

## SEFRAM 8460

### A new family of oscillographic thermal recorders 6 to 36 channels

#### Capabilities

- 6 oscillographic to 36 analogue channels
- Measurement boards :
  - 6 isolated channels universal input, 500V AC or 1000VDC
  - 12 channels multiplexed board (voltage, temperature, pt100)
  - 6 isolated channels for strain gauge, with voltage, pt100 and thermocouples
  - 6 isolated channels 1000V AC or 2000V DC
- 16 logical channels
- 270 mm paper width
- 15.4 inches panoramic TFT touch screen
- 500Gb hard disk, with fast transfer
- Interface: Ethernet, 6 x USB, VGA
- Power analysis (50Hz, 60Hz, 400Hz, 1kHz) for single and dual networks
- IRIG board option
- WiFi option
- IEC1010 : CAT III - 600V



#### A modular system

The new 8460 family is designed to match all your applications in the future. If your applications change, your 8460 can be upgraded with a mix of various measurement boards (4 measurement boards available).

#### A panoramic touch screen to ease the operation

With its 15.4 inches touch screen, using the 8460 is like a game: the man-machine interface has been designed to be intuitive, all menus are clear and simple and the user's manual can be displayed on the oscillographic recorder if needed.



#### Various analysis functions

The new 8460 will provide many automatic measurements, various triggers, the power analysis mode,... All is done to simplify the analysis of complex signals.

#### A connected instrument

With its 6 USB interfaces, the LAN interface or through WiFi communication, you can remote control your recorder or download your records. With Virtual Network Computing software (not included), view and control your 8460 from your computer or your tablet.... Just like if you have the recorder in front of you!

# SEFRAM 8460

## Oscillographic thermal recorders

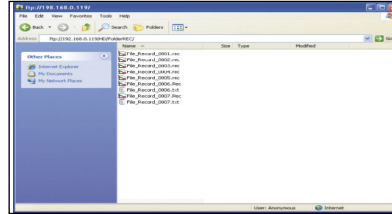
### ■ A modular concept for all your applications

Communication and simplified data export:



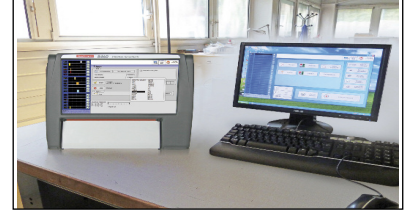
With Virtual Network Computing software, you remote control your 8460 from a computer or a tablet.

FTP : easy transfer of records



FTP or TCP-IP transfer of files and recorded data display.

WiFi



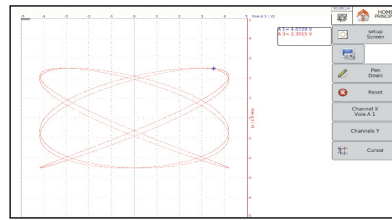
With the WiFi interface (option) you can take the best benefit of remote control of your recorder. All functions, all modes can be remote controlled.

Several operating modes



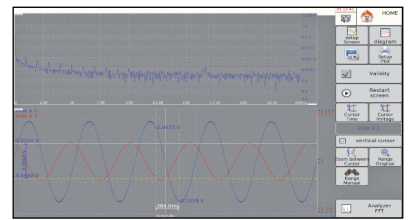
Expert mode: user will access to all parameters of the setup.  
User mode: restricted access.

XY mode with pen-up and pen-down.



With an efficient XY mode, your 8460 will replace your old analogue XY plotter.

FFT Analysis



Real time FFT analysis.

### ■ Energy / Power Analysis

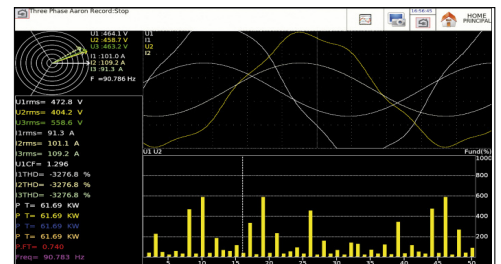
A very powerful analysis for single phase, dual phases or three phases networks. Analysis is provided with Fresnel diagram or oscilloscope mode.

