User's Guide

An OMEGA Technologies Company

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GP901 Series
Digital Probes

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The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: **These products are not designed for use in, and should not be used for, patient-connected applications.**

Introduction

The Digital Probe is a gauging transducer combined with conditioning electronics in a permanently connected ”smart connector” or PIE (Probe Interface Electronics).

The PIE converts and corrects the output from the gauge head and transmits the result in a digital format using the Orbit protocol. Because the Digital Probe is factory calibrated using a reference Laser, the probe has a very linear output with position.

The Digital Probe is one of an extensive range of Orbit Modules available for use with the Orbit Measurement System, which provides an easy way to construct and maintain a complete measurement system of up to 372 Orbit modules.

The Orbit protocol features an extensive set of commands that enable fast and efficient transmission of data between the Orbit module and the PC.

Digital Probe Specifications

This section contains the specifications of the Digital Probe. There are two sections, the first are the specifications for the complete Digital Probe (PIE + gauge head) and the second is mechanical data relevant to the gauge head only.

PIE is designed to be primarily used with the T-CON connector. Full details of mounting with T-CON refer to the section of PIE and T-CON installation.

Digital Probe Data

Performance Data						
Basic Probe Type	**GP901-05**	**GP901-1**	**GP901-2**	**GP901-5**	**GP901-10**	**GP901-20**
Calibrated Stroke mm	0.5	1	2	5	10	20
Full Mechanical Travel	0.58	1.5	3 (*2.5)	6	11	21
Resolution (14 bit over stroke) µm	0.03	0.061	0.122	0.305	0.610	1.22
Resolution (16 bit over stroke)	N/A	0.015	0.03	0.076	0.152	0.305
Resolution (18 bit over stroke)	N/A	N/A	N/A	0.019	0.038	0.076
Accuracy mm	see Accuracy section below					
Repeatability	<0.1 µm	<0.15 µm				
Reading Rate per Network channel	1000 readings / second minimum					
Reading Rate (per PIE)	240 readings / second minimum (4 ms internal update) in Normal Mode Up to 3906 readings per second in dynamic (8 probes per network)					
Calibration Temperature	20 ± 1°C					
Temperature Range	0 to 60°C					
Warm up Period	30 minutes					
General Data						
Supply Voltage	5 ±0.25Vdc					
Current Consumption	0.06 A max.					
PIE per Orbit channel	31 modules					

Network type	Orbit - RS485 2-wire multi-drop (up to 31 per channel)
Network speed	1.5Mbaud, 187.5k Baud or 9600 Baud (do not use 9600 Baud for New Applications as this will be phased out)
Network Control Character	Break Character - low (space) of >90 us (187.5k Baud) or >1.2mS (9600 Baud)
Command Character Format	1 start, 8 data, 1 odd parity, 1 stop bit

Accuracy

The error quoted assumes periodic re-setting against a setting master in accordance with normal gauging practice (not less than once per day). As the Digital Probe may be used anywhere on its stroke the setting master itself must be of known dimensions, but does not need to be precisely on its nominal value. The error quoted for the Digital Probe therefore includes a factor dependant on the distance between the setting master and the component being gauged.

Where D = difference in mm between setting master and component.

Error at calibration temperature: -

0.5 mm Probes i.e. GP901-05-S	± 0.05 μm ± 0.2% x D
1 mm Probes i.e. GP901-1-S	± 0.1 μm ± 0.1% x D
2 mm Probes i.e. GP901-2-S, GP901-2-P	± 0.1 μm ± 0.1% x D
5 mm Probes i.e. GP901-5-S, GP901-5-P	± 0.1 μm ± 0.2% x D
10 mm Probes i.e. GP901-10-S, GP901-10-P	± 0.1 μm ± 0.2% x D
20 mm Probes i.e. GP901-20-S, GP901-20-P	± 0.1 μm ± 0.2% x D

Gauge Head Specifications

Specifications Common to All Gauge Head Types

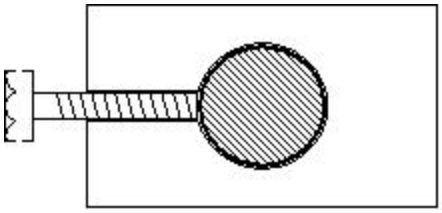
Body Material	Stainless Steel 400 Series
Probe tips	various types available
Non-repeat	<0.15 μm
Max. Angular Rotation of Tip	2°
Gaiter Material	Viton®
Max. Probe tip tightening Torque	0.22 Nm – M2.5 Thread
(when changing tip please take care not to damage probe)	0.12 Nm – M2 Thread
Storage Temperature Range	-20°C to +100°C
Operating Temperature	+5°C to +80°C
Environmental Protection (see mounting notes)	IP 65 (with gaiter)
Cable Standard (not all types)	2m screened, PUR, insulation
Option (not all types)	Standard cable with stainless steel or plastic braid

