

STRAP-ON PIPE RADIATION MONITOR

捆绑式管道辐射监测器

Model Series~ PEMO-7

PEMO-7 ~ PEMO-7-MCA ~ PEMO-7-G

FEATURES: 特点

- INSTALLS ANYTIME ANYWHERE
随时随地安装
- SENSITIVITY INDEPENDANT OF FLOW RATE
灵敏度不受流量影响
- NO PENETRATION, NO DOWNTIME
无需穿透管线, 无检修期
- SENSITIVITY: $1 \times 10^{-7} \mu\text{Ci/cc}$ ^{60}Co in 18" pipe
灵敏度: 18"管道 ^{60}Co 灵敏度为 $1 \times 10^{-7} \mu\text{Ci/cc}$
- REAL TIME ALARM
实时报警
- RATE & INTEGRATED EXPOSURE
照射量率&综合辐射暴露
- DETECTOR TYPE CHOICE: NaI (TI) or HPGe
探头选择: NaI (TI) 或 HPGe
- USB & ETHERNET PORTS
USB&以太网接口
- ON BOARD DATA ARCHIVE, TRANSMIT, & DISPLAY
机载数据存档, 传输&显示



APPLICATION: 应用

The **PEMO-7** Pipe Monitor assures accurate detection and quick alarm in case of waterborne radioactivity contamination flowing thru one or more pipes. A constant check with alarm and data record is accomplished by the onboard computer. Integrated exposure information is recorded and can provide a hard copy via external printer. It is a complete system and may be expanded per need with modules of the FM-9 series.

The **PEMO-7** is sensitive and versatile. It may be used to monitor water in pipes or effluent streams down to EPA levels.

应用: PEMO-7 管道监视器, 通过机载计算机持续带报警和数据录入检测, 一旦流经一条或多条管道中有水辐射污染, 可确保精确探测并快速报警。此仪器提供综合照射信息并通过外部打印机提供硬拷贝。此仪器为一体化系统, 但可根据需要使用 FM-9 系列模块进行功能拓展。PEMO-7 广泛使用款式, 可以用来监测管道, 风管, 排污渠中的水到 EPA 规定值。

DESCRIPTION:

The **PEMO-7** uses standard NaI (TI) Detector in T/A's unique Strap-On Style Shield to continuously measure any water or airborne gamma emitting Radioactive contaminants, onboard data logging. The water or air stream is under constant surveillance via a scintillation detector. The unit is completely self-contained.



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PEMO-7使用标准NaI (TI) 探头, 配备T/A公司专用的捆绑式屏蔽, 持续测量水或任何气溶胶伽马辐射污染物, 机载数据录入, 闪烁探头持续监测水流或气流, 此装置完全一体。

The **PEMO-7** utilizes a NaI (TI) scintillation crystal detector.

PEMO-7使用NaI (TI)闪烁晶体探头。

The **PEMO-7-MCA** utilizes a NaI (TI) scintillation crystal detector.

PEMO-7-MCA使用NaI (TI)闪烁晶体探头

The **PEMO-7-G** utilizes an intrinsic HPGe solid state detector.

PEMO-7-G使用高纯HPGe固体探头

NOTE FOR SELECTION OF INTRINSIC HPGe DETECTOR ~ PEMO-7-G:

注: HPGe固体探头~PEMO-7-G:

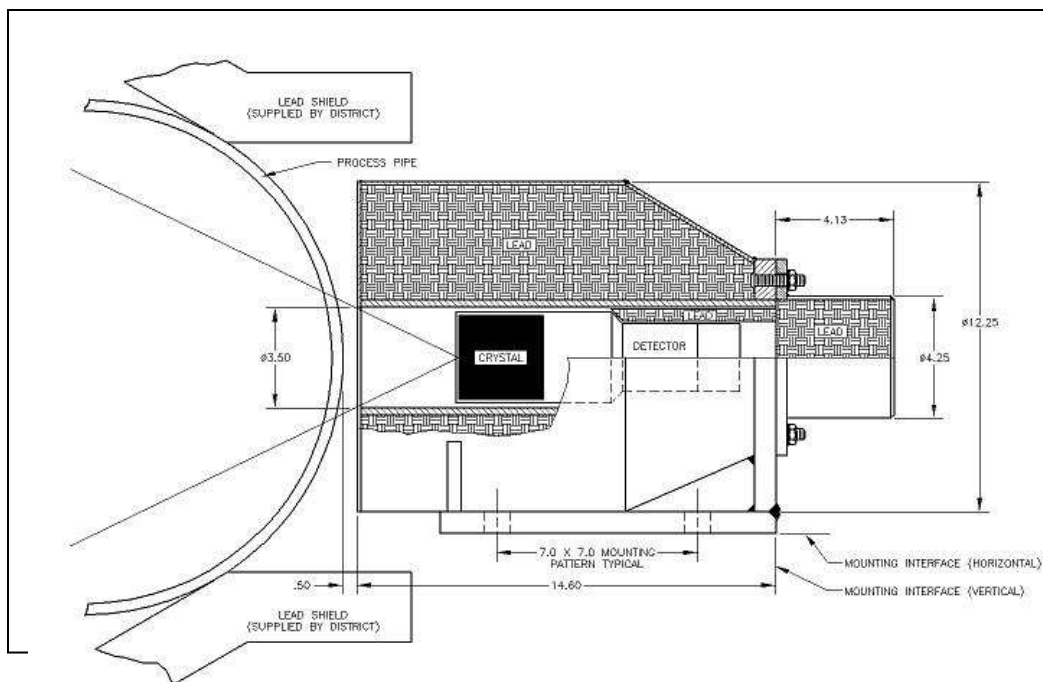
The **PEMO-7-G** System has an installed Dewar to maintain HPGe crystal at proper temperature range.

OPTIONAL: An electronic cryo-cooler is available.

PEMO-7-G系统配备杜瓦瓶以保持HPGe晶体恒温

选购: 电子cryo-cooler恒温系统。

ELECTRONICS
Model FM-9W



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SPECIFICATIONS: 规格

PEMO-7

Sensitivity: 灵敏度

Installation Diagram

Sensitivity and response time depend on user's requirements and physical circumstances such as pipe diameter, wall thickness, and ambient background radiation level and energy (KeV) of major nuclides of interest.

Example: The standard system with 3" x 3" NaI detector and 2" of lead shielding has a limit of sensitivity better than 1×10^{-7} Ci/cc of ^{60}Co in an 18" diameter pipe with 0.02 mR/hr background in a one hour measurement.

灵敏度: 灵敏度和响应时间视用户要求和实际情况而定, 比如管径, 壁厚和本底辐射水平及用户关心的核素能量, 例如带 3" x 3" NaI 探头和 2"铅屏的标准系统灵敏度限值优于 1×10^{-7} (相当于本底 0.02mR/h, 测量一小时后, 直径 18"管道中单位为 Ci/cc 的 Co-60)

DETECTORS: 探头

PEMO-7 & PEMO-7-MCA 3" x 3" NaI (TI) crystal scintillation detector probe, Model PGS-3X3T (typically one per pipe) with sensitivity to all Gamma above 100 KeV.

PEMO-7 & PEMO-7-MCA 3" x 3" 晶体闪烁探头
Model PGS-3X3T (典型每个管道一个) 对100KEV以上伽马敏感。

PEMO-7-G: Intrinsic HPGe Solid State Detector

PEMO-7-G: 高纯 HPGe 固体探头

ELECTRONICS:

电子学

Engineering Units:

User can input correct conversion factor and change to any units.

计量单位:

用户使用正确转换因子可转换为任何单位

Controls: Front Panel:

On-Off, Alarm-mute, Rate, Integrate, Reset.

控制: 前板:

On-Off, 报警静音, 辐射率, 综合, 重设

Recessed or Internal:

Discriminator level, high voltage. Other adjustable settings: See calibration.