#### ■ Capabilities

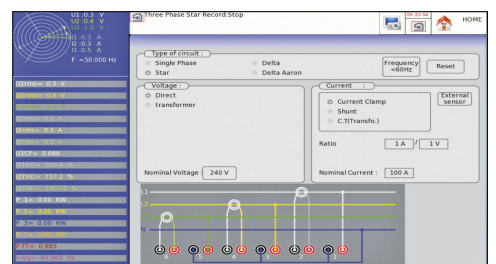
- Single phase, dual phases, three phases networks
- Dual networks analysis
- Up to 24 parameters memorized (U, I, W, Wh, ...)
- Network frequency: 40, 50, 60, 400, 1000 Hz
- Fresnel Diagram
- Oscilloscope mode
- Harmonics up to rank 50
- Memorization of harmonics
- 16 calculated values : mean value, RMS value, peak value, crest factor, THD, DF, active power, apparent power, reactive power, power factor (cos), energy, ...
- Real time word file of calculated values



Measurements are done with the voltage input (direct) of the universal board and accessories clamps (standard clamps or flexible clamps)



Harmonics up to rank 50 (calculation and memorization)



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# SEFRAM 8460

Oscillographic thermal recorders

## Highly flexible printing



To suit your specific and various applications, you can configure and select all printing parameters (including plotting mode  $f(t)$  or text), paper speed (1mm/h to 200mm/s), number of traces or grid pattern.

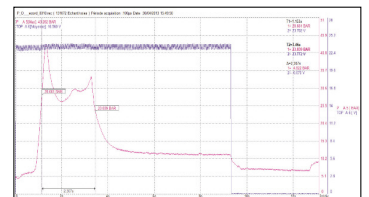
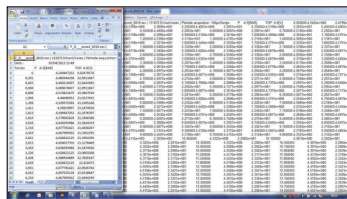
For all channels, you can add annotations, specifying the date, the time, the paper speed and the channel names.

## Sefram Viewer

This licence free software is supplied with each recorder. It allows the visualization of the recordings and the data transfer to other applications. SEFRAM Viewer makes the acquired signal analysis easier.

### Capabilities

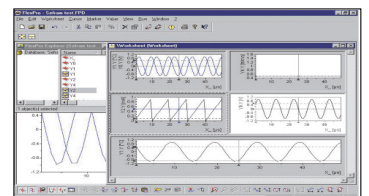
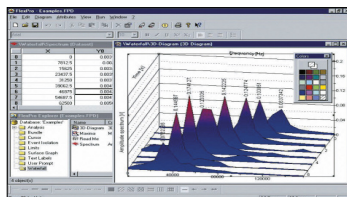
- Curve printing
- Display of values (text)
- Cursors and zoom
- File concatenation
- 8 math calculations
- Up to 120 characters text notes
- Bitmap, Excel®, txt, csv export
- Easy setup of curves display



## FLEXPRO™: a powerful software for your data analysis

With Flexpro® :

- More than 100 functions of statistical and math analysis
- Powerful graphical display
- Measurement report editing



## IRIG board option

This factory option allows to synchronise the instrument (and the timestamping of records) with an IRIG clock signal in order to have a better time accuracy.

