

Performance Liquid Expansion Temperature Switches **740 Series**

- Precision stainless steel mechanism for arduous atmospheres and high humidity.
- Set point adjustable over whole range against calibrated scale with tamperproof adjuster.
- Weatherproof and Flameproof models.
- Organic liquid or mercury fill, according to model.
- Models for fixed switching differential, adjustable differential and HI-LO operation.
- Hermetically sealed microswitch option.
- ATEX and IECEx

Performance **characteristics**

Enclosure

- IP66 Protection

Wetted parts

- Stainless Steel system - exposed parts 300 stainless steel, capillary sensing bulb 316 stainless steel.

Standard Electrical ratings

- Refer to table 6

Process connection

- 3/8 NPT External Sliding Gland, 1/2 NPT External Adaptor.

Unit weight

- Between 3.5kg – 11.0kg (7.7lb – 24.3lb)

Accuracy

- Set point repeatability $\pm 1\%$ of span at 20 °C / 68 °F ambient.
- Scale accuracy $\pm 3\%$ of full scale.

**741/2/3/4
Issue I**



Product **applications**

The 740 series is suitable for a wide range of applications in many Industry sectors:

- Oil & Gas
- Chemical
- Petrochemical
- Refining
- Power
- Food Industry

The choice of models available ensures that the 740 series is suitable for use in:

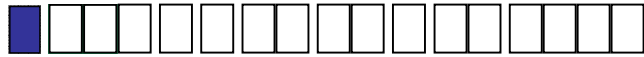
- Corrosive atmospheres
- Resistant to chemical attack

How can we **help you?**

Delta Controls' range of reliable pressure and temperature measurement instruments can be customised to meet individual requirements. For technical advice or to discuss your application please contact us on +44 (0) 20 8939 3500

Enclosure

TABLE 1





FINISH

All enclosures except Type A are finished in light grey epoxy resin paint. Special finishes to order.

INTRINSIC SAFETY

Because of the low voltages and currents of I.S. circuits, we recommend using gold and/or sealed contacts.

WEATHERPROOF ENCLOSURES	Code
General Purpose The basic enclosure is pressure die-cast in zinc alloy, offering weather protection not less than NEMA 4 + 13/IP66.	W
For Aggressive Atmospheres Investment cast enclosure in austenitic stainless steel with weather protection not less than NEMA 4X + 13/IP66.	A
FLAMEPROOF ENCLOSURES CATEGORY 2 (ZONE 1)	
EExd IIC T6 (-60 to + 40°C), T4 (-60 to +80°C) II 2 G D Gravity die-cast enclosure in aluminium-silicon alloy, certified to CENELEC EN50 014 and EN50 018.  II 2 G D Suitable for outdoor use, IP66 / NEMA 4	H
IECEX ExdIIC certified to IEC 60079-0 and certified by IEC60079-1	
EExd IIC T6 (-60 to + 40°C), T4 (-60 to +80°C) II 2 G D  II 2 G D As Code H, but sand cast in high quality grey iron.	K
IECEX ExdIIC certified to IEC 60079-0 and IEC 60079-1	
EExn ENCLOSURES CATEGORY 3 (ZONE 2)	
Type of Protection EExn II T6 (-20 to +40°C) II 3 G As code 'W' but EExn to EN50021. Weatherproof to NEMA 4/IP66. Limited switching facility (see table 6)	N
As 'N' but with investment cast enclosure in austenitic stainless steel as 'A'.	O

Models

TABLE 2



Models 741-4 are filled with a non-flammable, low toxicity liquid.

	Code
	Liquid Expansion
Fixed Switching Differential. See table 10A & 10D. Basic model giving close, fixed switching differential using proprietary microswitch operated by high integrity stainless steel mechanism. Set point field adjustable over full range against calibrated scale. SPDT & DPDT options available	741
Adjustable Switching Differential (Limited Span). See table 10B & 10E. Achieved by special microswitch with built in adjuster SPDT only. Not available with enclosure code N or O	742
Adjustable Switching Differential (Wide Span) See table 10B & 10E. Separate control of set and reset points with individual setting points on calibrated scale.	743
HI-LO Switching (Adjustable Gap). See tables 10C & 10F. Two individual set points, with independent adjustment against scale. Each switch may be SPDT only.	744

Electrical Entry

TABLE 3

Adaptors are available for other popular thread sizes.

