



T7W SERIES

SMART TRANSMITTER FOR WATER-IN-OIL RATE MEASUREMENT (WATER CUT)



DESCRIPTION

T7W is an online water determination transmitter in crude oil pipes. It is suitable for extreme pressure and temperature process conditions.

T7W is equipped with microcontroller digital electronic which allows a very accurate and reliable management of the capacitive sensor.

Diagnostic information about the transmitter functioning are available through the standard 4÷20 mA analog output with HART® communication protocol ("Highway Addressable Remote Transducer").

APPROVALS



APPLICATIONS

- Oil production.
- Oil/water separators.
- Aviation fuel.
- Suitable for Oil & Gas, Chemical, Petrochemical industries.

SPECIAL FEATURES

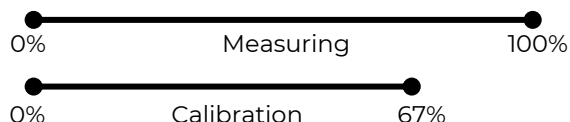
- Temperature compensated.
- Ex protection per ATEX.
- For SIL 2 applications.
- Wetted parts in special materials (HC-276, INCONEL, Titanium).
- Ceramic sensor.
- Sensor: capacitive validated through fluidodynamic models
- Galvanically isolated probe input
- 10 points calibration



DEFINITIONS

Measuring Range: the oil-water ratio, defined by a minimum value and a maximum value of capacitance, within which the transmitter can be calibrated.

Calibration Range: the oil-water ratio, defined by a minimum value and a maximum value, at which the instrument is actually calibrated.



ELECTRICAL PARAMETERS

Supply: 12.5 ÷ 30 Vdc

Output signal: 4 ÷ 20 mA + Hart®, 2 wires

Alarm values: 3.85 mA \ 21 mA

Response time (63% FS): < 256 ms (Standard Hart®)

Measured value update frequency:

4 ÷ 20 mA + Hart®: ≈ 1 s

Hart® output only: ≈ 500 ms (On request)

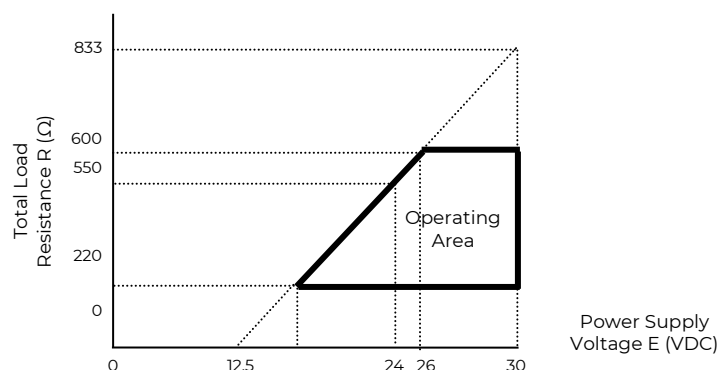
Polling time:

4 ÷ 20 mA + Hart®: ≈ 800 ms

Hart® output only: ≈ 500 ms (On request)

Load resistance: 220 Ω < RL < 600 Ω (Hart®)

The total load resistance includes both the line resistance of the connection cable and the load resistance of the reading or receiving units



MEASUREMENT PERFORMANCE

Total accuracy:

< 1 % FS (10 ÷ 70°C)

Measuring range: 0÷100% concentration of water in oil (or oil in water with reverse function)

Power supply effect:

negligible between 12.5 and 30 Vdc

Measured value update frequency:

4 ÷ 20 mA + Hart®: ≈ 1 s

Hart® output only: ≈ 500 ms (On request)

Polling time:

4 ÷ 20 mA + Hart®: ≈ 800 ms

Hart® output only: ≈ 500 ms (On request)

Response time (63% FS): < 256 ms (Standard Hart®)

ENVIRONMENTAL CONDITIONS

Ambient Temperature: -40 ÷ +85°C

Process fluid Temperature: -40 ÷ +85°C

- **with finned extension:** up to 150°C;

Storage Temperature: -40 ÷ +90°C

Relative Humidity: 0 ÷ 99% R.H. (not condensating)

LCD Display reading: -20 ÷ +75°C

PARAMETER SETTINGS

LRV Setting of Lower Range Value (must be within the Measuring Range and lower than URV)

URV Setting of Upper Range Value (must be within the Measuring Range and higher than LRV)

ALARM TYPE: according to NAMUR NE43:

- **Working Zone (WZ)** is between $3.9 < \text{WZ} < 20.5$ and the display shows the value of measured current.

