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 Ки

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Технические характеристики на

датчики перепада давления из нержавеющей

стали для тяжелых условий

эксплуатации 2НТ, 387

компании Delta Mobrey

Technical Datasheet



387 Series ANALOGUE Pressure Transmitter Model: 387

Key Features

- High Accuracy ± 0.15%
- Ranges from 1 bar to 1000 bar
- 4 : 1 turndown
- 4-20mA analogue
- 316 stainless steel investment cast enclosure
- NEMA 4X, IP66 weatherproof rating
- Stainless Steel, Monel and Hastelloy "Wetted Parts" options
- NACE MR-01-75 compatibility
- Compact, robust design
- All welded construction



- The model 387 has a compact, robust, all stainless steel construction making it particularly suited to the harsh corrosive environments of offshore applications
- The model 387 offers excellent accuracy of 0.15% of the upper range value, including combined effects of linearity, hysteresis and repeatability

Other related products:

• D23 SMART Pressure Transmitter





Product applications

The 387 is suitable for a wide range of applications in many industry sectors:

- Oil & Gas
- Chemical
- Petrochemical
- Water
- Power

The choice of models available ensures that the 387 suitable for use in:

- Corrosive atmospheres
- Resistant to chemical attack

How to order

Switches can be configured by selecting codes representing the desired features from the tables that follow. The chart below, describes how the model code is built up. For assistance in configuring a switch that best suits your needs, please contact your local sales office.

	Π					
Enclosure Table 1						
Model Table 2						
Electrical Entry Table 3						
Material of Wetted Part Table 4						
Range Table 5		 				
Signal Output Table 7		 	 	ļ		
Process Connection Table 8						
Options & Treatments Table 9		 	 			
Special Engineering						

NOTE: Options shaded in the following tables are the most common options and are available on the quickest lead-times and at the lowest cost.

NOTE: Only the most common options are shown in this data sheet. Should you require a feature that is not shown, please contact your local sales office for further details.

Technical Specification

Accuracy:	For turndowns of 1:1 to 4:1 \pm 0.15% of span. Less than \pm 0.15% of URV*, including combined effects of linearity, hysteresis and repeatability
Temperature limits:	Process: -40 to +120°C (-40 to +240°F) Ambient: -20 to +85°C (-4 to +185°F) Compensated range: -20 to +85°C (-4 to +185°F) Ambient temperature drift: Less than $\pm 0.025\%$ of URL*, for every 1 deg C (1.8 deg F) change in ambient temperature.
Enclosure classification:	IP66 / NEMA 4X / Flameproof Ex d / Intrinsically safe Ex ia
Signal output: Power supply:	4 to 20mA, 2-wire system. See Table 6. 12 to 38V DC at instrument terminals. Reverse polarity protected. Less than 0.01% per volt effect.
Long term stability.	and repeatability
Vibration tolerance:	5g peak to peak sinusoidal at 5 to 200Hz.
Radio frequency interference effect:	Induced error shall not exceed $\pm 0.15\%$ of URL*, when tested to IEC 801-3 severity level 3 (10v/m) with cover closed)
Warm-up time: Response time: Adjustability:	250 milliseconds typical 150 milliseconds typical Zero adjustment within ±5% off full range
Weight:	0.9kg.



Setting Ranges

The values shown in this table are the UPPER RANGE LIMIT (URL); a 4:1 turndown facility enables full 4 to 20mA output to be obtained for a working span equal to 25% of URL.

Unless specified, the instruments are despatched with

LOWER RANGE VALUE (LRV) set to zero and

UPPER RANGE VALUE (URV) set to URL.

Medium Pressure

Material Code "R" only. (Table 4)

Accuracy ±0.15%

Maximum working pressure (Pmax) 2 x URL.

Available on models 4387 and A387

*Intrinsically Safe and Flameproof only

High Pressure

Material Codes "S, T, U and C". (Table 4)

- Code S: Accuracy ±0.15% Maximum working pressure (Pmax) 2 x URL.
- Codes T,U and C: Accuracy ±0.25%. Maximum working pressure (Pmax) 1.5 x URL.