### Capabilities

- Synchronisation of records with an IRIG clock
- Resynchronisation of acquisition data every seconde
- Compatible with IRIG format: IRIG-A133, A132, A003, A002, B123, B122, B003, B002 and AFNOR NFS 87-500
- Amplitude of IRIG signal : from 600 mVpp up to 8Vpp
- Input impedance: 50 Ohms
- BNC input



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# SEFRAM 8460

## Oscillographic thermal recorders

### Common features (for all models of the family)

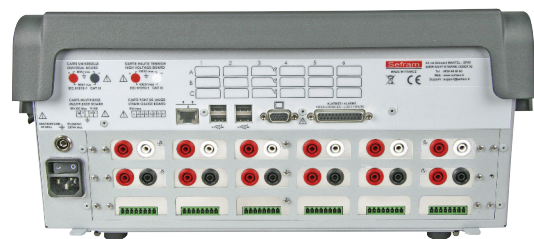
|  |   |
|--|---|
| <b>Display</b>   |   |
| 15,4 inches TFT touch screen, with backlight   |   |
| Resolution 1280 x 800 dots   |   |
| f(t) and XY oscilloscope-type display capability   |   |
| Functions: zoom, cursors, zoom between cursors   |   |
| Math and scaling functions (Y = aX + B)  |   |
| 20 automatic measurements available  |   |
| <b>Memory</b>  |   |
| Memorization of setup  |   |
| Memory   | 128 Mwords, in segments   |
| Internal hard disk   | 500Gb, with fast transfer ( 6Ms/s)  |
| <b>Interfaces and I/O</b>  |   |
| Interfaces   |   |
| 6 x USB (2 on the front panel, 4 on the rear panel),<br>VGA, Ethernet  |   |
| Logical channels   | 16 logical channels (V max: 24V, Zin = 4,7kohms)<br>Sensor supply 12V / 0,2A max (non floating)   |
| Alarm output   | 3 output, with 1 relay (24V/100mA)<br>and 2 x TTL 5V  |
| <b>Power analysis function</b><br><i>(this function can be used with one universal board and accessories for current measurements)</i> |   |
| Networks   | single phase, dual phases, three phases   |
| Frequency  | 50-60Hz, 400Hz and 1000Hz   |
| Display  | oscilloscope, Fresnel diagram   |
| Harmonics  | calculated up to rank 50, with recording capabilities<br>24 measurements: U and I (mean values,<br>RMS, peak), crest factor, power (active,<br>reactive, apparent), power factor, harmonics,<br>THD, DF, frequency, energy,...  |
| Measurements   |   |
| <b>General and environment</b>   |   |
| Power supply   | 90VAC to 264VAC, 47Hz to 63Hz   |
| Consumption  | 230VA max, 60w without print  |
| Operating temperature  | 0°C to +40°C  |
| Storage temperature  | -20°C to +60°C  |
| Maximum operating RH   | 80% max.  |
| Dimensions   | 370 x 440 x195 mm   |
| Weight<br>(with one board installed)   | 11kg  |
| <b>Recording and traces</b>  |   |
| Paper width  | 270mm   |
| Paper speed  | direct mode: 1mm/h up to 200mm/s<br>mixed mode: 1mm/h up to 50mm/s<br>memory tranxcription: 10mm/s max<br>quick advance: 100mm/s<br>external control: 50mm/s<br>test mode: from 1 line/s to 1 line/h<br>y axis: 8 dots per mm<br>X axis: 16 dots per mm up to 50mm/s<br>and 8 dots for higher speed<br>XY mode: 8 dots per mm<br>Accuracy in relation to graticule: 0,01% |
| Resolution accuracy  |   |
| Graticule  | 5 pré-programmed graticules   |

