

ECHOTEL® 961/962 LINE POWERED

Installation and Operating Manual

Ultrasonic

Single and

Dual Point

Level Switches



Model 961



Model 962



UNPACKING

Unpack the instrument carefully. Make sure all components have been removed from the foam protection. Inspect all components for damage. Report any concealed damage to the carrier within 24 hours. Check the contents of the carton/crates against the packing slip and report any discrepancies to Magnetrol. Check the nameplate model number to be sure it agrees with the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.



These units are in compliance with:

1. The EMC directive 2014/30/EU. The units have been tested to EN 61326: 1997 + A1 + A2.
2. Directive 2014/34/EU for equipment or protective system intended for use in potentially explosive atmospheres. EC-type examination certificate number FM19ATEX0204X - flameproof enclosure.
3. RoHS directive 2011/65/EU (restriction of the use of certain hazardous substances in electrical and electronic equipment).

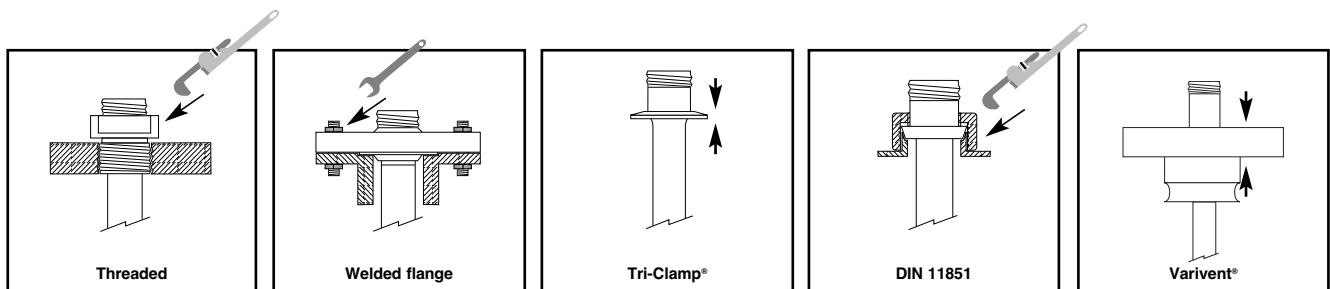
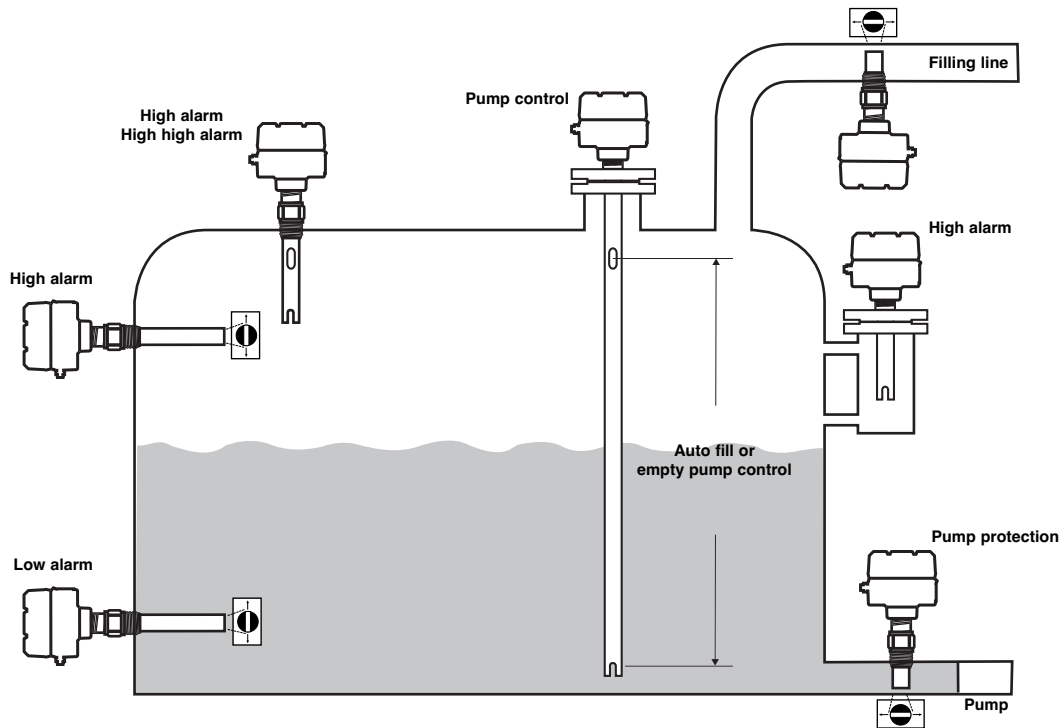
Nameplate:
- part number
- serial n°



SPECIAL CONDITIONS FOR ATEX USE

1. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
2. To maintain the T6 temperature code care shall be taken to ensure the "Enclosure Temperature" does not exceed 70 °C.
3. The risk of electrostatic discharge shall be minimized at installation, clean non-conductive surfaces with moist cloth only.
4. Contact the original manufacturer for information in the dimensions of flameproof joints.
5. For installation with ambient temperature of 70 °C, refer to the manufacturer's instructions for guidance on proper selection of conductors.
6. The ultrasonic probe is only for use with the Echotel ultrasonic switch.

