



Annual Users' Conference

**ADVANCING RADIATION SAFETY.
EMPOWERING PROGRESS.**

M Resort, Henderson, NV | June 15 – June 18



MIRION
TECHNOLOGIES

*Advancing Radiation Safety.
Empowering Progress.*

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Overview on NFMS & Safety I&C

HIPS, CoreVision, proTK, Detectors & EPAs

Jörg von Loeben

VP I&C - Safety, Protection & Control

Mirion Connect | Annual Users' Conference 2026

Henderson, NV



Safety Protection Control

Ultra-precise instruments that help operators maintain reactor safety and peak performance.

Electrical Penetration Assemblies *Sealed signal & power feedthroughs*

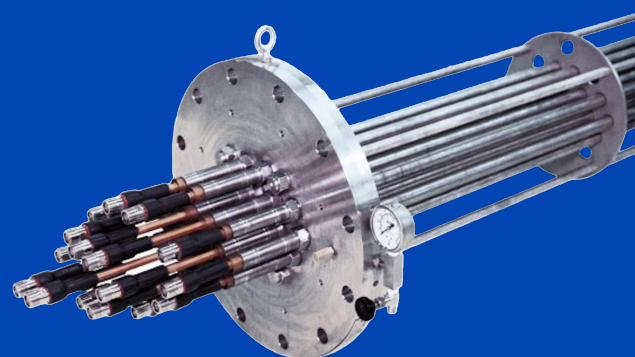
In-Core Detectors & Nuclear Service Sensors *Spatial neutron flux mapping, temperature, level*

Ex-Core Detectors *Source, Intermediate, Power & Wide Range*

NFMS Electronics *proTK & CoreVision*

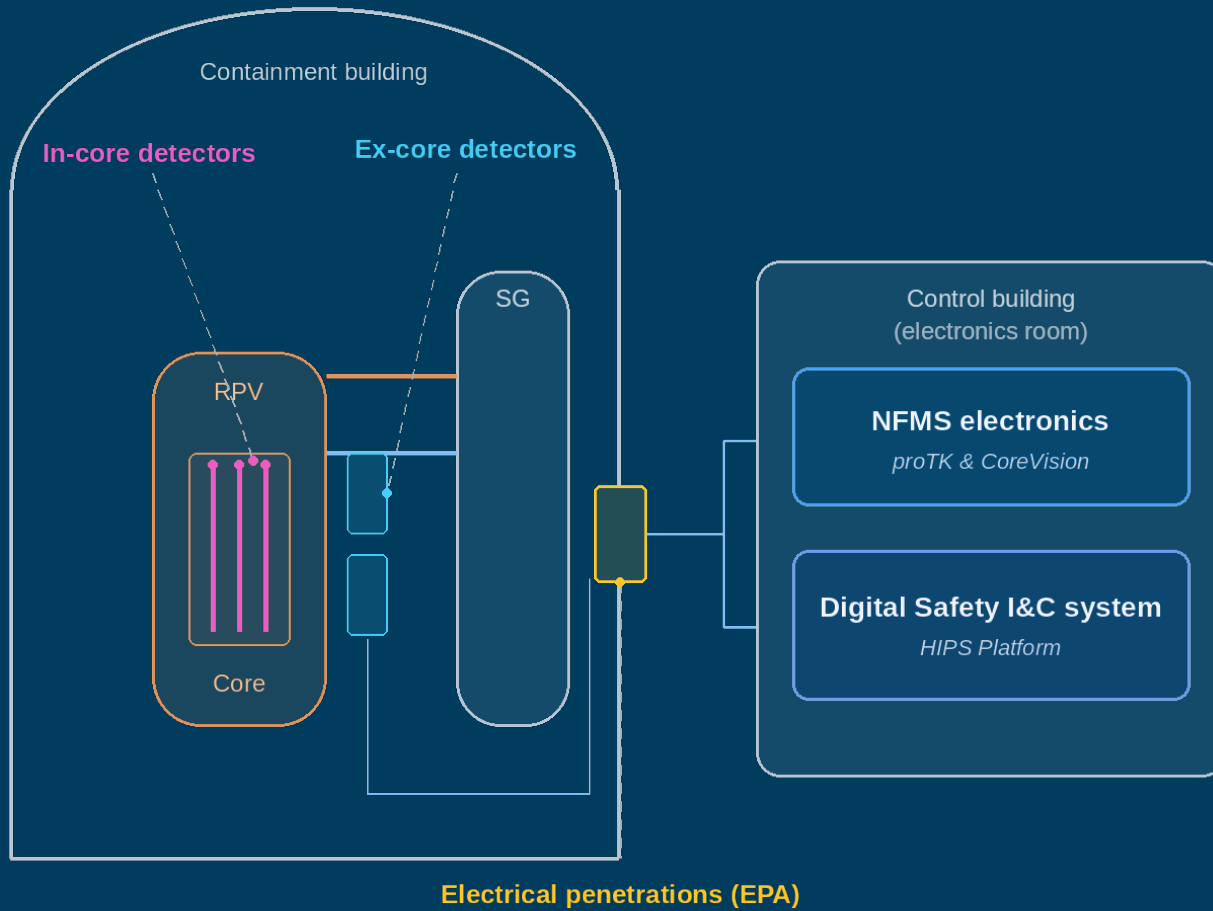
Digital Safety I&C System *HIPS Platform*

