



PROTK™

# BM 501™

## Boron Meter



Continuously measuring the boron concentration in water circulating in process of light water nuclear power plants.

### DESCRIPTION

The BM 501 boron meter forms part of the proTK™ product line. The BM 501 meter is designed to continuously measure the boron concentration in water circulating in process of light water nuclear power plants. The measurement principle is based on measuring the neutron absorption rate through the B-10 isotope, which depends on the boron concentration contained in the water coolant.

The neutrons are generated by an internal source, which is part of the detection sub-assembly.

### FEATURES

- ✓ Non-intrusive on-line measurement, directly placed around process pipe
- ✓ Can be adapted to pipe diameter
- ✓ Category B software according to IEC 62138
- ✓ Seismic qualification
- ✓ Temperature compensated measurement
- ✓ Detection sub-assembly featuring a moderator/shield (for neutron thermalization and radiation protection)
- ✓ Standard version with two detectors, temperature sensors and signal processing units for redundancy of measurement (also available with single detector)

## BM 501™ BORON METER

### PHYSICAL CHARACTERISTICS

- Detector: Boron-lined proportional counter
- Measurement capability: up to 3500 ppm (Boron total)
- Neutron source: Am-Be ( $7.4 \times 10^{10}$  Bq, can be adapted to the application)
- Dose rate on contact with the detection sub-assembly: less than 300  $\mu$ Sv/h

### ENVIRONMENTAL CHARACTERISTICS

- Average long-term temperature ranges:
  - For detection sub-assembly, pipe shall not exceed: +10 °C to +60 °C (+50 °F to +140 °F)
  - Preamplifier: 0 °C to +55 °C (+32 °F to +131 °F)
  - Processing unit: +10 °C to +40 °C (+50 °F to +104 °F)
- Short-term maximum temperature ranges:
  - For detection sub-assembly, pipe shall not exceed: +110 °C (+230 °F) for 1.5 hours, followed by cooling at +5 °C/h
  - Processing unit: 0 °C to +45 °C (+32 °F to 113 °F)
- TID (detection sub-assembly and pre-amplifier): 8.7 kGy (0.87 Mrad)
- Protection index (detection sub-assembly): IP25 and IK07
- MTBF (preamplifier and processing unit): > 180 000 hours

### MECHANICAL CHARACTERISTICS

- Approximate dimensions:
  - Detection sub-assembly (L x H x D): 553 mm x 390 mm x 334 mm (21.8 in x 15.4 in x 13.2 in)
  - Processing unit: standard 19" x 3U rack
- Typical pipe: DN 80, DN 100 (may differ according to process design and operating conditions)

### ELECTRICAL CHARACTERISTICS

- Power supply: 230 Vac (187 to 242 Vac)
- Two isolated analog outputs (4-20 mA) for:
  - Total Boron concentration
  - B10 concentration
- Two SPDT alarm relays for:
  - Boron meter fault
  - Boron concentration  $\leq$  alarm threshold
- Local RS232/RS485 on the front panel of the processing unit
- Distance between processing unit and preamplifier (mounted next to the detection sub-assembly): 200 m max. (656 ft)

### SIGNALING (ON PROCESSING UNIT)

- Alphanumeric display (2 lines x 16 characters) for measurement and status indication
- Status LEDs on the front panel

### REFERENCE STANDARDS

- Software: class C2 according to RCC-E C5130, for functions category B according to IEC 62138
- Qualification: K3 according to RCC-E-B4000
- Seismic: IEC 60980, IEC 60068-3-3
- EMC/RF: IEC 61000-6-2 and IEC 61000-6-4
- European directives: 2014/30/EU and 2014/35/EU

### VERSIONS

- 230/115 Vac or 24 Vdc
- One or two detectors and processing units
- Detection sub-assembly for DN 80 or DN 100 pipes
- Various detector cable lengths
- Additional analog or binary I/O modules
- Off-line version (design upon request)

### ACCESSORIES

- Calibration software



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