Switches for
Nuclear Applications

delta-mobrey

Nuclear Switch Overview

Delta Mobrey has been supplying the nuclear industry with process control instrumentation for more than 40 years, with installed base in Conventional and Nuclear Island applications in locations such as UK, Sweden, China and Korea.

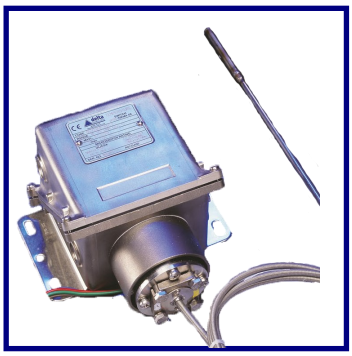
Delta's product range consists of Pressure, Differential Pressure and Temperature Switches, all of which have been qualified by a combination of testing and analysis to the requirements of the RCC-E (Règles de Conception et de Construction des Matériels Electriques des Centrales Nucléaires)

Nuclear 200 Series
Pressure Switch

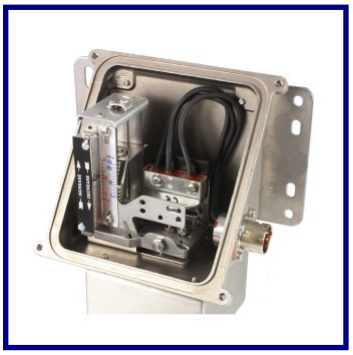
Nuclear 300 Series
Differential Pressure Switch

Nuclear 700 Series
Temperature Switch

Nuclear S20 Series
Pressure Switch



Nuclear S70 Series
Temperature Switch



View inside a Nuclear Switch showing the all stainless steel construction, RCC-E qualified microswitch and electrical connector

All products are manufactured within a quality system based on ISO9001:2015 and supplemented with the specific requirements of the RCC-E.

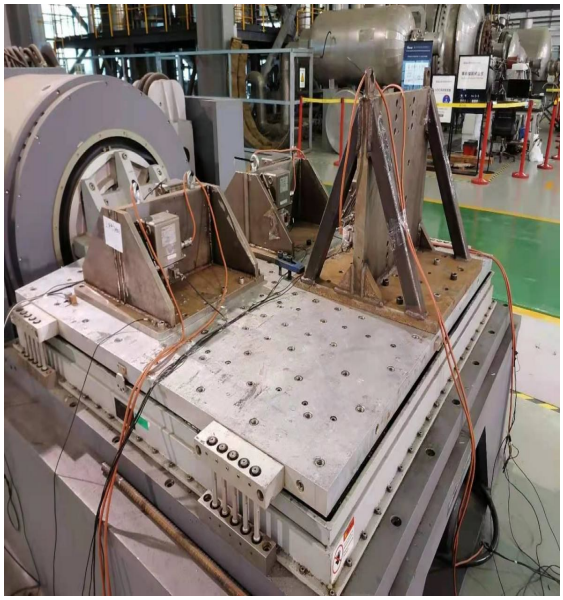
Qualification Summary

QUALIFIED EQUIPMENT		QUALIFICATION					INSTRUCTING PARTY
Type	Model	Test methodology / Specifications	Procedure	Report	Year	Level	
Gauge pressure	**200 series**	RCC -E -2005	DCTP-K949-0001-E	RCC-E Complete Qualification File RCC-E Test Results Analysis EDL 12320 EDL 12320-1 EHL 12320	2010 & 2011	K3	Delta Controls
Gauge pressure	**S20 series**						
Differential pressure switch	**300 series**						
Temperature Switch	**700 series**						
Differential pressure switch	**300 series**	Class 1E IEEE 323-1974 & IEEE 344-1975/1987 TBE 102:2	EGS-TR-HC1804-02 (contained within file EGS-TR-HC1804-05 - Revision B)	EGS-TR-HC1804-05 - Revision B	2014	IEEE 1E / Equivalent K2	OKG/ Delta Control
		Class 1E IEEE 323-1974 & IEEE 344-1975/1987 TBE 100, TBE 101, TBE 102:1, TBE 102:2, TBE 104:2, KBE 100-2, KBE IP-104:2.1	EGS-TR-HC1804-02 (contained within file EGS-TR-HC1804-05 - Revision B)	EGS-TR-HC1804-05 - Revision B			
Temperature Switch	**700 series (Helix)**	IEEE 344 – 1975/1987 KBE EP-147	QA-2305/ rep/2016/18	UJV DITI 2305/198 Delta Report K965-D03-VR	2016	IEEE 1E	Forsmarks
Gauge pressure switch	**200 series**	EJ/T 1197-2007 RCC-E-2005	See Delta Test Plan Ref K967-D01-VP And SITIIAS Test Plan	Delta Report - K967-D02-VR C17-002-HD	2017	Radiation	Delta Controls
Differential pressure switch	**S30 series**						
Temperature Switch	**700 series**						
Hermetic switch	**Hermetic switch**	EJ/T 1197-2007 RCC-E-2005	See Delta Test Plan Ref K967-D01-VP, 387 and Micro-switches Feb 17 2017 And SITIIAS Test	C17-002-HD			
Gold plated switch	**Microswitch**						
Gauge pressure switch	**200 series**	RCC -E -2016	DMTP-K978-0001-Rev E	DMTR-K978-0002 Rev B	2021	K3 & K3ad	Delta Mobrey
Gauge pressure switch	**S20 series**						
Differential pressure switch	**300 series**						
Gauge pressure switch	**200 series**	RCC -E -2016	DMTP-K978-0001-Rev E	DMTR-K978-000X			
Gauge pressure switch	**S20 series**						
Differential pressure switch	**300 series**						
Temperature Switch	**700 series**						
Temperature Switch	**S70 series**	RCC -E -2016 (by analysis)	By analysis	DMTR-K978-000X	2021	K3 & K3ad	Delta Mobrey

Nuclear Switch Test Program – RCC-E 2016

Testing was conducted to the K3 and K3ad level and involved the following:

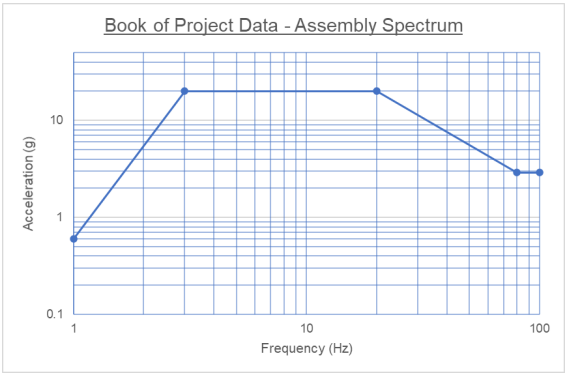
- Reference tests
  - Dielectric test
  - Insulation test
  - Functional characteristics including accuracy & leak check
- Tests in extreme operating conditions
  - Maximum Working Pressure (MWP)
  - Maximum Working Temperature (MWT)
  - Ambient temperature (Hot and Cold)
  - Rapid Change in temperature
  - EMC
- Aging tests (simulating up to 30 years aging)
  - Thermal aging test - Dry Heat
  - Mechanical Endurance tests
    - Pressure cycling (30,000 cycles)
    - Temperature cycling (500 cycles)
  - Radiation test up to 140 KGy.
- Vibration
- Seismic (see below)



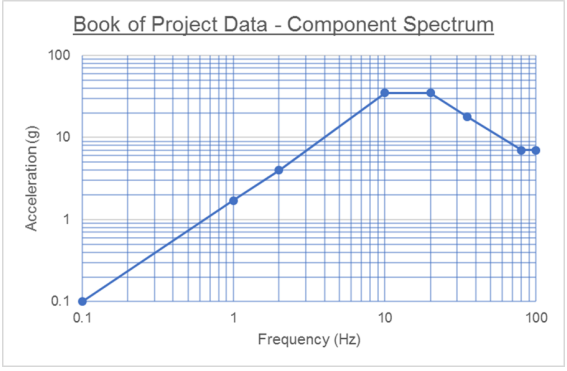
Seismic testing

Seismic testing was conducted using the Required Response Spectra (RRS) referenced in the RCC-E and shown opposite

Full details of the test program along with the test results are available upon request.