I&C One-Stop-Shop *Turnkey nuclear I&C solutions*



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Safety Protection Control

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I&C One-Stop-Shop Turnkey nuclear I&C solutions

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A Portfolio of Trusted Brands

Full-service provider for Nuclear Instrumentation & Safety Systems

Horseheads

USA

- Ex-Core Detectors incl. Fission Chambers
- In-Core (Miniature Fission Chamber)
- Cabling + MI-Cables

Cambridge

CANADA

- In-Core Neutron Detectors & Reactor Feedthroughs
- Nuclear Service Sensors + MI-Cables
- Analog Measurement Channels

Buffalo & Fussy

USA · FRANCE

- Electrical Penetrations
- Nuclear Service Sensors

Munich

GERMANY

- Digital NFMS & Safety RMS (proTK)
- Ex-Core Detectors
- RMS Detectors & Safety Systems

Fort Worth, Texas

USA

- Safety I&C Platform (HIPS)
- Analog NFMS (CoreVision)
- Reverse Engineering & Commercial Grade Dedication / Qualification

End-to-End Coverage

From core to cabinet — engineered, qualified & delivered by Mirion



MIRION
TECHNOLOGIES

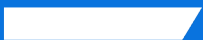


A decorative pattern of overlapping hexagons in a lighter blue shade, located at the top of the slide.

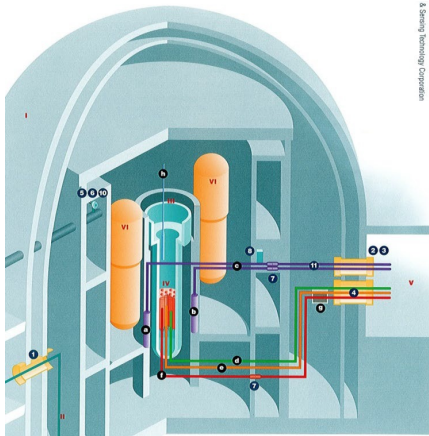
EPA

Electric Penetration Assembly

Sealed signal and power feedthroughs for the containment structure

A short, white, horizontal bar with a slight 3D effect, located below the subtitle.

Electric Penetration Assembly



Pass conductors through a containment structure

EPAs 40–50 per plant with 5,000 to 12,000 conductors

Conductor sizes 0.8 mm² to 1,134 mm²

Current 4–20 mA up to 800 A

Voltage 50 V DC to 15 kV AC

Conductor types Thermocouples, Coaxial, Optical fibers, MI-Cables



Maintains the integrity of the containment structure for 40/60 years under normal, abnormal, and severe accident conditions

Electric Penetration Assembly

Proven design serving the global nuclear fleet

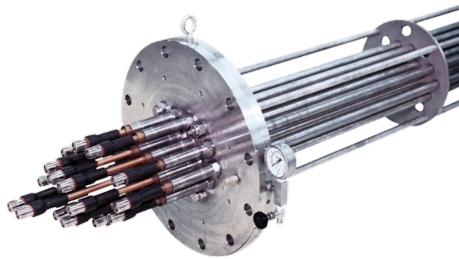


Compatible designs *AP1000, EPR, VVER, Hualong1, CANDU*

Nuclear standards *IEEE 317 / 323 / 344, ASME Sec. III, IEC 60772*

Modular construction *Factory assembled, no internal splices*

Leak monitoring *Integrated detection system*



Over 15,000 units installed across 290 nuclear power plants worldwide

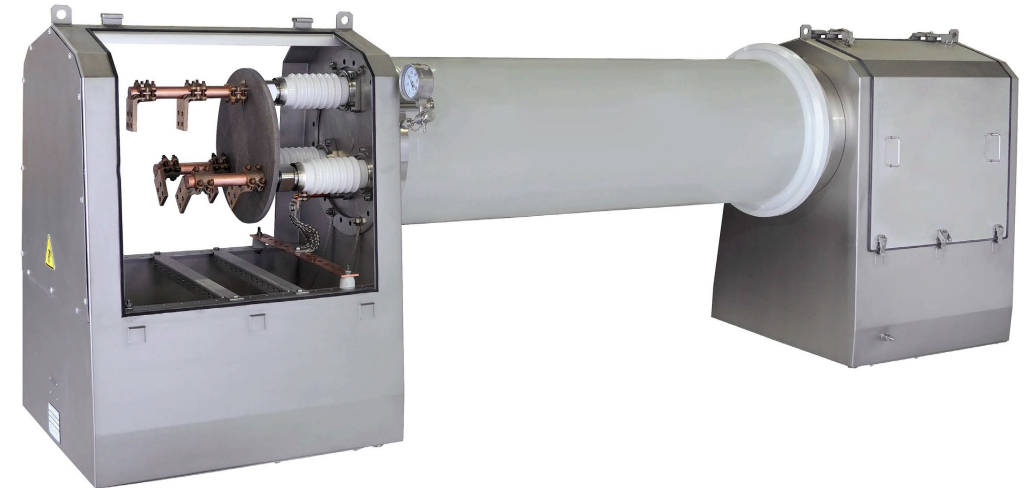
EPA - Examples

Field installations across leading reactor designs



AP 1000

Vogtle 3



EPR

OL 3, FA 3, TSN 1&2, HPC 1&2

In-Core Detectors & Nuclear Service Sensors



In-Core Detectors & Sensors

A complete portfolio of in-vessel instrumentation

Neutron Flux Detectors

Self Powered Neutron Detectors (SPND) and bundles, Movable Miniature Fission Chambers – $1E-20$ to $1E-17$ A/nv