Enclosures 'W' and 'N'

Standard option code 1 (22mm dia) is provided with a nylon 22/20 reducer and fibre washer suitable for a standard M20 cable gland and back nut. Option code 0 elbow adaptor is factory fitted. Adapter kits may also be provided retrospectively to fit at site if required. Ask for details. See diagram in DIMENSIONS

'W' and 'N' SAFETY NOTE

If a metal cable gland is site fitted it must either be earthed locally or an earth/gland plate must be used to connect the body of the gland at the enclosure earthing point. Earth/gland plates can be provided either factory fitted or in kit form for

	Code
Enclosure W & N: Clearance for 20mm (3/4 in) outside dia conduit.	1
Enclosures H, K & A: M20 x 1.5 ISO thread.	0
Enclosures H & K: M20 x 1.5 ISO thread, dual entry.	5
Enclosures H & K: 3/4-NPT INT.	3
Enclosures H & K: 3/4-NPT INT. dual entry	6
Enclosure W: M20 x 1.5 elbow adaptor.	0
Enclosure N: M20 x 1.5 straight adaptor (Approved).	0

System Details

TABLE 4

The flexible thermal system of Models 741-4 comprises an armoured capillary attached to the sensing bulb via a semi-rigid extension on which a compression gland slides to enable various depths of thermowell (pocket) to be accommodated.

All exposed parts of the thermal system are in 300 series austenitic stainless steel with the capillary sensing bulb and armour in 316 stainless steel.

Capillary Length		Length of Semi-rigid Extension		Bulb Diameter		Code
Metres	Feet	mm	inches	mm	inches	
3	10	250	10	12	0.47	J
3	10	500	20	12	0.47	K
6	20	250	10	12	0.47	L
6	20	500	20	12	0.47	M

Other lengths are available to order.

Setting Ranges

TABLE 5

Table 5A – °C

T_{max} = maximum working temperature

Model 741-4			
T_{max}	Range °C	Bulb Length mm	Code
75	-50 to +50	65	F1
125	0 to 100	65	K2
145	20 to 120	65	L3
235	50 to 200	65	R3
335	150 to 300	65	V5

Table 5B – °F

Model 741-4			
T_{max}	Range °F	Bulb Length ins	Code
167	-60 to +120	2.56	FF
257	32 to 212	2.56	KA
293	70 to 250	2.56	LA
455	120 to 390	2.56	RF
635	300 to 570	2.56	V6

Switching Options

TABLE 6

A much wider variety of switching options can be engineered to customer's requirements for Model 741 and 744 temperature switches, including heavy DC, manual latching, pneumatic output etc. On models 742 and 743 only the switching options specified can be supplied. Please consult our engineers for further information.

