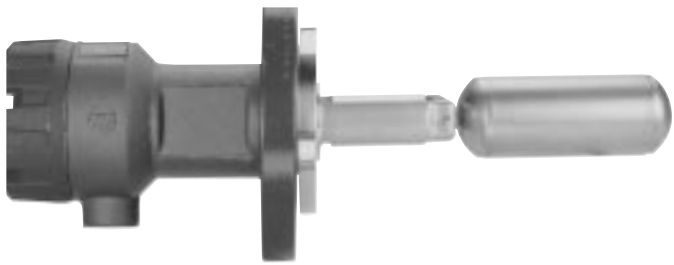


Tuffy® T3 Liquid Level Controls with Electric Switches

Installation and Operating Manual

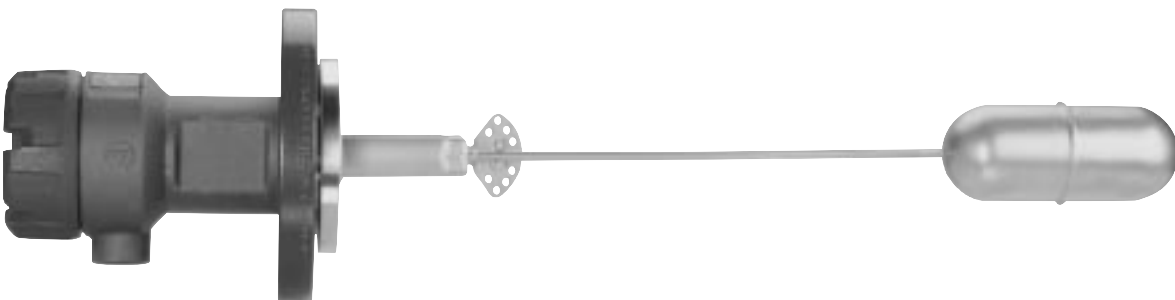
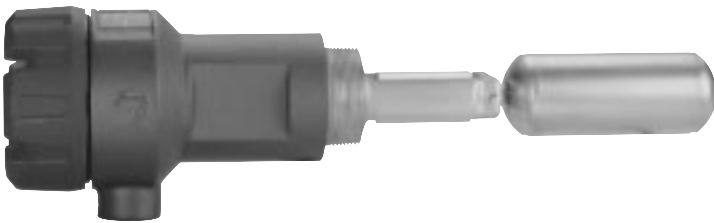


Side

Mounted

Float Level

Switch

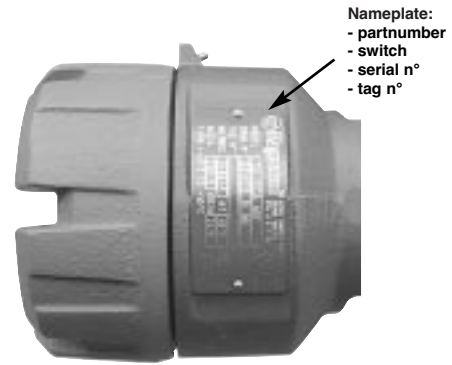


UNPACKING

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 (Model number/approvals as per inserted separate sheet) to be sure it agrees with the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.