*Subject to 1500 bar (22,500psi) maximum.

Available on models 4387, A387 and R387.

Signal Output

Code M is only available with wetted part material codes C or U. Ref Table 4.

Inalogue Pressure Transmitter

All 4-20mA.

TABLE 5

Bar/mbar absolute

Psi absolute

Ranges shown are to gauge (i.e. atmospheric reference) absolute pressure is called up by amending the last character of the three character range code:

**A

**Q

If range settings are required which cannot be achieved within the adjustment range of zero and span controls, refer to special engineering

Table 5A				
Bar	Code	PSI	Code	
0 to 1	DAB	0 to 16	DAP	
0 to 1.6	DBB	0 to 25	DBP	
0 to 2	D2B	0 to 30	D2P	
0 to 2.5	DCB	0 to 40	DCP	
0 to 4	DDB	0 to 60	DDP	
0 to 6	DEB	0 to 100	DEP	

Table 5B					
Bar	Code	PSI	Code		
0 to 10	EAB	0 to 160	EAP		
0 to 16	EBB	0 to 250	EBP		
0 to 25	ECB	0 to 400	ECP		
0 to 40	EDB	0 to 600	EDP		
0 to 60	EEB	0 to 1000	EEP		
0 to 100	FAB	0 to 1600	FAP		
0 to 160	FBB	0 to 2500	FBP		
0 to 250	FCB	0 to 4000	FCP		
0 to 400	FDB	0 to 6000	FDP		
0 to 600	FEB	0 to 10000	FEP		
0 to 1000	GAB	0 to 15000	GAP		

Note: Range codes GAB and GAP are only available with wetted parts codes 'S', 'U' and 'C' Ref. Table 4.

TABLE 6 Image: Constraint of the second second

	Code
4 to 20mA, 2-wire system. 4mA equivalent to nominal zero input pressure. Span of unit adjustable so that 20mA may be equivalent to any pressure between 25% and 100% of Upper Range Limit. Maximum permitted voltage between circuit and case, 50V DC	6
4 to 20mA, 2-wire system. 4mA equivalent to nominal zero input pressure. Span of unit adjustable so that 20mA may be equivalent to any pressure between 25% and 100% of Upper Range Limit. Maximum test voltage between circuit and case, 500V AC.	М

Process Connection

Other thread specifications and sizes are available without using adaptors.

Adaptors are available for applications where their use is permitted.

TABLE 7

TABLE 8

TABLE 9

FEATURE

	Code
1/2" NPT Male external (standard)	J
G1/2"A to ISO 228 (1/2" BSP Parallel Male, spigotted)	Ν
High Pressure Cone and Thread (Autoclave) 9/16" UNF	V

NOTE: All $1\!\!\!\!/ _2$ NPT process connections are limited to a maximum over range pressure of 1200 bar / 17,500 psi.

Options and Treatments

For requirements that fall outside the specifications listed above we will be pleased to advise on your particular application.

	Code
Panel Mounting Clamp in Stainless Steel	
Pipe Mounting Clamp in Stainless Steel	APPLY FOR DETAILS
Approved IS Indicator in Hazardous Area	
Instrument Valves	SPECIFY
Chemical Seal (Remote or direct)	IN FULL
Oxygen Service 2: Process (wetted) parts are cleaned for oxygen.	04
Tagging – Variety of tagging methods are available	APPLY FOR DETAILS
Applies when no option is required and selection is made from SPECIAL ENGINEERING	00

Please consult Delta sales engineering for special requirements.

Special Engineering

To your individual requirements, where specified. For your convenience, enter your special listing in space provided.