Model 741									
UL/CSA Rating (RESISTIVE) §SEE NOTE	IEC 947-5-1/EN 60947-5-1 Rating							Contact	Code
	Designation & Utilization Category	Rated operational current I_e (A) at rated operational voltage U_e	U_i	U_{imp}	VA Rating				
					Make	Break			
5 Amps @ 110/250V AC Light Duty for AC only	AC14 D300	0.6/0.3A @ 120/240V AC	250V	0.8kV	432	72	SPDT DPDT	00 01	
	DC13 R300	0.22/0.1A @ 125/250V DC			28	28			
5 Amps @ 110/250V AC & 2 Amps @ 30V DC General purpose precision	AC14 D300	0.6/0.3A @ 120/240V AC	250V	0.8kV	432	72	SPDT DPDT	02 03	
	DC13 R300	0.22/0.1A @ 125/250V DC			28	28			
1 Amp @ 125V AC & §100mA @ 30V DC gold alloy contacts for low voltage switching	1 A @ 125 VAC RESISTIVE (IEC 1058-1/EN 61058-1)						SPDT DPDT	04 05	
§ 5 Amps @ 110/250V AC & 5 Amps @ 30V DC Environmentally sealed.	AC14 D300	0.6/0.3A @ 120/240V AC	250V	0.5kV	432	72	SPDT* DPDT*	08 09	
	DC13 R300	0.22/0.1A @ 125/250V DC			28	28			
§ 1 Amp @ 30V AC & 30V DC Environmentally sealed with gold contacts	AC14 E150	0.3A @ 120V AC	125V	0.5kV	216	36	SPDT* DPDT*	0G 0H	
5 Amps @ 250V AC and 2 Amps @ 30V DC Hermetically sealed. Gold plated silver contacts.	AC14 D300 DC13 R300	0.6/0.3A @ 120/240V AC 0.22/0.1A @ 125/250V DC	250V	0.5kV	432 28	72 28	SPDT DPDT	H2 H3†, H6‡	
† 2 Single pole, double throw, simultaneous falling under pressure ‡ 2 Single pole, double throw, simultaneous rising under pressure.									
Model 742 (Cannot be supplied with enclosure Code N)									
5 Amps @ 110/250V AC Light Duty for AC only	AC14 D300	0.6/0.3A @ 120/240V AC	250V	0.8kV	432	72	SPDT	0C	
5 Amps @ 110/250V AC and 2 Amps @ 30V DC Adjustable	AC14 D300 DC13 R300	0.6/0.3A @ 120/240V AC 0.22/0.1A @ 125/250V DC	250V	0.8kV	432 28	72 28	SPDT	0D	
Model 743									
5 Amps @ 110/250V AC & 2 Amps @ 30V DC General purpose precision	AC14 D300 DC13 R300	0.6/0.3A @ 120/240V AC 0.22/0.1A @ 125/250V DC	250V	0.8kV	432 28	72 28	SPDT	02	
Model 744									
5 Amps @ 110/250V AC Light Duty for AC only	AC14 D300 DC13 R300	0.6/0.3A @ 120/240V AC 0.22/0.1A @ 125/250V DC	250V	0.8kV	432 28	72 28	SPDT	20	
5 Amps @ 110/250V AC & 2 Amps @ 30V DC General purpose precision	AC14 D300 DC13 R300	0.6/0.3A @ 120/240V AC 0.22/0.1A @ 125/250V DC	250V	0.8kV	432 28	72 28	SPDT	22	
1 Amp @ 125V AC & §100mA @ 30V DC gold alloy contacts for low voltage switching	1 A @ 125 VAC RESISTIVE (IEC 1058-1/EN 61058-1)						SPDT	24	
§ 5 Amps @ 110/250V AC & 5 Amps @ 30V DC Environmentally sealed.	AC14 D300	0.6/0.3A @ 120/240V AC	250V	0.5kV	432	72	SPDT*	28	
	DC13 R300	0.22/0.1A @ 125/250V DC			28	28			
§ 1 Amp @ 30V AC & 30V DC Environmentally sealed with gold contacts	AC14 E150	0.3A @ 120V AC	125V	0.5kV	216	36	SPDT*	2G	
5 Amps @ 250V AC and 2 Amps @ 30V DC Hermetically sealed. Gold plated silver contacts.	AC14 D300 DC13 R300	0.6/0.3A @ 120/240V AC 0.22/0.1A @ 125/250V DC	250V	0.5kV	432 28	72 28	SPDT	H4	
<p>The electrical rating is dependent on the microswitch fitted to the instrument. The electrical ratings defined by each approval that the microswitch complies with and is shown on the product nameplate, ie UL/CSA, or IEC. It should be noted that the instrument must be used within the electrical rating specified from the approval you require. This table lists the actual IEC ratings against the Designation & Utilization Category marked on the nameplates. In the absence of any verification by UL/CSA the microswitch § manufacturer's rating is stated in italics and bold. If in doubt seek guidance from the factory.</p> <p>NOTE: For low energy circuits e.g. 30V and up to 100mA, we recommend using gold alloy contact switches. U_i = rated insulation voltage U_{imp} = rated impulse withstand voltage across contacts.</p> <p>*Suitable for use with EExn Enclosures (Code N)</p>									

Process Connection

Adaptors to other threads are available as optional extras.

Other thread specifications and sizes are available without using adaptors.

TABLE 7



	Code
3/8 –18 NPT EXT Sliding Gland	E
1/2 – 14NPT EXT Adaptor	R

Options & Treatments

Combinations available, apply for details.