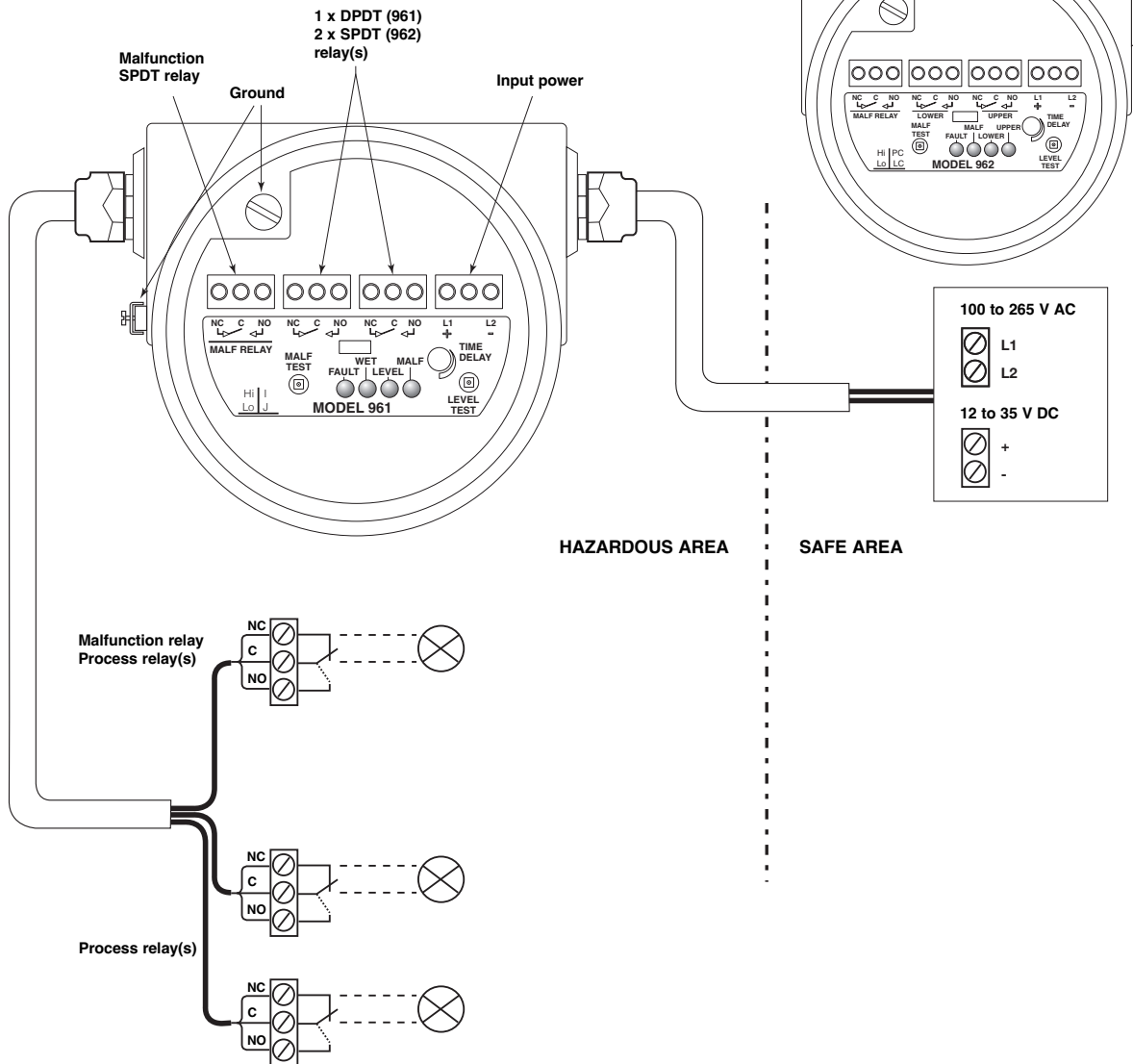
MOUNTING



WIRING

Echotel® 961 electronics

Echotel® 962 electronics

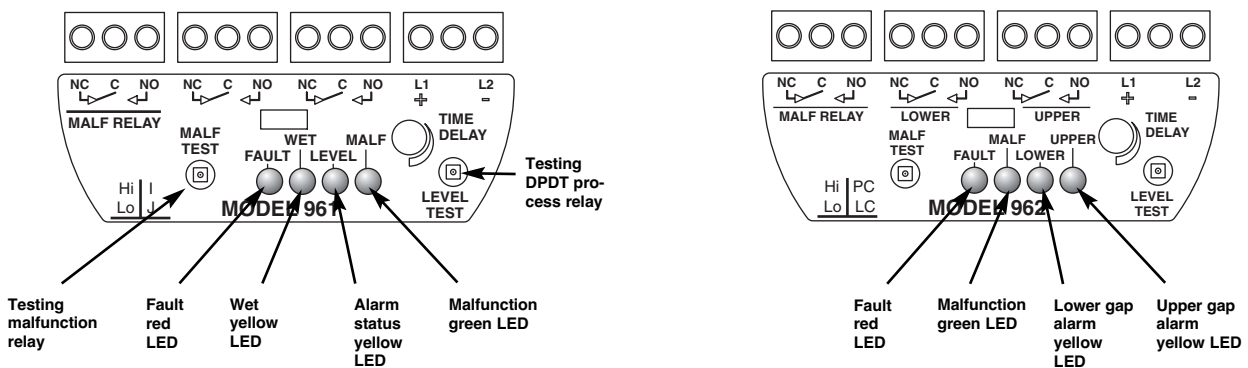


Important: Connect the unit to the ground for avoiding earth potential drifts. Use the green internal grounding screw