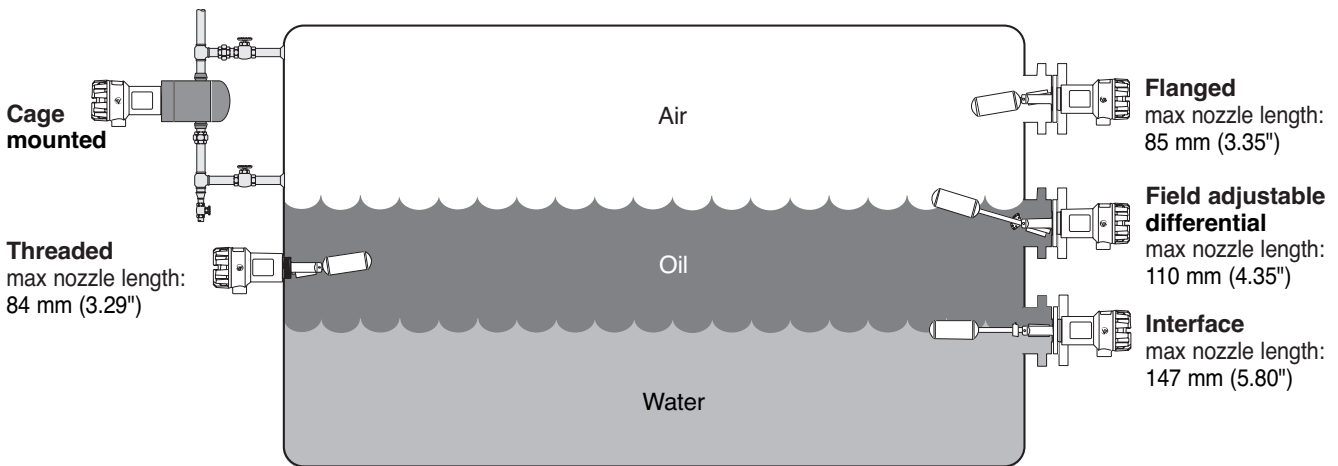
For flanged units

Cut and remove the plastic shipping straps on flanged units.



These units have been tested and are in compliance with the Directive 94/9/EC for equipment or protective system for use in potentially explosive atmospheres (EEx d/EEx i units)

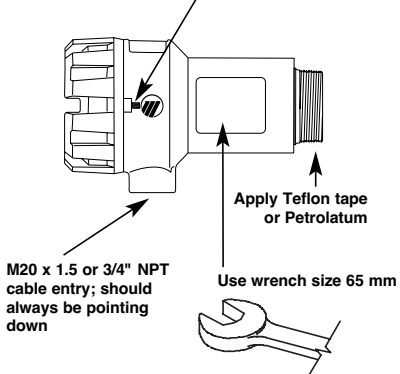
MOUNTING



Note: min nozzle size is 3" SCH 80 (max nozzle lengths are specified as per this size)

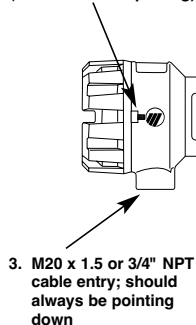
2" NPT Tuffly

Locking screw, loosen before removing cover (refasten after replacing)

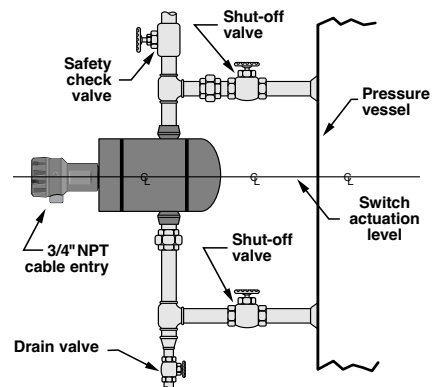


Flanged Tuffly

Locking screw, loosen before removing cover (refasten after replacing)

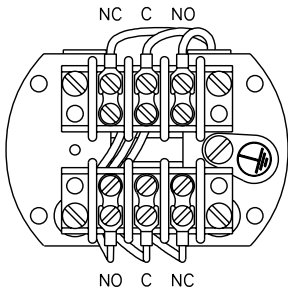


External cage mounted Tuffly

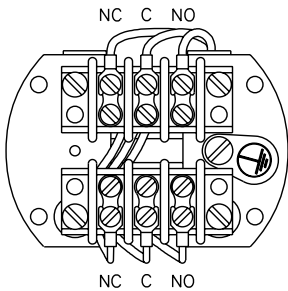


WIRING

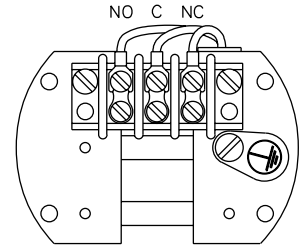
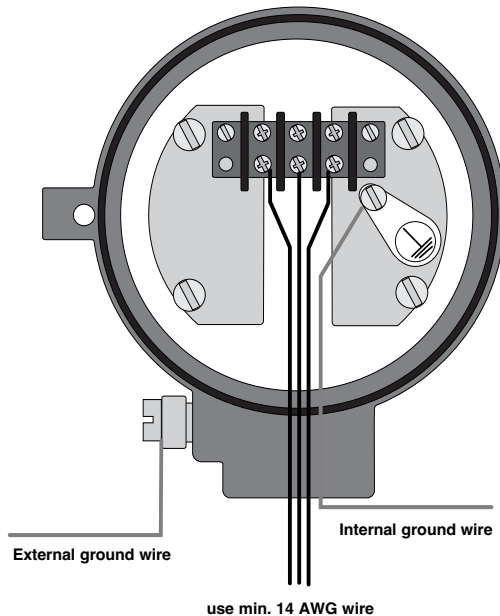
CAUTION: power must be switched OFF before wiring the unit.