### Specifications - 6 isolated high voltage channels board

|                               |  |
|-------------------------------|--|
| Channels                      | 6  |
| DC voltage                    | ranges from 100mV to 2000V   |
| Max. offset                   | ±5 ranges (limited at 2000V max)   |
| Accuracy                      | ±0,2% ±0,2% of offset  |
| Max. RMS AC+DC voltage        | 1000V AC   |
| Bandwidth (-3dB)              | 26kHz (depending on range)   |
| Crest factor                  | 2,2 (with max. 2000Vpeak)  |
| Input impedance               | 11MΩ for ranges <10V<br>10MΩ for ranges ≥10V                               |
| Sécurité                      | CAT III - 1000V and CAT IV - 600V  |
| <b>Frequency</b>              |  |
| Sensitivity                   | 100mVrms. Min  |
| Duty cycle                    | 10% min.   |
| Frequency range               | 10Hz to 100kHz   |
| Basic accuracy                | ±0,02% of full scale   |
| <b>Sampling</b>               |  |
| Resolution                    | 14 bit   |
| Sampling rate                 | 1Ms/s per channel max.   |
| <b>Bandwidth</b>              |  |
| Analogue input bandwidth      | Range ≥100V: 26kHz<br>Ranges from 10V to 100V: 20kHz<br>Ranges < 10V: 3kHz |
| Programmable analogue filters | 10kHz, 1kHz, 100Hz (pente 60dB/decade)                                     |

### Specifications - Universal input board

|                              |  |                |
|------------------------------|--|----------------|
| Channels                     | 6  |                |
| DC voltage ranges            | 1mV to 1000 V  |                |
| Max offset                   | ± 5 ranges ( except 1000V)   |                |
| Accuracy                     | ± 0,1% ± 10 μV ± 0,2% offset   |                |
| TRMS AC+DC                   | 200 mV to 500 V  |                |
| Bandwidth (-3dB)             | (- 3 dB) : 5 Hz - 100 kHz  |                |
| Crest factor                 | 4  |                |
| <b>Frequency</b>             |  |                |
| Sensitivity                  | 300 mV rms min.  |                |
| Duty cycle                   | 10%  |                |
| minimum                      |  |                |
| Frequency range              | 10Hz to 100 kHz  |                |
| Basic accuracy               | 0,2% of full scale   |                |
| Maximum input voltage        | ± 500VDC or 440V AC (sine)   |                |
| <b>Temperature</b>           |  |                |
| Sensor                       | Using environnement  | Ranges         |
| J                            | -20°C to 1200°C  | 20°C to 2000°C |
| K                            | -250°C to 1370°C   | 20°C to 2000°C |
| T                            | -200°C to 400°C  | 20°C to 500°C  |
| S                            | -50°C to 1760°C  | 50°C to 2000°C |
| B                            | -200°C to 1820°C   | 50°C to 2000°C |
| E                            | -250°C to 1000°C   | 20°C to 1000°C |
| N                            | -250°C to 1300°C   | 20°C to 1000°C |
| W5                           | 0 to 2320°C  | 50°C to 2000°C |
| Accuracy                     | Cold junction compensation : ±1,25°C   |                |
| <b>Sampling</b>              |  |                |
| Resolution                   | 14 bits  |                |
| Sampling rate                | 1M sample/sec per channel  |                |
| Memory length                | 32M word in segments of up to 128 Blocks   |                |
| Triggering                   | Positive edge, negative edge, on logical input, delay, Go No Go.   |                |
| Pre trigger                  | -100% to +100%   |                |
| <b>Bandwidth</b>             |  |                |
| Analogue input               | range ≤ 1V : 100kHz  |                |
| bandwidth to -3dB            | range ≤ 50m V to 1V : 50kHz  |                |
| Programmable digital filters | 10 Hz, 100 Hz, 1 kHz, 10 kHz   |                |
| Input impedance (DC)         | >25M Ω for range <1V<br>1 M Ω for upper ranges   |                |
| Input capacitance            | 150pF  |                |
| Maximum input voltage        | between one channel and the frame ground ± 500V<br>between 2 terminals of one channel ± 500V<br>Isolation between frame ground and channel<br>>100MΩ at 500VDC |                |



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## Oscillographic thermal recorders