RRS for Assemblies Horizontal & Vertical Spectrum



RRS for Components Horizontal & Vertical Spectrum

Nuclear Switch Test Program – IEEE Class 1E

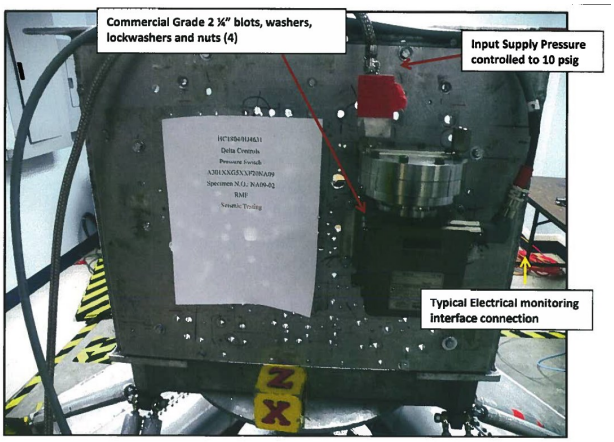
Testing was conducted on Differential Pressure switches but for similarity of construction and components, the result can be applied also to Pressure and Temperature switches.

- Reference tests
  - Baseline Functional Test
  - Accelerated Aging Test
  - Radiation aging
  - Mechanical Cycle aging

to simulate 20 years prior to simulated seismic DBE and loss of coolant accident (LOCA test).
The test has been performed according to :

- EGS-TR-HC1804-01
- EGS-TR-HC1804-02

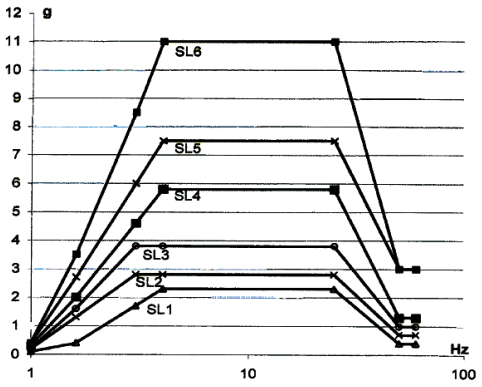
- Aging tests (simulating up to 20 years aging)
  - Thermal aging test—121.1 ^{0}C for 43.9 days
  - Radiation aging 275kGy
- Mechanical cycle
  - instruments has been cycled 1100 times cycles
- Seismic (see below)



Delta Switches being Vibration Tested

Seismic testing

The seismic qualification requirements for the equipment were based on the random multi-frequency (RMF) test equipment of TBE 102:2 (SL5 at 4% damping) and IEEE 344-1975/1987. the test items were subject to tri-axial RMF test level as described in the adjacent figure



Seismic environmental classes – 4 % damping

Hz	SL1 g	SL2 g	SL3 g	SL4 g	SL5 g	SL6 g
1	0,1	0,2	0,2	0,3	0,4	0,4
1,6	0,4	1,3	1,6	2,0	2,7	3,5
3	1,7	2,8	3,8	4,6	6,0	8,5
4	2,3	2,8	3,8	5,8	7,5	11,0
25	2,3	2,8	3,8	5,8	7,5	11,0
50	0,4	0,7	1,0	1,3	3,0	3,0
60	0,4	0,7	1,0	1,3	3,0	3,0

Switches for Nuclear Applications

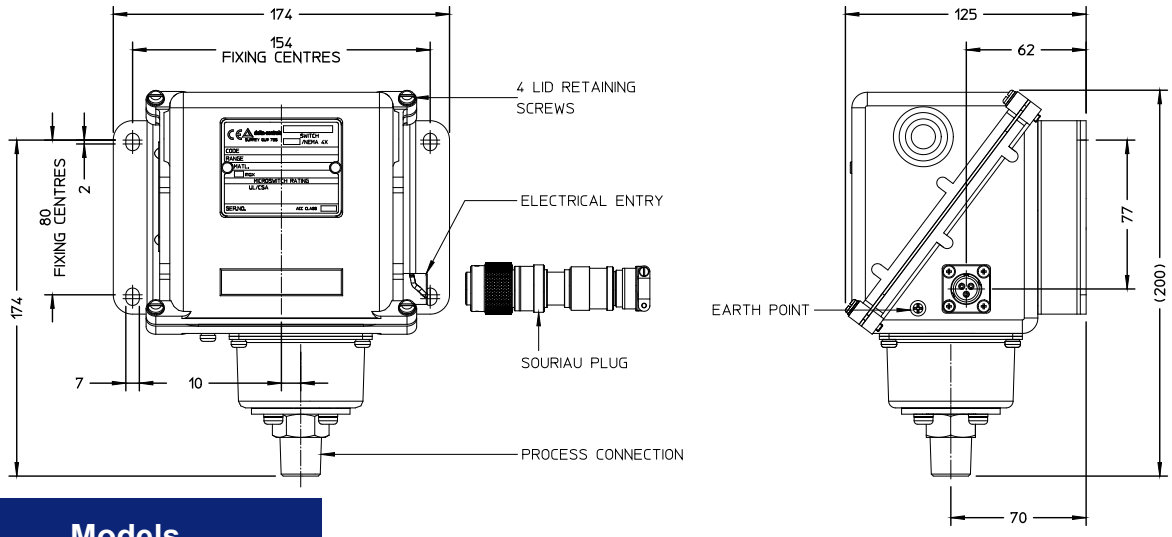
Nuclear 200 Series

Pressure Switches Bellows Operated

Key **Features**

- RCC-E K3 Qualified
- RCC-E qualified Souriau plug and socket electrical connectors
- RCC-E qualified ABB/ Delta hermetically sealed microswitch option
- Best in class set-point repeatability of up to ± 0.5% of span
- FEP and EPDM seals and gaskets suitable for exposure to radiation
- Weatherproof and Flameproof/ Intrinsically safe models - ATEX
- Ranges available up to 75 Bar (1,000 psi)
- Precision stainless steel mechanism for arduous atmospheres and high humidity
- Set point adjustable over whole range against calibrated scale with tamperproof adjustment
- Precise and accurate operation guaranteed by use of hydraulic formed bellows or capsule stack
- Models for fixed and adjustable switching differential

Dimensions



Models

- A selection of common model options are shown opposite. Many more options are available. Please contact Delta Mobrey for more information.