USER INTERFACE

Echotel® 961

Echotel® 962



**Note: in normal operation «Fault» is OFF / «MALF» is ON
in malfunction condition: «Fault» is ON / «MALF» is OFF**

SET UP AND FUNCTIONS

Set up

High – Low Level Failsafe selection:

In «Hi» position, the process relay will de-energize (report alarm) when the transducer is **wet**.

In «Lo» position, the process relay will de-energize (report alarm) when the transducer is **dry**.

Fault selection:

The echotel 961 is equipped with a malfunction relay separate from the 5A DPDT process relay. The separate or joined operation of both relays can be selected :

I = in case of a malfunction, only the malfunction relay will de-energize. The process relay will only de-energize in case of a process alarm

J = in case of a malfunction, both the malfunction relay and the process relay will de-energize

The Echotel 962 is equipped with a malfunction relay separate from the two 5A SPDT process relays. In case of a malfunction, both the malfunction relay and the process relays will de-energize. The operation of the two process relays can be selected:

LC (level control) = the two relays operate independent and will be de-energized when the corresponding transducer gap is immersed/dry (following Hi/Lo setting)

PC (pump control) = the two relays operate in a latched mode, allowing to perform an automatic fill or drain pump control function in between the 2 transducer gaps. Consult below tables for proper indication and function.

Time delay setting:

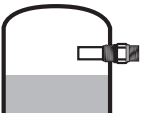
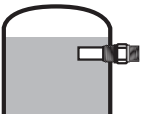
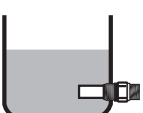

Turning the potentiometer clockwise will increase the time delay from 0,5 s to 10 s. Time delay is typically used where turbulence, boiling or splashing can cause false level alarms.

961 - Relay/ LED Indication:

When «WET» (wet LED): OFF = transducer gap is dry / ON = transducer gap is immersed

When «LEVEL» (level LED): ON = relay is energized / OFF = relay de-energized

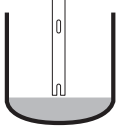
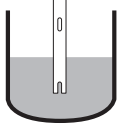
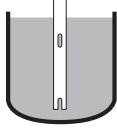
Echotel 961: Relay/LED indication

Mode	Level	Process relay	« LEVEL» LED (relay - yellow)	« WET» LED (gap - yellow)	Error LED indication	
					Fault (red)	Malfunction (green)
«Hi» High level failsafe		Energized	ON	OFF	OFF = Normal operation ON = Malfunction	ON = Normal operation OFF = Malfunction
		De-energized	OFF	ON		
«Lo» Low level failsafe		Energized	ON	ON	See troubleshooting for malfunction identification	See troubleshooting for malfunction identification
		De-energized	OFF	OFF		

SET UP AND FUNCTIONS

Echotel 962 as level control «LC»: Relay/LED indication

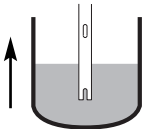
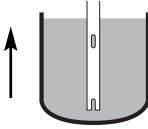
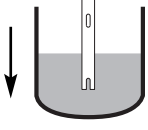
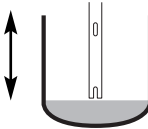
Relay # 1 = lower gap – Relay # 2 = upper gap

Level	Mode	Process relay	Lower LED	Upper LED	Error LED indication	
					Fault (red)	Malfunction (green)
	«Hi» High level failsafe	# 1 & 2: Energized	ON	ON	OFF = Normal operation ON = Malfunction See troubleshooting for malfunction identification	ON = Normal operation OFF = Malfunction See troubleshooting for malfunction identification
	«Lo» Low level failsafe	# 1 & 2: De-energized	OFF	OFF		
	«Hi» High level failsafe	# 1: De-energized # 2: Energized	OFF	ON		
	«Lo» Low level failsafe	# 1: Energized # 2: De-energized	ON	OFF		
	«Hi» High level failsafe	De-energized	OFF	OFF		
	«Lo» Low level failsafe	Energized	ON	ON		

Echotel 962 pump control «PC»: Relay/LED indication

High Level Failsafe (Hi) = auto empty mode

Low Level Failsafe (Lo) = auto fill mode

Level	Mode	Process relay	Lower LED	Upper LED	Error LED indication	
					Fault (red)	Malfunction (green)
	«Hi» High level failsafe	Energized	ON	ON	OFF = Normal operation ON = Malfunction See troubleshooting for malfunction identification	ON = Normal operation OFF = Malfunction See troubleshooting for malfunction identification
	«Lo» Low level failsafe	De-energized	OFF	OFF		
	«Hi» High level failsafe	De-energized	OFF	OFF		
	«Lo» Low level failsafe	Energized	ON	ON		
	«Hi» High level failsafe	De-energized	OFF	OFF		
	«Lo» Low level failsafe	Energized	ON	ON		
	«Hi» High level failsafe	Energized	ON	ON		
	«Lo» Low level failsafe	De-energized	OFF	OFF		

Manual Testing

Level Test: (process relay(s)):

Pressing the "Level Test" pushbutton, will manually test the process relays and connected actuators/indicators. The level test forces the relay(s) to change from a de-energized to an energized status and vice versa. The LED's will be ON/OFF corresponding (see tables in the configuration section). The time delay setting is not active during testing.

