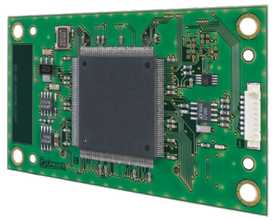
ELECTRONIC
POSITION DETECTORS

2 parts proximity sensor

Proximity sensor without electronic

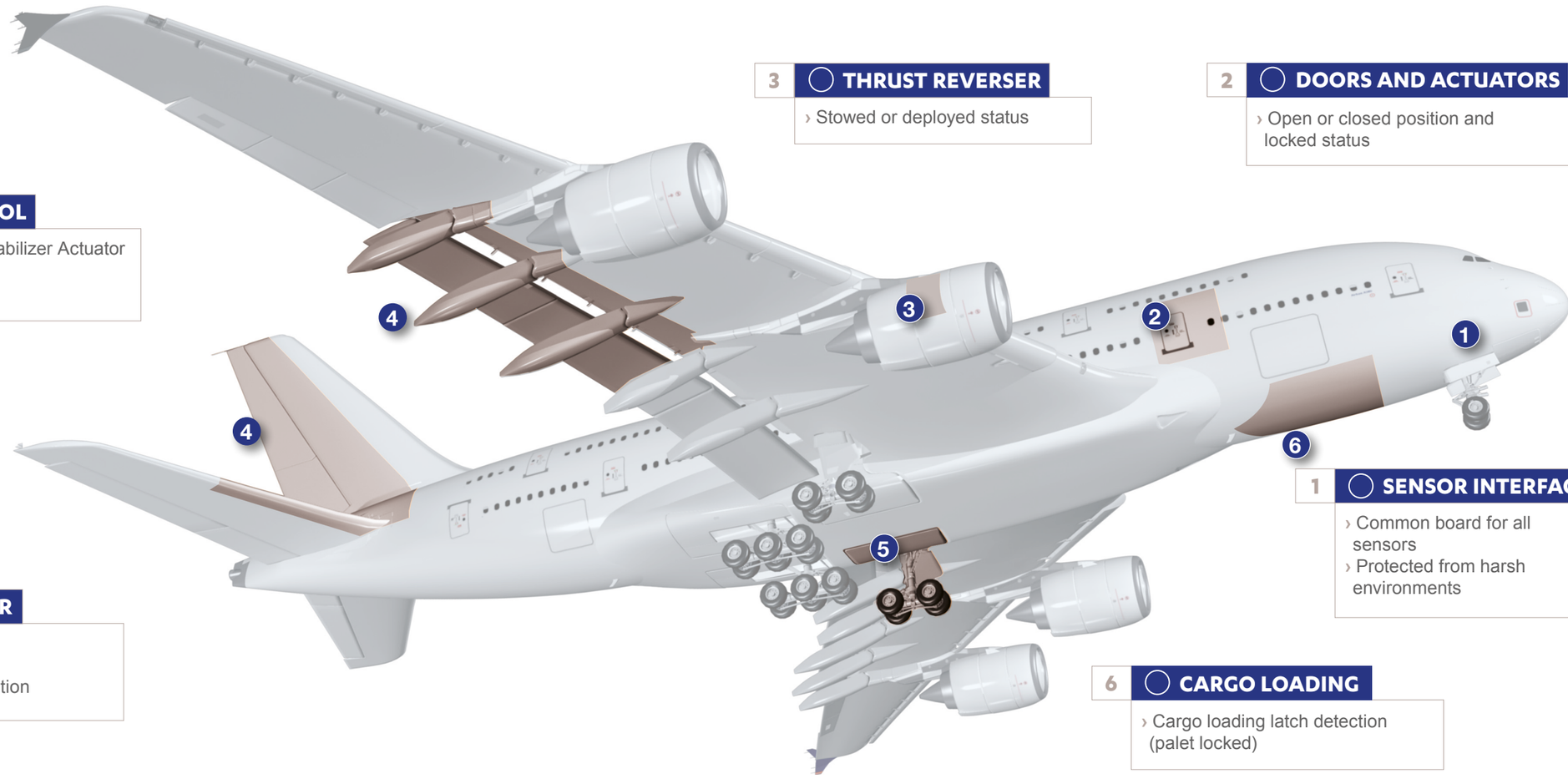


Remote electronic

IN ALL CASES, CROUZET WILL FIND A WAY!

with Crouzet's expertise in mechanical position detectors, Crouzet offers a range of standards product, but has the ability and capacity to develop specific components, entirely adapted to the application into its environment.

