

SAAScan

Model 003



Measurand's ShapeArray is a flexible, calibrated shape measuring system. It measures 2D and 3D shape and 3D vibration using a compact array of MEMs accelerometers. SAAScan is a special SAA which has robust joints with additional torsional stiffness, stainless steel segment tubes, and steel fittings that are intrinsically watertight. In normal use, the steel fittings are the only elements in contact with the casing, so that wear is greatly reduced compared to the SAAF construction. The SAAScan is intended for use when the ShapeArray will be repeatedly inserted and removed from boreholes or drill strings during the course of a project. It can also be used in installations where more robust construction or greater joint range is required (contact Measurand for installation details).

The SAAScan can be used in vertical or horizontal installations. It can be used to measure 3D shape within 60° of vertical as x, y, z displacements and tilt angles. Near horizontal shapes are measured as 2D projections in a vertical plane. The x, y, and z tilts due to gravity are measured in each segment. As with

the SAAF, the temperature is measured in each segment. An unsensorized section is attached at the top of the SAAScan and includes Cable Terminator and Extension Hose. The Cable Terminator is meant to remain attached to the reel in order to help with determining the azimuth of the instrument, and to help properly align the SAAScan during reeling and unreeling without applying lateral force.

Related products: SAA Field Power Unit

SPECIFICATIONS



PHYSICAL PROPERTIES

SEGMENT LENGTH	500 mm joint centre to joint centre
LENGTH OF FAR TIP EYEBOLT	32 mm
LENGTH OF UNSENSORIZED NEAR CABLE END (SEE DIAGRAM BELOW)	Standard 8.2 m (includes: 330 mm Cable Terminator Segment and 7900 mm Hydraulic Hose)
LENGTH OF COMMUNICATION CABLE	Standard 15 m, (extending past the extension hose and cable terminator)
MAXIMUM DIAMETER	23 mm
MAXIMUM STANDARD SENSORIZED LENGTH	50 m
MAXIMUM CUSTOM SENSORIZED LENGTH	Over 100 m ⁶ (Contact Measurand for details)
WEIGHT	1.0 kg/m
OPERATING TEMPERATURE	-40°C to 60°C
WATERPROOF TO	2000 kPa (200 m Water)
MAXIMUM TENSILE RESISTANCE	550 kgf
MAXIMUM JOINT BEND ANGLES	70°
POWER REQUIREMENTS	12 VDC at 4.2 mA/segment

ELASTIC TWIST TOLERANCE

MAXIMUM TORQUE FOR ELASTIC RETURN ¹	2.0 N-m per joint
TWIST TOLERANCE ¹	0.5° per joint
ACCURACY OF RETURN FOR ELASTIC TWIST ¹	±0.01° per joint

DYNAMIC ACCELERATION MEASUREMENTS

RANGE	± 1.7 G
3DB BANDWIDTH	50 Hz
NOISE FLOOR OF MEMS	110 µG/Hz ^{0.5}
DATA RATE	SAA232: 38.4 kbps to 230.4 kbps

STATIC SHAPE MEASUREMENTS

ANGULAR RANGE OF MEMS SENSORS	± 360° (software selection required for 2D/3D modes)
RANGE OF 3D MODE (VERTICAL)	± 60° with respect to vertical (SAAScanner alert at ±70° w.r.t. vertical)
RANGE OF 2D MODE (HORIZONTAL)	± 60° with respect to horizontal
RANGE OF 2D MODE (MIXED H/V)	± 180° with respect to horizontal
ACCURACY OF DEFORMATION RELATIVE TO STARTING SHAPE ^{2,4,5}	± 1.5 mm for 32 m SAAScan
ACCURACY OF ABSOLUTE SHAPE ^{1,2,4,5}	± 10 mm for 32 m SAAScan
RESOLUTION ^{3,4,5}	± 0.5 mm for 32 m SAAScan
ACCURACY OF TILT/SEGMENT WITHIN 20° OF VERTICAL ^{2,4,5}	± 0.0005 rad = 0.029°
AZIMUTH ERROR IN JOINTS	< ±0.01°
LONG-TERM RELIABILITY MTBF ⁷	38 years for 32 m SAAScan

NOTES



¹ Measured at 20°C, with X mark facing a consistent direction.

² Long term measurement value based on field measurements of vertical arrays > 1 year of operation.

³ Short-term measurement ≤ 24 h.

⁴ Value based on averaging 1000 frames per reading.

⁵ Specification is for 3D mode within $\pm 15^\circ$ of vertical.

⁶ Caution: Long SAAScans are heavy and winches would be involved in installing them.

⁷ Conservatively based on longevity data for electronic components used in ShapeArray, a) assuming total system failure if any single component fails, b) system powered on 100% of the time, c) ambient 6 deg C, d) internal temperature rise of 8 deg C above ambient due to 100% powered-on duty, and e) a benign ambient environment typical of geotechnical instrumentation. MTBF will increase for more typical duty cycles (not powered on 100% of the time). At higher temperatures, MTBF will decrease (e.g. by ~half at 52 deg C). MTBF is based on "MIL-HDBK-217F Notice 2" performed by, ALD/SoHaR.

NOTES



Minimum Capped SAA Length (A to B) = Min Cable Bend Radius + Unsensorized Length + Sensorized Length + Eyebolt

Standard Unsensitized Length = 8.2 m

Sensorized Length = "Near (Cable) End" Sensorized Segment through "Far (Tip) End" Sensorized Segment

PVC conduit End Cap and Install Kit Top Stack require additional depth

Standard tolerance on measurements +/- 2 mm unless stated

