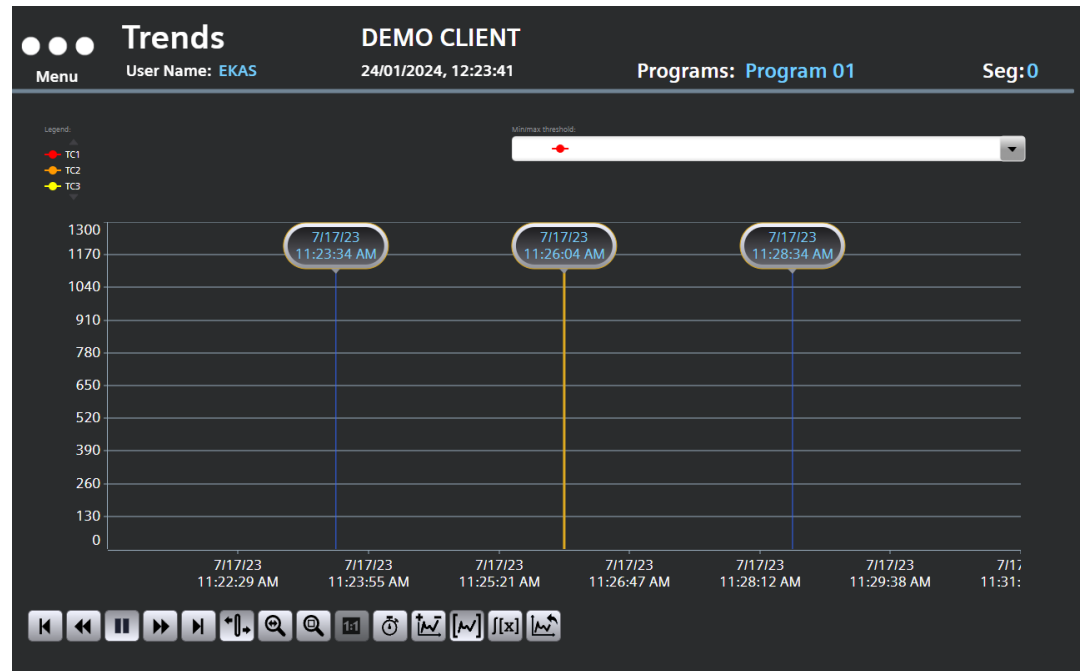
Program 01	Program 02	Program 03	Program 04
Program 05	Program 06	Program 07	Program 08
Program 09	Program 10	Program 11	Program 12
Program 13	Program 14	Program 15	Program 16
Program 17	Program 18	Program 19	Program 20

# Programme edit



The **Program Edit** screen is divided into 2 parts, the upper part provides the user with the relevant options for the program name and segments. The lower part provides a graphical overview of the profile, segments and the gas supply solenoids that are active.

# Trends



The trends page provides a historical graphical view of all the points being logged. The historical temperatures of the sample, mid and catalyst zones can be selected from the drop down menu.

# Data entry

**Data Entry** DEMO CLIENT  
Menu User Name: EKAS 24/01/2024, 12:23:05 Programs: Program 01 Seg: 0

Analyst  
EKAS

	Worktube 1	Worktube 2	Worktube 3	Worktube 4	Worktube 5	Worktube 6
Sample Name	Test					
Sample Type	Fish					
Catalyst Type	0.3% Pt-Al ▼	▼	▼	▼	▼	▼
Wet or Dry	Wet ▼	▼	▼	▼	▼	▼
Sample Mass Grams	13.00	0.00	0.00	0.00	0.00	0.00

 Enter Data

- Data can be entered for all 6 Work tubes;
- Data entry is not mandatory to run a new cycle.
- The catalyst type and the wet or dry field have dropdown boxes displaying all options available.



# Settings

Settings DEMO CLIENT  
Menu User Name: EKAS 24/01/2024, 12:25:32 Programs: Program 01 Seg:0

### Over Temperature

Over Temperature Offset 20.0 °C

Max Over Temperature 720.0 °C

Sample Over Temperature 0.0 °C

Middle Over Temperature 0.0 °C

Catalyst Over Temperature 0.0 °C

### Alarms

Enclosure Over Temperature 50.0 °C

Enclosure Alarm Hyst 1.0 °C

The *Settings* screen allows the user to set the over temperature offset and Enclosure over temperature alarm for the Pyrolyser