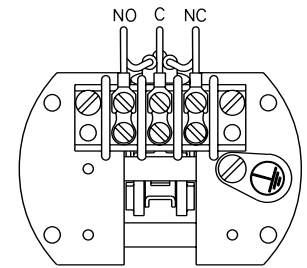
**Terminal connections
DPDT dry contact switch
with silver contacts**



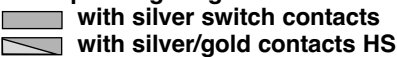
**Terminal connections
DPDT dry contact switch
with gold contacts**

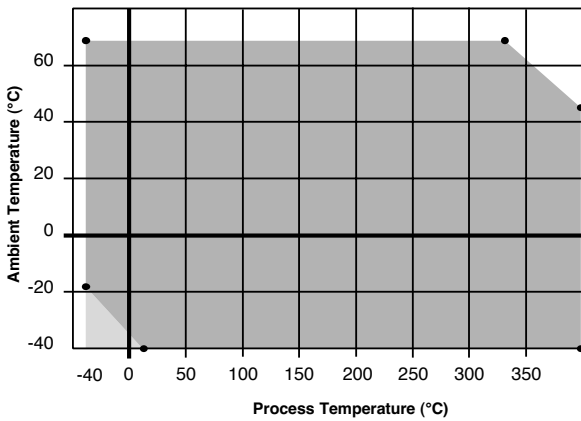


**Terminal connections
SPDT dry contact switch
with silver or gold contacts**

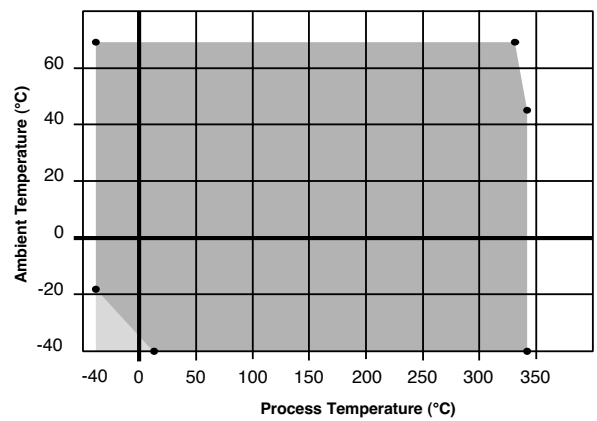


**Terminal connections
SPDT HS switch
with silver or gold contacts**

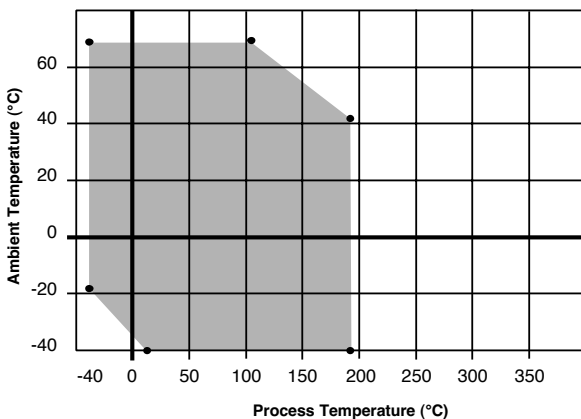
**Allowable operating range
Cast iron housing**  with silver switch contacts
with silver/gold contacts HS



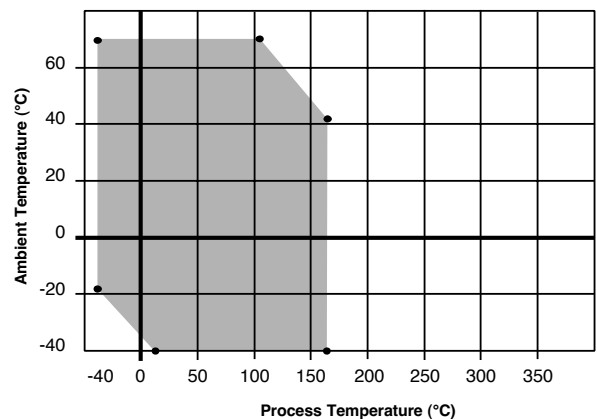
**Allowable operating range
Aluminium housing**  with silver switch contacts
with silver/gold contacts HS