Switches for Nuclear Applications

Technical Specification - 200 series

Set point repeatability:	± 0.5% of span (20°C ±5°C)
Scale accuracy:	± 2% of full scale at nominal reference ambient temperature (20°C ±5°C)
Storage Temperature:	-25 to +80°C / -13 to +176°F (range B1 –25°C to +35°C & BF –13 °F to 95 °F)
Ambient Temperature:	-25 to +80°C / -13 to +176°F; SPECIAL ENGINEERING –60 to +80°C (-76 to 176 °F)
Maximum Process Temperature:	At the process connection, the component parts withstand up to +80°C (+176°F). For higher media temperatures, refer to Operating Instruction for installation practice or contact your local sales office.
Enclosure classification:	Weatherproof / Flameproof
Ingress protection:	IP 66 / NEMA 4X
Electrical Entry	Harting connector (via non-standard code 'X'), Souriau or SAIB as per request.
Pollution degree:	pollution degree 3 according EN60947-5-1 (For extreme conditions where condensation may readily form, then sealed contacts should be used)
Switch output:	1 x SPDT or 1 x DPDT (2 SPDT Synchronized with 1% of range) or 2 x independent SPDT snap action microswitch (standard)
Electrical rating:	See relevant section for switching characteristics.
Electrical Safety Class:	safety electrical class 1 according IEC 61298-2:2008
Process Connection:	Rc 1/4 (BSP), 1/4 NPT Internal, 1/2 NPT Internal & 1/2 NPT External, G1/2B direct process connection.
Approximate Weight:	Enclosures: "A" - 3.9kg/8.6lb

Part number **Datasheet**

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Enclosures

Code	Description
A	Investment cast enclosure in austenitic stainless steel to NEMA 4X / IP66.

Models

Code	Description
201	Bellows Operated – Fixed Switching Differential.
203	Bellows Operated – Adjustable Switching Differential.
207	Diaphragm Operated—Absolute Pressure Fixed Switching Differential
281	Bellows Operated - Hi Lo switching

Electrical Entry

Code	Description
P	3 pins SAIB receptacle. Part number 251-103-400 K2
Y	7 pins SOURIAU receptacle, Part number 8N45S211125
Z	3 pins SOURIAU receptacle. Part number 8N45S111125.

Wetted Parts

Code	Description
2	Stainless steel bellows/capsule stack and process connection. All welded fabrication.

Ranges

Code	Range bar	Range mbar	Code	Range KPa	*P*max bar	*P*max MPa
E1		5 to 120	E2	0.5 to 12	1	0.1
G1	0.2 to 1		GE	20 to 100	1.4	0.14
G3	-1 to 1.5		GJ	-100 to 150	4	0.4
G5	0.1 to 1.5		GN	10 to 150	2	0.2
GQ	1 to 15 mH20					
Q2	6 to 25		QA	600 to 2500	40	4
J0	0.2 to 4		J1	20 to 400	8	0,8
M1	0.2 to 7		M3	20 to 700	9	0,9
P6	0.3 to 15		PA	30 to 1500	20	2

Switch Options

Code	Description
H9	SPDT Hermetically Sealed. Gold Plated Silver Contacts. 5 Amps @ 250 Volts AC, 2 Amps @ 30 Volts DC, 1 Amp @ 48 Volts DC. Fitted with Radiation Resistant wiring - Passed RCC-E and IEEE testing.

Process Connection

Code	Description
F	1/4NPT F process connection
J	1/2NPT M process connection
K	G1/2B direct Process connection.

Options & Treatments

Code	Description
20	Stainless steel permanently fixed stamped tags.
2A	Stainless steel permanently fixed stamped tags. Tropicalised and offshore marine application.

A	2	0	1	Z	2	E	1	H	9	K	2	0	N	0	0	6

For Location & Special Engineering see next page.

A	2	0	1	Z	2	E	1	H	9	K	2	0	N	0	0	6

Location

Description	Code
Conventional Island.	**C**
Nuclear Island	**N**

Special Engineering

Description	Code
Commercial grade product for use in unclassified areas of NPP.	**C006**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants. Range -750 to 750 mbar.	**C047**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants. Range -70 to 10 mbar.	**C053**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants. 207 with all welded 316 stainless steel wetted parts construction for Pmax 16 bar Abs. Range 0 to 1000mbar Abs.	**C056**
Qualified/ Class 1E/RCC-E product for use in classified areas of Nuclear Power plants zones with seismic and/or radiation requirement.	**N006**
Qualified/ Class 1E/RCC-E product for use in classified areas of Nuclear Power plants zones with seismic and/or radiation requirement. Instrument ranged -750 to +750mbar.	**N088**
Qualified/ Class 1E/RCC-E product for use in classified areas of Nuclear Power plants zones with seismic and/or radiation requirement. Chemically filled system - Delta Type 2 CFS design. Wetted part and CFS in super duplex material (UNS S32760 or UNS S32750). G1/2 Threaded connection and FEP/EPR seals, 8.5m length	**N089**
Qualified/ Class 1E/RCC-E product for use in classified areas of Nuclear Power plants zones with seismic and/or radiation requirement. Chemically filled system - Delta Type 2 CFS design. Wetted part and CFS in super duplex material (UNS S32760 or UNS S32750). G1/2 Threaded connection and FEP/EPR seals, 12m length	**N090**

Switches for Nuclear Applications

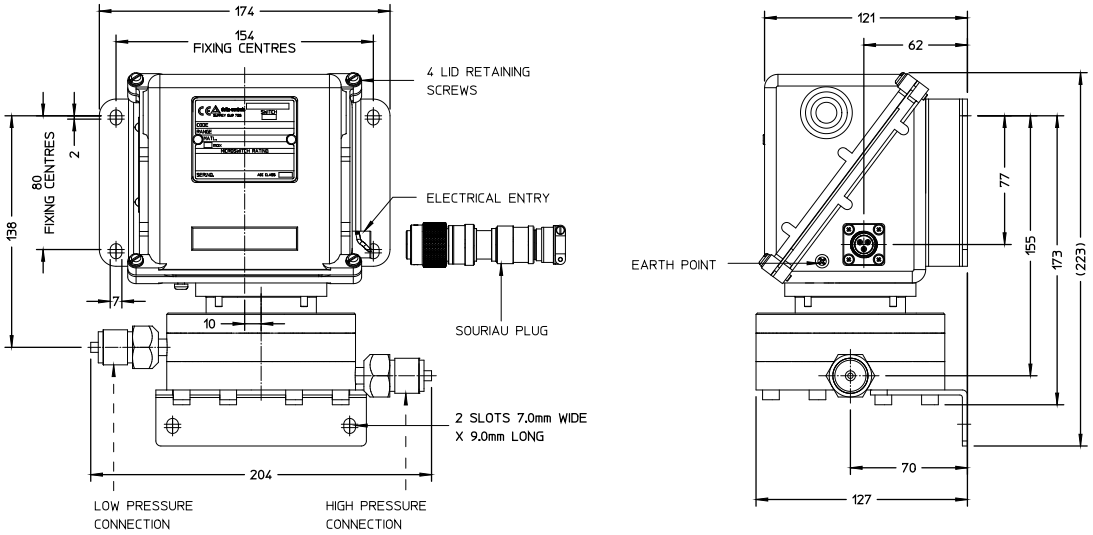
Nuclear 300 Series

Differential Pressure Switches

Key **Features**

- RCC-E K3 Qualified
- RCC-E qualified Souriau plug and socket electrical connectors
- RCC-E qualified ABB/ Delta hermetically sealed microswitch option
- Set-point repeatability of 1% of span
- FEP and EPDM seals and gaskets suitable for exposure to radiation
- Weatherproof and Flameproof/ Intrinsically safe models - ATEX
- Static pressure up to 250 bar (3500 psi)
- Precision stainless steel mechanism for arduous atmospheres and high humidity
- Set point adjustable over whole range against calibrated scale with tamperproof adjustment
- Models for fixed and adjustable switching differential

Dimensions



Models

- A selection of common model options are shown below. Many more options are available. Please contact Delta Mobrey for more information.