# System

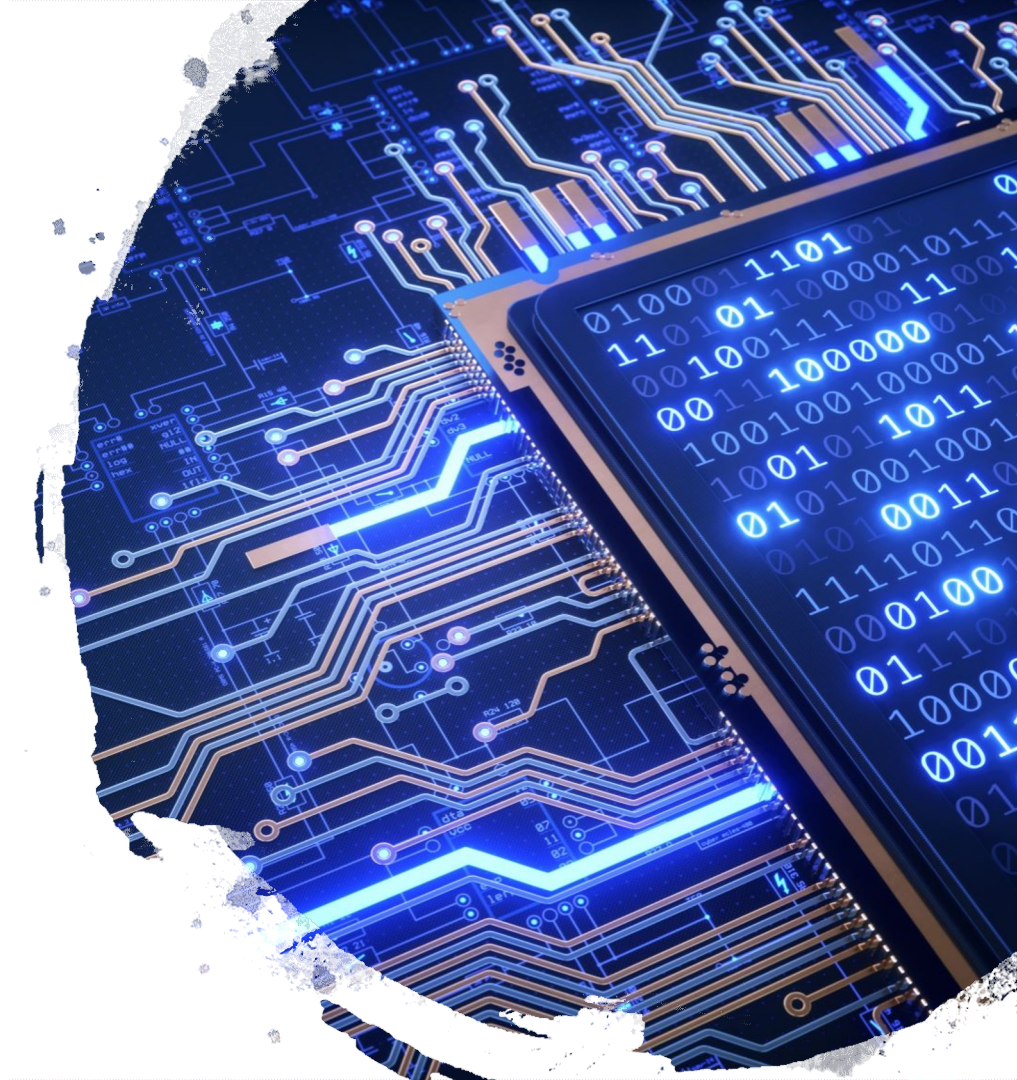
The screenshot shows a web-based configuration interface for a Siemens PLC system. The top navigation bar includes a 'Menu' icon, the title 'System', the user name 'EKAS', the date and time '24/01/2024, 12:26:06', the current program 'Program 01', and the segment 'Seg:0'. The main content is divided into two columns. The left column contains several input fields: 'Siemens PLC IP Address' (10.0.0.1), 'Siemens PLC Mac Adress' (EC-1C-5D-84-6F-F2), 'Project Version' (GEN IV Siemens), 'Programmed By' (EK), 'N2 Present' (On), and 'Pyrolyser Serial Number' (F489523). At the bottom left of this column is a 'Stop Runtime' button. The right column is titled 'Configuration' and features a 'Brightness Adjustment' slider set to 100. Below this are 'Ethernet X1' and 'Ethernet X2 (G/Bit)' sections, each with an input field (10.0.0.2) and a menu icon. An 'End User Banner' field contains the text 'DEMO CLIENT'. At the bottom right, there are two tables: 'Version Information' and 'Hardware Information'.

Version Information		Hardware Information	
Product Version	GEN IV Siemens PLC	CPU ET200SP 6ES7 510-1SJ01-0AB0	
PLC Version	v1.6	HMI	MTP1000 Unified Comfort
HMI Version	v1.6	OverTemp	EPC2000 ProfINET

The *System* page provides basic information about the system (IP / MAC address of the PLC, Project version and software version information, System Serial No.). The page also allows users to adjust the display brightness and enter a User Banner (e.g. Company Name).

# System

- Remote access the Pyrolyser PLC via an on-board EWON interface module
- Online diagnostic or troubleshooting
- Remote software updates
- Pyrolyser must be connected to an external internet access point (either via a local network or cellular data hotspot) using a standard cat5 network cable connected to the RJ45 port on the rear panel of the Pyrolyser.

