

**Gauge Set Introduction and
Information Document**

PRESSURE (0-5000 PSIA)
TEMPERATURE (2 °C – 80 °C / 35.6 °F – 176 °F)

**PRESSURE & TEMPERATURE MEMORY GAUGE DOWNHOLE
SET - For Oil Well Data Logging:**

Set consists of:

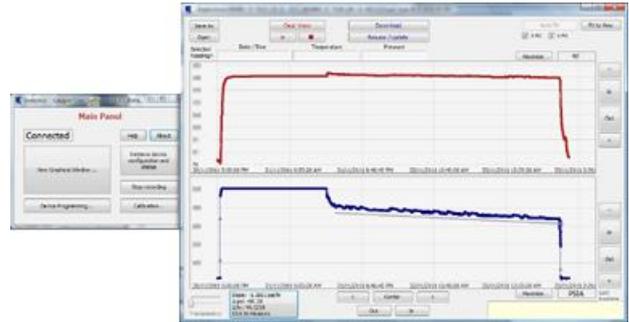
- 3x INVRONICS Electronic Memory Gauges (Model-1050) incl. rubber shock absorber caps
- 1x External Housing – Outer Diameter (OD) 55.5 mm / 2.185 inch +/- 0.1 mm / 0.003''
- 4x Shock Absorbing Springs



Features

- **Ease of Use**

- Any of the 3 memory gauges can be used to take real-time readings and display them on a PC while connected through USB. The device enclosure is open and not pressure or fluid submersible under this condition because of the USB connection. The PC should be running windows XP, windows Vista or Windows 7.
- After connecting the device to a PC through USB, and easily programming the device to start recording, through a user friendly software, the device records data while still connected or not connected to a PC, and then, data is downloaded through a the USB connection to a PC after connecting the device again. The PC should be running an operating system from those stated above.
- A device calibration option is provided in the software.
- While downloading data, the user can choose to be able to view the graph of the new downloaded part to visually to check the trend of the new readings downloaded. Downloading can also be stopped and resumed. (Note: *Choosing to view data while downloading should slow down the download speed.*)



- **Data Recovery**

- Three memory gauge devices are used together instead of two. This helps in data safety against, for instance, the effect of an unexpected human error in wrenching a gauge sealed, on the data safety of the job.)
- The software saves the data twice on clicking the saving command. The extra backup copy is for data safety (The file extension of the backup file will just need to be changed by the user).

- **Consumable Products Needed for Use**

- The device uses two non-rechargeable lithium-thionyl chloride (Li-SOCl₂) AA batteries.
- O-rings which must be rated to withstand the conditions encountered in each job (downhole chemicals, gasses, temperature, pressure, rapid changes etc.), rated to withstand the wrench tightness made, and of the correct dimensions, must be used. And, **VERY IMPORTANTLY – THE ORINGS SHOULD BE CHANGED AND NOT USED AGAIN, EVERYTIME A TIGHTENING IS MADE ON THEM, AND AFTER EACH JOB. The devices, and the set, are not supplied with the o-rings.**

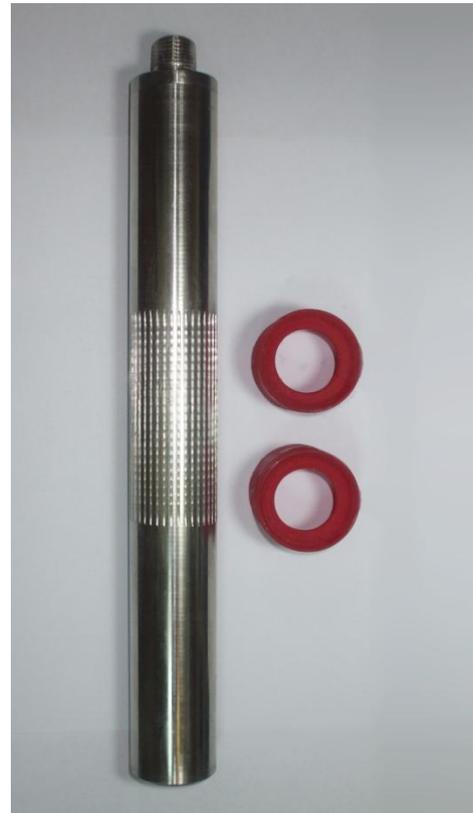
Description

The Memory Gauge Set

The set includes 3 of our model no.1050 Memory Gauges which are capable of measuring and logging up to 2 months of temperature and pressure readings at 15 seconds time intervals. The memory gauges are also programmable for other time intervals as well.