### Specifications - Multiplexed board

|   |   |
|---|---|
| Channels  | 12  |
| <b>Voltage</b>  |   |
| DC voltage ranges   | 1mV to 50 V   |
| Max offset  | ± 5 ranges  |
| Accuracy  | ± 0.1% ± 10µV ± 0.1% offset   |
| TRMS AC+DC  | 200mV to 50V.   |
| Bandwidth (-3dB)  | 5Hz à 100Hz   |
| Crest factor  | 2,2   |
| <b>Temperature</b>  |   |
| Sensor  | Using environnement Ranges  |
| PT100 (2,3,4 Fils)  | -200°C to 850°C 20°C to 1000°C  |
| J   | -20°C to 1200°C 20°C to 2000°C  |
| K   | -250°C to 1370°C 20°C to 2000°C   |
| T   | -200°C to 400°C 20°C to 500°C   |
| S   | -50°C to 1760°C 50°C to 2000°C  |
| B   | -200°C to 1820°C 50°C to 2000°C   |
| E   | -250°C to 1000°C 20°C to 1000°C   |
| N   | -250°C to 1300°C 20°C to 1000°C   |
| W5  | 0 to 2320°C 50°C to 2000°C  |
| Accuracy  | Cold junction compensation: ±1,25°C   |
| <b>Sampling</b>   |   |
| Resolution  | 16 Bits   |
| Sampling rate   | 200µs maxi. (5K sample/s)   |
| Memory length   | 32M word in segments of up to 128 Blocks  |
| Triggering  | Positive edge, negative edge, on logical input, delay, Go No Go.                                    |
| Pre trigger   | -100% to +100%  |
| <b>Bandwidth</b>  |   |
| Analog input bandwidth to -3dB                            | 1 kHz to -3 dB  |
| Programmable digital filters                              | 0,01Hz to 50Hz  |
| Input impedance (DC)                                      | 2 M Ω range >5V<br>10M Ω (150pF) for other ranges<br>between one channel and the frame ground ± 50V |
| Maximum input voltage                                     | between 2 terminals of one channel ± 50V<br>all input are differential, non isolated                |
| Common mode voltage (max.)                                | ± 5V for ranges < 5V<br>± 50V for ranges > 5V   |
| <b>Measurement boards and options (*= factory option)</b> |   |
| 984405500   | 16 isolated logical channels module   |
| 910007000   | Logical channels cords  |
| 984402000   | 12 channels multiplexed board   |
| 984401000   | 6 isolated channels universal board   |
| 984402500   | 6 isolated channels strain gauge / temperature board  |
| 984603000   | IRIG board*   |
| 916006000   | 6 isolated channels high voltage board  |
| 902402000   | WiFi communication option   |
| <b>Current clamps</b>                                     |   |
| A1257   | Kit with 3 flexible clamps 30A/300A/3000A AC for three phases measurements                          |
| A1287   | Flexible clamp 30A/300A/3000A AC  |
| SP201   | Current clamp 200A AC, 10mV/1A, D 15mm  |
| SP221   | Current clamp 10A AC, 100mV/1A, D 15mm  |
| SP230   | Current clamp 1200A AC, 10mV/1A, D 50mm   |
| SP261   | Current clamp 1200A AC+DC, 1mV/1A, D 50mm   |
| SP270   | Current clamp 2000A AC, 1mV/1A, D 70mm  |
| <b>Shunts</b>   |   |
| 910007100   | Shunt 0,01 ohm 3A max   |
| 910007200   | Shunt 0,1 ohm 1A max  |
| 989006000   | Shunt 1 ohm 0,5A max  |
| 912008000   | Shunt 10 ohms 0,15A max   |
| 989007000   | Shunt 50 ohms 0,05A max   |
| 207030301   | Shunt 0,01 ohm 30A max  |
| 207030500   | Shunt 0,001 ohm 50A max   |
| <b>Transportation case (Trolley)</b>                      |   |
| 984605000   | case for 8460   |
| <b>FLEXPRO® analysis software</b>                         |   |
| 100081  | Flexpro® View (basic version)   |
| 100082  | Flexpro® Full   |

