APPLIED MEASUREMENTS LTD.
Transducer Specialists...

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https://appmeas.co.uk

In-Line Submersible Load Cell | IP68 | Underwater Force Sensor | DDEN

O-Ring Sealed, Fully Submersible, Accurate and Easily Adaptable

- **Lead Time:** 6 - 8 weeks
- **Buy online:** https://appmeas.co.uk/shop/load-cells/dden/

AT A GLANCE

- Capacities: 0-50N up to 0-50kN
- Output: 0.75mV/V to 2mV/V
- Fully Submersible: IP68 to 10m
- Accuracy: <±0.15%/RC (0.05% typical)
- Optional Integral Amplifier

- **Ideal for any Freshwater Application**
- **Fully Submersible Long-Term Immersion Protected**
- **Underwater Protection Guaranteed Thanks to 'O' Ring Sealing**
- **Greater Underwater Depth Ratings Available for Deep Sea Applications**
- **Special Versions Alternative Construction Materials for Seawater and other Corrosive or Aggressive Media.**

DESCRIPTION

Applied Measurements high accuracy DDEN in-line submersible load cell can be used in both tension and compression and is specially designed for applications where load or force needs to be measured underwater, or in areas subject to high humidity or the risk of flooding.

The submersible in-line load cell is sealed using 'O' rings to provide integrity at depths up to 10 metres as standard, with greater depths possible if the appropriate modifications are made to the design. Applied Measurements standard in-line waterproof load cell model DDEN, is currently being used in various applications including wave tank measurement systems and mooring buoy cable tension monitoring.

Applied Measurements DDENA in-line submersible load cell is fitted with an ICA Series Load Cell Amplifier (https://appmeas.co.uk/products/instrumentation/miniature-load-cell-amplifier-ica/) to provide a high-level analogue output, commonly 0-5Vdc, 0-10Vdc, ±10Vdc or 4-20mA, which is suitable for use with most data acquisition and control systems. An RS485 digital output is also possible by fitting the DCell Load Cell Digitiser (https://appmeas.co.uk/products/instrumentation/miniature-strain-gauge-load-cell-digitiser-dcell/) in place of the ICA.

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Customised versions of our DDEN submersible load cell can be designed to meet your specific requirements. Plus, instrumentation and rod ends are available to buy in our online shop, including calibration options to make a complete system.

TECHNICAL SPECIFICATIONS

Rated Capacity (RC)	**N**	**0-50, 0-100, 0-250, 0-500, 0-1000, 0-2000, 0-5000, 0-10,000, 0-20,000, 0-50,000**
Operating Modes	Tension/Compression / Tension & Compression	
Sensitivity (RO)	mV/V (nominal)	50N = 0.5 / 100N=1.0 / 250N = 0.75 / 500N = 1.5 / 1000N up = 2.0
Zero Balance/Offset	±%/Rated Output	<1.0
Output Symmetry (tension vs. compression)	±%/Rated Output	<0.25 typical
Non-Linearity	±%/Rated Output (BFSL)	<0.15 (0.05 typical)
Hysteresis	%/Rated Output	<0.15 (0.05 typical)
Repeatability	±%/Rated Output	<0.1
Temperature Effect on Zero	±%/Rated Output/ ˚C	<0.005
Temperature Effect on Sensitivity	±%/Applied Load/ ˚C	<0.005
Input Resistance	Ohms	700
Output Resistance	Ohms	700
Insulation Resistance	Megohms	>5000 @ 50Vdc
Excitation Voltage	Volts AC or DC	10 recommended (2-15 acceptable) - Note mV/V only, see page 5 for details of conditioned output versions.
Operating Temperature Range	˚C	-20 to +80
Compensated Temperature Range	˚C	0 to +70
Storage Temperature Range	˚C	-20 to +80
Safe Overload	% of Rated Capacity	150
Ultimate Overload	% of Rated Capacity	200
Deflection @ Rated Capacity	mm	50N=0.08; 100N=0.12; 250N=0.09; 500N=0.06; 1000N=0.04; 2000N=0.03; 5000N=0.02; 10,000N=0.015; 20,000N=0.01; 50,000N=0.03
Fundamental Resonant Frequency*	kHz	50N=1.7; 100N=1.3; 250N=0.72; 500N=1.18; 1000N=2; 2000N=3.1; 5000N=6.1; 10,000N=9.9; 20,000N=18.2; 50,000N=13.3
IP Rating (Environmental Protection)		IP68 to 10m depth (please consult sales for greater depths)
Weight (excluding cable)	kg	50N to 20kN: 0.3kg / 50kN: 0.45kg,
Fatigue Life	10^8 cycles typical (10^9 cycles on fatigue-rated version)	
Cable Length (as standard)	metres	2
Cable Type	4-core screened submersible, PUR (weight: 82g/m) sheath, Ø7.5	
Construction Materials / Wetted Parts	17-4PH Stainless Steel, 303 Stainless Steel, PUR, NBR, TPE, Silicone	
Resolution	1 part in 250,000 (with appropriate instrumentation)	
Pressure Effect on Output	9N/mH^2O nominal	

*The resonant frequency is calculated with the body of the load cell attached to a large plate, ensuring that only the sensing element oscillates: This is vital to achieve the highest natural frequency and subsequent frequency response.