Switches for Nuclear Applications

Technical Specification - 300 series

Set point repeatability:	± 1% of span (20°C ±5°C)
Scale accuracy:	± 3% of full scale at nominal reference ambient temperature (20°C ±5°C)
Storage Temperature:	-25 to +80°C / -13 to +176°F (range B1 –25°C to +35°C & BF –13 °F to 95 °F)
Ambient Temperature:	-25 to +80°C / -13 to +176°F; SPECIAL ENGINEERING –60 to +80°C (-76 to 176 °F)
Maximum Process Temperature:	At the process connection, the component parts withstand up to +80°C (+176°F). For higher media temperatures, refer to Operating Instruction for installation practice or contact your local sales office**.**
Enclosure classification:	Weatherproof / Flameproof
Ingress protection:	IP 66 / NEMA 4X
Electrical Entry	Harting connector (via non-standard code ‘X’), Souriau or SAIB as per request.
Pollution degree:	Pollution degree 3 according EN60947-5-1 (For extreme conditions where condensation may readily form, then sealed contacts should be used)
Switch output:	1 x SPDT or 1 x DPDT (2 SPDT Synchronized with 1% of range) or 2 x independent SPDT snap action microswitch (standard)
Electrical rating:	See relevant section for switching characteristics.
Electrical Safety Class:	safety electrical class 1 according IEC 61298-2:2008
Process Connection:	Rc 1/4 (BSP), 1/4 NPT Internal, 1/2 NPT Internal & 1/2 NPT External, G1/2B direct process connection.
Approximate Weight:	Enclosures: “A” - 6.4kg/ 1.8lbs

Part number **Datasheet**

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Enclosures

Code	Description
A	Investment cast enclosure in austenitic stainless steel to NEMA 4X / IP66.

Models

Code	Description
301	Bellows Operated – Fixed Switching Differential.

Electrical Entry

Code	Description
P	3 pin SAIB receptacle. Part number 251-103-400 K2.
Z	3 pin SOURIAU receptacle. Part number 8N45S111125.

Wetted Parts

Code	Description
3	316 Stainless Steel diaphragm. All other wetted parts fully austenic 300 Series Stainless Steel, FEP and Viton seals. Flange with bottom entry process connections.
4	316 Stainless Steel diaphragm. All other wetted parts fully austenic 300 Series Stainless Steel, FEP and Viton seals. Flange with side entry process connections.

Ranges

Code	Range bar	Range mbar	Code	Range Pa	Range KPa	*P*max bar	*P*max MPa
B5		0 to 5	BP	0 to 500		1	0.1
BC		-12.5 to +12.5	BS	-1250 to +1250		110	11
C6		3 to 25	CN		0.3 to 2.5	110	11
E1		5 to 120	E2		0.5 to 12	110	11
E8		50 to 350	E5		5 to 35	110	11
G5	0.1 to 1.5		GN		10 to 150	110	11
J0	0.2 to 4		J1		20 to 400	110	11
M2	0.7 to 7		M7		70 to 700	110	11
P8	1.5 to 15		PJ		150 to 1500	110	11

Switch Options

Code	Description
H9	SPDT Hermetically Sealed. Gold Plated Silver Contacts. 5 Amps @ 250 Volts AC, 2 Amps @ 30 Volts DC, 1 Amp @ 48 Volts DC. Fitted with Radiation Resistant wiring - Passed RCC-E and IEEE testing.
04	1 A @ 125V AC, Ñ00 mA @ 30V DC, 100mA @ 48VDC. Fitted with Radiation resistant wiring. Gold alloy contacts for low voltage switching

Process Connection

Code	Description
F	1/4NPT F process connection
J	1/2NPT M process connection
K	G1/2B direct Process connection.
X	Non standard requirement.

Options & Treatments

Code	Description
20	Stainless steel permanently fixed stamped tags.
2A	Stainless steel permanently fixed stamped tags. Tropicalised and offshore marine application.

A	3	0	1	Z	4	B	S	H	9	K	2	0	C	0	0	6

For Location & Special Engineering see next page.

Part Number Datasheet
Model: 301 NUCLEAR

A	3	0	1	Z	4	B	S	H	9	K	2	0	C	0	0	6

Location

Description	Code
Conventional Island.	**C**
Nuclear Island	**N**

Special Engineering

Description	Code
Commercial grade product for use in unclassified areas of NPP.	**C006**
C006 + Chemical filled system with flange PN16 DN50.	**C031**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants. Range -70 to 10 mbar.	**C053**
Qualified/ Class 1E/RCC-E product for use in classified areas of Nuclear Power plants zones with seismic and/or radiation requirement. Instrument ranged -750 to +750mbar.	**N088**

Switches for Nuclear Applications

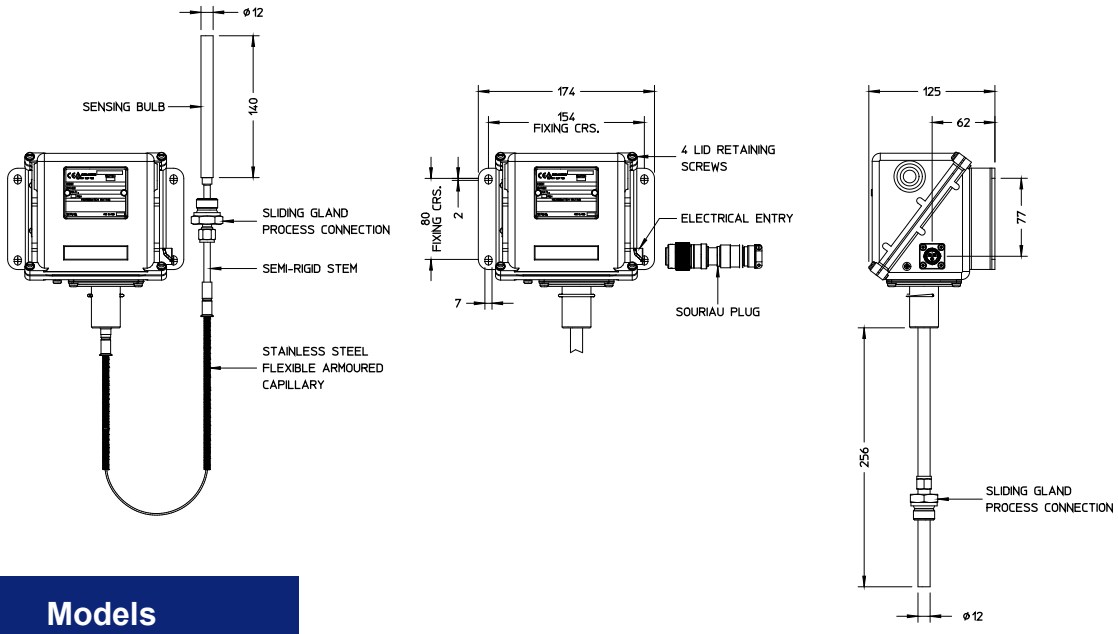
Nuclear 700 Series

Vapour Pressure and Gas Filled

Key **Features**

- RCC-E K3 Qualified
- RCC-E qualified Souriau plug and socket electrical connectors
- RCC-E qualified ABB/ Delta hermetically sealed microswitch option
- FEP and EPDM seals and gaskets suitable for exposure to radiation
- Weatherproof and Flameproof/ Intrinsically safe models - ATEX
- Set point ranges up to 300°C (580°F)
- Rigid and semi-rigid thermal system options
- Precision stainless steel mechanism for arduous atmospheres and high humidity
- Set point adjustable over whole range against calibrated scale with tamperproof adjustment
- Models for fixed and adjustable switching differential

Dimensions



Models

- A selection of common model options are shown below. Many more options are available. Please contact Delta Mobrey for more information.