内凹或内置型:

甄别器, 高压, 其它可调整设定: 见标定程序

Input Sensitivity:

Adjustable from less than 1 millivolt to 100 millivolt

输入灵敏度:

可调整范围 1 毫伏-100 毫伏

可选择抗饱和电路与死时间更正

2000 Hz audio tone with audio "mute" switch + RED LIGHT
High current relay. 0-100% of full scale.

Alarm:

报警:

2000 赫兹带静音按钮+红灯

大电流继电器,

Alarm Set Point:

User settable to any point on detector range.

报警设定:

探测器量程内用户设定

Serial Output:

Two way USB standard, Ethernet optional.

串口输出:

两路 USB 标准接口, 可选以太网。



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- Power:** 105-125 volts, 50-60 Hz (220 V optional)
电源: 105-125V, 50-60 Hz (可选 220 V)
- **OPTIONAL:** Software package for integration into facility computer & to link multiple detectors.
选项: 通过软件包与设施内电脑兼容并与多部探测器连接

ELECTRONICS DIMENSIONS & WEIGHT:

电子学尺寸&重量

21" W X 11" H X 16" D
21" 宽 X 11" 高 X 16" 深
20 pounds (9 kg)
20 磅 (9 公斤)

MODEL	ENERGY ANALYZER 能量分析仪	DETECTOR 探测器	SMART ELECTRONICS 智能电子学	ANALYSIS OUTPUT 分析输出	TEMPERATURE OPERATION 操作温度
PEMO-7	Single Channel Analyzer (SCA) 单道分析仪	3" x 3" NaI (TI)	FM-9W	Wide or Narrow Window 宽或窄窗	No Dewar Ambient Temperature Operation 无杜瓦保温容器 环境温度操作
PEMO-7-MCA	Multi-Channel Analyzer (MCA) 多道分析仪	3" x 3" NaI (TI)	Full Computer 全电脑	Isotope Identification Enhanced Display 核素识别显示	No Dewar Ambient Temperature Operation 无杜瓦保温 环境温度操作
PEMO-7-G	Multi-Channel Analyzer (MCA) 多道分析仪	HPGe Solid State HPGe 固态	Full Computer 全电脑	Isotope Identification Enhanced Display 核素识别显示	Manual Dewar or Electronic Cryo-Cooler Cryogenic Temperature Operation 手动操作保温容器或电子 Cryo-Cooler 低温操作

- Shielding:** 0.25" to 3" low- activity-lead around detector.
屏蔽: 探头周围0.25" - 3" 低活度铅
- Range - PEMO-7:** **Example:** 1×10^{-7} to 1×10^{-4} $\mu\text{Ci/cc}$ with 3" x 3" NaI (TI) & 18" Pipe.
Range-PEMO-7: 举例: 3" x 3" NaI (TI) & 18" 管道, 1×10^{-7} - 1×10^{-4} $\mu\text{Ci/cc}$
- Alarm:** User Settable. 2000 Hz beeper, red flasher and relay contacts for user.
报警: 用户设定, 2000 Hz 蜂鸣音, 红色闪灯, 提供继电器触片



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Response Time:	Settable 1 second to 10 minutes.
响应时间:	可设定1秒-10分钟
Readout:	Color Monitor showing: concentration, total activity and programmed information.
读数:	彩屏显示浓度、总活度及编程信息
Power:	115 V, 50-60 Hz (230 V optional).
电源:	
Flow Rate:	Measurement is independent of Flow rate.
流量:	测量不依赖流量
Sample Volume:	The pipe should be full of liquid for best sensitivity.
样品容量:	管道里装满液体灵敏度最佳
Case:	Electronics rack mounted or housed in enameled steel case.
外箱:	电子学带烤漆钢质外箱

WEIGHT & DIMENSIONS:

重量&尺寸

Detector Assembly Weight:	10 lbs for unshielded PEMO-7 assembly, up to 350 lbs for 2" thick lead shielding.
探测器组件重量:	10磅 FEMO-7无屏蔽组件, 2"厚度铅屏蔽总重达到350磅
Shipping Weight:	450 lbs. for complete 1 detector PEMO-7 system, including detector light shielding. (weight will vary dependent on shield & detector selection)
邮寄重量:	450磅整套PEMO-7系统, 包括探头和轻量屏蔽(重量根据选择的屏蔽和探头变化)