Today, Crouzet is a market leader in this technology.



4 FLIGHT CONTROL

- Trimable Horizontal Stabilizer Actuator
- Spoilers
- Flap & slat

5 LANDING GEAR

- Weight on wheels
- Up position
- Down and locked position

PROXIMITY SWITCHES:

- Contactless detection with integrated electronics
- 2, 3 wires or connector output
- Full hermetic stainless steal housing
- Possibility of multiple output, BIT, high pressure, extended temperature range...

We create the product fully customisable dedicated to your need.

1 piece proximity switches

Proximity switches with integrated electronic

3 THRUST REVERSER

- Stowed or deployed status

2 DOORS AND ACTUATORS

- Open or closed position and locked status

1 SENSOR INTERFACE MODULE SIM

- Common board for all sensors
- Protected from harsh environments

6 CARGO LOADING

- Cargo loading latch detection (palet locked)

DETECTION PRINCIPLE
FOR PROXIMITY SWITCHES AND TWO PARTS SENSORS

A proximity switch is a device detecting, without any physical link, a metallic part that enters a predefined space in front of it.

The sensing chain is composed of a sensing element, an electronic board and a moving part, called a target. The electronics applies a variable current in the sensing element, what creates a magnetic field around the sensing element. When the target enter the magnetic field, it changes the electromagnetic properties of the sensor which will lead to the change of one or several parameters of the current or the voltage of the coil (amplitude, frequency, phase lag, response time ...). Any variation over a threshold will set a binary signal which indicates that the target has entered a predefined space.

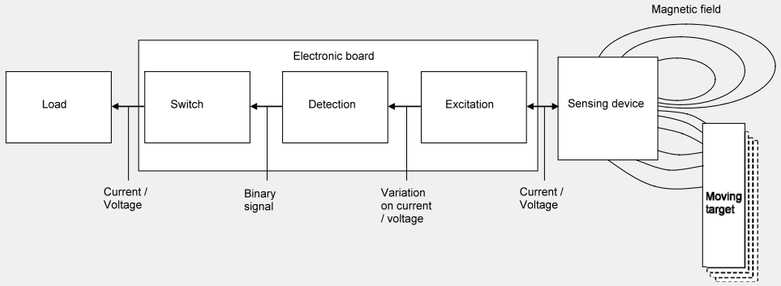


Figure 1 Measurement chain

PRODUCT INTEGRATION

The sensing device and electronic board can be integrated into one product called an active one-piece proximity switch. Such a product can be used in place of mechanical switches to detect parts that have short displacements or when there is little room to install a sensor.

When the usage conditions are harsh and when a very high MTBF is critical, sensing device and electronic board should be separated. The electronic board will be put in a protected area, typically inside a control box within the aircraft fuselage, and linked to the sensing device with two wires. In this case, the product is called two-piece proximity sensor.

KEEP OFF ZONE

Ferromagnetic and / or conductive metallic parts are forbidden between target and sensing face when target is near. More than 25 mm (1 ") of free space must also be left on proximity switch sides and more than 15 mm (0.60 ") behind the sensing face, for nominal detection characteristics.

When target is far away from the sensing face, there is a minimum space in front of the sensing face that has to be kept free from any metallic part to prevent from any change of the detection performance of the switch. The limit of this keep off zone in front of the sensing face is defined by a half-circle of minimum 25 mm (1 ") of radius.