Status	Display Indication	Range [mA]
WZ	[current value]	$3.9 < \text{WZ} < 20.5$

- **Limit Zone (LZ)** between $3.85 < \text{LZ} < 3.9$ mA and $20.5 < \text{LZ} < 21.0$ mA. In this case the display blinks the value of measured current;

Status	Display Indication	Lower Range [mA]	Upper Range [mA]
LZ	[Blinking current value]	$3.85 < \text{LZ} < 3.9$	$20.5 < \text{LZ} < 21.0$

- **Alarm Zone (AZ)** is between $3.85 < \text{AZ} < 21$. The transmitter failure method and relevant output current depends on the configuration type, and can be set in 4 different ways as per below table.

Status	Display Configuration	Display Indication
AZ	[NONE]	Random current value
	[21]	AZ = 21 (default configuration)
	[3.85]	AZ = 3.85
	[LAST]	Output to Last read current Value before breakdown

DAMP VALUE: damping digitally adjustable from 0 to 60 sec. (minimum response time ~ 0,1 sec.)

SET LRV: Fixes the current value to 4 mA (without changing the displayed value)

SET URV: Fixes the current value to 20 mA (without changing the displayed value)

SET ZERO EL: At the button pushing the transmitter performs the zero elevation, in manner to put to zero the actual measure. The elevation is applied to the whole span.

ZERO EL: allows to insert manually the ZERO ELEVATION value.

GAIN: manual gain adjustment



LOOP TEST: Simulates the current output at a selectable fixed value

CAL 4-20mA: Calibration of the Analog output 4-20mA

ADDRESS: setting of the HART polling address

INFO: scrolling of general transmitters' info (Polling, LSL, USL e Firmware Revision)

PASSWORD: setting of a protection password

OFFSET: Allows Zero Re-setting

RESTORE: Factory settings restore

PHYSICAL SPECIFICATIONS

Housing:

- Die cast aluminum alloy EN AB-44100 finished with epoxy resin (RAL 7024). It is dust and sand tight and protected against sea wave effects as defined by IEC IP66. Suitable for tropical climate operation as defined by DIN 50015.
- SS AISI 316 defined by IEC IP67.

Covers O-ring: EPDM.

Helium Test: All pressure retaining welds are 100% Helium tested in house in accordance with ASME V, Article 10, Mandatory Appendix V "Helium Mass Spectrometer Test".

Nameplate: Stainless Steel, firmly fixed or engraved on housing.

Calibration:

- **Standard:** 10 points calibration

Electrical connections: two cable entries on electronic housing: M20 x 1.5 and cable gland PG 13.5 for 7 to 12 mm diameter cable as a standard.

Terminal board: 2 terminals for signal wiring up to 1.5 mm² (14 AWG). Connection for ground and cable shield.

Mounting position: any position.

Net weight: 11 kg approx. with process connection 4" Class 150 RF flange.

PROCESS WETTED PARTS

Different combinations between process connection and wetted parts can be achieved, to reach the best compliance with the process application:

- **Sensor:** ceramic.
- **Process connection** in AISI 316 / 316L.

OPTIONS

- Washing system with annular chamber;
- Bracket for local sunshade mounting;
- Housing with radial or back mounting: AISI 316 (IP67);
- Others on request

EXTRA CERTIFICATES

- Material Test Certificates as per UNI EN 10204, 3.1;
- Material Test Certificates as per UNI EN 10204, 3.2 by ISO 17025 Third Party Laboratory;
- Wetted parts in compliance with NACE MR0175 / ISO 15156 and MR0103 / ISO 17945;
- Wetted parts testes with ASTM A262 Pr. E or ASTM G28 (Intergranular Corrosion Test);
- Special materials (Nickel based alloys and SDSS) tested with ASTM G48 (Pitting);
- HIC Test as per NACE TM0284;
- SSC Test as per NACE TM0177;
- PMI Standard;
- PMI with Carbon content examination (For SS AISI 316 / 316L only);
- Hydrostatic test as per 2014/68/EU Directive;
- Hydrostatic test as per ASME Standard.