### Strain Gauge board - Specifications

|   |  |                  |
|---|--|------------------|
| Channels:   | 6  |                  |
| Measurements  | Strain gauge, voltage, thermocouple and current with optional external shunt |                  |
| Input   | differential, fully isolated   |                  |
| Input impedance   | 2 MΩ for ranges < 1 Volt<br>1 MΩ for ranges ≥ 1 Volt                         |                  |
| Maximum input voltage   | 200V DC  |                  |
| (Between one input and ground, or between ground and mechanical chassis)    |  |                  |
| Input voltage   | ± 50V  |                  |
| (entre les entrées, entre entrée et masse tiroir)                           |  |                  |
| Isolation   | >100 MΩ under 500V   |                  |
| (between channels and mechanical chassis)                                   |  |                  |
| Input connectors  | Fast plug-in / plug-out,<br>6 contacts per channel                           |                  |
| All accuracies are given with 1Hz filter                                    |  |                  |
| <b>Voltage measurement</b>  |  |                  |
| Maximum range   | 50 V   |                  |
| Lowest range  | 1 mV   |                  |
| Maximum offset  | ±50V limited at ± 5 ranges   |                  |
| Accuracy  | ± 0.1% of full scale<br>± 10µV ± 0.1% of offset                              |                  |
| Résolution  | 16 bits  |                  |
| Offset drift  | 100 kéch/s (10µs)  |                  |
| Sampling rate   | 100ppm/°C ±1 µV/°C   |                  |
| Noise   | <30µV without filter   |                  |
| <b>Strain gauge measurement</b>   |  |                  |
| The unit is µSTR (micro strain) - 2000µSTR = 1 mV/V                         |  |                  |
| Bridge  | Full bridge (4 and 6 wires), half bridge                                     |                  |
| Automatic balancing range   | ± 25000 µSTR   |                  |
| Bridge supply voltages  | 2V and 5V (symmetrical ±1V and ±2.5V)  |                  |
| Gauge rate  | 2 (ajustable between 1.8 and 2.2)  |                  |
| Maximum range   | 50 000 µSTR  |                  |
| Minimum range   | 1000 µSTR  |                  |
| Maximum offset  | ± 50000µSTR  |                  |
| Accuracy  | ± 0.1% of full scale<br>± 5µSTR ± 0.1% of offset                             |                  |
| Resolution  | 16 bits  |                  |
| Sampling rate   | 10µs/100 kéch/s  |                  |
| <b>Bandwidth</b>  |  |                  |
| 3 dB bandwidth  | >18 KHz  |                  |
| Analogue filter   | 1KHz, 100Hz  |                  |
| (low pass 60dB/decade)  |  |                  |
| Low pass (digital)  | 1 Hz, 0.1 Hz, 0.01 Hz, 0.001 Hz  |                  |
| <b>Temperature measurement</b>  |  |                  |
| Cold junction compensation for J,K,T,S,N,E,<br>W5 thermocouples : ± 1.25 °C |  |                  |
| <b>Sensor</b>   | <b>Maximum possible range</b>  | <b>Range</b>     |
| Couple J  | -210°C to 1200 °C  | 20 °C to 2000 °C |
| Couple K  | -250°C to 1370 °C  | 20 °C to 2000 °C |
| Couple T  | -200°C to 400 °C   | 20 °C to 500 °C  |
| Couple S  | -50°C to 1760 °C   | 50 °C to 2000 °C |
| Couple B  | 200°C to 1820 °C   | 50 °C to 2000 °C |
| Couple E  | -250°C to 1000 °C  | 20 °C to 1000 °C |
| Couple N  | -250°C to 1300 °C  | 20 °C to 1000 °C |
| Couple W5   | 0°C to 2320 °C   | 50 °C to 2000 °C |

For assistance and ordering

# Sefram

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FT 8460 A 01 - Specifications can be updated without notice