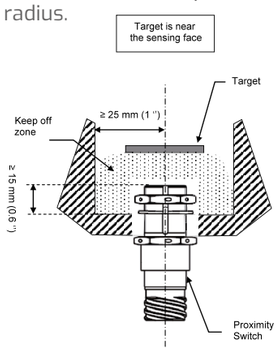


Figure 3 Keep off zone for embeddable switches

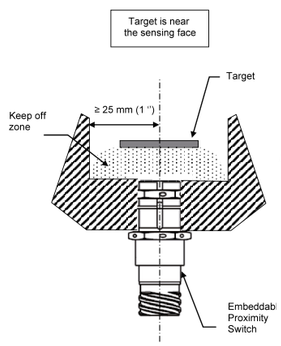


Figure 2 Keep off zone

DETECTION CURVES PRINCIPLE

Detection curves given on Crouzet datasheets are generally plotted according to the X and Z coordinates, i.e. target slide-by movement is along X axis, and gap between sensing face and target is along Z axis, assuming that proximity switch and target centres are aligned according to X-Y axis. for X-Y-Z axis definition, see figure 3. Curves are valid for a specified target, i.e. target material and dimensions.

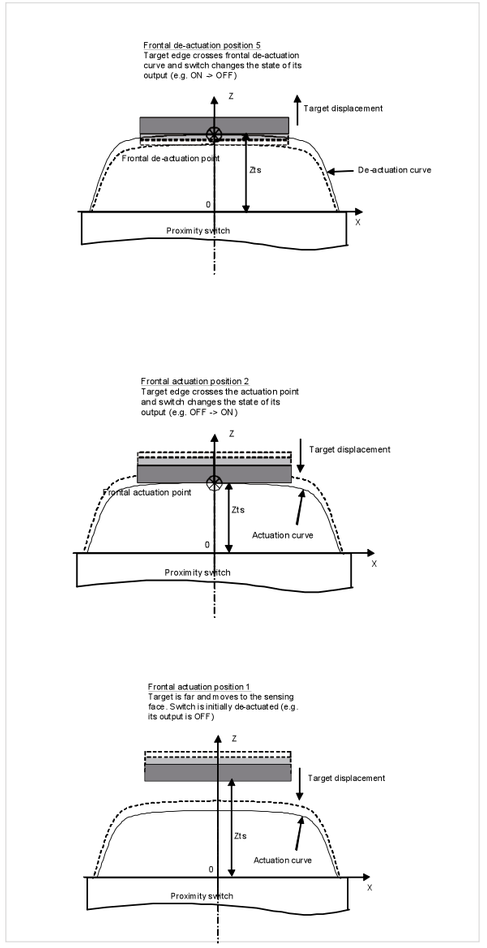


Figure 3 Target head-on actuation – deactuation point

The following sections describe the typical operating of a proximity switch according to simple target movement (slide-by and rotate-by movements), conditions on target positioning and definition, the definition of guaranteed detection curves and working zones, the constraints for target mounting, the electrical connections.

Target head-on approach

For the first "standard" movement, the head-on displacement, target and switch are centred. Target will move along the Z axis. Gap Zts is measured between sensing face of the switch and target side facing the switch.

Let target be FAR away from the sensing face and, in that case, switch de-actuated, e.g. its output being OFF if the switch is Normally Open (NO) and ON if the switch is Normally Closed (NC). When target approaches the sensing face, the switch output turns from OFF to ON (resp. ON to OFF if NC) when the gap is equal to the head-on actuation point. When target continues to approach the sensing face, the switch output remains ON (resp. OFF if NC).

Let target be NEAR to the sensing face and, in that case, switch actuated, e.g. its output state being ON (resp OFF if NC). When target moves away from the sensing face, the switch output turns from ON to OFF (resp OFF to ON if NC) when the gap is equal the head-on deactuation point. When target continues to move away from the sensing face, the switch output remains OFF (resp ON if NC).

There is a slight distance between actuation and deactuation points (for head-on or slide-by movement) which is called hysteresis. This characteristic is, generally, realised intentionally on the electronic board because it prevents random switching of the output of the sensor when target is on the detection curve and submitted to vibrations. This function can also be realised on the remote electronic board of a two piece sensor.

Hysteresis must not be confused with the grey zone. The grey zone is an area delimited by the guaranteed actuation and deactuation curves which take into account the tolerance ranges on the parts and the temperature drift of physical characteristics.