Switches for Nuclear Applications

Technical Specification - 700 series

Set point repeatability:	± 1% of span (20°C ±5°C)
Scale accuracy:	± 2% of full scale at nominal reference ambient temperature (20°C ±5°C) For models 721-3, 781 scale accuracy will be effected by relative position of head and sensing bulb i.e. “bulb elevation error”. Refer to Operating Instruction for more information.
Storage Temperature:	-25 to +80°C / -13 to +176°F (range B1 –25°C to +35°C & BF –13 °F to 95 °F)
Ambient Temperature:	-25 to +80°C / -13 to +176°F; SPECIAL ENGINEERING –60 to +80°C (-76 to 176 °F) On Vapour Pressure models it is advisable to avoid the condition where the ambient temperature is within ± 5°C (± 9°F) of the set point. Under this condition the liquid/ vapour phase becomes less well defined and the switching differential increases. Where this condition is unavoidable refer to Models 771-4.
Drift of set point due to T amb.:	Models 721-3, 781 and 731-4. a 10°C (18°F) rise in ambient temperature will on average result in a 0,8% of the span fall in set point.
Maximum Process Temperature:	See range table
Maximum Working Pressure:	System sensing probes for both the capillary and rigid stem version are designed to withstand 100 bar (1500psi) without thermowell.
Enclosure classification:	Weatherproof / Flameproof
Ingress protection:	IP 66 / NEMA 4X
Electrical Entry	Harting connector (via non-standard code ‘X’), Souriau or SAIB as per request.
Pollution degree:	pollution degree 3 according EN60947-5-1 (For extreme conditions where condensation may readily form, then sealed contacts should be used)
Switch output:	1 x SPDT or 1 x DPDT (2 SPDT Synchronized with 1% of range) or 2 x independent SPDT snap action microswitch (standard)
Electrical rating:	See relevant section for switching characteristics.
Electrical Safety Class:	safety electrical class 1 according IEC 61298-2:2008
Process Connection:	3/8 -18 NPT Ext. , ½ - 14 NPT Ext , 1/2 G Ext Sliding Connection.
Approximate Weight:	Enclosures: **“W & N”** 2.5kg / 5.5lb (models **731-4** 2.2kg/4.8lb); **“A & O”** 3.5kg /7.7lb (models **731-4** 3.2kg/7.0lb); **“H”** 4.0kg/8.8lb; **“K”** 8.7kg/19.1lb.

Part number **Datasheet**

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Enclosures

Code	Description
A	Investment cast enclosure in austenitic stainless steel to NEMA 4X / IP66.

Models

Code	Description
721	Vapour pressure flexible thermal system - Fixed Switching Differential.
723	Vapour pressure flexible thermal system - Adjustable Switching Differential
731	Vapour pressure rigid stem - Fixed Switching Differential.
733	Vapour pressure rigid stem - Adjustable Switching Differential.
771	Gas filled flexible thermal system - Fixed Switching Differential (only Range M1)
773	Gas filled flexible thermal system - Adjustable Switching Differential (only Range M1)
781	Vapour pressure flexible thermal system - HI-LO Switching (Adjustable Gap).
734	Vapour pressure rigid stem - HI-LO Switching (Adjustable Gap).

Electrical Entry

Code	Description
P	3 pin SAIB receptacle. Part number 251-103-400 K2.
Z	3 pin SOURIAU receptacle. Part number 8N45S111125.
Y	7 pin SOURIAU receptacle. Part number 8N45S211125.
X	Non standard requirement

Thermal System

Models 721, 723, 771, 781				
Stainless Steel System & Bellows	Capillary Length		Semi-rigid Stem Length	
Code	**Metres**	**Feet**	**mm**	**inches**
E	**3**	**10**	**250**	**10**
X	Non standard requirement			
Models 731, 733, 734				
T	Rigid stem 250mm (10in) long x 12mm (0.47in) dia Stainless steel Rigid Stem & bellows			

Ranges

Code	Range - °C	*T*max - °C
H2	-5 to +65	75
J1	20 to 90	95
L4	50 to 120	130
M1 (Only 77x*)	-50 to +150	250
Q4	100 to 170	180

Switch Options

Code	Description
H9	SPDT Hermetically Sealed. Gold Plated Silver Contacts. 5 Amps @ 250 Volts AC, 2 Amps @ 30 Volts DC, 1 Amp @ 48 Volts DC. Fitted with Radiation Resistant wiring - Passed RCC-E and IEEE testing.
H7	SPDT Hermetically Sealed. Gold Plated Silver Contacts. 5 Amps @ 250 Volts AC, 2 Amps @ 30 Volts DC, 1 Amp @ 48 Volts DC. Fitted with Radiation Resistant wiring - Passed RCC-E and IEEE testing. - Adjustable deadband switching.
H5	SPDT Hermetically Sealed. Gold Plated Silver Contacts. 5 Amps @ 250 Volts AC, 2 Amps @ 30 Volts DC, 1 Amp @ 48 Volts DC. Fitted with Radiation Resistant wiring. HI—LOW switching.

Process Connection

Code	Description
E	Sliding gland process connection, 3/8-18 NPT external.
J	Sliding gland process connection, 1/2-14 NPT external
K	Sliding gland process connection, G1/2 external
X	Non standard requirement.

Options & Treatments, see next page

A	7	2	1	Z	F	L	4	H	9	E	2	0	N	0	0	2

Special Engineering, see next page.

Part Number Datasheet
Models: 721, 731, 734, 771 & 781 NUCLEAR

Part number **Datasheet**

delta-mobrey

A	7	2	1	Z	X	L	4	H	9	E	2	0	N	0	0	2

Options & Treatments

Description	Code
Stainless steel permanently fixed stamped tags.	**20**
Stainless steel permanently fixed stamped tags. Tropicalised and offshore marine application.	**2A**

Location

Description	Code
Conventional Island.	**C**
Nuclear Island.	**N**

Special Engineering

Description	Code
(006*) + last 3 digit of coding to be defined at the time of order and will define more precisely the specific product features	**XXX**
(006*) + System 4m, S/Steel capillary, 250mm semi rigid stem. 12mm o/d bulb. SS bellows.	**001**
(006*) + System 6m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**002**
(006*) + System 8m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**003**
(006*) + Capillary 10m, 250mm semi rigid stem. 12mm o/d bulb. SS bellows.	**004**
Qualified Class 1E/RCC-E Product for use in Classified areas of NPP with Seismic and radiation require-ments.	**006***
(006*) + System 12m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**007**
(006*) + System 16m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**008**
(006*) + System 2m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**010**
(006*) + System 6.5m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**011**
(006*) + System 6m S/Steel capillary,500mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**012**
(006*) + System 4m S/Steel capillary,500mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**013**
(006*) + System 8m S/Steel capillary,500mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**014**
(006*) + System 10m S/Steel capillary,500mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**015**
N004 + Thermowell part number STBGPA02619C150OO	**035**
N004 + Thermowell part number STBEPA02619C3601O.	**036**
N015 + Thermowell part number STBEPA02619C3601O	**037**
N004 + Thermowell part number 37003306	**038**
N004 + Thermowell part number 37003305	**039**
N004 + no instrument connection	**040**
Fast response air temperature switch with Harting Han 7D plug and Socket, Hermetically sealed SPDT mi-croswitch with radiation resistant wires. Helix temperature system	**A47**