Special Engineering



WIRING AND ADJUSTMENT

Voltage to be within triangular area



Analogue Pressure Transmitter

Code

TBA

Approvals

EUROPEAN DIRECTIVES

(F

Electromagnetic Compatibility Directive (EMC) 2014/30/EU Compliant to EMC directive

Pressure Equipment Directive (PED) 97/23/EC: This product has a process connection size <=DN25 and is therefore categorised as sound engineering practice under Cat 3.3

ATEX APPROVALS



Intrinsically Safe: Certificate No. ITS03ATEX21062X - EN60079 & EN61241

For Zone 0 models (Enclosure code 4, see Table 1)



Ex ia IIC T4 (Tamb -20°C to +90°C) ll 1 Ga Ex ia IIC T5

II 2G $\langle \epsilon_{x} \rangle$

Ex iaD 20 T120 IIC T6 (Tamb -20°C to +80°C) Gb Ex iaD 20 T90

Flameproof:

Certificate No. BAS02ATEX2191 - EN60079 & EN50018

For Zone 1 models (Enclosure code R, see Table 1)

 $\langle E_{X} \rangle$ II 2 GD

Ex d IIC Ex tD A21 IP6X T85°C Ex d IIC Ex tD A21 IP6X T135°C (Tamb -20°C to + 90°C)

Dimensions





WALL MOUNTING BRACKET

PIPE MOUNTING BRACKET



250g approx



FM00720 Page 6 of 6

Technical Datasheet

delta-**mobrey**

2HT Series SMART Pressure Transmitter

Key Features

- High Accuracy ± 0.10%.
- Ranges from 1 bar to 1000 bar.
- 20 : 1 turndown.
- 4-20mA analogue with digital communications.
- Fully HART ® compatible.
- Rugged 316 stainless steel investment cast enclosure.
- NEMA 4X, IP66 Environmental Rating.
- Stainless Steel, Monel and Hastelloy "Wetted Parts" options.
- NACE MR-01-75 compatibility.
- Compact, Robust design.
- All welded construction.

Series Overview

The model 2HT has a compact, robust, all stainless steel construction making it particularly suited to the harsh corrosive environments of offshore applications.

For applications where the ambient temperature can vary significantly, the 2HT can be supplied with an optional high accuracy calibration enabling the accuracy to be maintained within 0.1% for ambient temperatures ranging from -30° C to $+70^{\circ}$ C.

Other related products:

• D23 SMART Pressure Transmitter



Product applications

The 2HT is suitable for a wide range of applications in many industry sectors:

- Oil & Gas
- Chemical
- Petrochemical
- Water
- Power

The choice of models available ensures that the 2HT suitable for use in:

- Corrosive atmospheres
- Resistant to chemical attack



How to order

Transmitters can be configured by selecting codes representing the desired features from the tables that follow. The chart below, describes how the model code is built up. For assistance in configuring a switch that best suits your needs, please contact your local sales office.

	$\Box \Box $	
Enclosure Table 1		
Model Table 2		
Electrical Entry Table 3		
Material of Wetted Part Table 4		
Range Table 5		
Units Table 6		
Signal Output Table 7		
Process Connection Table 8		
Options & Treatments Table 9		
Special Engineering		

NOTE: Options shaded in the following tables are the most common options and are available on the quickest lead-times and at the lowest cost.

NOTE: Only the most common options are shown in this data sheet. Should you require a feature that is not shown, please contact your local sales office for further details.

Technical Specification

Weight:	Without local display 1.6kg; With optional local display 1.8kg; Wall mount bracket 0.2kg; Pipe mounting bracket 0.5kg; Remote D-CAL unit 0.2kg.
Process Connection:	See Table 8.
Electrical rating:	See Table 6.
Signal output:	See Table 7.
Enclosure classification:	IP66 / NEMA 4X / Flameproof Ex d / Intrinsically safe Ex ia
Humidity limits:	0 to 100% relative humidity
Ambient Temperature effects:	Total effect ±0.1% at maximum span.
Temperature limits:	Process: -40 to +120°C (-40 to +240°F) Operating: -40 to +85°C (-40 to +185°F) Storage: -50 to +110°C (-58 to +230°F).
Accuracy:	For turndowns of 1:1 to $10:1 \pm 0.1\%$ of span. For turndowns of 10:1 to $20:1 \pm 0.15\%$ of span. Accuracy stated includes the combined effects of Linearity, Hysteresis, and Repeatability.