**Allowable operating range
Cast iron housing with gold switch contacts**



**Allowable operating range
Aluminium housing with gold switch contacts**



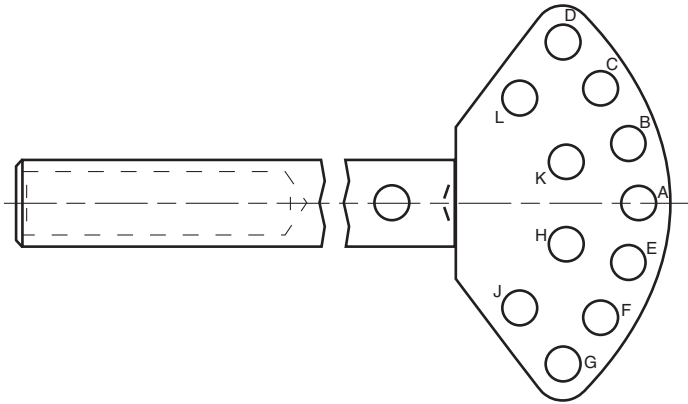
CALIBRATION

For T31-T35 / T3B / T3D and T3E units

Properly selected TUFFY units do not need any field calibration.

For T3C: field adjustable differential units

The Adjustable Differential Tuffy II, model T3C, may be set in the field for one of a variety of level differentials. By specific placement of the stops in the holes of the adjustment plate, the level differential may be changed.



To determine the differential

Example: T3C-C unit with stop holes **B** and **G**

1. Select the rising level of the upper stop:
example: upper stop = hole **B**: +85 mm
2. Select the falling level of the lower stop:
example: lower stop = hole **G**: -205 mm
3. Subtract levels:
rising level / upper stop - falling level / lower stop:
example: +85 mm - (-205 mm) = +290 mm

Example 2: T3C-8 unit: with stop holes **D** and **B**:
+183 mm - (+115 mm) = 68 mm

Partnumber	Level	Stop holes in mm (divide by 25,4 to obtain inches)										
		Upper stops					middle	Lower stops				
		B	C	D	K	L	A	E	F	G	H	J
T3C-4XXX-XXX	Rising	+47	+90	+124	+39	+104	+4	-37	n/a	n/a	-42	n/a
	Falling	+80	n/a	n/a	+84	n/a	+38	-10	-47	-82	+4	-62
T3C-8XXX-XXX	Rising	+63	+131	+183	+51	+153	-3	-67	n/a	n/a	-75	n/a
	Falling	+115	n/a	n/a	+122	n/a	+50	-25	-84	-136	-3	-106
T3C-CXXX-XXX	Rising	+85	+183	+259	+67	+215	-11	-105	n/a	n/a	-115	n/a
	Falling	+160	n/a	n/a	+170	n/a	66	-43	-128	-205	-11	-106

Impossible stop hole combinations due to the diameter of the stem (of the float):

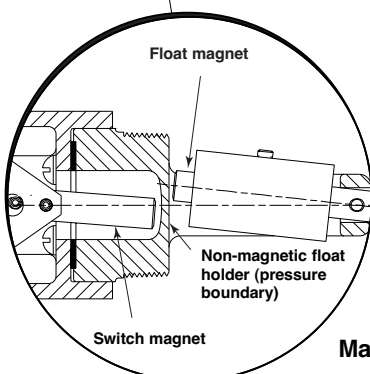
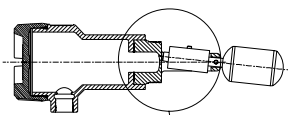
A and B **B and C** **C and D** **D and L** **E and F** **F and H** **J and G**
A and E **B and K** **C and K** **E and H** **F and J**
A and H **C and L** **F and G**
A and K

TROUBLESHOOTING

Symptom

Cause of malfunction / Action

Failure of the controlled equipment
eg. pump does not start,
signal lamps fail to operate etc...



Magnet/Switch action

Check external causes first:

- blown fuses
- tripped reset button
- open power switch.
- controlled equipment fails.
- defective wiring to level switch.

Check wiring as per wiring diagrams on page 3

Check actuating arm and magnet assembly

1. Remove switch mechanism
2. Check for wiring interference or binding of actuating arm. The switch and magnet must move throughout its entire range of motion without interference.
3. Replace the switch mechanism in case of binding.

Check float assembly

1. Remove the unit from service
2. Clean the mechanism if required
3. Tilt the float, when the unit is limited by its motion:
check differential setting (for T3C units only) – see above
4. Replace the unit in case cleaning and/or resetting did not solve the problem.

PREVENTIVE MAINTENANCE

Periodic inspections are a necessary means to keep your level control in good working order. This control is a safety device that protects the valuable equipment it serves. A systematic program of preventive maintenance should be implemented when the control is placed into service. If the following instructions are observed, your control will provide reliable protection of your equipment for many years.

What to do

1. Keep control clean.

Be sure the switch housing is always in place. This cover is designed to keep dust and dirt from interfering with the switch mechanism operation. In addition it protects against damaging moisture and acts as a safety feature by keeping bare wires and terminals from being exposed. Should the housing cover become damaged or misplaced, obtain a replacement immediately.

