INSTRUCTIONAL MANUAL

ACE INSTRUMENT

Pneumatic readout unit

[Model ACE-2500]

Geotechnical & Mining Instrumentations

Civil Engineering

Bridge
Structure
Dam
Tunnel
Railway
Roadway
Marine Structure
Foundation
Pile
Mine
Landfill
Slope
Excavation

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Please feel free to contact us if you have any questions or inquiries about geotechnical measuring instruments.

It is the product of Ace instrument which manufactures the first value in geotechnical & structural instrumentation.

These products are the crystals of sweat that was created by the continuous research and development of our engineers. we are trusted as a partner of civil engineering / building / rock and geology experts in overseas and are loved by the domestic industry through customer impressions.

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1. **ACE INSTRUMENT CO., LTD. holds the full responsibility of our products regardless of purchasing places and how you get it. The product passed a rigorous test and was under the quality management by top engineers.**

2. **If any defects of manufacturing are found or any breakdown happens within 3 years from purchasing date, we guarantee repair, adjustment and verification at no cost. But, when you ask repair, adjustment and verification, ACE INSTRUMENT CO., LTD. is not responsible for shipping and handling fees. In case the quality warrantee date has expired, or any breakdown owing to carelessness has happened and other operations such as dealing with zero point are needed, services would be provided at a minimum cost.**

3. **But, in the case the purpose of use is changed, incorrect installation, the use of components for manufacturing and installation, and repair of other firms take place, ACE INSTRUMENT CO., LTD is not liable to Quality warrantee.**

4. **In case of a product defect in manufacturing during the warranty period, the product will be replaced.**

5. **In case of failure or defect in the normal use of the user during the warranty period, repair, calibration and replacement of parts will be free of charge.**

6. **In case of failure or defect caused by negligence of the user during the warranty period, repair, calibration and replacement of parts will be charged.**

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1-1 Introduction

ACE-2500 pneumatic readout unit is easily connected through one touch coupler of pneumatic sensor. The nitrogen gas pressure acting on the sensor can be measured up to maximum of 20 bar.
ACE-2500 pneumatic readout consists of output device and pressure sensors to measure the gas pressure and nitrogen gas tank inside of the shock resistance water-proofing case.

1-2 Feature & advantage

The model ACE-2500 has the following features and advantages.

- Waterproof, damp-proof, shock resistance and portable construction
- Digital pressure gauge automatically off function (10 Minutes)
- Analog gauge nitrogen tank rechargeable pressured displaying (Maximum 25Mpa)
- High limit of resolution and High accuracy