Part number **Datasheet**

delta-mobrey

A	7	2	1	Z	X	L	4	H	9	E	2	0	N	0	0	2

Description Thermowell 59201098	**Code**
(006*) + Thermowell 59201098.	**N093**
(006*) + System 8m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows Thermowell 59201095.	**N094**
(006*) + System 12m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb. S/Steel bellows. Thermowell 59201099.	**N095**
(006*) + System 12m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb. S/Steel bellows. Thermowell 59201098.	**N096**
(006*) + System 10m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201098.	**N097**
(006*) + System 10m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Switch code 04 and 08 are tested for radiation requirements only. Thermowell 59201099.	**N098**
(006*) + System 16m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201098.	**N099**
(006*) + System 16m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201099.	**N100**
(006*) + System 18m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201099.	**N101**
(006*) + System 4m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb. S/Steel bellows. Thermowell 59201096.	**N102**
(006*) + System 8m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201098.	**N103**
(006*) + Thermowell 59201096.	**N104**
(006*) + Thermowell 59201096.	**N105**
(006*) + System 6m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201100.	**N106**
(006*) + System 8m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201097.	**N107**
(006*) + System 10m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201100.	**N108**
(006*) + System 6m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb. S/Steel bellows. Thermowell 59201099.	**N112**
(006*) + System 18m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201098	**N113**
(006*) + System 6m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201097.	**N114**
(006*) + Thermowell 59201106.	**N115**
(006*) + System 10m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201100. Extension 37003674. Adaptor 0920118	**N116**
(006*) + System 8m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201102. Extension 37003675. Adaptor 0920118.	**N120**
(006*) + System 8m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201108.	**N121**
(006*) + System 10m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201094. Extension 37003674. Adaptor 0920118.	**N122**

Special Engineering

Part number **Datasheet**

delta-mobrey

A	7	2	1	Z	X	H	2	H	9	E	2	0	C	0	0	4

Special Engineering

Description	Code
(006***) + xxx - last 3 digits of coding to be defined at time of order.	**XXX**
(006***) + Capillary 4m, 250mm semi rigid stem. 12mm o/d bulb. SS bellows.	**001**
(006***) + Capillary 6m, 250mm semi rigid stem. 12mm o/d bulb. SS bellows	**002**
(006***) + System 8m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**003**
Commercial grade product for use in unclassified areas of NPP. Capillary 10m, 250mm semi rigid stem. 12mm o/d bulb. SS bellows.	**004****
(006***) + System 12m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**005**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants.	**006****
(006***) + System 16m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**007**
(006***) + System 2m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**010**
(006***) + System 6.5m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**011**
(006***) + System 4m S/Steel capillary,500mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**012**
(006***) + System 6m S/Steel capillary,500mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**013**
(006***) + System 8m S/Steel capillary,500mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**014**
(006***) + System 10m S/Steel capillary,500mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**015**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants. Fast response air temperature switch with helix temperature system. Location to be where there is air movement.	**029**
Commercial grade product for use in unclassified areas of NPP. No process connection	**032**
(004**) + Thermowell part number STBEPA02619C3601O	**033**
(004**) + Thermowell part number 37003306	**034**
(004**) + Thermowell part number STBGPA02619C1950O	**035**
(006***) + System 4m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201097.	**060**
(006***) + System 16m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201099.	**063**
(006***) + Thermowell 59201098	**078**
(006***) + Thermowell 59201107.	**083**
(C006) + System 6m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb. S/Steel bellows. Thermowell 59201108.	**089**
(C006) + System 6m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb. S/Steel bellows. Thermowell 59201101.	**090**
(C006) + System 6m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb. S/Steel bellows. Thermowell 59201094. Extension 37003674. Adaptor 0920118.	**091**

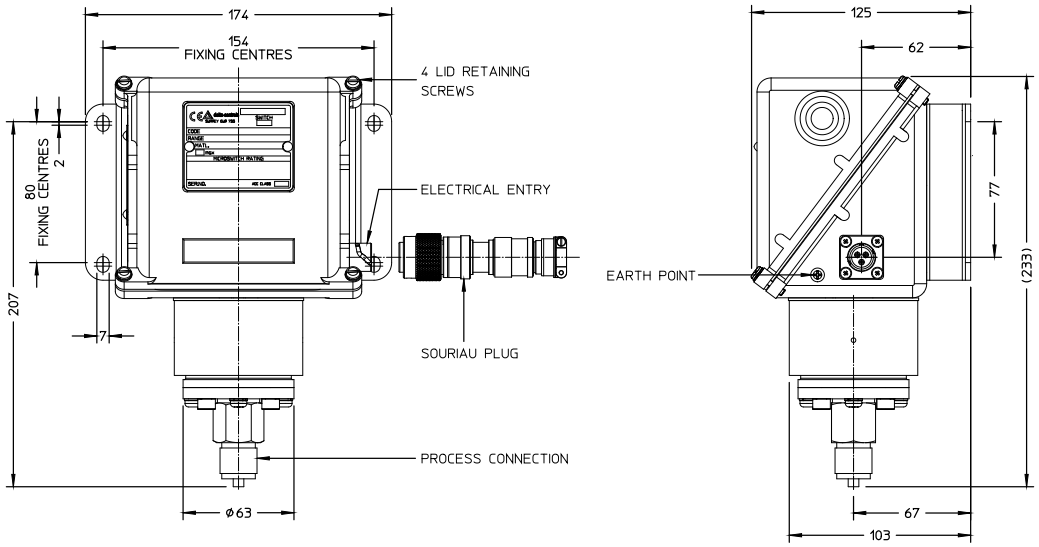
Nuclear S20 Series

Pressure Switches Diaphragm Operated

Key **Features**

- RCC-E K3 Qualified
- RCC-E qualified Souriau plug and socket electrical connectors
- RCC-E qualified ABB/ Delta hermetically sealed microswitch option
- FEP and EPDM seals and gaskets suitable for exposure to radiation
- Weatherproof and Flameproof/ Intrinsically safe models - ATEX
- Set point ranges up to 700 Bar (10,000 psi)
- Maximum Working Pressure up to 1000 bar (15,000 psi)
- Set point adjustable over whole range against calibrated scale with tamperproof adjustment
- Field set point adjustment against a reference scale
- Safety vented or blow out device as standard

Dimensions



Models

- A selection of common model options are shown below. Many more options are available. Please contact Delta Mobrey for more information.

Switches for Nuclear Applications

Technical Specification - S20 series

Set point repeatability:	± 1% of span (20°C ±5°C)
Storage Temperature:	-40 to +60°C / -40 to +140°F
Ambient Temperature:	-25 to +60°C / -13 to +176°F; SPECIAL ENGINEERING –60 to +60°C (-76 to 176 °F)
Maximum Process Temperature:	At the process connection, the component parts withstand up to +60°C (+176°F). For higher media temperatures, refer to Operating Instruction for installation practice or contact your local sales office.
Enclosure classification:	Weatherproof / Flameproof
Ingress protection:	IP 66 / NEMA 4X
Electrical Entry	Harting connector (via non-standard code 'X'), Souriau or SAIB as per request.
Switch output:	1 x SPDT or 1 x DPDT (2 SPDT Synchronized with 1% of range) or 2 x independent SPDT snap action microswitch (standard)
Electrical rating:	See relevant section for switching characteristics.
Electrical Safety Class:	safety electrical class 1 according IEC 61298-2:2008
Process Connection:	Rc 1/4 (BSP), 1/4 NPT Internal, 1/2 NPT Internal & 1/2 NPT External, G1/2B direct process connection.
Approximate Weight:	2.7kg / 5.9lb to 6.6kg / 14.5lb depending on model

Part number **Datasheet**

delta-mobrey

Enclosures

Code	Description
A	Investment cast enclosure in austenitic stainless steel to NEMA 4X / IP66.