2. Inspect switch mechanisms, terminals and connections monthly.

Tuffy T3 level switches may sometimes be exposed to excessive heat or moisture. Under such conditions insulation on electrical wires may become brittle, eventually breaking or peeling away. The resulting bare wires can cause short circuits. Check wiring carefully and replace at first sign of brittle insulation.

Vibration may sometimes cause terminal screws to loosen. Check all terminal connections to ensure that screws are tight. Check wiring carefully and repair or replace if necessary.

Note: It is recommended that spare switches, housing covers and o-rings be kept on hand at all times.

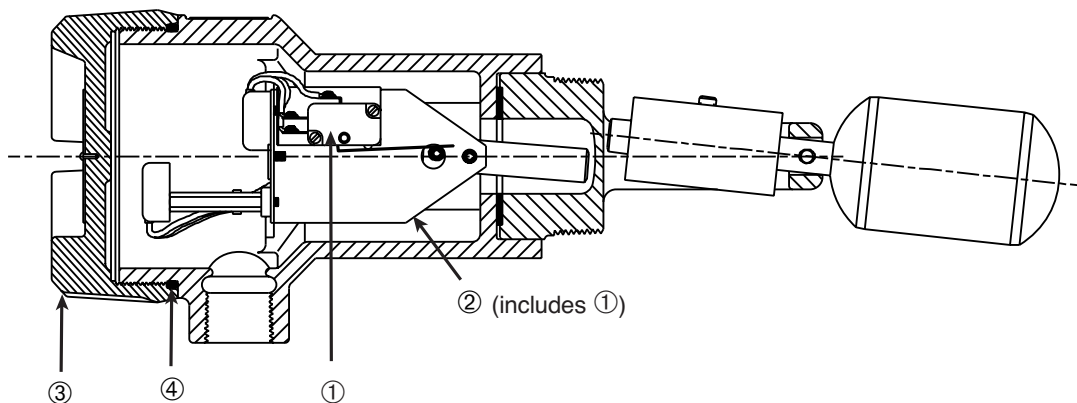
3. Inspect entire Tuffy T3 unit periodically.

A periodic cleaning of the float and counterweight assembly will ensure continued free movement of the mechanism.

What to avoid

1. NEVER leave the switch housing cover off of the control longer than is necessary to make routine inspections.
2. NEVER place a jumper wire across terminals to "cut-out" the control. If a jumper is necessary for test purposes, ensure that it is removed before placing the control into service.
3. NEVER attempt to make adjustments to or replace switches without reading instructions carefully. When in doubt, consult the factory or your local representative.
4. NEVER use in systems containing iron particles. The magnet in the float assembly can attract the particles and become jammed.
5. NEVER put insulation over the switch housing.

REPLACEMENT PARTS



N°	Discription	Part number		
		Right hand*	Left hand*	
1	Switch only	SPDT silver contacts	37-4814-001	not applicable
		DPDT silver contacts	37-4814-001	37-4814-002
		SPDT gold contacts	37-4814-003	not applicable
		DPDT gold contacts	37-4814-003	37-4814-004
		HS SPDT silver contacts	37-9101-001	37-9101-001
		HS SPDT gold contacts	37-9102-001	37-9102-001
2	Switch mechanisms	SPDT silver contacts	Consult factory	
		DPDT silver contacts		
		SPDT gold contacts		
		DPDT gold contacts		
		HS SPDT silver contacts		
3	Housing cover	Aluminium	04-9197-005	
		Cast Iron	04-9197-002	
4	Cover o-ring	12-2201-240		

* Position of the switch is determined by looking at the terminal block with the cable entry pointing downward.