DETECTION PRINCIPLE
FOR PROXIMITY SENSORS AND PROXIMITY SWITCHES

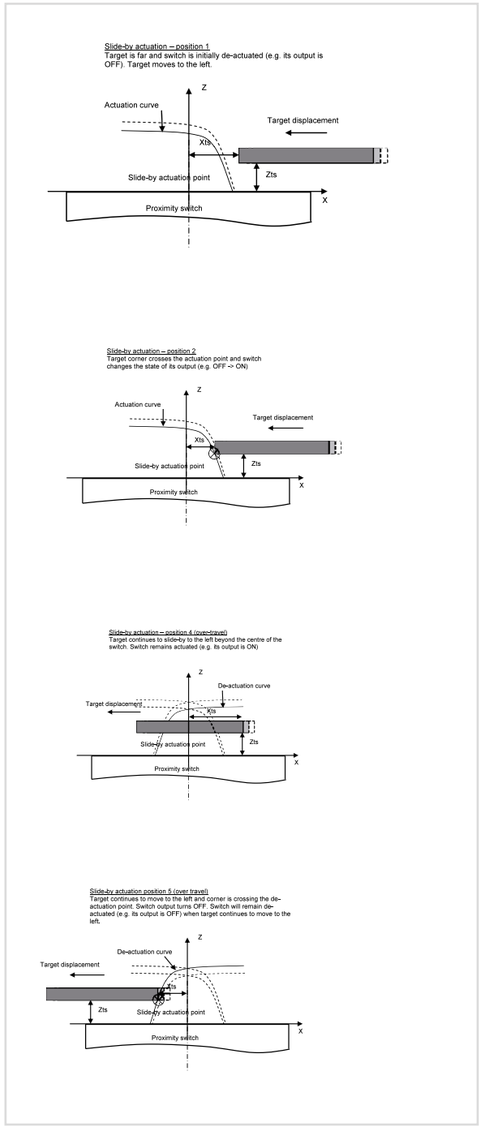


Figure 4 Slide by actuation – deactuation

Target slide-by movement

For the second "standard" movement, the slide-by displacement, target and switch Y axis are aligned, gap Z is predefined and target moves along X axis.

Let target be FAR away from the sensing face and, in that case, switch output state being OFF if switch is Normally Open (resp ON if NC). When target approaches the Z axis, the switch output turns from OFF to ON (resp ON to OFF if NC) when the lateral position is equal to the slide-by actuation point. When target continues to approach the Z axis, the switch output remains ON (resp OFF if NC).

In case of over travel (target centre crosses switch centre and continues to move), new Xts coordinate have to be considered. New Xts is measured between the centre of the switch and the other corner of the target.

Let target be NEAR to the Z axis and, in that case, switch output state being ON (resp OFF if NC). When target moves away from the Z axis, the switch output turns from ON to OFF (resp OFF to ON if NC) when the lateral position is equal the slide-by deactuation point. When target continues to move away from the Z axis, the switch output remains OFF (resp ON if NC).

Notice that, for a circular proximity switch and target, as long as switch front face and target face are parallel and their centres aligned, a target slide-by movement will always generate the same detection curves.

TARGET DEFINITION

In every case, target material and size are predefined on the datasheet.

The target is quite often a thin cylinder. Its diameter has to be sufficient so it will cover all the sensing face at a head-on position. Its thickness should be greater than 1 mm.

The material is generally a ferromagnetic metal. Typically it can be 17-4 PH or 15-5 PH stainless steel.

Other metals can be used, some of them as anti-target.

Target might also be rectangular, square, cylindrical, narrow or tall. It could rotate-by or have a complex movement. Shape and movement of the target will change detection curves. for any particular case, Crouzet can calculate and provide the relative detection curves.