Product Dimensions

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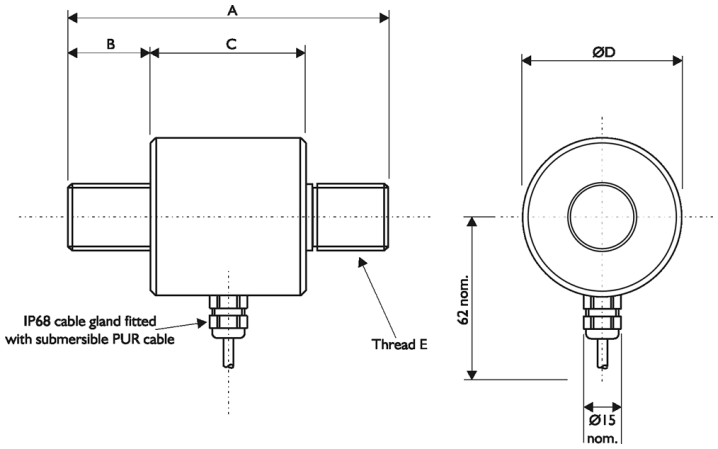

All dimensions are in mm

Model	Capacity	A	B	C	ØD	E
DDEN	0-50N up to 0-20kN	67	15	35	44	M12x1.75
DDEN	0-50kN	71	18	35	44	M16x2.0
DDENA	0-50N up to 0-20kN	67	15	35	44	M12x1.75
DDENA	0-50kN	71	17	37	50	M16x2.0

Wiring Details

Wire	mV/V Output	3-Wire Voltage or Current Otput	4-Wire Voltage Output	2-Wire Current	RS485 Digital
Red	+ve excitation	+ve supply	+ve supply	+ve supply	+5.4 to +18Vdc supply
Blue	-ve excitation	0V common	-ve supply	-ve supply / signal	-ve supply
White	+ve signal (tension) *	+ve signal	+ve signal	N/C	RS485 (B) Data -ve
Yellow	-ve signal	N/C	-ve signal	N/C	RS485 (A) Data +ve
Screen	To ground - not connected to load cell body				
* +ve signal in tension is standard, +ve signal in compression can also be offered.					

ORDERING CODES & OPTIONS

Core Product	Capacity (inc Engineering Units)	Cable Length (m)	Specials Code	Example Result
DDEN	50N	002	000	DDEN-50N-002-000
DDEN	100N	002	000	DDEN-100N-002-000
DDEN	250N	002	000	DDEN-250N-002-000
DDEN	500N	002	000	DDEN-500N-002-000
DDEN	1000N	002	000	DDEN-1000N-002-000
DDEN	2000N	002	000	DDEN-2000N-002-000
DDEN	5000N	002	000	DDEN-5000N-002-000
DDEN	10kN	002	000	DDEN-10kN-002-000
DDEN	20kN	002	000	DDEN-20kN-002-000
DDEN	50kN	002	000	DDEN-50kN-002-000

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MOUNTING AND INSTALLATION ACCESSORIES

Rod End Bearings for Tension Use

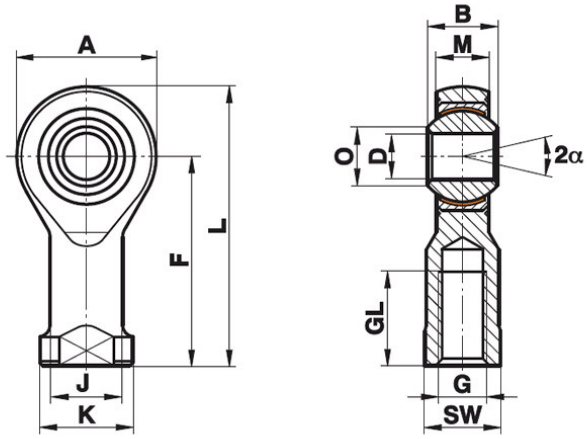
Designed to align forces through the principle axis of the load cell thus reducing the effects of extraneous forces, hence offering improved performance from the cell.

Rod End Bearings are used where tensile forces are being applied.

Maintenance-free rod ends are a complete units made up of a housing with both an integral shank (with an internal or external thread) and a maintenance-free spherical plain bearing, located within the housing.

Key Features:

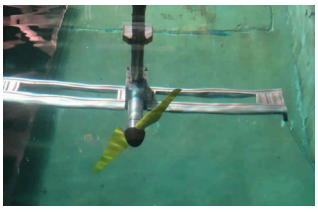
- Supports radial loads in a tensile or compressive direction.
- Suitable for unilateral loads – can support alternating loads and alternating loads in combination with bearing GE..UK-2RS, consult sales.
- Stainless Steel for corrosion resistance.
- Are maintenance-free.
- Fitted with radial spherical plain bearings.
- PTFE composite sliding contact surfaces.
- Enables compact adjacent construction thanks to its thin-walled design of the eye housing.



All dimensions are in mm

LOAD CELL	ORDERING CODES	Size (D)	B	M	A	F	L	K	J	O	SW	G	GL	Static load C_0 kN	Dynamic load C kN	Limiting Speed rev/min	Weight g
DDEN + DDENA-50N to 20kN	GIRSW-12RR-316	12	16	12	32	50	66	22	17.5	15.4	19	M12	22	34.5	32	300	115
DDEN-50kN	GIRSW-16RR-316	16	21	15	42	64	85	27	22	19.3	22	M16	28	60.5	52.5	230	230

CASE STUDIES



Submersible Load Cells Lower the Cost of Large Tidal Turbine Designs

This case study aims to significantly reduce the cost of large scale tidal turbine designs using our submersible load cells. The tidal turbine test rig was placed in a state-of-the-art test tank, where the team were able to increasing the size, flow rate and turbulence levels within the tank. Lowering the cost of rotor blade manufacture would make this renewable energy more economical to use and widely accessible, benefiting not only the UK renewable tidal energy markets but developing tidal energy countries too. Our submersible load cells measured both the torque and the thrust of the underwater tidal turbine design.

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Read more... (https://appmeas.co.uk/blog/submersible-load-cells-for-tidal-turbine-design/)

Array

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