Malfunction Test (malfunction relay):

Pressing the "Malfunction Test" pushbutton for min 2 s, will manually test the malfunction relay and connected actuators/indicators. The malfunction test simulates a circuit failure and forces all relays to de-energize. The «MALF» LED will turn OFF and the «FAULT» LED ON. The time delay setting is not active during testing.

Troubleshooting

Problem	Action/Indication	Solution
No output signal	No LED's are ON	Check wiring / input power Check for malfunction (962). See below
No change in output between wet gap / dry gap	Gap may be plugged by solids / dense foam	Clean the transducer
	Gap is out of reach of liquid	Check mounting section and relocate the unit or check blocking valves.
Chattering output	Excessive aeration / Turbulence	Introduce a time delay
		Check input power
		Relocate the switch If installed horizontally, make sure the 961 transducer gap is oriented in a vertical position as shown in the mounting section. This allows proper drainage from the gap, and prevents air bubbles from accumulating in the gap.
Fault LED is ON	A system fault has been detected	Check input power Check wiring between transducer and electronics or replace transducer.
	Press «LEVEL TEST» test pushbutton to identify the problem:	
	* --- * : 1 flash	Check wiring between transducer and electronics or replace transducer.
	** --- ** : 2 flashes	Replace electronics
*** --- *** : 3 flashes	The unit senses excessive noise interference. Check shield connection or eliminate interference from a walkie-talkie, radio or other nearby source	

REPLACEMENT PARTS

Replacing electronics/transducer

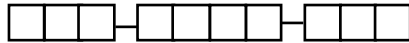
Echotel electronics can be removed in the field under process conditions. Follow below steps to exchange electronics/transducer:

Note: Adjust set up of the replacing electronics following the settings of the old electronics (see configuration section)

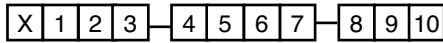
1. Disconnect power before removing the housing cover
2. Remove power/output wires (a)
3. (Skip step 3 if hygienic housing.) Click out the protection cap of the electronics (b)
4. Remove the 2 bracket screws and slide out electronics (c)
5. Remove the transducer wires (see Wiring section) (d)
6. Re-assemble following the same procedure in opposite way. Make sure that the tip on the bracket of the electronic block is seated properly in the corresponding recess in the housing base - (e)

Replacement parts

Partn°:



Digit in partn°:



↳ X = product with a specific customer requirement

Serial n°:



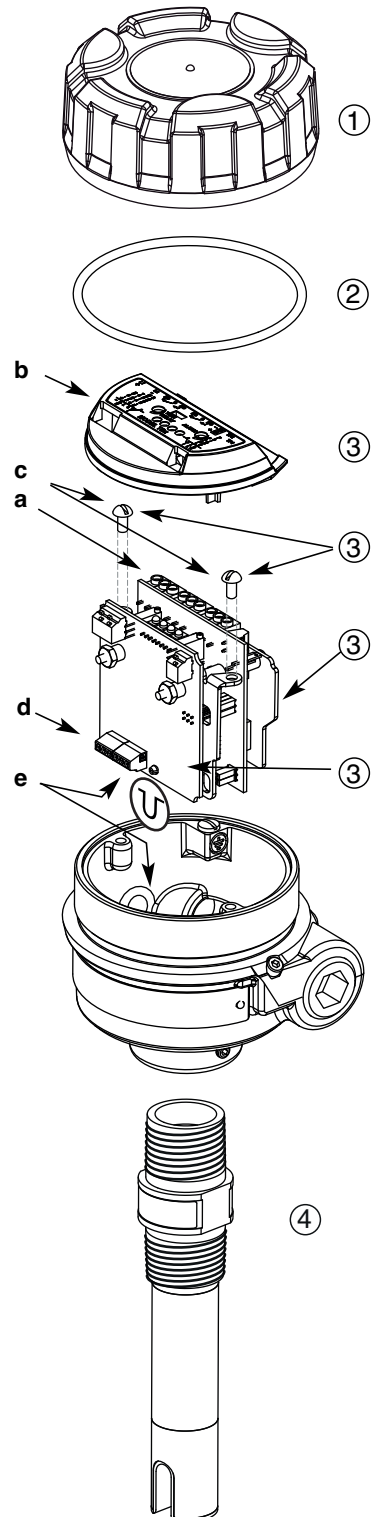
See nameplate, always provide complete partn° and serial n° when ordering spares.

EXPEDITE SHIP PLAN (ESP)

Several parts are available for quick shipment, within max. 1 week after factory receipt of purchase order, through the Expedite Ship Plan (ESP).

Parts covered by ESP service are conveniently grey coded in the selection tables.