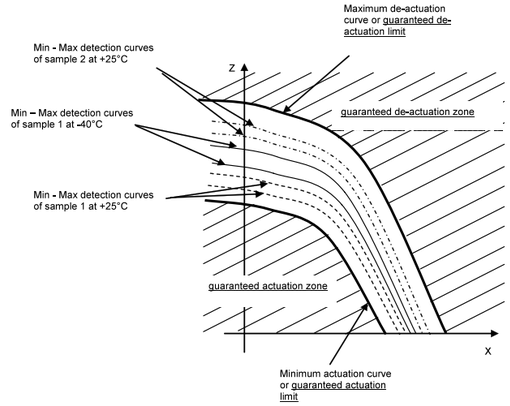


Figure 5 Definition of guaranteed detection curve and zones

GUARANTEED DETECTION CURVES

A proximity switch is a Line Replaceable Unit. to be sure to have the same sensing performance when a switch is replaced by another, a statistic study is made to determine the guaranteed detection curves applicable to any product. Typical actuation and deactuation curves deviate according to parameters of influence such as the tolerance on parts of the product, the temperature drift of the detection characteristics, the performance of the manufacturing process. As shown on the following figure, the cumulating of uncertainties induces larger distances between guaranteed actuation and deactuation points than for the typical curves. However the detection curves of a switch will always be inside the guaranteed curves.

ELECTRICAL OUTPUT CONNECTIONS FOR ONE PIECE SWITCH

Connection of Crouzet one-piece proximity switches can be shielded and twisted 3 wires (supply, ground and output) or 2 wires ("hot" input, ground) cable.

For an efficient EMI protection, back-shell termination must be shielded over 360 °. Pigtail termination should be avoided.Also available are proximity switches which have two or three electrically isolated outputs.

Three wires connections

For the 3 wires configuration, the load can be connected between supply and output (sinking) or between output and ground (sourcing).

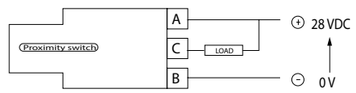


Figure 7 Load sinking (NPN)

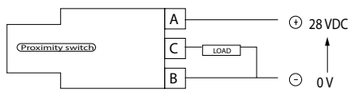


Figure 8 Load sourcing (PNP)

Two wires connection

For the 2 wires configuration, the "hot" input has two functions: first it provides the power supply to the PCB and second it controls the current through the load connected in series between the network and the "hot" input.

ELECTRICAL OUTPUT CONNECTIONS FOR A TWO PIECES SENSOR

Connection between sensing device and electronic board has to be done with a twisted pair cable. for harsh EMI environment, the cable should be shielded.
For an efficient EMI protection, back-shell termination must be shielded over 360 °. Pigtail termination should be avoided.

PROXIMITY SENSOR

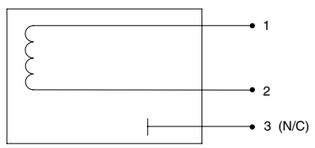
RECTANGULAR PASSIVE SENSOR FOR DOORS FUNCTION

Specifications

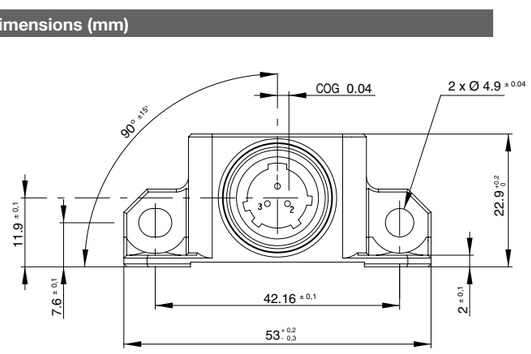
Part numbers **DPI798016**

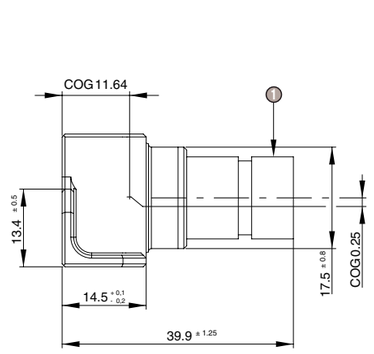
Environment characteristics	
Full metal hermetically sealed housing	
Housing body material	AISI316L
Connector	EN2997-Y1 08 03 PN
Operational temperature domain	-55 °C to +85 °C
Dielectric strength	< 1 mA @ 1 500 V rms
Mass	≤ 65 g