The Memory Gauge Device Pressure Seal

The single gauge device (Model 1050) is tightened twice on two separate o-rings backing up each other to seal against pressure. The stainless steel 316 pressure tight assembly consists of a 3 stainless steel part approach to pressure seal the device. The 3 stainless steel parts are the front and rear metal parts, which press on the bottom o-ring for a tight seal, and another small ring-like metal part designed to press on the top o-ring against the top metal part for another backup pressure seal, and with a separate mechanical tie than the first one, to add more safety to the device and data inside.



Cost Effectiveness

The memory gauge is designed only for wells with a maximum absolute pressure of up to 5000 PSI, and a maximum temperature of up to 80 °C / 176 °F. This helps in reducing cost when a data logging job is needed within these down-hole conditions compared to using other more expensive alternatives designed to withstand more extreme conditions, for the same situation. This may significantly improve cost efficiency.

Specifications of the Gauge Set

Gauge Set Fluid Submergibility and Compatibility.	While the stainless steel gauge enclosures are assembled, and tightened correctly on suitable o-rings, and the gauge set is assembled: The gauge set can be submerged in oil well fluids which do not harm stainless steel 316 tools and devices, yet the device is not compatible or submersible in significant H2S or CO2 oil wells. The gauge set can only be submerged within the maximum conditions stated in this document and specification sheet.
Pressure Range	0 – 5,000 PSIA
Pressure Resolution	~ 0.04 PSI
Pressure Accuracy (at assuming zero-error calibration)	Manufacturing multi-sample test results: Maximum drift error at reading different pressure values for the 5000 PSIA memory gauge is as follows: at atmospheric pressure: 0.22% FS at 200 PSIA: 0.2 % FS at 1000 PSIA: 0.33% FS at 3000 PSIA: 0.78% FS at 5000 PSIA: 1.66% FS max. pressure noise on reading ± 1.5 PSI
Pressure Hysteresis	Typical: $\pm 0.015\%$ FSS Maximum: $\pm 0.030\%$ FSS
Pressure Calibration Details	Adjustable calibration software steps are 0.2 psi shift steps and 0.00004 multiplier steps
Temperature Range	2 - 80 °C / 35.6 – 176 °F
Temperature Resolution	~ 0.00008 °C
Temperature Accuracy (at assuming zero-error calibration)	Typical: ± 0.01 °C
Temperature Non-linearity	Typical: ± 0.15 °C Design limit: ± 0.3 °C
Temperature Response	Typical step response in water (moving or flowing) -Reaches 10% of step in less than or equal 10 sec. -Reaches 63.2% of step (time const.) in 1 min 50sec (± 20 sec) Typical step response in water (not moving/still) -Reaches 63.2% of step (time const.) in 2min 30sec (± 30 sec) -Reaches 90% of step in 12 min
Temperature Calibration Details	Adjustable calibration software steps are 0.01 °C shift steps and 0.00004 multiplier steps
Batteries	2x AA Lithium-thionyl chloride, 3.6V (Saft LS 14500 or equivalent)
Battery Lifetime	2 months at recording every 15 seconds Note: setting to more frequent readings reduces battery life time. And in all cases, the device consumes from the battery even while turned off, so batteries should be disconnected from the device if not in use, to sustain the remaining battery lifetime. Important: Batteries are consumed more rapidly while the device is connected to the computer. Therefore, devices should always be disconnected from the computer when connection is not needed.
Memory	Memory capacity is over 1,000,000 readings, HOWEVER, BATTERY LIFETIME IS A MORE CRITICAL CONSTRAINT TO THE NUMBER OF READINGS WHICH CAN BE TAKEN. (Battery lifetime provides 2 months at 15 seconds intervals as stated above. Any extra memory may then not be filled with recordings if the batteries stop after the 2 months period in this case, or earlier if a more frequent reading rate is selected.)

Overall Gauge Set Dimensions	Outer Diameter (OD): 55.5 mm / 2.185 inches +/- 0.1 mm / 0.003" Length: 154 cm / 60.6 inches
O-rings That Must Be Used	Two o-rings per memory gauge device (6 o-rings per set) O-ring: Inner diameter 30mm, Thickness 2.5 mm. Shore A70. O-rings you should use in our device must be rated to withstand the conditions encountered in each job (down-hole chemicals, gasses, temperature, pressure, rapid changes etc.), and rated to withstand the wrench tightness made. And, VERY IMPORTANTLY – THE ORINGS SHOULD BE CHANGED AND NOT USED AGAIN, EVERYTIME A TIGHTENING IS MADE ON THEM, AND AFTER EACH JOB. The devices, and the set, are not supplied with the o-rings.