Pneumatic Operation (Not GP901-05 version)

Minimum operating pressure (bar)	With Gaiter Without Gaiter	0.4 0.3
Maximum operating pressure (bar)	With Gaiter Without Gaiter	1.0 2.0
Air leak rate ml/min. at 1.0 bar	With Gaiter Without Gaiter	<10 <150

Gauge Head Application Information

When mounting the Gauge Head in a fixture, care must be taken as the linear bearing assembly at the tip end is made to very fine tolerances. If a high force is applied to the probe casing performance may be affected. Ideally probes should be clamped in a yoke, split or collar clamp. If single point screw clamping is adopted (see diagram), then a tightening torque (in Nm) should be limited to that which will give a maximum of 50Kg point load. The Gauge Head may be mounted in any attitude.



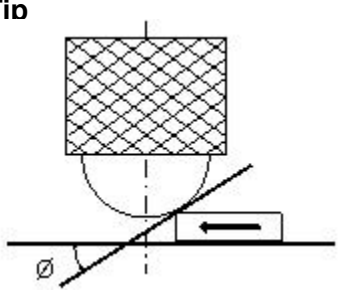
Maximum Tightening Torque

$$\frac{0.28d \times \left(\frac{P}{\pi \times d} + 0.15\right)}{\left(1 - \frac{0.15\,P}{\pi \times d}\right)}$$

where d = Screw dia. (mm)
P = Screw pitch (mm)
(assumes a V form thread and 0.15 coefficient of friction).

Typical maximum torque is 0.27 Nm (i.e. M5 x 0.8 steel or 10-32 UNF steel)
A clearance hole in the fixturing of 9.5 mm Φ is desirable around the gaiter for satisfactory operation.

Tip



Care should be exercised when a piece part is inserted sideways under a probe especially when using a spring push type. The maximum contact angle should be limited to a maximum of 45° in order to avoid applying excessive side loads to the precision bearing.

Generally, where piece parts are automatically loaded into a fixture, or where there is the possibility of severe side loads, the use of pneumatically operated transducers is strongly recommended.

To remove the tip, the shaft should be fully retracted into the body before unscrewing.

Pneumatic Gage Heads

The tip of a pneumatic Gage Head is normally biased in the inward direction and the extension of the tip is achieved by applying air pressure to the Gauge Head nozzle.

Air pressure may be varied within the specified limits to achieve the desired tip force at zero. The pneumatic Gage Heads are designed to be leak free and of small volume to minimise the air flow requirements and maintain a consistent tip force. Care must be taken not to damage the gaiter seal as the satisfactory operation of the Gage Head is entirely dependent on this component. A clearance hole in the fixturing of 9.5 mm Φ is desirable around the gaiter for satisfactory operation.

To maximise working life of the Gage Heads the air supply should be both clean and dry for continual reliable operation. Maximum relative humidity of 60 % RH and filtered to better than 5 µm particle size.

Environmental Considerations

Most Gage Heads are designed to be used with a gaiter and are designed to withstand the rigours of in-process gauging and will operate satisfactorily in the presence of copious amounts of coolants and cleaning solvents.

For Gage Heads without a gaiter such as Feather touch or in situations where removal of the gaiter is necessary (i.e. at low temperatures where stiffening of the gaiter may be a problem) then the working atmosphere must be both clean and dry. Ingress of dirt or fluids may interfere with the performance of the probe or even cause damage.