Enclosure			
FINISH	ENCLOSURE TYPES	Code	
All enclosures are investment cast in	Intrinsically Safe Enclosure (Zone 0)		
16 Stainless Steel and offer nvironmental protection to (NEMA YPE 4X) IP66.	Intrinsically Safe to EN60079-0 & EN60079-11 & EN 60079-26 Ga Ex ia IIC T4 @ -20 to +80°	4	
	Flameproof Enclosure		
OTE struments subject to National or ternational approval may be limited in rms of options available. See notes djacent to relevant tables.	Flameproof to EN50 014 & EN50 018 EEx d IIC T4 @ -40 to +85°C (for Blind Instruments) EEx d IIC T6 @ -40 to +60°C (for Blind Instruments) EEx d IIB + H2 T6 @ -40 to +60°C (for Indicating Instruments) EEx d IIB + H2 T6 @ -40 to +85°C (for Indicating Instruments) Refer also to note on table 7	R	
	Weatherproof		
	Weatherproof only IP66 / NEMA 4	А	
Model	TABLE 2		
		Code	
	Pressure transmitter.	2HT	
Electrical Entry			
20 x 1.5 (ISO) and 1/2" NPT Internal reads available as standard. Other		Code	
reads e.g. Pg 13.5, can be made	M20 x 1.5 Internal thread (standard)	1	
	1/2" NPT Internal thread	2	
Naterial of Wetted Parts	TABLE 4 Image: Constraint of the second		
ntions T. I.I. and C. are all compatible		Code	
th the requirements of NACE MR 01 Other factors in highly aggressive emical environments may determine	For liquids and gases. Welded 316 stainless steel sensor and pro- cess connection. Ranges 0 to 1 bar up to 0 to 6 bar.	R	
e final choice. or Sour-gas and Crude applications, ode C offers the most cost effective	For liquids and gases. Welded 17-4 PH or 15-5 PH sensor to 316 stainless steel process connection. Ranges 0 to 10 bar up to 0 to 1000 bar.	S	
olution. onel Code T is preferred for highly idising media, such as pure Oxygen	Welded nickel alloy (Monel) sensor and process connection. Ranges 0 to 10 bar up to 0 to 1000 bar (Suitable for NACE MR-01-75).	т	
nd Chlorine.	Welded Hastelloy C sensor and process connection. Ranges 0 to 10 bar up to 0 to 1000 bar. (Suitable for NACE MR-01-75).	U	
	Welded Hastelloy C sensor to annealed stainless steel process con- nection. Ranges 0 to 10 bar up to 0 to 1000 bar. (Suitable for NACE MR-01-75)	с	

Setting Ranges

TABLE 5

The values shown in this table are the UPPER RANGE LIMIT (URL); a 20:1 turndown facility enables full 4 to 20mA output to be obtained for a working span equal to 5% of URL.

Unless specified, the instruments are despatched with

LOWER RANGE VALUE (LRV) set to LOWER RANGE LIMIT and

UPPER RANGE VALUE (URV) set to UPPER RANGE LIMIT.

Ranges shown are to gauge (i.e. atmospheric reference) absolute pressure is called up by amending the last character of the three character range code:

NOTE: Model R 2HT is not available on ranges below 10bar.

Units

Bar	PSI	Code
0 to 1	0 to 16	DA
0 to 2	0 to 30	D2
0 to 6	0 to 100	DE
0 to 10	0 to 160	EA
0 to 16	0 to 250	EB
0 to 40	0 to 600	ED
0 to 100	0 to 1600	FA
0 to 400	0 to 6000	FD
0 to 600	0 to 10,000	FE
0 to 1000*	0 to 16,000	GA

*NOTE: Range GA only available with SS or Hastelloy Process connection



UNITS	Code
Gauge	G
Absolute	А

Signal Output

TABLE 7 Image: Table 1 Image: Table 1

NOTE:

For Flameproof model R2HT, gas group reduced to IIB+H2 when option codes 2 & B are selected. Also refer to table 1

All 4-20mA with digital signal based on the ${\rm HART}^{\rm I\!R}$ protocol.