Models

Code	Description
S21	Diaphragm Operated – Fixed Switching Differential.
S24	Diaphragm Operated – High Overload.

Electrical Entry

Code	Description
P	3 pin SAIB receptacle. Part number 251-103-400 K2.
Z	3 pin SOURIAU receptacle. Part number 8N45S111125.

Wetted Parts

Code	Description
S	Stainless steel diaphragm and process connection. All welded fabrication.
X	Non Standard

Ranges

Code	Range mbar/bar	Code	Range	*P*max bar	*P*max MPa
CC	12 to 250	CT	1.2 to 25 KPa	15	1.5
CE	0.1 to 0.6 (100 to 600 mbar)	CJ	10 to 60 KPa	15	1.5
DB	0.25 to 1.6	DJ	25 to 160 KPa	27	2.7
DC	0.4 to 2.5	DN	4 to 250 KPa	27	2.7
DE	1 to 6	DY	100 to 600 KPa	27	2.7
EA	1.6 to 10	EG	160 to 1000 KPa	70	7
G3	-1 to +1.5	GJ	-100 to 150 KPa	15	1.5
U7	7 to 160	UJ	0.7 to 16 MPa	1000	100
V7	25 to 250	VB	2.5 to 25 MPa	1000	100
W7	50 to 400	W1	5 to 40 MPa	1000	100
Y4	100 to 700	YE	10 to 70 MPa	1000	100

Switch Options

Code	Description
H9	SPDT Hermetically Sealed. Gold Plated Silver Contacts. 5 Amps @ 250 Volts AC, 2 Amps @ 30 Volts DC, 1 Amp @ 48 Volts DC. Fitted with Radiation Resistant wiring - Passed RCC-E and IEEE testing.

Process Connection

Code	Description
A	Rc 1/4 (1/4 BSP tr INT) to ISO 7/1.
F	1/4 NPT F process connection.
J	1/2 NPT M process connection.
K	G1/2B direct Process connection.

Options & Treatments

Code	Description
20	Stainless steel permanently fixed stamped tags.
2A	Stainless steel permanently fixed stamped tags. Tropicalised and offshore marine application.

A	S	2	1	Z	S	D	C	H	9	K	2	0	C	0	0	6

For Special Engineering see next page.

Part Number Datasheet
Model: S21 NUCLEAR

Part number **Datasheet**

delta-mobrey

A	S	2	1	Z	S	D	C	H	9	K	2	0	C	0	0	6

Description	Code
Conventional Island.	**C**
Nuclear Island.	**N**

Description	Code
Qualified Class 1E/RCC-E Product for use in Classified areas of NPP with Seismic and radiation requirements.	**N006**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants.	**C006**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants. Chemical filled system 7m capillary, G1/2 threaded process connection. CFS material in super duplex material UNS S32760 or UNS S32750	**C044**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants. Chemical filled system 14m capillary, G1/2 threaded process connection	**C045**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants. Super Duplex material - UNS S32205 or S32760 or UNS S32750 diaphragm and process connection. All welded construction.	**C046**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants. Chemical filled system 12m capillary, G1/2 threaded process connection. CFS material in super duplex material UNS S32760 or UNS S32750	**C054**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants. Chemical filled system 4m capillary, G1/2 threaded process connection. CFS material in super duplex material UNS S32760 or UNS S32750	**C055**
Qualified/ Class 1E/RCC-E product for use in Classified areas of NPP with seismic and/or radiation requirement AND Chemically filled system - Delta Type 2 CFS design. Wetted part and CFS in super duplex material (UNS S32760 or UNS S32750). G1/2 Threaded connection and FEP/EPR seals, 3m length	**N072**
Qualified/ Class 1E/RCC-E product for use in Classified areas of NPP with seismic and/or radiation requirement AND Chemically filled system - Delta Type 2 CFS design. Wetted part and CFS in super duplex material (UNS S32760 or UNS S32750). G1/2 Threaded connection and FEP/EPR seals, 8.5m length	**N073**
Qualified / Class 1E/RCC-E product for use in classified areas of NPP with seismic and/or radiation requirements. Wetted part with PREN>40, super duplex material (UNS S32750 or UNS S32760)	**N074**
Qualified/ Class 1E/RCC-E product for use in classified areas of Nuclear Power plants zones with seismic and/or radiation requirement. Chemically filled system - Delta Type 2 CFS design. Wetted part and CFS in super duplex material (UNS S32760 or UNS S32750). G1/2 Threaded connection and Fep/EPR seals, 4m length	**N091**
To be deferred at the time of order.	**XXX**

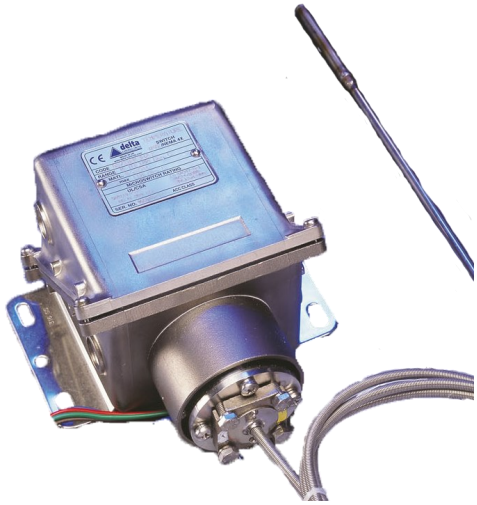
Special Engineering

Switches for Nuclear Applications

Nuclear S70 Series

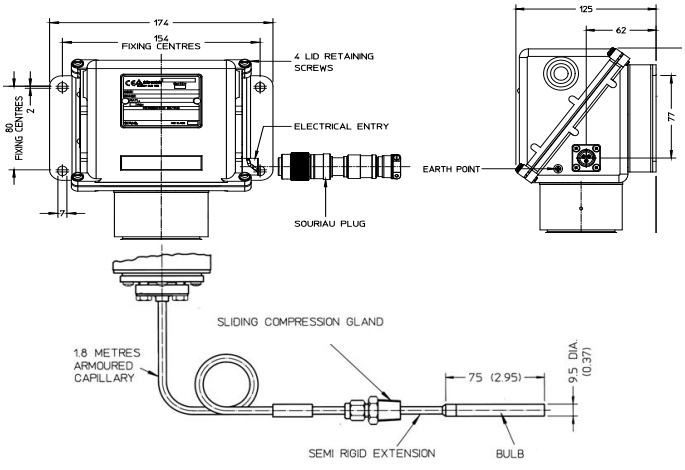
Temperature Switches Diaphragm Operated

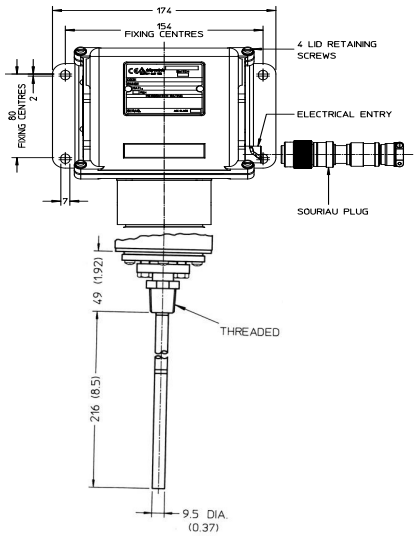
Key **Features**



- RCC-E K3 Qualified
- RCC-E qualified Souriau plug and socket electrical connectors
- RCC-E qualified ABB/ Delta hermetically sealed microswitch option
- FEP and EPDM seals and gaskets suitable for exposure to radiation
- Weatherproof and Flameproof/ Intrinsically safe models - ATEX
- Set point ranges up to 260° C (500°F)
- Maximum Working temperature up to 270°C (518°F)
- Set point adjustable over whole range against reference scale with tamperproof adjustment
- Field set point adjustment against a reference scale
- Safety vented or blow out device as standard

Dimensions





Models

- A selection of common model options are shown below. Many more options are available. Please contact Delta Mobrey for more information.