TABLE 8



	Code
Tropicalisation High humidity environment	01
Marine and Offshore Saline atmosphere or salt spray	02
Ammonia Process (wetted) parts and construction suitable for atmospheric ammonia.	03
Oxygen Service 2: Process (wetted) parts are cleaned for oxygen.	04
Oxygen Service3: Process and non-process parts are cleaned for use with oxygen.	05
Stainless Steel Pipe Mounting Bracket Permits local 2" pipe work to be utilised for mounting the instrument.	10
Tagging - Variety of tagging methods are available	APPLY FOR DETAILS
Applies when – no option is required and selection is made from special engineering.	00
PVC covered armoured capillary	40

Special Engineering

TABLE 9

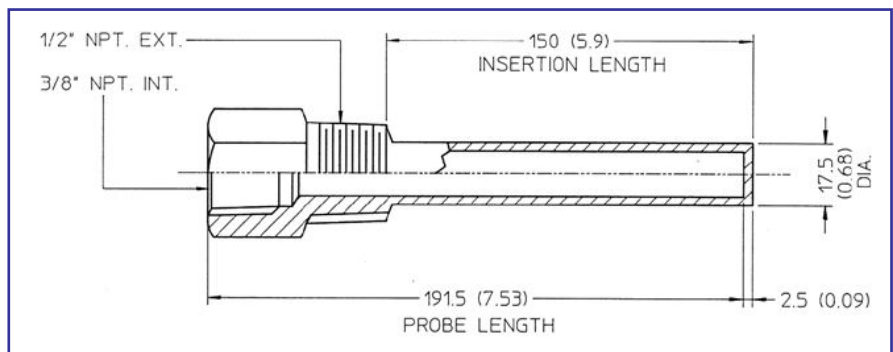


FEATURE	Code
Please consult Delta sales engineering for special requirements.	TBA

THERMOWELLS

Material 316SS.
Maximum Working Pressure
140bar (2000psi) at 20°C

Thermowells can also be manufactured to customers own drawing/specification requirements.



Performance Data

TABLE 10

Celsius Units (°C)

**TABLE 10A
MODELS 741
FIXED SWITCHING
DIFFERENTIAL**

Model 741											
Code	Setting Range	SPDT Options					DPDT Options				
		00	02	04	08/0G	H2	01	03	05	09/0H	H3/H6
F1	-50 to +50	2	4	2	6	6	3	6	4	8	6
K2	0 to 100	2	4	2	6	6	3	6	4	8	8
L3	20 to 120	2.5	5	2.5	7	7.5	4	7	5	9	10
R3	50 to 200	3	6	3	8	9	6	12	7	12	14
V5	150 to 300	3	6	3	8	9	6	12	7	12	14

**TABLE 10B
MODELS 742, 743
ADJUSTABLE
SWITCHING
DIFFERENTIAL**

Code	Setting Range	Model 742				Model 743							
		SPDT Only								SPDT Options			
		0C		0D		02							
		From	To	From	To	From	To						
F1	-50 to +50	2.5	6.5	5	12	20	100						
K2	0 to 100	2.5	6.5	5	12	20	100						
L3	20 to 120	3	7	6	13	20	100						
R3	50 to 200	4	10	8	20	30	150						
V5	150 to 300	4	10	8	20	30	150						

**TABLE 10C
MODEL 744
HI/LO SWITCHING
GAP = The
difference
between rising (HI)
and falling (LO)
in deg C.**

Model 744																
Code	Setting Range	SPDT Only														
		20			22			24			28/2G			H4		
		Diff	Min	Max	Diff	Min	Max	Diff	Min	Max	Diff	Min	Max	Diff	Min	Max
F1	-50 to +50	2	20	100	4	28	100	2	20	100	6	32	100	6	32	100
K2	0 to 100	2	20	100	4	28	100	2	20	100	6	32	100	6	32	100
L3	20 to 120	2.5	25	100	5	30	100	2.5	25	100	7	35	100	7.5	35	100
R3	50 to 200	3	30	150	6	48	150	3	30	150	8	45	150	9	48	150
V5	150 to 300	3	30	150	6	48	150	3	30	150	8	45	150	9	48	150

Fahrenheit Units (°F)

**TABLE 10D
MODELS 741
FIXED SWITCHING
DIFFERENTIAL**

Model 741											
Code	Setting Range	SPDT Options					DPDT Options				
		00	02	04	08/0G	H2	01	03	05	09/0H	H3/H6
FF	-50 to +120	3.5	7	3.5	11	11	5.5	11	7	14.5	11
KA	30 to 212	2.5	7	3.5	11	11	5.5	11	7	14.5	14.5
LA	70 to 250	4.5	9	4.5	12.5	13.5	7	12.5	9	16	18
RF	102 to 390	5.5	11	5.5	14.5	16	11	21.5	12.5	21.5	25
V6	300 to 570	5.5	11	5.5	14.5	16	11	21.5	12.5	21.5	25