Temperature Sensors

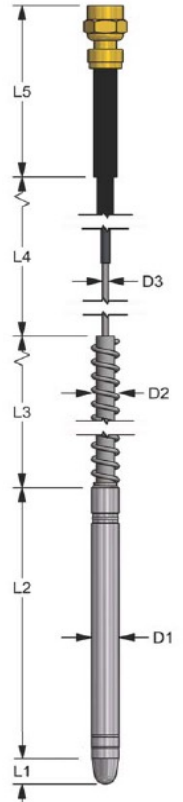
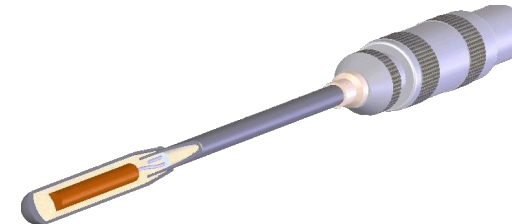
RTD 100/200 Ω platinum (dual or single element) and thermocouples for in-core and severe accident conditions

HJTC Water Level

Heated Junction Thermo Couples for refueling water and PWR vessel water level measurement

Reactor Vessel Feedthroughs

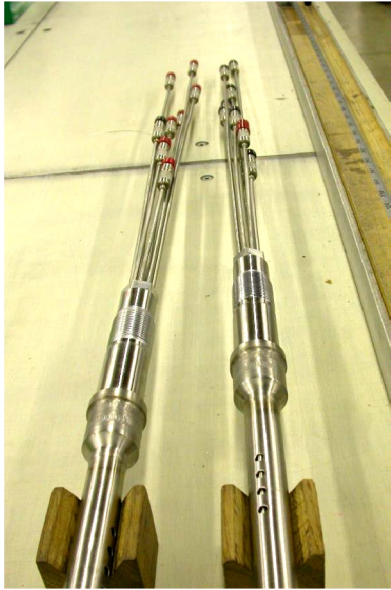
Sealed vessel pass-throughs for routing sensor signals through reactor pressure boundary



Complete in-core instrumentation portfolio – temperature, neutron flux, water level, and vessel feedthroughs from a single supplier

In-Core Detectors, Sensors & Cables

Manufacturing scale: assemblies, bundles and channels for the reactor core



Typical Boiling Water Reactor

30–40 in-core bundles (4+ detectors per bundle) · > 100 in-core channels in total

~5,000 detectors & sensors
manufactured at Mirion Cambridge per year

Ex-Core Detectors



Ex-Core Detectors & Cables

Source · intermediate · power · wide range — qualified to IEC and IEEE standards

Proportional Counters

B-10 and BF3 counters for source-range neutron detection

Ionization Chambers

B-10 chambers covering intermediate and power range

Fission Chambers

Source-range and wide-range neutron flux measurement

MI Coaxial Cables

Mineral-insulated cables for harsh in-containment environments



Qualified to IEC/IEEE 60780-323, IEC 60515, IEEE-344, IEC-60980 — many variations available, customization on request

Ex-Core Detectors & Cables

Watertight housings, detector assemblies, and moderator designs

Watertight Detector Housings

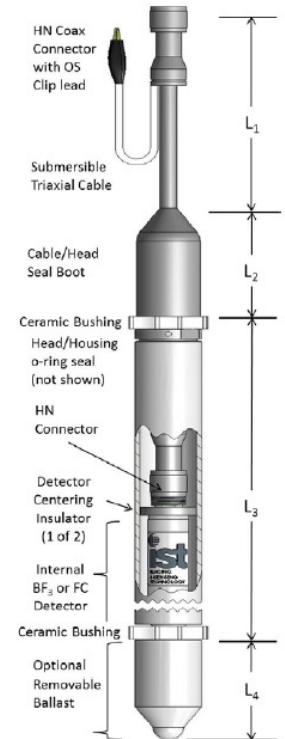
Sealed housings rated for in-vessel and harsh environments