NOTES FOR RADIATION MEASUREMENT WHEN DETECTOR IS OUTSIDE OF THE PIPE:

当探头在管道外进行辐射测量时注意事项:

OBSTACLES IN OBTAINING GOOD EFFICIENCY AND HIGH SENSITIVITY WHEN MEASURING RADIOACTIVE ACTIVITY FROM THE OUTSIDE OF A PIPE.

从管道外测量辐射活度时要获得理想效率和高灵敏度的障碍:

1. Unknown volume if pipe is not always full.
管道内被测物不一定满容量
2. Unknown list of nuclides & energies.
核素&能量未知
3. Pipe wall thickness and material, such as steel will absorb all Alphas & all Betas below 1 MeV, & Gammas below 100 KeV.



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管壁厚度和材质，如钢将会阻挡1MeV以下的所有 α & β 和100KEV以下的 γ 。

4. Geometry of measurement is poor because pipe presents only a small angle source to the probe crystal's view.

测量角度不好因为管道只呈现小角度供探测器晶体测量。

UNITS OF MEASUREMENT FOR PIPE MONITOR

管道监测器测量单位

The instrument can calculate & display any engineering units desired. But the user needs to input a valid calibration coefficient factor.

仪器可计算并显示任何需要的测量单位，但是用户需输入有效刻度系数

In the absence of a good calibration factor for the **PEMO-7**, read-out defaults to units in **cps** or can easily be set to read-out in **cpm** without calibration. Units of **mR/hr** can be set with minimum effort.

无刻度系数情况下，PEMO-7读数默认单位CPS或者可容易设定为CPM，单位MR/hr也可轻松设定。

Instructions for Manual Input of Calibration Coefficient:

手动输入标定系数说明：

1. Fill the pipe full with a known concentration of the single nuclide of greatest interest or abundance.
将管子装满已知浓度感兴趣的单个核素或富集的核素
2. Set energy window or area of interest to the major energy peak.
设定能量峰值能量窗或兴趣区
3. Record the count rate
记录计数率
4. Calculate calibration coefficient factor.
计算标定系数

Calculation Formula: 计算公式

Divide cps by Bq (Counts per second divided by disintegrations per second)

CPS除以Bq(每秒总计数除以每秒衰变)

5. Repeat procedure for the second most abundant nuclide.
重复以上程序测量第二种最富集的核素（数量最多）
6. Use the factors that you have determined to calculate a weighted average factor which reflects the abundance of each important nuclide in the liquid mixture.
使用你得出的因数计算出反映液体混合物中每一个重要核素富集度的加权平均系数
7. Input the calibration factor as you follow the on-screen calibration instructions.
按照屏幕显示的标定说明输入标定常数
8. The **PEMO-7** can then readout in concentration units such as $\mu\text{Ci/L}$ (microCuries per liter) or KBq/m^3 or as desired.
然后PEMO-7可以读出浓度单位 $\mu\text{Ci/L}$ ，或 KBq/m^3 ，或其它单位

NOTE: Solid sources can be used to approximate the correct calibration factor for particular nuclides if pipe thickness is taken into account.