1-3 Applying sensor

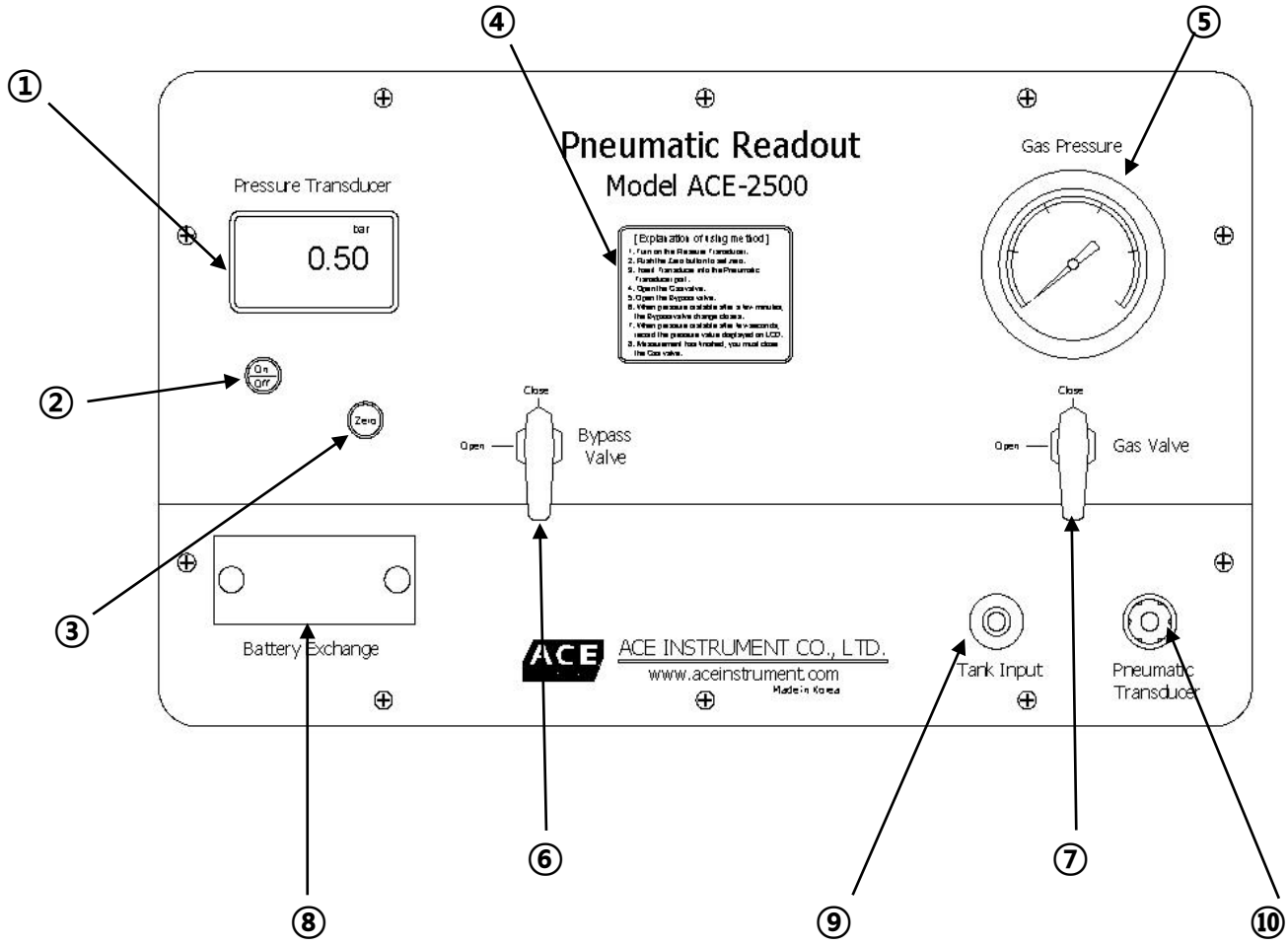
The model ACE-2500 is applicable to the following sensors.

- Pneumatic piezometer
- Pneumatic earth pressure cell
- Pneumatic extensometer

2 Specifications

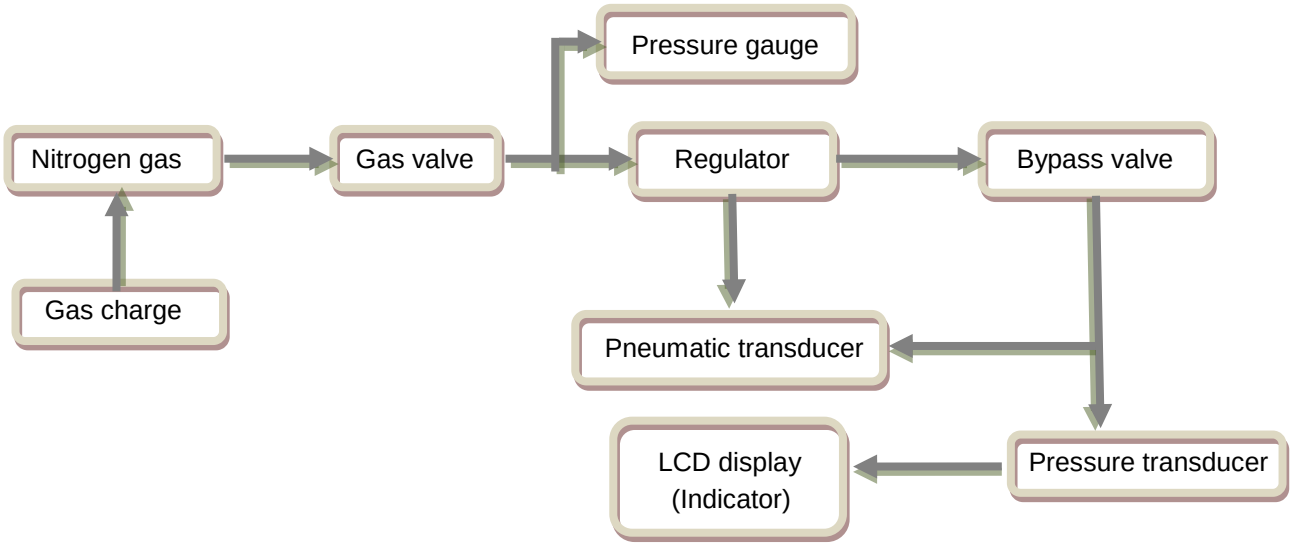
Model	ACE-2500
Applied sensor	Pneumatic sensor
Measurement range	0~20bar (290psi)
Resolution	Gage-dependent
Accuracy	±0.1 %FSR(0.02bar)
Operating temperature	0~50 ℃
Operating humidity	Less than 80 %R.H.
Display	15mm, 4 Digit LCD
Power	9VDC / Alkaline battery
Internal Tank	Ø80 × 320L (1.0 liter)
Battery life	Around 50 Hours continuous
Dimension	185×300×450mm
Weight	10 kg
Material of case	ABS Plastic case
Accessories	Tube kit for sensor extension, filling hose for Nitrogen gas