No.	Description	Part Number
1	Cast aluminium cover (digit 10 = 0 or 1)	
	Blind	004-9192-009
	With window	036-4410-010
	Cast stainless steel cover (digit 10 = 2 or 3)	
Blind	004-9224-014	
	Deep drawn stainless steel cover (digit 10 = 4 or 5)	
Blind	032-3934-001	
	With window	036-5702-002
2	"O"-Ring	
	digit 10 = 0, 1, 2 or 3 digit 10 = 4 or 5	012-2201-237 012-2201-155
3	Electronic module for industrial housing (digit 10 = 0, 1, 2 or 3)	
	961 – AC power	089-7259-001
	961 – DC power	089-7259-002
	962 – AC power	089-7258-001
	962 – DC power	089-7258-002
	Electronic module for hygienic housing (digit 10 = 4 or 5)	
	961 – AC power	089-7256-001
	961 – DC power	089-7256-002
	962 – AC power	089-7257-001
	962 – DC power	089-7257-002
4	Transducer	consult factory



MODEL IDENTIFICATION

A complete measuring system consists of:

1. Echotel® electronics
2. Echotel® transducer

1. Code for Echotel® electronics

1 2 3 | BASIC MODEL NUMBER

9 6 1	Echotel 961 electronics for single setpoint 9M1 transducers
9 6 2	Echotel 962 electronics for dual setpoint 9M2 transducers

4 5 6 | INPUT POWER

2 D A	12 - 35 V DC line powered electronics with 5 A gold flash relay(s) output
7 D A	100 - 265 V AC line powered electronics with 5 A gold flash relay(s) output

7 | ACCESSORIES

0	Blind housing cover
1	Housing cover with glass window (not for cast stainless steel housings)

8 | MOUNTING

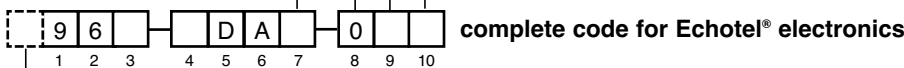
0	Integral mount electronics
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9 | APPROVALS

C	ATEX II 1/2 G / IEC Ex db IIC T6 Ga/Gb, flameproof enclosure - except deep drawn SST housing
3	Weatherproof - except deep drawn SST housing
7	Weatherproof - deep drawn SST housing

10 | HOUSING / CABLE ENTRY

1	Cast aluminium housing with M20 x 1,5 cable entry (2 entries – one plugged)
0	Cast aluminium housing with 3/4" NPT cable entry (2 entries – one plugged)
3	Cast stainless steel with M20 x 1,5 cable entry (2 entries – one plugged)
2	Cast stainless steel with 3/4" NPT cable entry (2 entries – one plugged)
5	Deep drawn 304 stainless steel with M20 x 1,5 cable entry (2 entries – one plugged)
4	Deep drawn 304 stainless steel with 1/2" NPT cable entry (1 entry)



X = product with a specific customer requirement

2. Code for Echotel® transducer

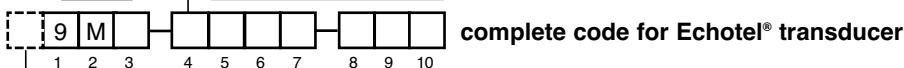
1 2 3 | BASIC MODEL NUMBER

9 M 1	Echotel® 961 transducer with single setpoint
9 M 2	Echotel® 962 transducer with dual setpoints

4 | TRANSDUCER MATERIALS (use only metal transducers for hazardous area)

A	316/316L (1.4401/1.4404) stainless steel
B	Hastelloy® C (2.4819) – only available with 9M1
C	Monel® (2.4360) – only available with 9M1
N	316/316L (1.4401/1.4404) stainless steel & NACE MR0175/MR0103
P	CPVC
R	Kynar® (PVDF) – only available with 9M1
S	316/316L (1.4401/1.4404) stainless steel with 0,5 µm Ra (20 Ra) surface finish

SEE NEXT PAGE



X = product with a specific customer requirement

MODEL IDENTIFICATION

2. Code for Echotel® transducer

SEE PREVIOUS PAGE

5 6 | PROCESS CONNECTION

Threaded (plastic transducers are only available with 3/4" NPT connection)

1 1	3/4" NPT
2 1	1" NPT

1 2	3/4" BSP (G 3/4")
2 2	1" BSP (G 1")

ASME Flanges for metal transducers

2 3	1"	150 lbs	ASME RF
2 4	1"	300 lbs	ASME RF
2 5	1"	600 lbs	ASME RF
3 3	1 1/2"	150 lbs	ASME RF
3 4	1 1/2"	300 lbs	ASME RF
3 5	1 1/2"	600 lbs	ASME RF
4 3	2"	150 lbs	ASME RF
4 4	2"	300 lbs	ASME RF
4 5	2"	600 lbs	ASME RF
5 3	3"	150 lbs	ASME RF
5 4	3"	300 lbs	ASME RF
5 5	3"	600 lbs	ASME RF
6 3	4"	150 lbs	ASME RF
6 4	4"	300 lbs	ASME RF
6 5	4"	600 lbs	ASME RF