SPECIFICATIONS

PHYSICAL SPECIFICATIONS

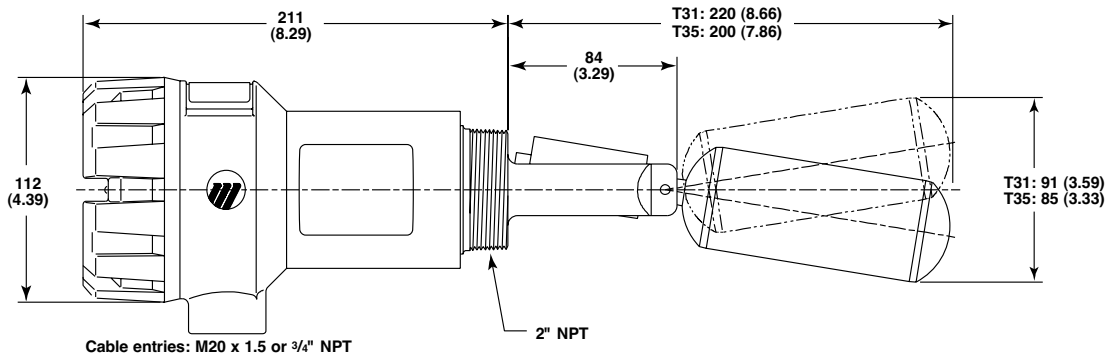
Description	Specification
Measured variable	Liquid level
Physical range	Narrow differential: 13 mm (0.5") Adjustable differential: up to 464 mm (18.26") Interface Service Differential: 44 mm (1.72") Interface: min S.G. difference between both liquids: 0,1
Process temperature	From -55 °C (-65 °F) up to 400 °C (750 °F) depending switch/housing selection
Process pressure	Standard models: up to 50 bar abs. (720 psi) High pressure models: up to 150 bar abs. (2160 psi)
Wetted parts	316/316L (1.4401/1.4404) or Hastelloy C (2.4819)
Flange materials	Carbon steel 316/316L (1.4401/1.4404) or Carbon steel with 316/316L (1.4401/1.4404) cladding Hastelloy C (2.4819) or Carbon steel with Hastelloy C (2.4819) cladding
Housing materials	Cast aluminium or cast iron

ELECTRICAL SPECIFICATIONS

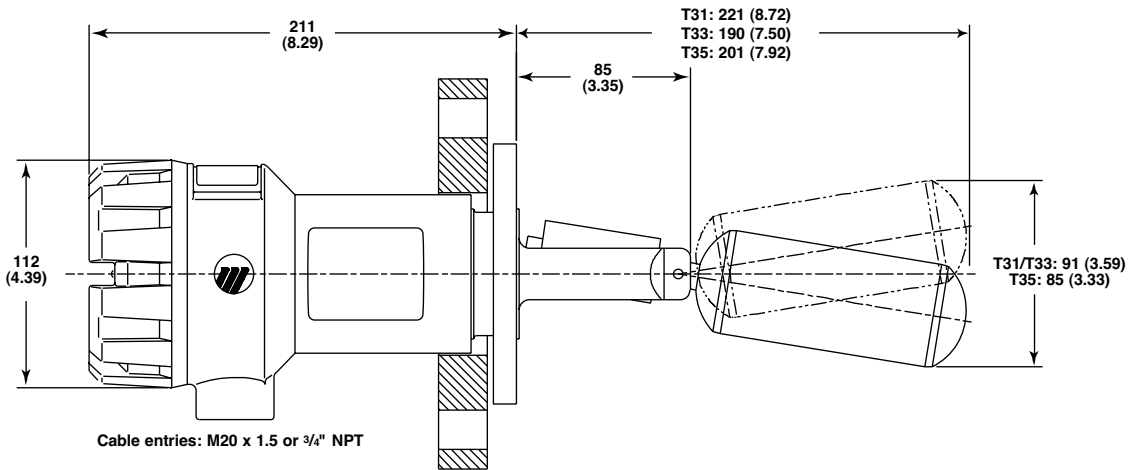
Description	Specification
Switch ratings	Up to 10 A @ 240 V AC Up to 6.0 A @ 24 V DC
Signal output	Single SPDT or single DPDT contacts
Switch types	Dry contact with silver or gold plated contacts Hermetically sealed for corrosive environment
Approvals	ATEX II 1/2G EEx d II C T6, explosion proof (Zone 0) ATEX II 1G EEx ia II C T6, intrinsically safe NEMA 4X/7/9, Class 1, Div 1, Groups B, C & D
Cable entries	3/4" NPT and M20 x 1,5

DIMENSIONS in mm (inches)