Detector Assemblies & Custom Mounts

Pre-engineered assemblies and other custom mounting solutions

Moderator Designs

Custom moderator structures optimized for neutron detection geometry



Mirion designs and manufactures the complete ex-core hardware stack — from individual detectors to integrated assemblies

proTK™ - Digital NFMS



proTK™ Platform

Digital · modular · accurate · fast · testable · reliable

Scalable 19" Rack Platform

Multiprocessor for radiation, process monitoring, and neutron flux measurement

Highly Customizable

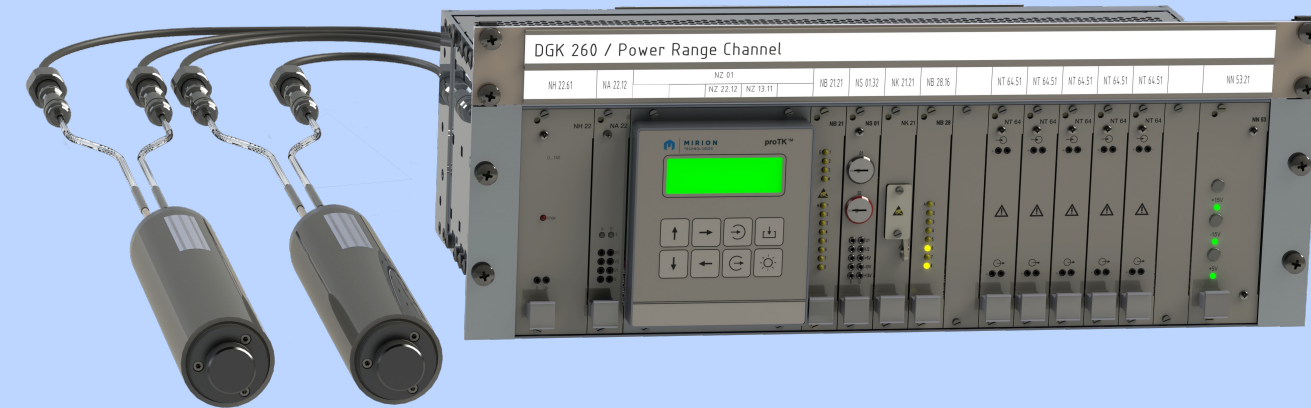
Adapts to functional, normative, and customer requirements

Versatile Applications

Retrofit, advanced nuclear, new builds, and research reactors

Modern Architecture

Recently upgraded to modern microcontrollers



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Empowering Progress.

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proTK™ Digital Neutron Instrumentation System

Modular safety platform – 35 years field-proven

Modular Integration

Third-party compatible for seamless on-site deployment

Real-Time Performance

Fixed 2.5/5 ms cycle times for deterministic safety response

Certified to Nuclear Standards

IEC 61513/IEEE 603, IEC 60880/IEEE 7-4.3.2, IEC/IEEE 60780-323

NRC Safety Evaluation

NRC SE of the proTK platform has started – 1E, CAT A certified

Modern Architecture

µController-based – digital, modular, and future-ready

Platform Advantages

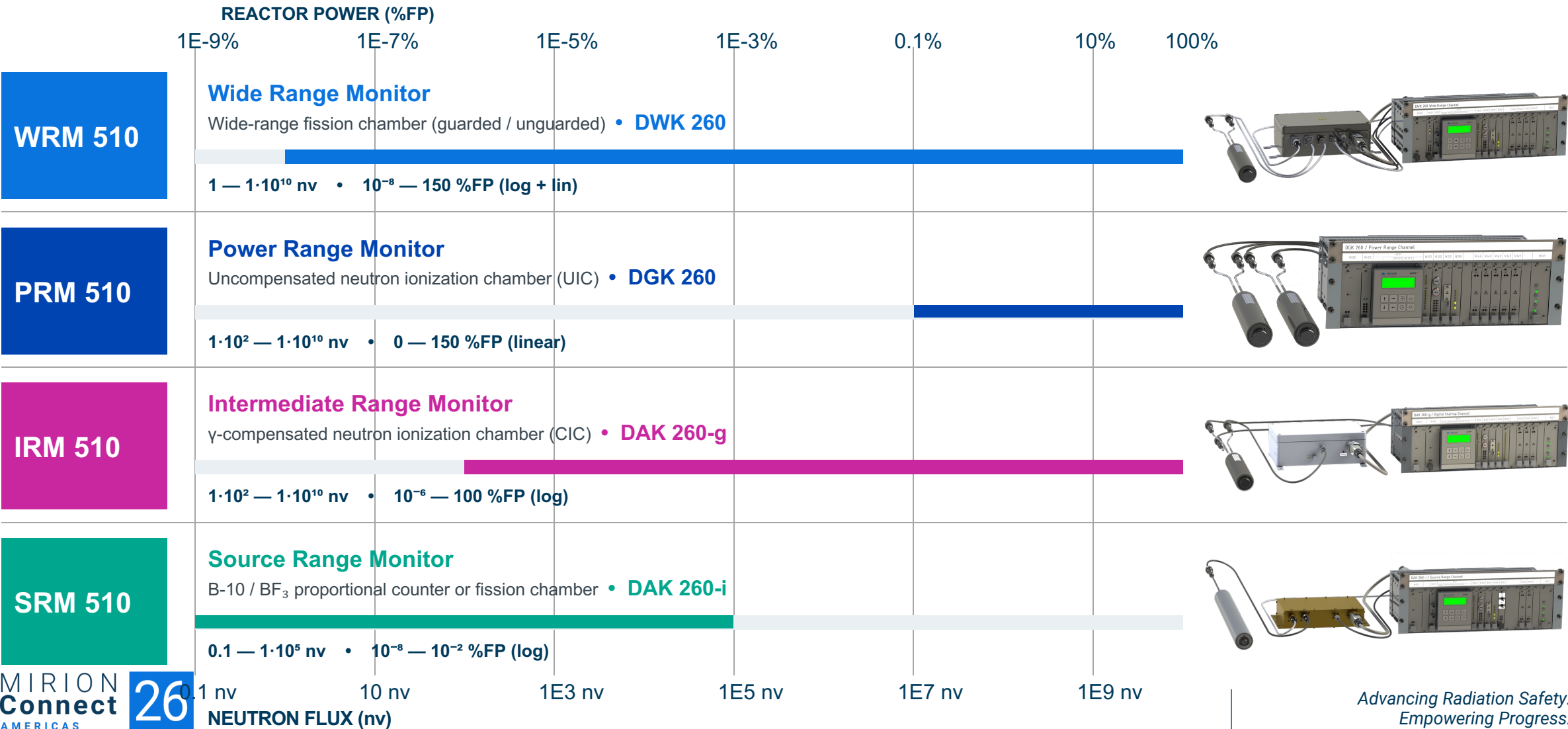
- ✓ Simple and clear
- ✓ Deterministic and fast
- ✓ Reliable
- ✓ Safe
- ✓ Simplified testing
- ✓ Independent V&V certification