EN Flanges for metal transducers

B B	DN 25	PN 16/25/40	EN 1092-1 Type A
B C	DN 25	PN 63/100	EN 1092-1 Type B2
C B	DN 40	PN 16/25/40	EN 1092-1 Type A
C C	DN 40	PN 63/100	EN 1092-1 Type B2
D A	DN 50	PN 16	EN 1092-1 Type A
D B	DN 50	PN 25/40	EN 1092-1 Type A
D D	DN 50	PN 63	EN 1092-1 Type B2
D E	DN 50	PN 100	EN 1092-1 Type B2
E A	DN 80	PN 16	EN 1092-1 Type A
E B	DN 80	PN 25/40	EN 1092-1 Type A
E D	DN 80	PN 63	EN 1092-1 Type B2
E E	DN 80	PN 100	EN 1092-1 Type B2
F A	DN 100	PN 16	EN 1092-1 Type A
F B	DN 100	PN 25/40	EN 1092-1 Type A
F D	DN 100	PN 63	EN 1092-1 Type B2
F E	DN 100	PN 100	EN 1092-1 Type B2

ASME Flanges for plastic transducers^①

2 3	1"	150 lbs	ASME RF ^②
3 3	1 1/2"	150 lbs	ASME RF ^②
4 3	2"	150 lbs	ASME RF ^②

EN Flanges for plastic transducers^①

B A	DN 25	PN 16	EN 1092-1 Type A
C A	DN 40	PN 16	EN 1092-1 Type A
D A	DN 50	PN 16	EN 1092-1 Type A

- ① CPVC flanges for CPVC transducers, Kynar® clad SST flanges for Kynar® transducers
 ② FF (flat face) flanges for CPVC transducers

Hygienic

3 T	1 1/2" Tri-clamp®
4 T	2" Tri-clamp®
V V	DN 65 Varivent® type N

B S	DN 25	DIN 11851
C S	DN 40	DIN 11851
D S	DN 50	DIN 11851

7 | SENSOR TYPE

A	Standard sensor: min -40 °C / max +165 °C (-40 °F / +325 °F)
C	Low temperature sensor: min -80 °C / max +120 °C (-110 °F / +250 °F) – only available with 9M1-A

8 9 10 | ACTUATION LENGTH – specify per cm (0.39") increment
 Total insertion length = actuation length + 6 mm (0.25")

9M1 transducers

0 0 3	Minimum 3 cm (1.2") – for metal transducers with NPT connections only
0 0 5	Minimum 5 cm (2") – for all other connections
3 0 4	Maximum 304 cm (120") – for Kynar® (PVDF) material
3 3 0	Maximum 330 cm (130") – for all other materials

9M2 transducers "A" length

specify "B" length separately (see drawing and note shown in the dimensions section)

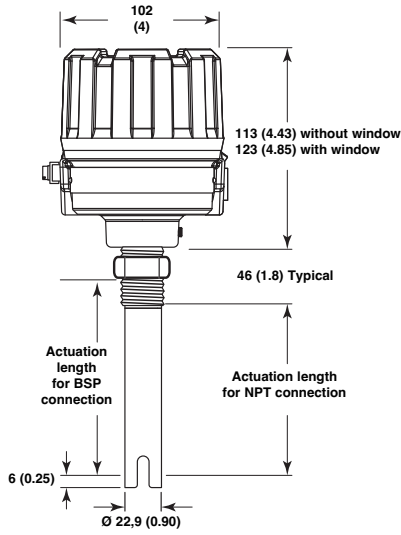
0 1 3	Minimum 13 cm (5.1") – for metal transducers with NPT connections only
0 1 5	Minimum 15 cm (5.9") – for all other connections
3 3 0	Maximum 330 cm (130")



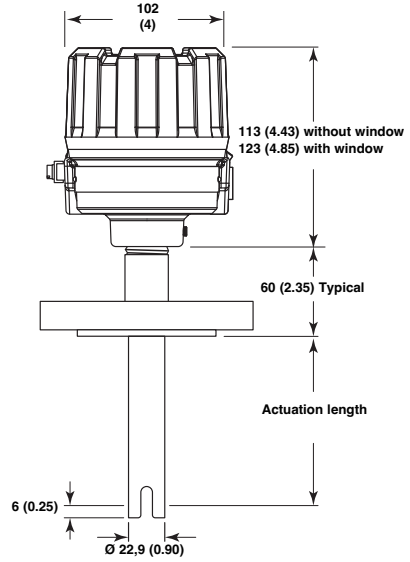
complete code for Echotel® transducer

X = product with a specific customer requirement

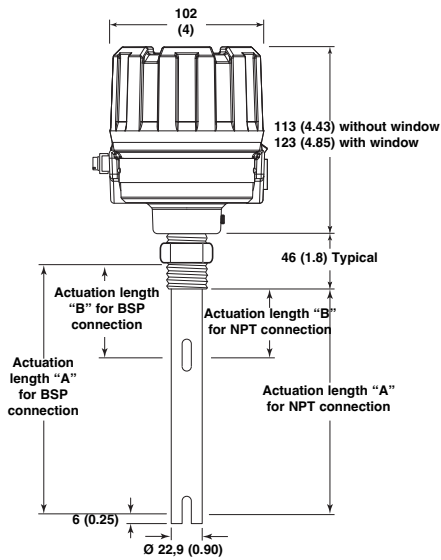
DIMENSIONS IN mm (inches)