Codes A and B are only available with wetted part material codes C or U. Ref Table 4.

	Code
50 V DC Maximum voltage between circuit and case, blind instru- ment.	1
50 V DC Maximum voltage between circuit and case, instrument with indicator.	2
500 V AC Maximum voltage between circuit and case, blind instrument.	A
500 V AC Maximum voltage between circuit and case, instrument with indicator.	В

Process Connection

Other thread specifications and sizes are available without using adaptors.

Adaptors are available for applications where their use is permitted.

TABLE 8

TABLE 9

	Code
1/2" NPT Male external (standard)	J
G1/2"A to ISO 228 (1/2" BSP Parallel Male, spigotted)	Ν
High Pressure Cone and Thread (Autoclave) 9/16" UNF	V

NOTE: All 1/2" NPT process connections are limited to a maximum pressure of 1200 bar/17500 psi.

Options and Treatments

For requirements that fall outside the specifications listed above we will be pleased to advise on your particular application.

	Code
Tagging – Wired on Stainless steel tag	30
Applies when no option is required and selection is made from SPECIAL ENGINEERING	00

Special Engineering

Last 4 digits of model code only used when special engineering is required.

TABLE 10	

	Code
Please consult Delta sales engineering for special requirements.	TBA

Accessories

Order as separate items.

		.=
	Code	S M M
Hand held indicator/configurator (DCAL)	IDCL	ran.
Modem (For PC Serial Port)	9400012	Ire T
Panel mounting clamp in stainless steel	9HTBW	ressi
2" Pipe mounting clamp in stainless steel	9HTBP	art D

1odel: 2H

ter

Technical Specifications

Process

Liquid, gas or vapour applications.

Ranges

0 to 1bar up to 0 to 1000bar. (0 to 16psi up to 0 to 16,000psi.) **Outputs**

Two-wire, 4-20mA DC output with Digital AC signal superimposed onto it, using the HART $\ensuremath{\mathbb{B}}$ protocol.

Power Supply

9 to 55 Volts DC. On intrinsically safe circuits the maximum voltage is limited to 28VDC.

Load Limits

The maximum loop resistance is determined by the voltage level of the power supply.



Digital communication requires a minimum loop resistance of 230 ohms.

Indication

Optional Local Display. Hazardous Area Certification ATEX Intrinsically safe and flameproof.

Zero Elevation & Suppression

Can be set anywhere within the sensor limits, providing the required span is greater or equal to the minimum span, the lower range value does not exceed the lower range limit, and the upper range value does not exceed the upper range limit.

Normal or Reverse Action

Set by reversing the upper and lower range values. **Overpressure**

Overpressure

316 St. St. diaphragm 2 x URL 17-4 PH or 15-5 PH diaphragm 2 x URL* Monel diaphragm 1.5 x URL* Hastelloy diaphragm 1.5 x URL*

*Subject to 1500 bar maximum.

Temperature Limits

 Process:
 -40 to +120°C (-40 to +240°F)
 Operating:
 -40 to +85°C (-40 to +185°F)
 Storage:
 -50 to +110°C (-58 to +230°F)
 -50 to +100°C (-58 to +230°C)
 -50 to +100°C (-5

Failure Mode Alarms

"Burnout" indication can be selected to be either minimum or maximum current output .

Humidity Limits

0 to 100% relative humidity.

Turn-on Time

Performs within specifications in less than 3 seconds, after power is applied to the transmitter including full self-diagnosis.

Volumetric Displacement

Less than 0.01cm³

Damping

Adjustable 0 to 39 seconds. This is in addition to the sensor response time of 150mS.