Switches for Nuclear Applications

Technical Specification - S70 series

Set point repeatability:	± 1% of span (20°C ±5°C)
Storage Temperature:	-40 to +60°C / -13 to +140°F
Ambient Temperature:	-25 to +60°C / -13 to +140°F; SPECIAL ENGINEERING –60 to +80°C (-76 to 176 °F)
	On Vapour Pressure models it is advisable to avoid the condition where the ambient temperature is within ± 5°C (± 9°F) of the set point. Under this condition the liquid/ vapour phase becomes less well defined and the switching differential increases. Where this condition is unavoidable refer to Models 771-4.
Drift of set point due to T amb.:	Models S71 a 10°C (18°F) rise in ambient temperature will on average result in a 0,8% of the span fall in set point.
Maximum Process Temperature:	See range table
Maximum Working Pressure:	System sensing probes for both the capillary and rigid stem version are designed to withstand 100 bar (1500psi) without thermowell.
Enclosure classification:	Weatherproof / Flameproof
Ingress protection:	IP 66 / NEMA 4X
Electrical Entry	Harting connector (via non-standard code ‘X’), Souriau or SAIB as per request.
Pollution degree:	Pollution degree 3 according EN60947-5-1 (For extreme conditions where condensation may readily form, then sealed contacts should be used)
Switch output:	1 x SPDT or 1 x DPDT (2 SPDT Synchronized with 1% of range) or 2 x independent SPDT snap action microswitch (standard)
Electrical rating:	See relevant section for switching characteristics.
Electrical Safety Class:	safety electrical class 1 according IEC 61298-2:2008
Process Connection:	3/8 -18 NPT Ext. , ½ - 14 NPT Ext , 1/2 G Ext Sliding Connection.
Approximate Weight:	Enclosures: 2.6kg / 5.7lb to 7.1kg / 15.6lb depending on model

Switches for Nuclear Applications

delta-mobrey

Enclosures

Code	Description
A	Investment cast enclosure in austenitic stainless steel to NEMA 4X / IP66.

Models

Code	Description
S71	Diaphragm Operated – Fixed Switching Differential.

Electrical Entry

Code	Description
P	3 pin SAIB receptacle. Part number 251-103-400 K2.
Z	3 pin SOURIAU receptacle. Part number 8N45S111125.

Wetted Parts

Stainless Steel System & Bellows	Capillary Length		Semi-rigid Stem Length	
Code	Metres	Feet	mm	inches
N	1.86	6	250	10
R	Rigid stem 250mm (10in) long x 12mm (0.47in) dia Stainless steel Rigid Stem & bellows			
X	Non standard requirement			

Ranges

Code	Range - °C	*T*max - °C
H1	-40 to 60	70
K3	0 to 100	110
L5	50 to 170	180
Q5	90 to 190	200
Q6	110 to 190	200
U5	160 to 260	270

Switch Options

Code	Description
H9	SPDT Hermetically Sealed. Gold Plated Silver Contacts. 5 Amps @ 250 Volts AC, 2 Amps @ 30 Volts DC, 1 Amp @ 48 Volts DC. Fitted with Radiation Resistant wiring - Passed RCC-E and IEEE testing.

Process Connection

Code	Description
E	Sliding gland process connection, 3/8-18 NPT external.
J	Sliding gland process connection, 1/2-14 NPT external
K	Sliding gland process connection, G1/2 external
X	Non standard requirement.

Options & Treatments

Code	Description
20	Stainless steel permanently fixed stamped tags.
2A	Stainless steel permanently fixed stamped tags. Tropicalised and offshore marine application.

A	S	7	1	Z	N	L	5	H	9	K	2	0	C	0	0	6

Part number **Datasheet**

delta-mobrey

A	S	7	1	Z	N	L	5	H	9	K	2	0	C	0	0	6

Description	Code
Conventional Island.	**C**
Nuclear Island.	**N**

Description	Code
(C006) + System 8m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows	**C003**
Commercial Grade product for use in unclassified areas of Nuclear Power Plants.	**C006**
Nuclear Qualified Class 1E/RCC-E Product for use in Classified areas of NPP with Seismic and radiation requirements.	**N006**
(C006) + Without process connection.	**N040**
(C006) + Thermowell 59201101.	**C074**
(C006) + Thermowell 59201108.	**C084**
(C006) + Thermowell 59201094. Extension 37003674. Adaptor 0920118. Range 90 to 190 Deg. C. (Tmax = 200 Deg. C) or 194 to 374 Deg. F. (Tmax = 392 Deg. F)	**C085**
(006*) + System 8m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201102. Extension 37003675. Adaptor 0920118. Range 90 to 190 Deg. C. (Tmax = 200 Deg. C) or 194 to 374 Deg. F. (Tmax = 392 Deg. F)	**N109**
(006*) + System 8m S/Steel capillary,250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201108.	**N117**
(006*) + System 10m S/Steel capillary, 250mm Semi rigid stem. 12mm o/d Bulb.S/Steel bellows. Thermowell 59201094. Extension 37003674. Adaptor 0920118. Range 90 to 190 Deg. C. (Tmax = 200 Deg. C) or 194 to 374 Deg. F. (Tmax = 392 Deg. F)	**N118**
To be deferred at the time of order.	**XXX**

Special Engineering

About Delta Mobrey

Delta Mobrey has built a global reputation over 65 years for its expertise in the design and manufacture of reliable, high quality instrumentation for the power and process industries. Delta offers both customised and standard solutions for process monitoring, alarm and shutdown applications, backed by local support from a worldwide network of carefully selected, professional and fully trained representatives.

Quality is a cornerstone of the company's success. This is recognised by industry and international approvals that cover every aspect of Delta Mobrey's manufacturing, test and product portfolio.

Service and Support

Delta Mobrey is totally committed to delivering the best possible customer service and technical support reducing the lifetime cost of ownership while providing long term security - for one-off engineering specials through to large volume, more standard requirements.

To add value for each customer, a flexible responsive approach to meeting individual instrumentation requirements has been put in place. Delta Mobrey's support infrastructure includes:

- Technical advice
- Spare parts
- Recalibration
- Tailored accessory packages
- Installation support
- Operations and maintenance assistance
- Comprehensive documentation
- Extended warranty
- Local support

Special Engineering

In addition to offering over 1 million product variants, Delta Mobrey can also provide custom engineered solutions to meet your exact requirements. The complexity of special engineering can vary from a simple change in process connection to a completely redesigned product to meet specific performance criteria.

Special engineered DP switch incorporating chemical seals with flushing ports and small deadband for use in Nuclear Power Plant.

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