35 years field-proven – 3,500+ operational years across 400 safety-critical systems

Measurement Ranges

Complete neutron flux coverage from reactor start-up to full power — four monitors, one integrated proTK™ solution.



proTK™ in the Field

Digital NIS — trusted by established and advanced reactor leaders

Westinghouse Refits

Direct digital replacement for analog NIS drawers · Drop-in installation · Standard licensing

Advanced Reactors

TerraPower Sodium XIS · Microreactors · DOE pilot programs

European Fleet

All Belgian NPPs run on proTK

Research Reactors

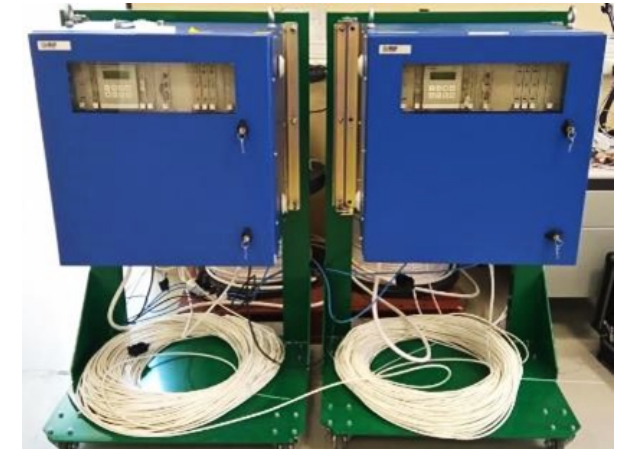
Labgene · JRTR · Petten · KJRR · MIT · Purdue



200 Start-up · 60 Wide Range · 40 Power Range — plus 500+ RMS installations

proTK™ - More Safety Systems

Specialized monitoring for steam generator integrity and boron concentration



Steam Generator Leakage Monitoring (Cat. A)

SGLM / SGTR — proTK with rugged NaI gamma scintillation detector and optional lead shielding; Version with robust gamma ionization chamber existing.

Boron Concentration Monitor (Cat. A & Cat. B)

BM 501 / BM 502 — Continuous B-10 concentration measurement in light water reactors. Components: 2× proTKs (DBK 250), detection assembly, 2× B-10 proportional counters, neutron source in moderator.

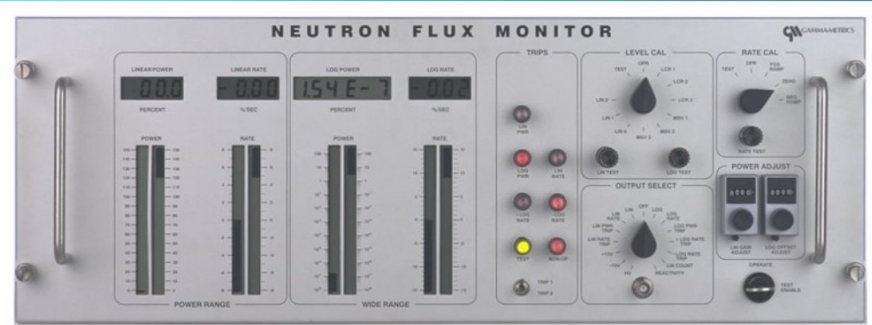
Cat. A and Cat. B certified safety monitoring — built on the proTK platform

CoreVision - Analog NFMS



CoreVision™ – Analog NFMS Solutions

LEGACY



NEW DESIGN



Exclusively operated & supported by Paragon

- Existing and new large NPPs
- Trusted and proven at 70+ plants
- Continuing the GammaMetrics and Thermo Legacy

Compact Analog NFMS

- SMRs & Advanced Reactors
- Compact wall-mount form factor
- Trusted by NuScale, X-Energy and more