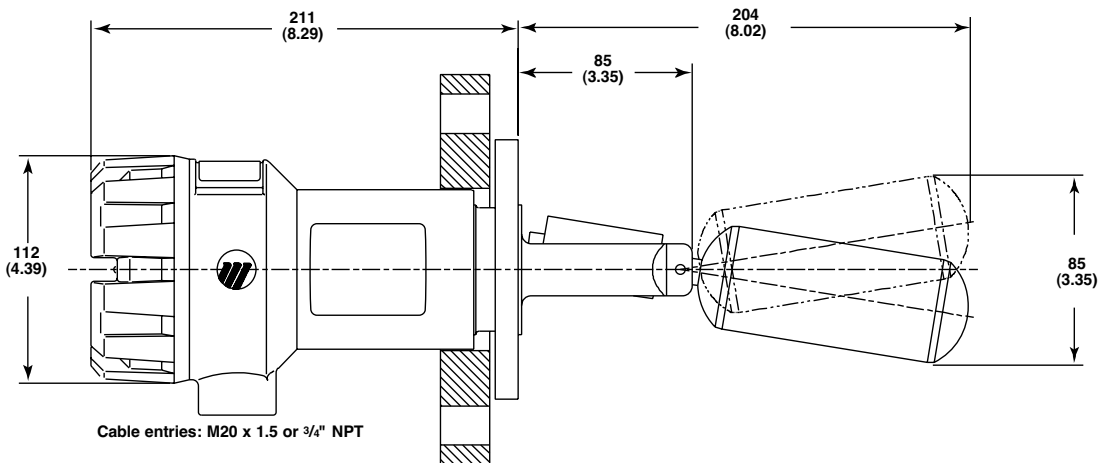
T31 and T35: threaded narrow differential



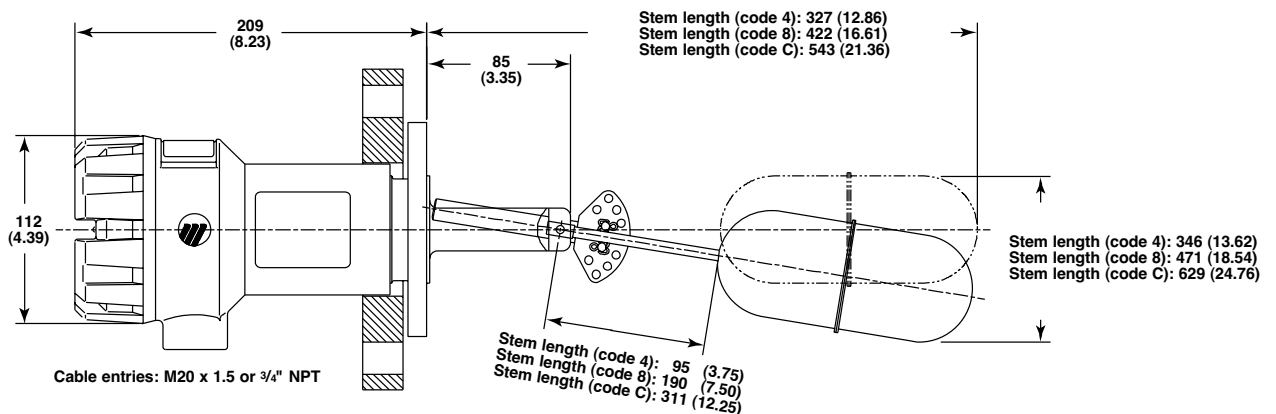
T31, T33 and T35: flanged narrow differential



T32: flanged high pressure narrow differential

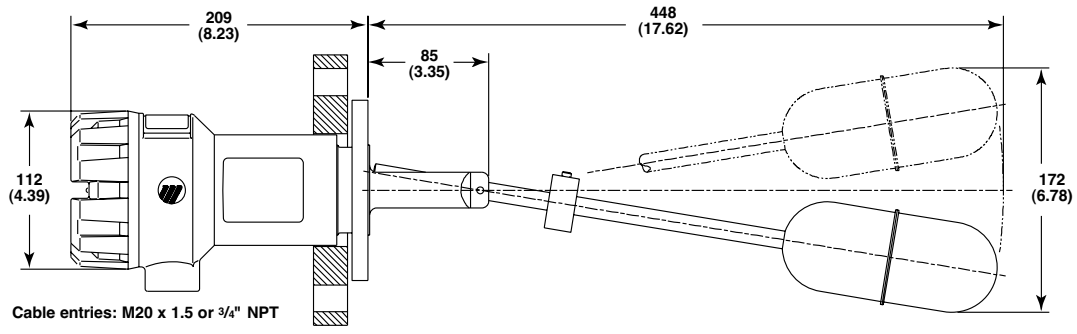


T3C: adjustable wide differential



DIMENSIONS in mm (inches)

T3B: interface



MODEL IDENTIFICATION

SEE PAGE 9

DESIGN CODE AND FLANGE MATERIAL

Design codes				Flange material
Standard	ANSI/ ASME B31.3	NACE	ANSI/ASME B31.3 & NACE	
1	2	3 ^①	4 ^①	Carbon steel
A	E	J	N	Carbon steel w. 316/316L cladding
B	F	K	P	316/316L (1.4401/1.4404) stainless steel
C	G	L	R	Carbon steel w. Hastelloy C cladding
D	H	M	T	Hastelloy C (2.4819)