Principles

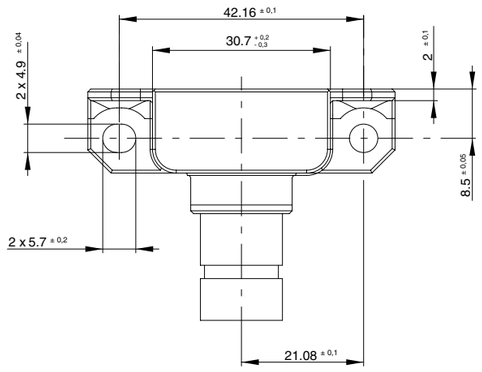


Dimensions (mm)





3 pin connector



NOTES

PROXIMITY SENSOR

ROUND PASSIVE SENSOR FOR LANDING GEAR FUNCTION

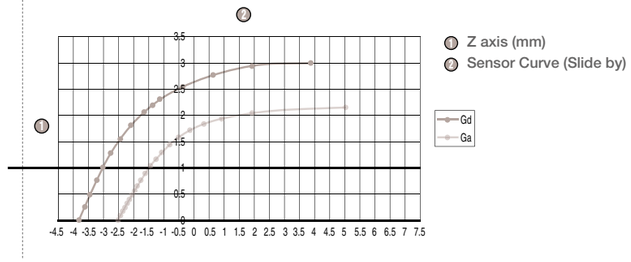
Specifications

Part numbers **DPI798015**

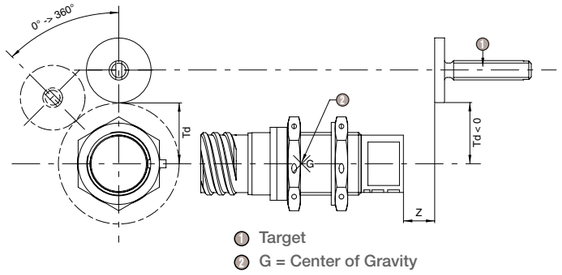
Environment characteristics	
Operational explanations and conditions of use	C.CT.SAV.00056.GB
Environmental condition according to	DR72694
Proximity sensor mass	≤ 50 g
Housing body material	ASTM A838 alloy 2 ferritic stainless steel
Housing front face material	AISI 316L
Connector	D38999/25YA98PN matches with plug D38999/26KA98SN
Operational temperature	-55 °C to +70 °C
Survival temperature	-55 °C to +85 °C
Inductances defined @ 1 000 ±10 Hz 20 mA ±0.2 mA	
Inductance for target near	>24.53 mH @ Ga = 0.085 in (2.159 mm) at room temperature (25 °C)
Inductance for target far	<23.64 mH @ Gd = 0.12 in (3.048 mm) at room temperature (25 °C)
Inductance for target near	>24.23 mH @ Ga = 0.085 in, within operational temperature limit
Inductance for target far	<23.84 mH @ Gd = 0.12 in, within operational temperature limit
DC coil resistance at room temperature	70 Ω < R < 90 Ω
DC coil resistance within operational temperature limits	40 Ω < R < 120 Ω
ATP reference	C.CT.DCO.05761.GB
Insulation resistance	>100 MΩ @ 500 VDC
Dielectric strength	1 500 V rms , 1 mA
Bonding	2.5 mΩ

Principles

Actuation curves
Curves are guaranted when «keep off» requirement is met.
Other cases with metal in vicinity are to be specifically studied and validated by Crouzet.

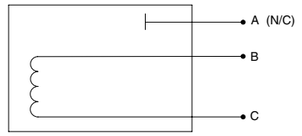


1. Z axis (mm)
2. Sensor Curve (Slide by)



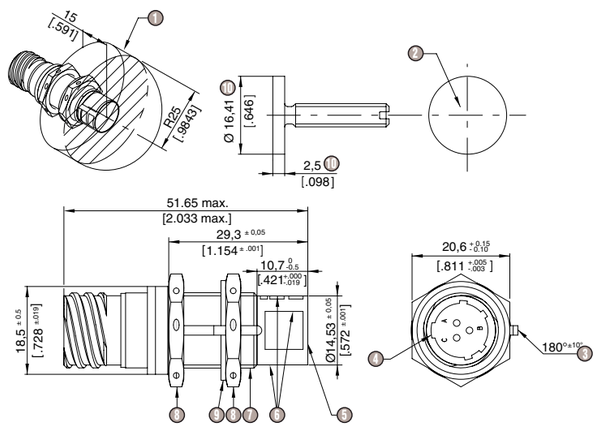
1. Target
2. G = Center of Gravity

Cables and wiring
Shielded twisted pair AWG 22
Wiring external to fuselage must have 360° shield bond