3 Name and description of each part



LCD Display	① Indicates the pressure (bar) acting on the pneumatic pressure sensor.
[ON/OFF] Button	② ON/OFF the power of Pressure Transducer LCD display.
[ZERO] Button	③ It is used when measurement and adjusts the display pressure before pressurization to zero.
Using method	④ Simply show using method of ACE-2500.
Pressure Gage	⑤ Indicates the pressure inside the nitrogen gas tank. The display pressure varies depending on the amount of nitrogen gas charged.
Bypass Valve	⑥ Adjusts the flow rate of nitrogen gas entering the pneumatic pressure sensor.
Gas Valve	⑦ Valve for open & close the nitrogen gas into the tank.
Battery entry	⑧ Entry for exchanging battery.
Tank Input	⑨ Port for charging the nitrogen gas.
Pneumatic Transducer	⑩ It is the part to connects the pneumatic transducer and be easily connected using one-touch coupler.

4-1 Flowchart of Pneumatic readout unit



4-2 Operation sequence and operation principle

LCD [ON]

① Turn on the Pressure Transducer; Push the zero buttons to set “0” in first pressure.

Inserting sensor

② Insert pneumatic sensor to one touch coupler “Pneumatic Transducer” to measurement. (If the pneumatic sensor's coupler is shorter, please use the enclosed extension tube for measuring).

Open the gas valve

③ Open the Gas valve and inflow nitrogen gas to inside of tank.

Open the bypass valve

④ Open the Bypass Valve with “open” to quickly introduce the nitrogen gas through the regulator into the pneumatic sensor.

Close the bypass valve

⑤ If the pressure acting on the pneumatic sensor and the pressure of the nitrogen input from the pneumatic output device are equal, the output pressure no longer increases. At this time, close the Bypass Valve with "close".

Record the measured pressure value

⑥ After close the Bypass valve, the measurement pressure getting bit lower.
Wait for approximately 10-15 seconds then record the pressure value displayed on LCD.

End of measurement

⑦ When measuring finished, you must close the Gas Valve and off the Pressure Transducer then separation of Pneumatic sensor to terminate.

5-1 Maintenance

Caution	First delivery of product does not contain the nitrogen gas in the nitrogen gas tank. The nitrogen gas has to recharge the nitrogen gas through Tank Input connector [UNF 7/16(20 pitch/inch)] of console. To keep the nitrogen gas valve as “OPEN” while charging the nitrogen gas in order to measure the gas pressure. The measuring time can be adjusted by the operation of the metering valve. However, since the measurement value may not come out due to the operation mistake of the metering valve, consult with the maker when operating the metering valve. Gas consumption per 10m cable sensor is 0.1MPa. For example, when 10MPa nitrogen gas is recharged, it can measure 100times with 10m cable sensor. Therefore, it should be checked the nitrogen gas amount before going to the field. If there is lack of nitrogen gas, it may not measure properly.
Carrying & keeping products	If the Model ACE-2500 is subject to severe shocks or vibrations during transportation, the zero point of the pressure sensor and flow control valve constituting the part may change, which may cause errors and inconvenience in measurement. Avoid direct sunlight and store in a well-ventilated place.

5-2 Service

Caution	For effectively using a Pneumatic readout unit without any trouble, it is strongly recommended to read the manual and to handle it consistently. We will check any defects or performances if there are any troubles. ACE INSTRUMENT A/S team Tel) +82-31-459-8753 Fax) +82-31-459-8758 acens@naver.com www.aceinstrument.com

1. Handling caution

Engineering measuring instrument is precisely manufactured and sensitive. Don't drop it and don't allow it to be exposed to external shocks. In particular, the VW measuring instrument is likely to see its zero point changed due to shocks.