注：如果管壁考虑在内的话，固体源可以用来估算某些核素刻度常数



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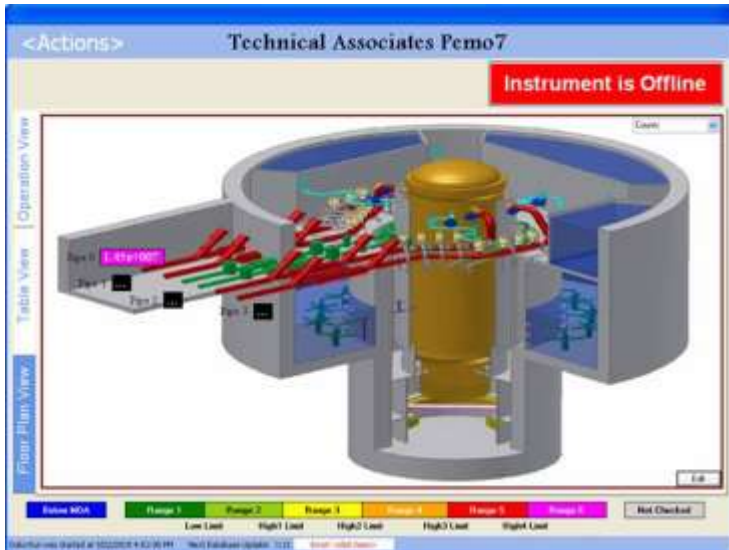
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OPTIONAL SOFTWARE SCREEN SHOTS



Technical Associates Pemo7
Instrument is Offline

Measurable Name	EUs	Units	Counts Per Second	EUs (2 min Average)	EUs (30 min Average)	EUs (8 hr Average)	EUs (24 hr Average)	Limit Level	Loss Of Signal
Pipe 0 Counts	1.45e+02	counts		1.44e+02	1.44e+02	1.35e+02	1.30e+02	5	<input type="checkbox"/>
Pipe 0 Count Rate	615	cps		615	617	617	430	5	<input type="checkbox"/>
Pipe 0 Dose Rate	615	mR/h		617	617	617	430	5	<input type="checkbox"/>
Pipe 0 Dose	1.45e+02	mR		1.44e+02	1.44e+02	1.35e+02	1.30e+02	5	<input type="checkbox"/>
Pipe 1 Counts		counts		0	0	0	0	0	<input type="checkbox"/>
Pipe 1 Count Rate		cps		0	0	0	0	0	<input type="checkbox"/>
Pipe 1 Dose Rate		mR/h		0	0	0	0	0	<input type="checkbox"/>
Pipe 1 Dose		mR		0	0	0	0	0	<input type="checkbox"/>
Pipe 2 Counts		counts		0	0	0	0	0	<input type="checkbox"/>
Pipe 2 Count Rate		cps		0	0	0	0	0	<input type="checkbox"/>
Pipe 2 Dose Rate		mR/h		0	0	0	0	0	<input type="checkbox"/>
Pipe 2 Dose		mR		0	0	0	0	0	<input type="checkbox"/>
Pipe 3 Counts		counts		0	0	0	0	0	<input type="checkbox"/>
Pipe 3 Count Rate		cps		0	0	0	0	0	<input type="checkbox"/>
Pipe 3 Dose Rate		mR/h		0	0	0	0	0	<input type="checkbox"/>
Pipe 3 Dose		mR		0	0	0	0	0	<input type="checkbox"/>

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Pipe 0 Dose	1.45e+02	mR		1.44e+02	1.44e+02	1.35e+02	1.30e+02	5	<input type="checkbox"/>
Pipe 1 Counts		counts		0	0	0	0	0	<input type="checkbox"/>
Pipe 1 Count Rate		cps		0	0	0	0	0	<input type="checkbox"/>
Pipe 1 Dose Rate		mR/h		0	0	0	0	0	<input type="checkbox"/>
Pipe 1 Dose		mR		0	0	0	0	0	<input type="checkbox"/>
Pipe 2 Counts		counts		0	0	0	0	0	<input type="checkbox"/>
Pipe 2 Count Rate		cps		0	0	0	0	0	<input type="checkbox"/>
Pipe 2 Dose Rate		mR/h		0	0	0	0	0	<input type="checkbox"/>
Pipe 2 Dose		mR		0	0	0	0	0	<input type="checkbox"/>
Pipe 3 Counts		counts		0	0	0	0	0	<input type="checkbox"/>
Pipe 3 Count Rate		cps		0	0	0	0	0	<input type="checkbox"/>
Pipe 3 Dose Rate		mR/h		0	0	0	0	0	<input type="checkbox"/>
Pipe 3 Dose		mR		0	0	0	0	0	<input type="checkbox"/>



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