Thermo Fisher IP Acquisition

Legacy NFMS – Now Exclusively Owned & Supported by Paragon

Installed in 70+ PWR & BWR fleet plants

Backbone of commercial NPP and TRTR in the US & internationally for decades

Continued Support

Spares, upgrades, services, and new systems for the legacy install base

System Upgrades

Modernization of existing TFS installations

Full Support Services Available

Licensing, replacement detectors, spares & new systems



Source Range

0.1 – 10⁶ CPS | BF3, B-10, He3 & fission chamber detectors | Start-up & shutdown monitoring

Intermediate / Wide Range

10⁻¹¹ – 10⁻³ A (CIC) or 10⁻⁸ – 200% power (FC) | CIC & fission chamber detectors | Full start-up overlap

Power Range

0 – 120% full power | Uncompensated ion chamber (UIC) or fission chamber | Upper/lower axial deviation detection

130+ NMS systems supported

3 continents served

40+ years of TFS heritage

CoreVision for SMRs & Advanced Reactors

Purpose-built for next-generation designs – scalable, cyber-secure, and analog-reliable

Analog architecture

Meets NRC cybersecurity requirements (10 CFR 73.54) by design

Safety Class 1E

Qualified for harsh post-accident environments as required by 10 CFR 50 App. A

Built-in test

Built-in test generators

Fiber Optic Remote Gain

Flux-to-thermal matching without physical access – critical for unmanned or remote SMR sites

Display

2 multi-digit displays + 2 or 5 vertical bar graphs (NUREG-0700)



Compact Enclosure

24"x16"x10" wall-mount fits the constrained control room footprint of SMRs

CoreVision for Advanced Nuclear

Compact, fully analog electronics – built for advanced reactors

Source Range



Detector compatibility

B-10 / BF3 / He-3 proportional counters · Fission Counter

Neutron flux range

0.1 ... 1E5 nv

Typical output / scaling*

Log count rate: 0.1 ... 1E6 cps

Log count period: -3 s... +30 s

Output options: 0...10 V, 4...20 mA, RS-485

Trip Functions

Multiple trip outputs per flux measurement channel

Wide Range



Detector compatibility

Wide Range Fission Chambers

Neutron flux range

1E2 ... 1E10 nv

Typical output / scaling

Log count rate: 0.1 ... 1E6 cps

Reactor Power: 10E-8 ... 200 % (log) | 0 ... 200 % (lin)

Log Period: -3 s ... +30 s (count rate and wide range)

Trip Functions

10 trip functions: CR, WR Level/Rate, Power Range



IST Legacy Analog Neutron Systems

Legacy signal processors — primarily CANDU reactors

In- & Ex-Core Signal Processors

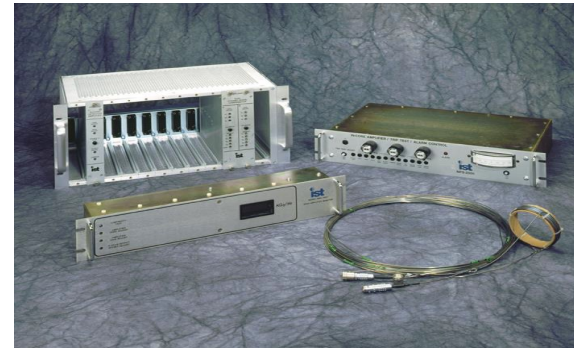
Primarily designed for CANDU reactor neutron flux measurement

Up to 4 Analog Outputs

Log Rate + Power, Linear Rate + Power signal channels

Hardware-Based Display

Numeric display implemented without software or microprocessor



Proven analog instrumentation — serving CANDU plants worldwide

HIPS

Digital Safety I&C Platform



HIPS Platform

Paragon's Highly Integrated Protection System — Modern Digital Safety I&C

Platform Overview

FPGA-based reactor protection platform, NRC Class-1E SER approved (2017). 19" cabinet mountable card frame, 10.5" x 15.75".

Applications

Small modular reactors, advanced reactor designs, and operating nuclear plant modernization

Key Differentiators

Analog-like reliability with digital diagnostics, scalable architecture, FPGA diversity mitigates digital CCFs



The safety I&C platform for next-generation SMRs, advanced reactor designs, and nuclear plant modernization

HIPS Platform

FPGA-based design — built for reliability, security, and regulatory certainty

Reactor-Specific & Diverse

Tailored to each plant; hardware and software diversity mitigates digital CCFs

Automated & Reliable

Eliminates error-prone, time-consuming manual configuration tasks

Parallel Processing

Independent functions execute in parallel for faster, deterministic response times

Cybersecure FPGA

Deterministic control with no executable software



Powering the Duke AFIS digital upgrade and the system of choice for 9 new nuclear companies — including X-Energy, NuScale, Aalo, and more