Cable

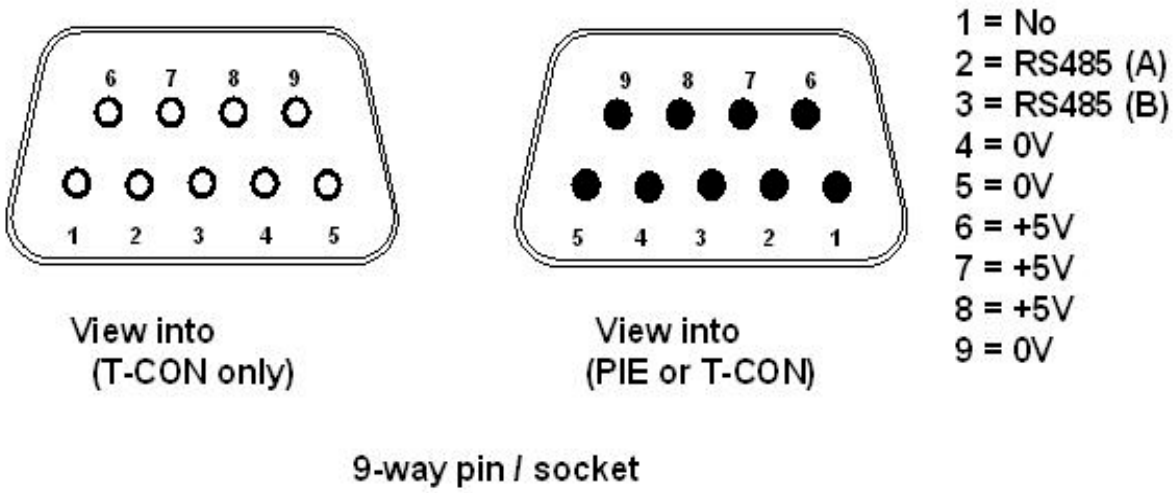
The Gage Head cable is custom made to achieve the optimum balance between flexibility, flex life, chemical resistance, abrasion resistance electrical and electrical screening.

To minimise transducer failure due to cable damage cable runs should be positioned well clear of moving components and vulnerable working areas. If the cable is in a flex situation then a minimum bend radius of 150 mm should be maintained, the vacuum and pneumatic options should not be flexed from the transducer cable entry, but should be anchored separately at a position of 50 - 70 mm from the end cap.

If the cable of a Digital probe is damaged it is not possible to repair it without affecting probe calibration. It must be replaced.

Connections

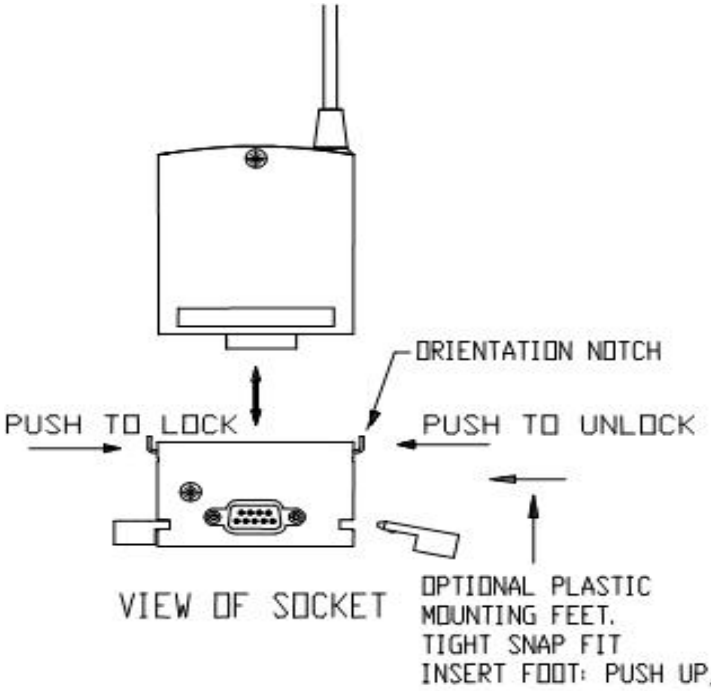
The PIE is designed to be used with the T-CON connector and allows for fast network configuration. All connections are via the 9-way sub D-type connector.