Td axis (mm)		
	Guaranted actuation gap (Ga)	Actuation curves
Z mm	Td (mm)	Td (mm)
0	-2.49	-3.81
0.508	-2.06	-3.48
1.016	-1.47	-3.02
1.524	-0.48	-2.44
1.651	-0.13	
1.778	0.33	-2.08
1.905	0.91	
2.032	1.93	-1.65
2.159	5.08	-1.37
2.159	6.35	
2.286		-1.12
2.54		-0.43
2.794		0.64
2.921		1.91
3.048		3.81
3.048		6.35

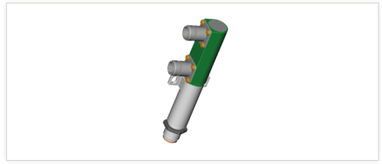
Dimensions (mm)



1. Room free of metal exclusivly target
2. Laser marking
3. Washer nose aligned with master keyway 180°±10°
4. Master keyway
5. Sensing surface
6. Marking according to drawing: MA84798015
7. Thread 0.625-24 UNEF-2A
8. Nut MS21340-05 or Crouzet nut 79238608 tightening torque 70.8 Lb in / 8 Nm Max.
9. Washer key MS25081-C6 or Crouzet washer 70515367
10. Dimension critical for actuation / deactuation curves

CUSTOMIZED PRODUCTS

PROXIMITY SWITCH
FOR THRUST REVERSER ACTUATOR FUNCTION



Specifications

Part numbers **DPI799121**

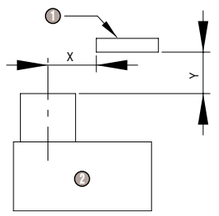
Environment characteristics

Conditions		RTCA/DO-160D Section	Category
Temperature	-55 °C to +125 °C	4	F3
Temperature variation		5	A
Altitude	-2 000 to 41 000 feet	4	D3
Humidity		6	C
Waterproofness		10	R
Salt spray		14.0	S
Sand & Dust		12	D
Vibration		8	Curve W/3000 Hz
Shocks		7	A Except with 3 shocks of 6 G in each direction on each axis
Hermeticity	MILPRF8805E Watertight		
Supply voltage		16	A
Voltage spike		17	A
EMI	Conducted susceptibility	18	A
	Induced signal susceptibility	19	Z
	HIRF	20/20-5	Cat V
	Emission of radio frequency energy	21	H
Explosion proof		9.0	Environment 11
Fluids susceptibility	SKYDROL	11.0	F
Fungus		13.0	F
Magnetic effects		-	N/A
Lightning indirect effect	Pin injection	22	Power: L4 waveform 5A Signal: L3 waveform 4
Sustained acceleration		7	Procedure type R
Electrostatic discharge		25	H