HIPS Platform – Hardware Architecture

Modular, redundant, and built for decades of operation

TMR Data Processing

Triple modular redundant architecture at any system scale

Redundant Power

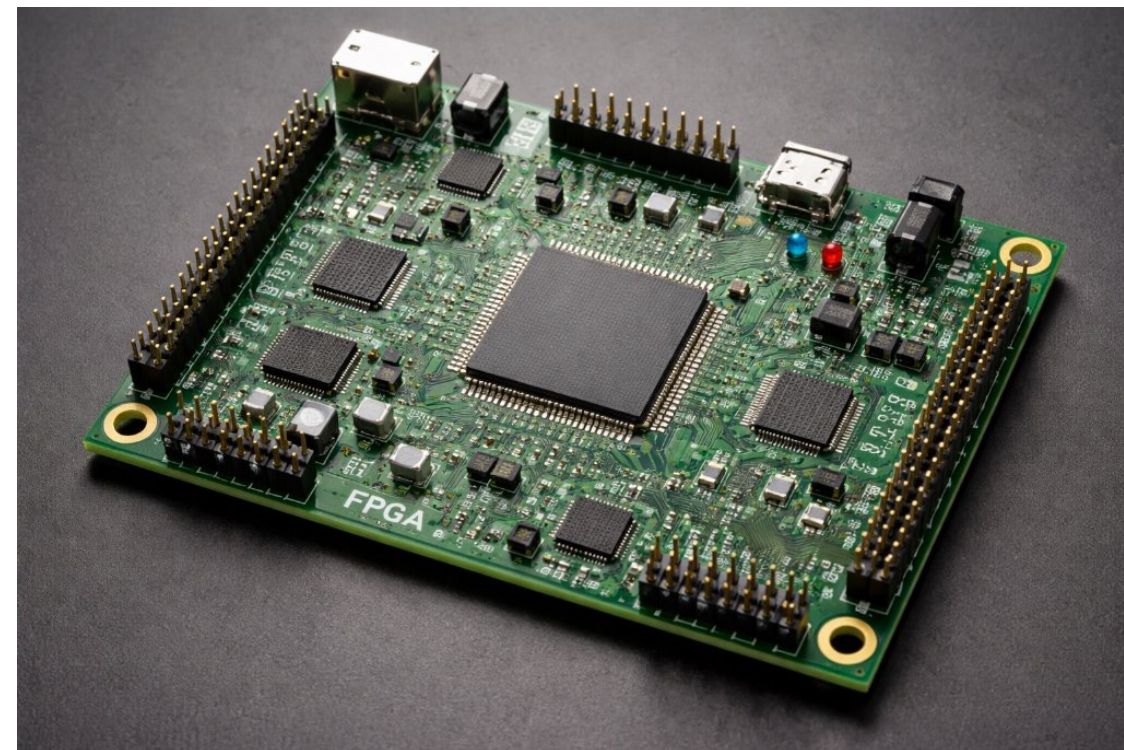
Auctioneered power source for uninterrupted operation

Hot-Swappable Modules

Replace modules without interrupting safety functions

Functional Independence

Each safety function on its own module – no single point of failure



Future-proof investment – portable Hardware Description Layer keeps the platform resilient to component obsolescence for decades to come

HIPS – Typical Hardware Examples

Field-deployed examples – from modules to full rack systems



HIPS Modules

*Safety Function · Communications · Equipment Interface ·
Hardwired modules*



HIPS Rack Systems

Production-deployed cabinets with control station

Mirion One-Stop-Shop



FULL SCOPE NEW NUCLEAR I&C DEVELOPMENT

ONE STOP SHOP

One Integrated Partner. One Complete Solution. Every Stage of Your Plant Lifecycle.

1

Safety
I&C



2

Non-Safety I&C
(Special-Treatment)



3

Non-Safety
I&C



4

Security &
Safeguards



5

Cyber
Security



6

Human Factors
Engineering



7

Simulator
Development



8

Control Room
Development



9

Licensing &
Regulatory Support



REACTOR CORE



NSSS



TURBINE ISLAND



CONTROL ROOM



POWER TO GRID

SUPPORTING THE ENTIRE PLANT LIFECYCLE



DESIGN



LICENSE



BUILD



COMMISSION



OPERATE



MODERNIZE



MIRION
TECHNOLOGIES

SAFEGUARDING TODAY.
POWERING TOMORROW.

ONE PARTNER. ONE SOLUTION. COMPLETE PEACE OF MIND.

Turnkey I&C Discipline Solution for New Nuclear Plant Life Cycle



One Partner. One Integrated Solution. Delivered Across Every Stage.



PROJECT LIFE CYCLE

 DEFINITION PHASE Define the right solution						 DEVELOPMENT PHASE Design & engineer with confidence								 EXECUTION PHASE Build, commission & deliver						 UTILIZE Operate & optimize		
Pre-Concept	Conceptual Design					Preliminary Design					Final Design I (System Level)		Final Design II (Product Level)		Construction				Commissioning		Operations	
Pre-Concept	C1	C2	C3	C4	C5	B1	B2	B3	B4	B5	D1	D2	D4	D6	R1	R2	R3	R4	R5	R6	U1	U2
 Business objectives & initial I&C strategy	 Regulatory framework & requirements	 System architecture & boundaries	 I&C technology selection	 Vendor strategy & evaluation	 I&C concept & validation	 Architecture & system integration approach	 Complete functional design	 Detailed I&C specifications & standards	 Interface & data management strategy	 Verification & validation planning	 System architecture & network design	 Detailed engineering & I/O definition	 Cybersecurity & functional safety analysis	 Factory acceptance & test packages	 I&C installation & preparation	 Loop checks & pre-commissioning tests	 System integration & functional testing	 SAT & site acceptance	 System commissioning & dynamic testing	 Handover to operations	 Performance monitoring & optimization	 Lifecycle support & upgrades