**TABLE 10E
MODELS 742,743
ADJUSTABLE
SWITCHING
DIFFERENTIAL**

Code	Setting Range	Model 742				Model 743							
		SPDT Only								SPDT Options			
		0C		0D		02							
		From	To	From	To	From	To						
FF	-50 to +120	4.5	11.5	9	21.5	36	180						
KA	32 to 212	4.5	11.5	9	21.5	36	180						
LA	70 to 250	4.5	12.5	11	23.5	36	180						
RF	120 to 390	7.5	18	14.5	36	54	270						
V6	300 to 570	7.5	18	14.5	36	54	270						

**TABLE 10F
MODELS 744
HI/LO SWITCHING
GAP = the difference
between rising (HI)
and falling (LO) in
deg C.**

Model 744																
Code	Setting Range	SPDT Only														
		20			22			24			28/2G			H4		
		Diff	Min	Max	Diff	Min	Max	Diff	Min	Max	Diff	Min	Max	Diff	Min	Max
FF	-50 to +120	3.5	36	180	7	51	180	3.6	36	180	11	58	180	11	58	180
KA	32 to 210	3.5	36	180	7	51	180	3.6	36	180	11	58	180	11	58	180
LA	70 to 250	4.5	45	180	9	54	180	4.5	45	180	12.5	63	180	13.5	63	180
RF	120 to 390	5.5	54	270	11	87	270	5.5	54	270	14.5	81	270	16	87	270
V6	300 to 570	5.5	54	270	11	87	270	5.5	54	270	14.5	81	270	16	87	270

Due to manufacturing tolerances, the figures quoted in these tables are for guidance only. Should the differential be critical for specific applications our engineers should be consulted prior to ordering.

Technical Specifications

ACCURACY

Set point repeatability $\pm 1\%$ of full scale at 20°C (68°F) ambient.
Scale accuracy $\pm 3\%$ of full scale.

AMBIENT TEMPERATURE RANGE

All models are suitable for operating within a range of ambient temperature of 0 to 60°C (32 to 140°F). Ranges F1, K2 and L3 may operate down to -25°C (-13°F). Head compensation is provided as standard. However, for each metre of system length the set point will change due to expansion/contraction of system fluid. The following figures give guidance on the change of the set point for 10 deg C rise in ambient per metre of system.

740	F1, K2, L3	-0.45 deg C
740	R3, V5	-0.48 deg C

NOTE: For 10 deg C fall in ambient figures are plus. If required, full system compensation can be provided.

ELECTRICAL CONNECTIONS

Terminal Block

Cable entry is to a non-pinching block made of a non-Hygroscopic thermosetting plastic, suitable for cables up to 2.5mm²/14AWG.

Earthing/Grounding

An earthing stud is provided inside all weatherproof enclosures, adjacent to the entry. External earthing is standard on flameproof versions.

'W' and 'N' Safety Note

If a metal cable gland is site fitted it must either be earthed locally or an earth/gland plate must be used to connect the body of the gland at the enclosure earthing point. Earth/gland plates can be provided either factory fitted or in kit form for site assembly. Ask for details. See diagram in DIMENSIONS

Dielectric Strength

The electrical assembly is capable of withstanding *2kV between live parts and earth/ground and 500V between open contacts.

*1.2kV for micro switch Codes H2, H3, H4 and H6. Refer to Table 6.

Electrical Entry

Standard options are listed in Table 3. Other threads can be accommodated by adaptors. Dual entry available on some enclosures.

OPTIONAL EXTRAS

Thermowells: Available for use with these temperature switches. Specify details in full.

MAXIMUM WORKING PRESSURE

System sensing probes for both the capillary and rigid stem version are designed to withstand 100bar (1500psi) without a thermowell.

Mounting

Position/Location/Installation

Vertical as shown, in **dimensions**, taking care to avoid siting in locations that transmit excessive shock or vibration. For further advice contact our engineers.

Pollution degree (EN60947-5-1)

All products are suitable for use in pollution degree 3. For extreme conditions where condensation may readily form, then sealed contacts should be used. See Table 6 codes 08/90, 0G/0H, 2G, 28, H2/H3/H4/H6.