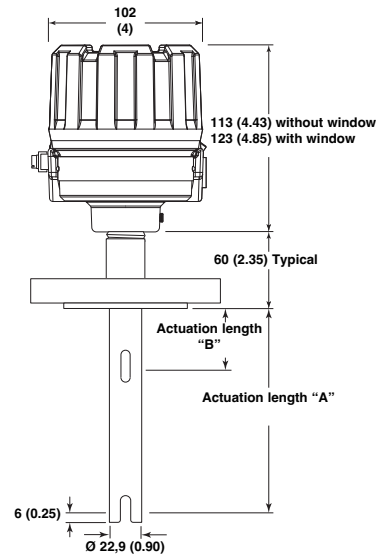
961 - Threaded connection



961 - Flanged connection

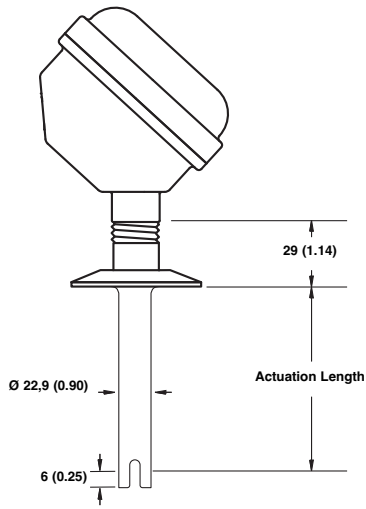
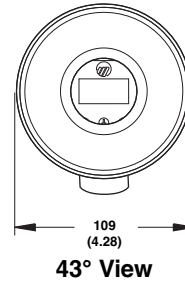
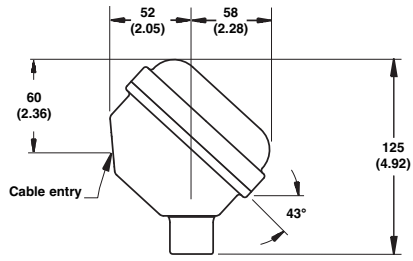


962 - Threaded connection

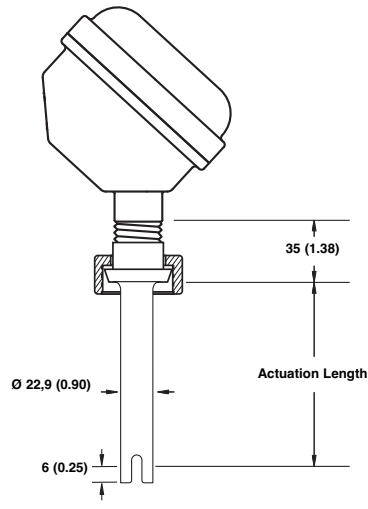


962 - Flanged connection

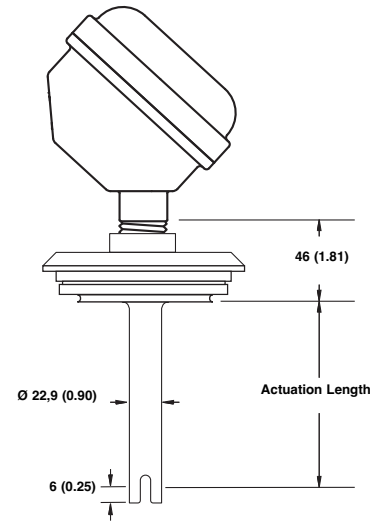
Note: - Difference between actuation lengths "A" and "B" must be min. 8 cm.
 - Max. length for dimension "B" is 322 cm.



Tri-Clamp®



DIN 11851



Varivent®

SPECIFICATIONS

Electronics specifications

Description		Specification
Input Voltage		100 - 265 V AC 50/60 Hz or 12 - 35 V DC
Power Consumption		< 3 Watt
Output		961 : one 5 A DPDT relay, 962 : two 5 A SPDT relays 961/962 : one 5 A SPDT malfunction relay
Time delay		0,5 to 10 s adjustable (in addition to transducer response time)
Indication		LED's for process alarm status, malfunction (error of transducer, electronics or electrical noise interference) and wet/dry status of transducer (961 only)
Selftest	Automatic	Continuously verifies electronics, transducer and noise interference
	Manual	Via pushbutton for checking alarm output(s) and error output/function.
Housing material		IP66, cast aluminium, cast stainless steel or deep drawn 304 stainless steel (IP 67)
Approvals ^①		ATEX II 1/2 G Ex db IIC T6 Ga/Gb flameproof enclosure IEC Ex db IIC T6 Ga/Gb Overfill prevention TÜV - WHG § 63 / VLAREM II 5.17.7 Other approvals are available, consult factory for more details
SIL (Safety Integrity Level)		Functional safety to SIL 2 in accordance to IEC 61508 – SFF > 90 %. Full FMEDA report and declaration sheets available at request.
Shock/Vibration		ANSI/ISA-S71.03 Class SA1 (shock), ANSI/ISA-S71.03 Class VC2 (vibration)
Net weight		Aluminium / Deep drawn 304 SST: 1 kg (2.2 lbs) – electronics only Cast SST: 2,5 kg (5.5 lbs) – electronics only

^① Only available with cast aluminium or cast stainless steel housings.