Performance specifications

Accuracy

 For turndowns of 1:1 to 10:1
 +0.1% of Span

 For turndowns of 10:1 to 20:1
 +0.15% of Span

Accuracy stated includes the combined effects of Linearity, Hysteresis, and Repeatability.

Stability

Typically less than ±0.1% URL per annum. Linearity ±0.05% of calibrated span. Ambient Temperature Effects Total effect ±0.1% at maximum span. Overrange Effect Zero shift, 0.2% URL. Step Response Less than 150mS.

Vibration Effect 5g Peak sinusoidal at 5Hz to 200Hz.

Power Supply Effect 0.005% of calibrated span per volt.

Mounting Position Effect

Zero shift of up to 2mbar for a 10° tilt in any place.

RFI Effect

With lid on, in accordance with IEC801, level 3 (30V/m) over the range 20Mhz to 1000Mhz.

Physical Specifications

Electrical Entry M20 x 1.5 Internal or 1/2" NPT Internal. Process Connections 1/2" NPT External (Standard). Autoclave, 'Cone and Thread' 9/16" UNF (For pressure ranges up to 1000bar.) External G 1/2" A to ISO 228. Process Wetted Parts 316 St. St. 17-4 PH St. St. or 15-5 PH. Hastelloy.

Monel.

Programming, configuration & display functions

The model 2HT SMART transmitter uses the HART® protocol, enabling digital communications with host computer systems, universal hand-held communicator and any other process control system that supports the HART® protocol; as a result it can be configured and calibrated remotely.

In addition to remote digital communications, the Model 2HT has a standard local Zero and Span adjustments at the touch of a button.



If more than just local Zero and Span is required, there is the unique D-CAL local display option.

The Delta D-CAL local display is more than just a local indicator, it is, in fact, a local configurator, that can directly access more than 80% of the SMART transmitter commands, for installation, commissioning and maintenance checks.

Non-Wetted Parts

Lowerbody, Case and Lid 316 Sta Mounting Hardware 316 Sta Environmental Protection IEC IP66, NEMA 4X. Mounting Direct process mounting as standard. Optional 2" pipe mounting bracket.

316 Stainless Steel.316 Stainless Steel.

The D-CAL local display unit is constructed from a single, stainless steel disc and when fitted gives the transmitter an environmental rating of IP65 with the lid removed.

The display gives diagnostic capabilities and shows prime variable and temperature, it also contains a user friendly, alphanumeric menu allowing access to internal functions including password protection. Passwords can be enabled to limit operation access to critical parameters during operation.

If a local display is not required, but the ability to check and configure the model 2HT is still needed, then our unique hand held configuration is a low cost alternative, when purchasing two or more transmitters.



Once the first unit is configured, simply unplug the D-CAL unit and move onto the next unit.

Approvals

EUROPEAN DIRECTIVES



Low voltage Directive (LVD) 2006/95/EC Compliant to LVD

Pressure Equipment Directive (PED) 97/23/EC:

This product has a process connection size <=DN25 and is therefore categorised as sound engineering practice under Cat 3.3

CENELEC / INTERTEK / ATEX

Intrinsically Safe: Certificate No. ITS03ATEX21213X EN60079-0 & EN60079-11 & EN 60079-26

For Zone 1 models (Enclosure code 4, see Table 1)



II 2 Ga Ex ia IIC T4 (Tamb -20°C to +80°C) Gb

Flameproof/Waterproof: Certificate No ITS03ATEX11187 Issue 2 EN50 014 & EN50 018

For Zone 1 models (Enclosure code R, see Table 1)



Ex d IIC T4 @ -40°C to +85°C (for Blind Instruments) Ex d IIC T6 @ -40°C to +60°C (for Blind Instruments) Ex d IIB + H₂ T6 @ -40°C to +60°C (for Indicating Instruments) Ex d IIB + H₂ T6 @ -40°C to +85°C (for Indicating Instruments)

Dimensions



All dimensions mm (Inches)





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