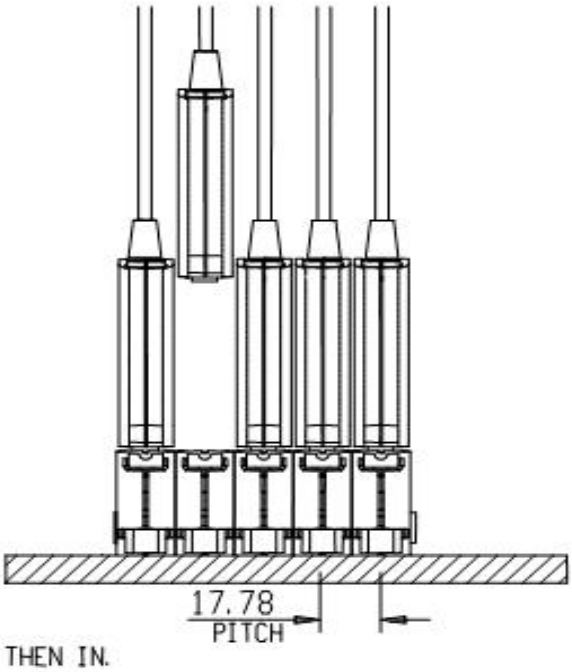


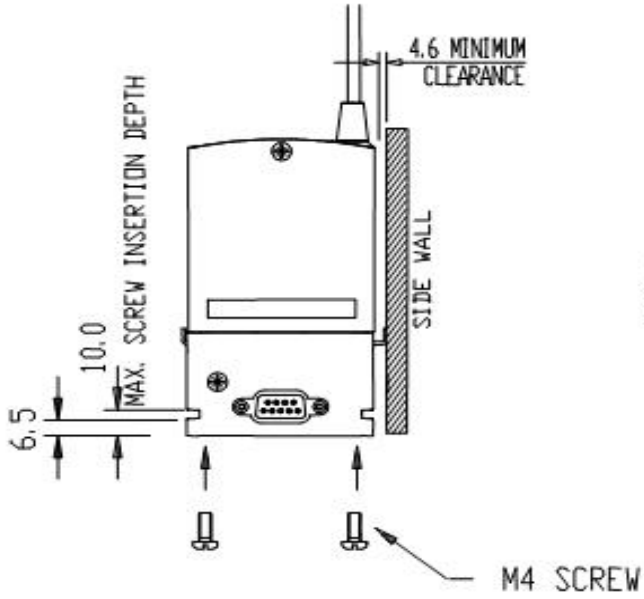
9-way pin / socket

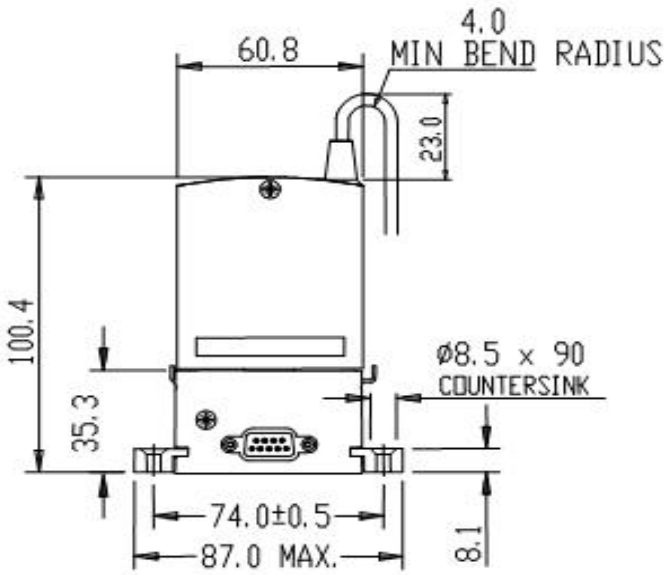
The Orbit Network has been designed to meet EMC requirements EN50081-1 for emissions and EN50082-1 for immunity when properly installed. The T-CON case should be connected to a good electrical ground. The mounting option using the captive nuts is the preferred method. Ensure screws make good contact with the mounting surface. If the mounting option using plastic feet is used paint should be removed from the T-CON base pads to ensure good electrical contact with mounting surfaces.

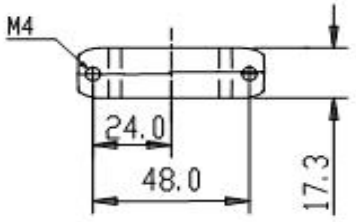
PIE and T-CON Installation



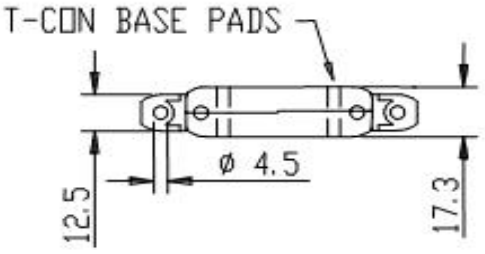








MOUNTING OPTION
USING CAPTIVE NUTS



MOUNTING OPTION
USING PLASTIC FEET

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WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal one **(1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.
If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.
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The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:
1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:
1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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