^① Not for all models

SWITCH TYPE (see table below - "SWITCH MECHANISMS")

0	SPDT with silver contacts
1	DPDT with silver contacts
2	SPDT with gold plated contacts
3	DPDT with gold plated contacts
4	Hermetically sealed, SPDT with silver contacts
6	Hermetically sealed, SPDT with gold plated contacts

HOUSING MATERIALS AND CABLE ENTRY

Consult factory for proper partnumbers for FM/CSA approved units

1	Cast aluminium, single 3/4" NPT cable entry,	ATEX II 1/2G EEx d II C T6
2	Cast iron, single 3/4" NPT cable entry,	ATEX II 1/2G EEx d II C T6
3	Cast aluminium, single M20 x 1,5 cable entry,	ATEX II 1/2G EEx d II C T6
4	Cast iron, single M20 x 1,5 cable entry,	ATEX II 1/2G EEx d II C T6
M	Cast aluminium, single 3/4" NPT cable entry,	ATEX II 1G EEx ia II C T6
N	Cast iron, single 3/4" NPT cable entry,	ATEX II 1G EEx ia II C T6
P	Cast aluminium, single M20 x 1,5 cable entry,	ATEX II 1G EEx ia II C T6
R	Cast iron, single M20 x 1,5 cable entry,	ATEX II 1G EEx ia II C T6

T 3

complete code for TUFFY® T3

SWITCH MECHANISMS

All TUFFY® are available with a selection of switch modules that vary in switch rating (Amp) and max process temperature allowance. The max temperature is dependent upon the housing material selected. Consult table below, before selecting the proper module in the order number structure on pages 9 or 10.

Code	Contacts and type	Electric switch rating				Process temperature range @ 40 °C (100 °F) ambient temp.	
		V AC		V DC		Cast Iron	Cast Aluminium
0	SPDT with silver contacts	10.0	10.0	6.0	0.6	-40 °C to +400 °C (-40 °F to +750 °F)	-40 °C to +345 °C (-40 °F to +650 °F)
1	DPDT with silver contacts	10.0	10.0	6.0	0.6	-40 °C to +400 °C (-40 °F to +750 °F)	-40 °C to +345 °C (-40 °F to +650 °F)
2	SPDT with gold plated contacts	0.1	-	0.1	-	-40 °C to +190 °C (-40 °F to +375 °F)	-40 °C to +160 °C (-40 °F to +325 °F)
3	DPDT with gold plated contacts	0.1	-	0.1	-	-40 °C to +190 °C (-40 °F to +375 °F)	-40 °C to +160 °C (-40 °F to +325 °F)
4	HS SPDT with silver contacts	1.0	1.0	3.0	0.5	-55 °C to +400 °C (-65 °F to +750 °F)	-55 °C to +345 °C (-65 °F to +650 °F)
6	HS SPDT with gold plated contacts	0.5	0.5	0.5	0.5	-55 °C to +400 °C (-65 °F to +750 °F)	-55 °C to +345 °C (-65 °F to +650 °F)

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

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

All replacements will be shipped FOB factory.

UNDER RESERVE OF MODIFICATIONS

BULLETIN N°: BE 44-605.8
EFFECTIVE: JUNE 2005
SUPERSEDES: October 2000



www.magnetrol.com

BENELUX	Heikensstraat 6, 9240 Zele, België Tel. +32 (0)52.45.11.11 • Fax. +32 (0)52.45.09.93 • E-Mail: info@magnetrol.be
DEUTSCHLAND	Alte Ziegelei 2-4, D-51491 Overath Tel. 02204 / 9536-0 • Fax. 02204 / 9536-53 • E-Mail: vertrieb@magnetrol.de
FRANCE	40 - 42, rue Gabriel Péri, 95130 Le Plessis Bouchard Tél. 01.34.44.26.10 • Fax. 01.34.44.26.06 • E-Mail: magnetrolfrance@magnetrol.fr
ITALIA	Via Arese 12, I-20159 Milano Tel. (02) 607.22.98 (R.A.) • Fax. (02) 668.66.52 • E-Mail: mit.gen@magnetrol.it
UNITED KINGDOM	Unit 1 Regent Business Centre, Jubilee Road Burgess Hill West Sussex RH 15 9TL Tel. (01444) 871313 • Fax (01444) 871317 • E-Mail: sales@magnetrol.co.uk
INDIA	E-22, Anand Niketan, New Delhi - 110 021 Tel. 91 (11) 6186211 • Fax 91 (11) 6186418 • E-Mail: info@magnetrolindia.com