APPROVALS

Directive 2014/34/EU (ATEX)

 II 1G Ex ia IIC T6, T5 Ga

 II 1/2G Ex ia IIC T6, T5 Ga/Gb

Power supply parameters:

If $T_a < 60^\circ\text{C}$

$U_i = 30\text{V}$, $I_i = 100\text{mA}$; $P_i = 0.75\text{W}$; $C_i = 10\text{nF}$; $L_i \approx 0,2\text{ mH}$

If $60 \leq T_a < 75^\circ\text{C}$

$U_i = 25,2\text{V}$, $I_i = 100\text{mA}$; $P_i = 0.62\text{W}$; $C_i = 10\text{nF}$; $L_i \approx 0,2\text{ mH}$

The transmitter must be supplied with associated apparatus certified according to EN 60079-0 and EN 60679-11 with the electrical characteristics described

Directive 2014/68/EU (PED)

Up to Category II, for fluids in Group 1

Directive 2014/30/EU (EMC)

Adequate level of electromagnetic compatibility

Directive EN 50581 (RoHS)

In compliance

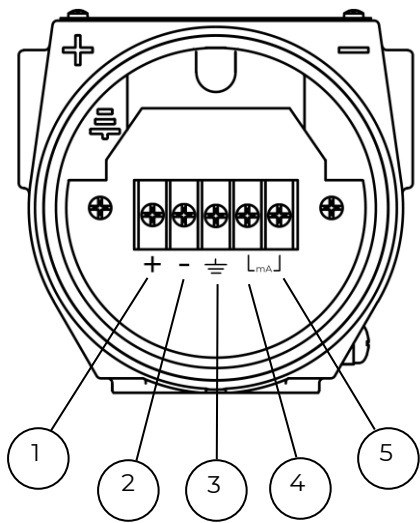
Functional Safety (IEC 61508:2010)

λ_{DD}	λ_{DU}	λ_S	λ_{TOT}	SFF
1,7053E-07	5,2470E-08	3,1482E-07	5,3782E-07	94,83%

- Level SIL 2 capable for single transmitter use
- Level SIL 3 capable for dual transmitter use.