2. Caution for storing calibration report

Calibration report is provided with each sensor. Information at the moment of calibration includes barometric pressure, calibration temperature, and temperature sensor in use, calibration data, conversion ratio and classification of signal cable by color. Therefore, you should be careful with storing the information until all work is done. In case the report is lost, tracking data and product might be impossible.

3. Operation by an engineer

All the process should be operated by a skilled engineer to prevent inappropriate choices such as errors of instrument choice, installation and operation which make impossible near-permanent calculation.

4. The need for shielding

It is common that sensor sends a weak electronic signal. And sensor is under the influence of electromagnetic induction, electrostatic induction static electricity electrification generated when other control machine is on. In particular, given that environmental condition of engineering work involving welding, generator, motor, antenna, and watery surface is poor, shielding and ground wire should be connected in the case of output device connection.

5. Caution for signal cable extension

There would be no problem that VW sensor outputting frequency signal is connected for extension .in the case that a sensor generating Voltage is connected for extension, electronic sensors are vulnerable to changes in resistance value. Therefore, the length of the cable plays a big influence. So, you should adjust resistance change value with adjustment value toward a sectional length of signal cable by manufacturers. Also, extension seam part should be finished up with Splice Kit (Epoxy).

6. The use of protection tube for signal cable

In the case of laying under the ground, dams, vulnerable foundation, concrete structures can have a big displacement, a source of signal cable disconnection. In the case of ground construction, given the construction condition, heavy equipment operation and frequent moving construction can be a source of disconnection or sensor damage. Therefore, caution should be taken for the protection of sensors and signal cables. And minimize the dangerous factors by using new construction pipe for drainage system.

7. Installation of Amplifier with sensors generating mV

Engineering measuring machine generating electronic signal has a 200-300 m transmission distance. In the case Junction Box and Terminal Box have a long distance from the measuring machine, an amplifier should be installed in proportion of measurement distance to prevent drop of voltage for sensor transmission.

8. Atmospheric pressure adjustment

When manometer is chosen as sensor, it is very sensitive to change in atmospheric pressure. Therefore, for precise measurement, places such as dams, valleys, the sea and reclaimed lands with high fluctuation of atmospheric pressure should adjust head height according to the difference of the pressure by using mercury barometer.

9. Lighting rod construction

In the case of large engineering work near water such as dams, lakes, the sea and large fields, valleys, lighting rods connecting each sensor individually should be constructed to protect sensors. Within the influence of over voltage, sensors are likely to function poorly.

10. Caution for filter use in pressure sensors

Pressure sensors such as negative pore water pressure have attached filters. Upon installation, make sure to let air out of the inside of the filter. Given that densities of air contraction and water are different, remained air might cause an error to measured value. Also, at places where unsaturated soil or negative pore water pressure are expected, it is recommended to use 1μm high-density ceramic filter.

11. Caution for bearing plate in use for load cell

For maintaining consistent measured value and high precision, the use of bearing plate is important, during installation of hard cell on Earth Anchor, heat processed steel materials should be manufactured with the enough thickness to endure unloading load and with the density of within 0.5 degree in top-down parallel lines. High quality products should be used for cone for spilt, cone-plate and mutual taper processed density.

12. Sensor temperature adjustment

An element of VW sensors uses wire rod (used for piano string) so that coefficient of linear expansion metallic materials hold can cause errors of margin and sensors of electricity and electron hold an adjustment factor. For precise measurement, adjust the difference of temperature with a mercury thermometer.

13. Auto Data Acquisition System requires UPS

In South Korea, relatively temporary blackout (0.5 seconds) is frequent. So overloading owing to simultaneous uses of equipment and accumulated power cables on sites are likely to cause ordinary and temporary blackouts, leading to computer Down and errors of built-in software.
Therefore, When Auto Data Acquisition System is operated; UPS(Uninterruptable Power Supply) must be used to minimize dangerous factors.

14. Caution for the choice of VW output unit

Manufactures of VW sensors and output units usually cover 600~3,200Hz (360~10,240 10^3Hz^2 or 1666～312 μsec) for possible measurement range. And they design sensors taking into consideration the purpose of sensors, durability, and precision. Therefore, when Mode for unit choice of output unit within this range is changed, you must select sophisticated output unit-making measurement possible.

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