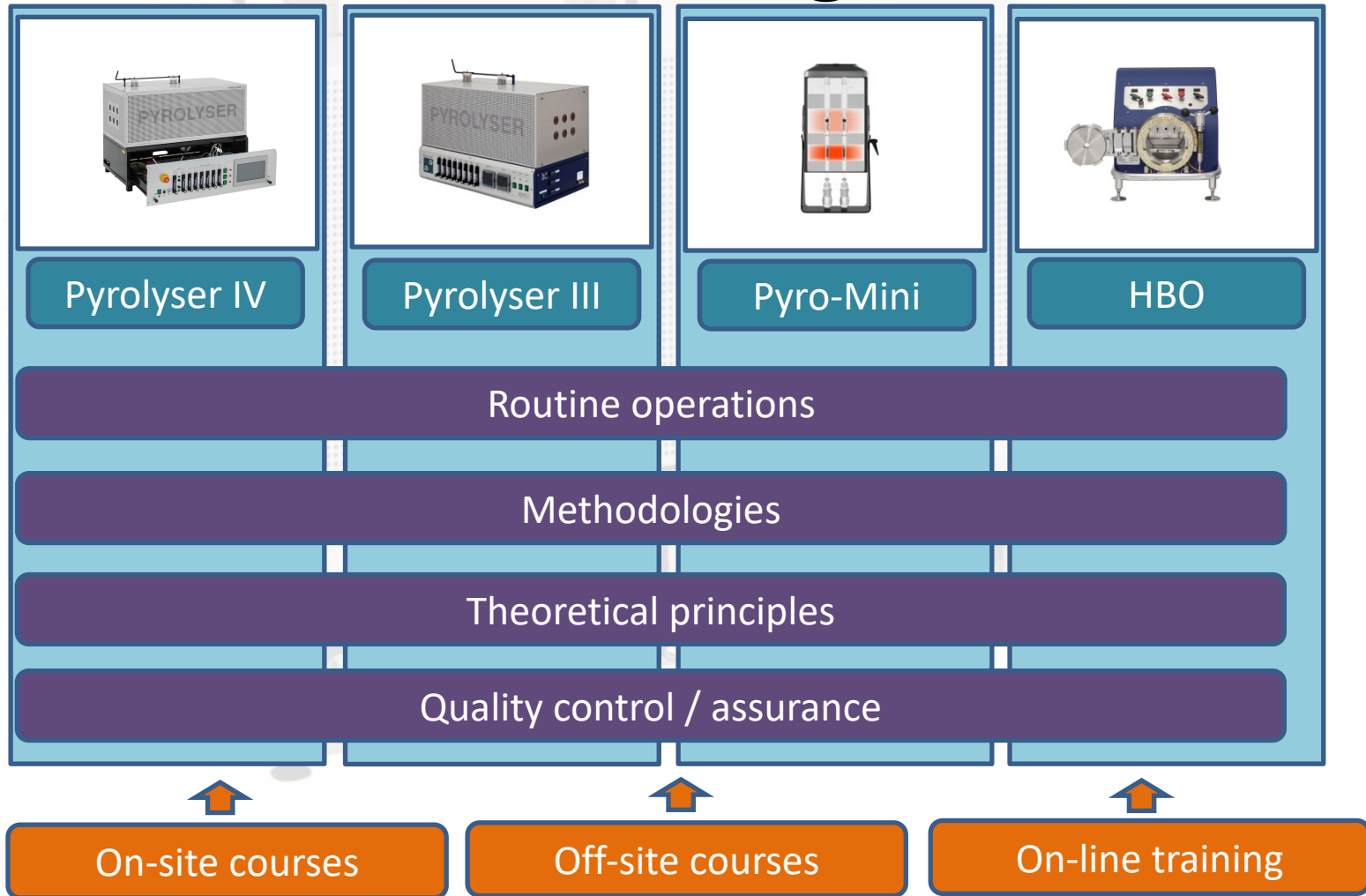




# Other improvements

- New standard worktube with a B34 entry cone to fit larger diameter boats (25cm OD x 20 cm) ; accommodates 10 grams fish
- Provision of larger diameter worktubes (up to 42 mm OD to enable even larger sample to be loaded (e.g. 10+ grams Fish, biota, foodstuffs)
- Development of a method to cleanly oxidise 10 g fish in 7.5 hours which generates approx. 6 g combustion water.
- A single Pyrolyser can readily process 60 g of fish in 1 working day
- FUKUSHIMA MARINE MONITORING STUDIES - some labs require 100 g Fish to be processed to generate 70 mL of combustion water for large volume LSC measurements

# Training



# Online

- Main web site at  
[www.raddec.com](http://www.raddec.com)
- Also, see technical videos on YouTube  
(follow link from our website)

# RADDEC

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