

## ENGINEERING SPECIFICATIONS AND REQUIREMENTS

### ELECTROMAGNETIC FLOW METERS

#### FOR WATER & WASTEWATER APPLICATIONS

#### **SPECIFICATIONS FOR PULSED AC MAGNETIC FLOW METERS**

##### OPERATING PRINCIPLE:

THE MAGNETIC FLOW METER SHALL OPERATE ACCORDING TO FARADAY'S LAW WHEREBY A VOLTAGE IS INDUCED BY A CONDUCTIVE LIQUID PASSING THROUGH A MAGNETIC FIELD. THE MAGNETIC FIELD IS GENERATED BY A SWITCHED ALTERNATING CURRENT WITH A MAGNITUDE OF 2-10AMPS DEPENDING ON THE DIAMETER OF THE FLOW SENSOR.

##### FLOW SENSOR:

###### FLOW TUBE AND LINER:

THE FLOW SENSOR TUBE SHALL BE CONSTRUCTED OF 304 STAINLESS STEEL WITH CARBON STEEL OR 304 STAINLESS STEEL FLANGES, WHICH SHALL CONFORM TO STANDARDS SUCH AS ANSI OR AWWA.

THE SENSOR WALLS SHALL BE LINED WITH A NON CONDUCTIVE MATERIAL SUCH AS HARD RUBBER (VHE/H3b FOR SEWAGE, SLUDGE, WASTE WATER, RAW WATER), SOFT RUBBER OR NOVALAK (FOR SLUDGE, ABBRASIVE CHEMICALS AND SLURRIES)

THE FLOW SENSOR SHALL BE EQUIPED WITH A SMART PLUG FEATURE FOR SENSOR CALIBRATION DATA AS WELL AS A PRE-AMPLIFIER. A SIGNAL PRE-AMPLIFIER SHALL PROVIDE BETTER IMMUNITY TO NOISE AND ALLOW FOR LONGER CABLE DISTANCES TO THE CONVERTER.

###### MAGNETIC COILS AND ELECTRODES:

THE PRIMARY COIL SHALL BE CONSTRUCTED IN A WAY THAT THE MAGNETIC FIELD LINES ARE PARALLEL AND COVER THE ENTIRE PIPE CROSS SECTION EVENLY AND COMPLETELY. NO MAGNETIC INSERTION SENSORS OR GROUNDING ELECTRODES WILL BE ACCEPTED. A SECONDARY SET OF REFERENCE COILS SHALL BE ASSEMBLED AROUND THE FLOW TUBE TO DETECT AND COMPENSATE FOR ANY VARIATIONS IN THE PRIMARY COIL. THE ELECTRODES SHALL BE 316 STAINLESS STEEL AND BE OF A FLAT DESIGN. NO GROUNDING ELECTRODES OF ANY KIND WILL BE ACCEPTED.

###### GROUNDING RINGS:

ONE GROUNDING RING SHALL BE SUPPLIED AT EACH END AND OF THE SAME MATERIAL OF THE ELECTRODE.

###### NEMA RATING:

THE FLOW SENSOR SHALL BE RATED **NEMA 6** DEFINED AS CONTINUOUSLY SUBMERSIBLE IN MINIMUM OF 10FT OF WATER.

##### SIGNAL CONVERTER:

THE SIGNAL CONVERTER SHALL BE MICROPROCESSOR BASED. THE ENCLOSURE SHALL BE RATED NEMA 4X. IT SHALL DISPLAY INFORMATION ON 2 ROWS OF 16 DIGITS. THE SIGNAL SHALL PROVIDE A **PULSED AC** MAGNETIZING CURRENT TO THE SENSORS PRIMARY COIL OF AT LEAST 2-10 AMPS DEPENDING ON THE FLOW SENSOR DIAMETER RESULTING IN A SIGNIFICANT INCREASE IN FIELD STRENGTH AND SIGNAL TO NOISE RATIO WHICH ALLOWS A WIDE VELOCITY RANGE AND INCREASED LOW FLOW ACCURACY.

**ACCURACY:**

THE OVERALL SYSTEM ACCURACY SHALL BE BETTER THAN +/- 0.5% OF RATE.  
THE CALIBRATION SHALL BE TRACEABLE TO A RECOGNIZED STANDARD.

**THE FLOW CONVERTER SHALL HAVE, AT A MINIMUM, THE FOLLOWING STANDARD FEATURES.**

- 1) SMARTPLUG:** AUTOMATIC RECOGNITION AND UPLOADING OF SENSOR TYPE AND FACTORY CALIBRATION DATA ON POWER UP. NO PROGRAMMING AT START UP SHALL BE REQUIRED TO MATCH SENSOR TO CONVERTER.
- 2)** COMPLETE SELF-MONITORING AND DIAGNOSTICS OF SENSOR USING MAG CURRENT AND WET ELECTRODE FUNCTION.
- 3)** HART COMMUNICATION.
- 4)** REMOTE MOUNT NEMA-4X HOUSING AND MINIMUM 2 LINE 16 CHARACTER LCD DISPLAY.
- 5)** ALL PROGRAMMING ADJUSTMENTS SHALL BE ACCESSIBLE WITHOUT OPENING THE HOUSING.
- 6)** ZERO FLOW CUTOFF; POSITIVE ZERO RETURN; FORWARD, REVERSE AND NET RESETTABLE TOTALIZERS; COMPREHENSIVE RANGE OF OUTPUTS; CURRENT, PULSE AND FREQUENCY.
- 7)** EMPTY PIPE DETECTION, FLOW AND CURRENT OUTPUT SIMULATION.
- 8)** FULL SCALE VELOCITY RANGES OF 0.25 – 12 M/S WITH AN OVERALL ACCURACY OF 0.5% OF ACROSS ENTIRE RANGE
- 9)** CAPABLE OF A MINIMUM OF 0.008 MICROS/CM CONDUCTIVITY.
- 10)** THE MAGNETIC FLOW METER SHALL BE MODEL SITRANS FM / TRANSMAG SERIES AS MANUFACTURED BY SIEMENS CORPORATION OR EQUAL.