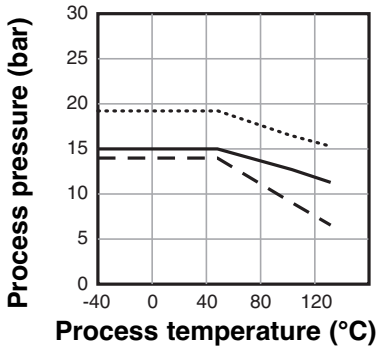
Performance

Description	Specification
Response time	0,5 s typical
Repeatability	± 2 mm (0.078")
Ambient Temperature	-40 °C to +70 °C (-40 °F to +160 °F)
Humidity	0-99 %, non-condensing
Electromagnetic Compatibility	Meets CE requirements (EN 61326: 1997 + A1 + A2) and NAMUR NE 21

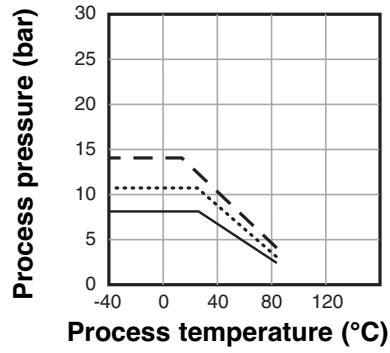
Transducer specification

Description	Plastic transducers	Metal transducers
Material	CPVC Kynar® (PVDF)	316/316L SST (1.4401/1.4404) Hastelloy® C (2.4819) Monel® (2.4360)
Mounting	Threaded (NPT/BSP) – Flanged (ASME - EN) – Hygienic	
Actuation length	From 5 cm up to 304 cm (2" up to 120") – PVDF From 5 cm up to 330 cm (2" up to 130") – CPVC	From 3 cm up to 330 cm (1.2" up to 130")
Process temp. (consult temp/press. graphs)	-40 °C to +120 °C (-40 °F to +250 °F) – PVDF -40 °C to +80 °C (-40 °F to +180 °F) – CPVC	-40 °C to +165 °C (-40 °F to +325 °F) – standard -80 °C to +120 °C (-110 °F to +250 °F) – low temperature version in 316/316L SST
Max pressure (consult temp/press. graphs)	13,8 bar @ +40 °C (200 psi @ +100 °F) for NPT threaded units	82,8 bar (1200 psi) for Monel transducers Consult temp/press. graphs for other materials
	Flanged models are downrated to the design pressure of the selected flange	

Kynar® Transducer Ratings

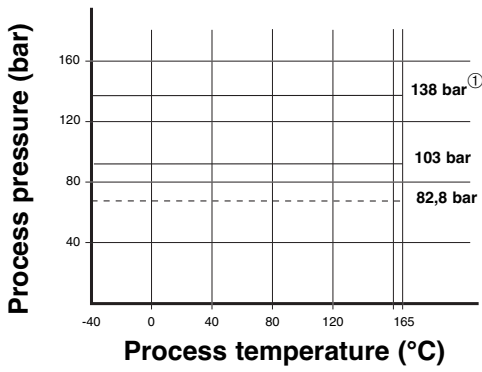


CPVC Transducer Ratings



- Range with 3/4" NPT
- Range with 150# flange
- Range with PN16 flange

Metal Transducer Ratings



- 316/316L (1.4401/1.4404)^②
- Hastelloy® C (2.4819)
- Monel® (2.4360)

① Only applicable to NPT-connections with actuation length = 3 cm and BSP/ASME/EN-connections with actuation length = 5 cm
 ② For low temperature sensor: from -80 °C up to +120 °C

IMPORTANT

SERVICE POLICY

Owners of Magnetrol products may request the return of a control; or, any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Magnetrol International will repair or replace the control, at no cost to the purchaser, (or owner) **other than transportation cost** if:

- a. Returned within the warranty period; and,
- b. The factory inspection finds the cause of the malfunction to be defective material or workmanship.

If the trouble is the result of conditions beyond our control; or, is **NOT** covered by the warranty, there will be charges for labour and the parts required to rebuild or replace the equipment.

In some cases, it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned, will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labour, direct or consequential damage will be allowed.

RETURNED MATERIAL PROCEDURE

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorisation" (RMA) form will be obtained from the factory. It is mandatory that this form will be attached to each material returned. This form is available through Magnetrol's local representative or by contacting the factory. Please supply the following information:

1. Purchaser Name
2. Description of Material
3. Serial Number and Ref Number
4. Desired Action
5. Reason for Return
6. Process details

Any unit that was used in a process must be properly cleaned in accordance with the proper health and safety standards applicable by the owner, before it is returned to the factory.

A material Safety Data Sheet (MSDS) must be attached at the outside of the transport crate or box.

All shipments returned to the factory must be by prepaid transportation. Magnetrol **will not accept** collect shipments.

All replacements will be shipped Ex Works.

UNDER RESERVE OF MODIFICATIONS

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European Headquarters & Manufacturing Facility

Heikensstraat 6
9240 Zele, Belgium
Tel: +32-(0)52-45.11.11
e-mail: info@magnetrol.be

www.magnetrol.com



MAGNETROL®

AMETEK®
SENSORS, TEST & CALIBRATION