INTELLIGENT DESIGN



RELIABLE TECHNOLOGY



EXPERT INSTALLATION



SEAMLESS COMMISSIONING



LIFETIME SUPPORT



Safety & Compliance
Built In



Proven Methodology
& Standards



Integrated Team
& Expertise



Risk Reduction &
Schedule Confidence



Optimized Cost of
Ownership

**ONE PARTNER.
ONE SOLUTION.
COMPLETE PEACE OF MIND.**

Summary

Nuclear Instrumentation & Safety — engineered end-to-end by Mirion & Paragon

EPA

Electric Penetrations

*Sealed signal & power feedthroughs
preserving containment integrity*

ICD

In-Core Detectors

SPNDs, RTDs and nuclear service sensors

EXD

Ex-Core Detectors

*Fission, ion & proportional chambers across
the full power range*

DNFMS

proTK™ Digital NFMS

*Digital neutron flux monitoring from start-up
to full power*

ANFMS

CoreVision Analog NFMS

*Sustaining Gamma Metrics legacy
Tailored for SMRs*

I&C

HIPS™ Safety I&C

Qualified digital reactor protection platform

From detector to safety I&C — your full-solution supplier for nuclear instrumentation

You're Invited

Join Us for a Pre-NECX Open House

Paragon, Certrec, and Mirion Technologies—the companies behind Mirion Nuclear Solutions—invite you to an open house at Paragon's Fort Worth headquarters ahead of the NECX opening reception in Dallas.

Join us for:

- Facility tours showcasing advanced capabilities and innovation, including seismic testing tables, loss-of-coolant accident (LOCA) simulation, electromagnetic interference and radio-frequency interference (EMI/RFI) testing, and a real-time reactor simulation environment
- A hands-on look at solutions supporting today's operating fleet and advanced reactors, including MCCs, plantwide modernization, digital upgrades, HVAC systems, and radiation monitoring technologies
- Insights into I&C repair and reverse engineering as a bridging solution
- Licensing support services
- Conversations with the Mirion Nuclear Solutions team on unified I&C approaches and the future of nuclear operation
- Lunch and refreshments

WHAT	An Open House before NECX
WHERE	Paragon Headquarters 7410 Pebble Drive, Fort Worth, TX
WHEN	Monday, August 24 Drop in between 10:00 a.m – 4:00 p.m.
RSVP	Scan QR code to register by August 7th

Transportation between the Hilton Anatole (NECX headquarters in Dallas) and Paragon will be available throughout the day.



SHUTTLE SCHEDULE

Departure times from Hilton Anatole to Paragon:
9:30 a.m.; 11:30 a.m.; 1:30 p.m.

Departure times from Paragon to Hilton Anatole:
12:30 p.m.; 2:30 p.m.; 4:00 p.m.

MIRION NUCLEAR SOLUTIONS



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A MIRION TECHNOLOGIES COMPANY

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CERTREC
A MIRION TECHNOLOGIES COMPANY

Paragon
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Your Voice Matters



2026 Customer Satisfaction Survey



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M Resort, Henderson, NV | June 15 – June 18



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Thank you



IST Legacy Analog Neutron Systems

Legacy signal processors — primarily CANDU reactors

In- & Ex-Core Signal Processors

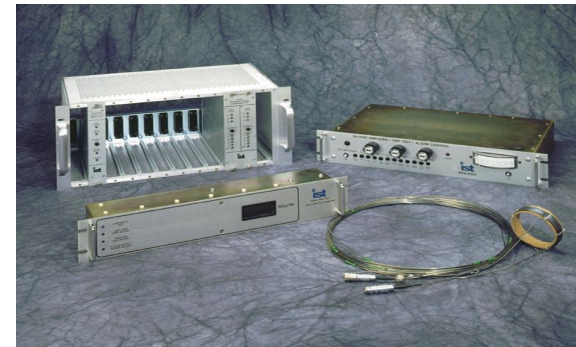
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Up to 4 Analog Outputs

Log Rate + Power, Linear Rate + Power signal channels

Hardware-Based Display

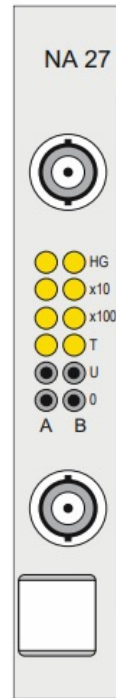
Numeric display implemented without software or microprocessor



Proven analog instrumentation — still serving CANDU plants worldwide

In-Core Amplifiers

Current input amplifiers for in-core neutron flux signals



2 Independent Inputs

Dual current measurement channels for redundant in-core signal acquisition

6 Measurement Ranges

5 μ A · 0.5 μ A · 50 nA · 5 nA · 0.5 nA · 50 pA — broad dynamic range

Test Signal Integration

Front plug for external test signals; remote activation of test inputs

Remote Gain Selection

Digital interface enables remote configuration of amplifier gain

Field-proven amplifier electronics for neutron flux measurement in modern and legacy nuclear plants