Electrical Isolation – These products are not suitable for electrical isolation. Always isolate circuit separately to carry out any electrical work.

Approvals

CENELEC / ATEX II 2 G D (Enclosure Codes H and K and all models).

Certified to CENELEC EN50 014, EExd IIC T6 (-60 to +40°C), EExd IIC T4 (-60 to +80°C) EN50 018, EN50 021-1-1 (DUST), EN5028-1-1 (DUST)

For use in Zone 1 hazardous areas. Category 2.

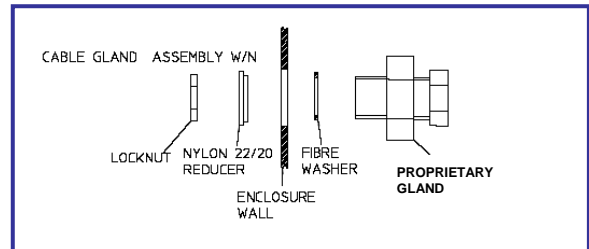
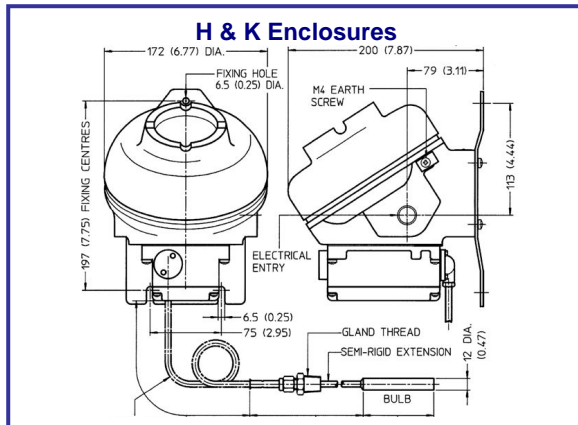
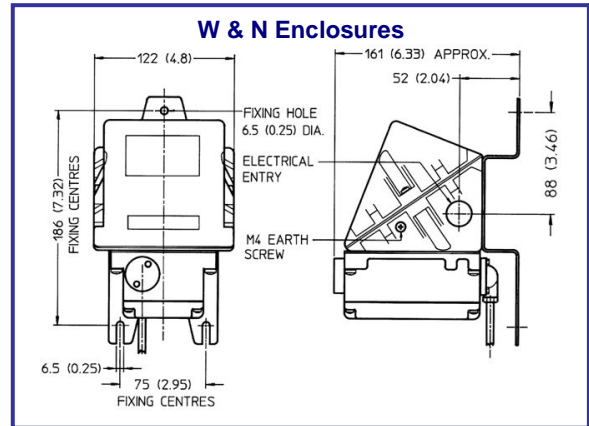
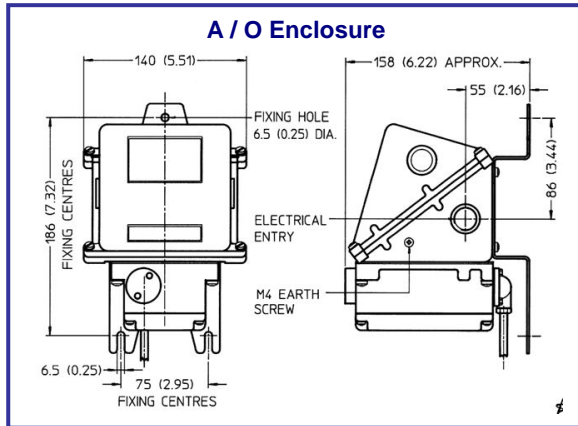
Certificate number BASOATEX2426X



IECEX APPROVAL for use in Zone 1 hazardous areas
Exd IIC certified to IEC 60079-0 and IEC60079-1
Cert No. IECExITS04 0006X

Dimensions

All dimensions mm (inches)



UNIT WEIGHTS (approx)	
W and N Enclosures	3.5kg / 7.7lb
A and O Enclosures	5.1kg / 11.2lb
H Enclosure	6.2kg / 13.7lb
K Enclosure	11.0kg / 24.3lb

In the interest of development and improvement Delta Controls Ltd, reserves the right to amend, without notice, details contained in this publication. No legal liability will be accepted by Delta Controls Ltd for any errors, omissions or amendments.



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