TERMINAL CONFIGURATION

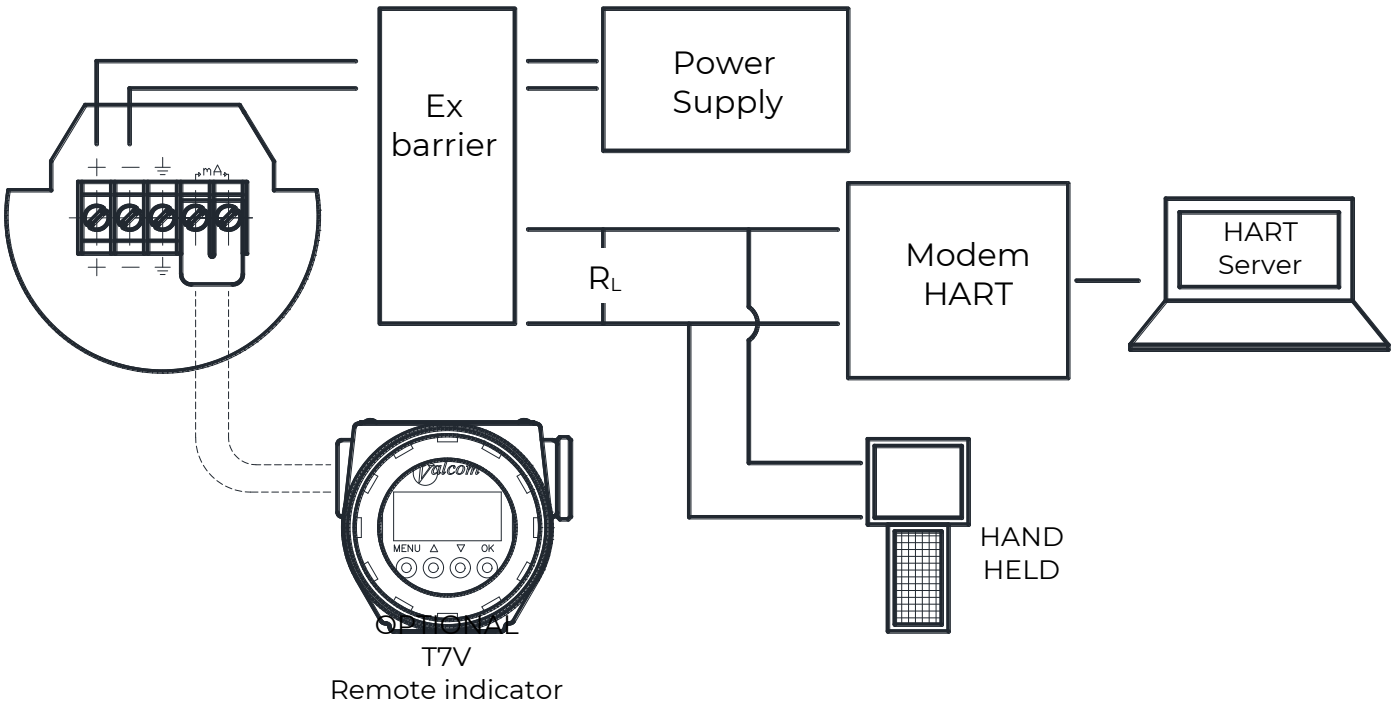


TERMINAL WIRING

	TERMINALS	SCOPE
SUPPLY & OUTPUT	1 (+) 2 (-)	Power supply and 4-20mA + HART Output Signal
GROUNDING	3	Ground Terminal
OPTIONAL REMOTE INDICATOR	4 5	Remote Indicator Loop Connection (no polarity)

- When Remote Indicator is not connected to the instrument, Terminals 4 and 5 **must be short-circuited** (default configuration)
- When connecting Remote Indicator or check meter to Terminals 4 and 5, the internal resistance must be 10 Ω or less.

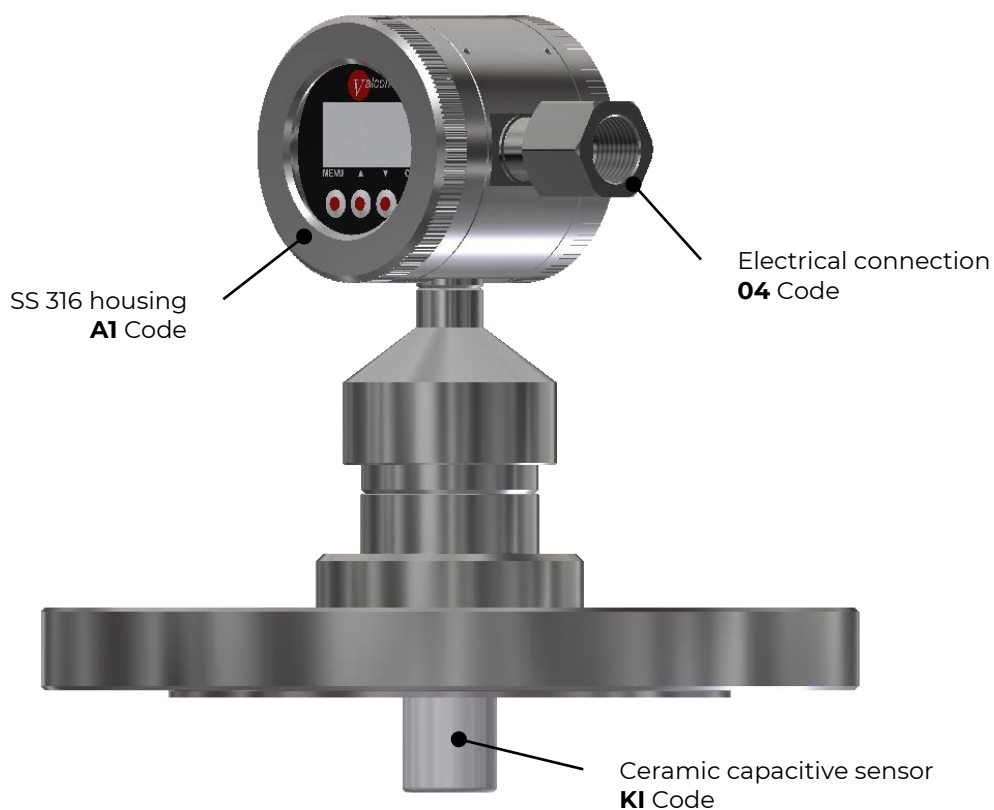
WIRING EXAMPLE



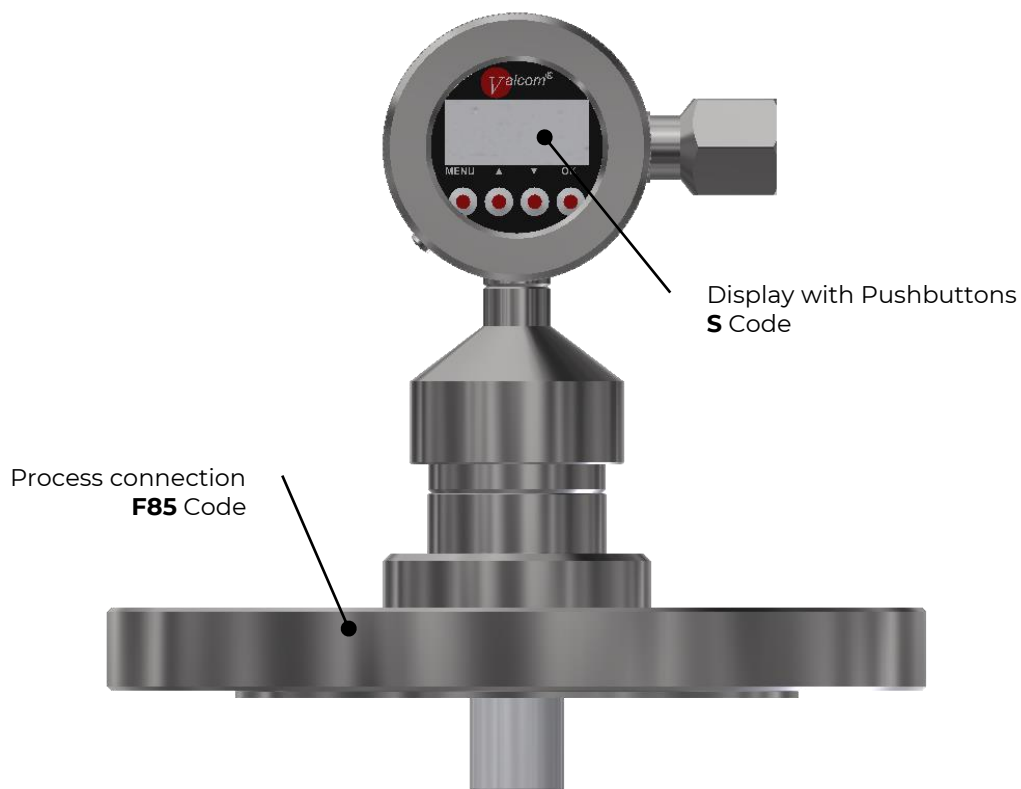


DIMENSIONAL DRAWINGS

Assonometric view



Front view





CODIFICATION

01 SERIES

T7W	Transmitter for rate measuring of water in oil smart
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02 TYPE OF MEASURE

I	Percentage of water in oil
O	Percentage of oil in water

03 SENSOR TYPE

KI	Capacitive integral
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04 NACE MR0175

Y	Yes
N	No

05 WETTED PARTS MATERIAL

AS	SS AISI 316L
KS	Hastelloy C
AN	SS AISI 316L (NACE MR0175)
KN	Hastelloy C (NACE MR0175)
ZZ	Special

06 SENSOR MATERIAL

ES	Ceramic
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07 PROCESS GASKET MATERIAL

F	FEP O SEAL
G	PTFE

08 MEASURING RANGE

E1	0 ÷ 100%
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09 PROCESS TEMPERATURE LIMITS

B	Standard -40 ÷ 85°C
Z	Special

10 FILLING OIL

N	No filling
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11 PROCESS CONNECTION

	TYPE	DN	PRESSURE CLASS	FACE / TYPE
F75	Flanged	2"	150	Raised Face
F79	Flanged	3"	150	Raised Face
F83	Flanged	3"	300	Raised Face
F85	Flanged	4"	150	Raised Face
F87	Flanged	4"	300	Raised Face
F88	Flanged	4"	600	Ring Joint
F89	Flanged	6"	150	Raised Face
F98	Flanged	2" 1/16	15000	Ring Joint
S81	Screwed	2"	-	G-M
ZZZ	Special			

12 PAINTING

V	RAL 7024
9	Special



13 ELECTRICAL OUTPUT

R	4 ÷ 20 mA + HART With blind cover
S	4 ÷ 20 mA + HART With LCD and transparent cover
F	Foundation Fieldbus With blind cover
G	Foundation Fieldbus With LCD and transparent cover
9	Special

14 PIPE MOUNTING BRACKET

N	No bracket
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15 ELECTRICAL CONNECTION + CABLE GLAND

01	2 x Screwed 1/2" NPT-F
02	2 x Screwed M20 x 1,5
03	1 x Screwed 1/2" NPT-F
04	1 x Screwed M20 x 1,5
05	1 x Nipple AISI 316 SS PG16-F
06	1 x Nipple AISI 316 SS 1/2" G-F
07	1 x Nipple AISI 316 SS 1/2" NPT-F
08	1 x Nipple AISI 316 SS 3/4" G-F
09	1 x Nipple AISI 316 SS M20 x 1,5 F
10	1 x Nipple AISI 316 SS M24 x 1,5 F
11	1 x Nipple AISI 316 SS M3/4" G-F
12	1 x Nipple AISI 316 SS M3/4" NPT-F
13	2 x Nipple AISI 316 SS PG16-F
14	2 x Nipple AISI 316 SS 1/2" G-F
15	2 x Nipple AISI 316 SS 1/2" NPT-F
16	2 x Nipple AISI 316 SS 3/4" G-F
17	2 x Nipple AISI 316 SS M20 x 1,5 F
18	2 x Nipple AISI 316 SS M24 x 1,5 F
19	2 x Nipple AISI 316 SS M3/4" G-F
20	2 x Nipple AISI 316 SS M3/4" NPT-F
21	1 x AISI 316 SS Gland PG9 IP67 for cable ø 5÷7 mm
22	1 x AISI 316 SS Gland PG13 IP67 for cable ø 8÷12 mm
23	2 x AISI 316 SS Gland PG9 IP67 for cable ø 5÷7 mm
24	2 x AISI 316 SS Gland PG13 IP67 for cable ø 8÷12 mm
25	NICKEL BRASS Gland PG9 IP67 for cable ø 5÷7 mm
26	NICKEL BRASS Gland PG13 IP67 for cable ø 8÷12 mm

16 EX TYPE APPROVAL

C	ATEX II 1G Ex ia IIC T6, T5, T4 Ga
D	ATEX II 1/2G Ex ia IIC T6, T5 Ga/Gb
N	None

17 HOUSING MATERIAL AND TYPE

A1	SS AISI 316
D4	Aluminum housing

18 OPTIONS AND ACCESSORIES

CODE	DESCRIPTION
30	Calibration report on 3 points
50	Calibration report on 5 points
90	Calibration report on 9 points
10	Test and material CERTIFICATE according to EN 10204 3.1
SI	SIL Certificate
20	Test and material CERTIFICATE according to EN 10204 3.2
PM	PMI Test
HI	HIC Test
SC	SSC Test
NN	No options

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HQ: Via Rosso Medardo, 16 - 20159 Milano IT

Factory: Via A. Gramsci, 1 - 26827 Terranova dei Passerini (LO) - IT

ph: +39 0377 911066

fax: +39 0377 919156

www.terranova-instruments.com