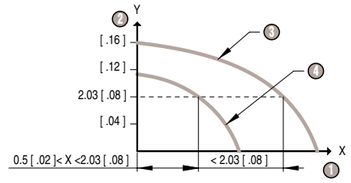
Electrical characteristics

Function	Normaly open
	When target is far, the output is not conductive
	When target is near, the output is conductive
Temperature	Operating: -55 °C, +125 °C
	Storage: -65 °C, +125 °C
Detection	Target: 19.05mm (0.75 IN) diameter 1.78mm (0.07 IN) thickness material 15-5 PH
	Slide by detection for a gap = 2.03 mm (0.08 IN)
	Differential travel: 1.02 mm max (0.04 IN)
	Shift actuation and deactuation point (temperature and supply variations): 0.51 mm (0.02 IN)
Supply voltage	16 V Min., 32.5 V Max., 28 VDC per MIL-STD-704
Max. Consumption current	10 mA Max. under 32.5 V
Output voltage	8 VDC Min., 32.5 VDC Max.
Output leakage voltage (target near)	1.5 V Max. under 25 mA
Output leakage current (target far)	100 µA Max.
Output current max. 25 mA	Resistive or Inductive Maximum switching frequency: 50 Hz
Protections	Against inversion supply polarity and output polarity with load
	Against permanent short circuit of the load
Dielectric test	ISO 2678 Category C
	Dielectric strenght: 750 VAC/50 Hz - 1 min - 1 000 µA
	Insulation resistance: 100 MΩ/45 VDC
	Bonding resistance between connector and housing: 2.5 mΩ max
Mtbf	100 000 flight hours
Endurance	80 000 cycles at max load (50 mA)
Weight	250 g max (0.55 pounds)

Principles

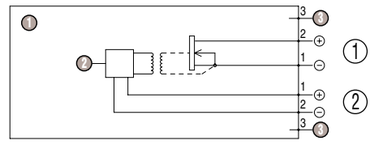


1. Target
2. IPD



1. Distance from Ref axis
2. Distance from sensing face
3. Guaranteed deactuation
4. Guaranteed actuation

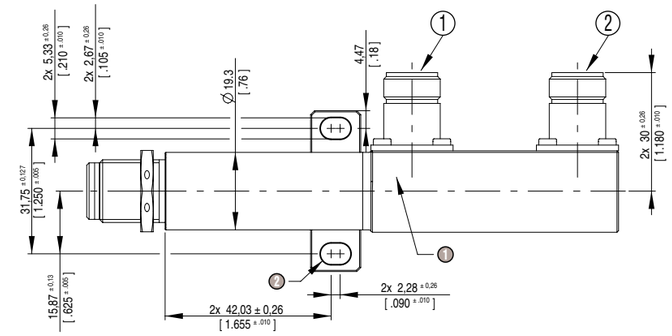
Connection

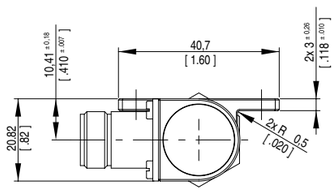


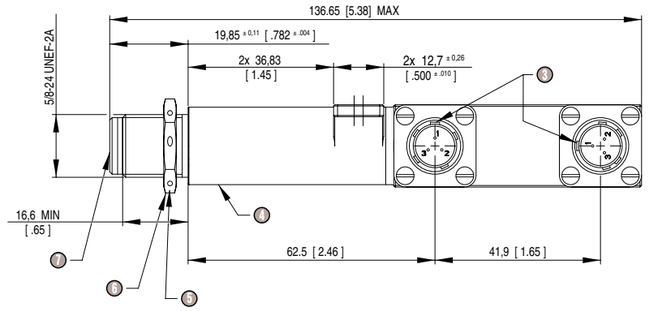
1. Proximity switch
2. Detection
3. Not connected

① EN2997 - Y00803M9 signal
② EN2997 - Y00803MN power

Dimensions (mm)







1. Laser or electrochemicaly etch
2. 4x R Full
3. Master key as shown ± 12°
4. Stainless steel body
5. Value torque 170 to 190 in-lbs
6. Stainless steel nut equivalent to MS21340-05
7. Plastic front face

CUSTOMIZED PRODUCTS

PROXIMITY SWITCH

ALL METAL FOR THRUST REVERSER ACTUATOR FUNCTION

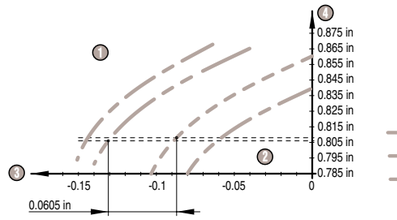
Specifications

Part numbers **DPI799184**

Environment characteristics	
Operating temperature	-65 °F to +185 °F (-55 °C to +85 °C)
Storage temperature	-65 °F to +160 °F (-55 °C to +71 °C)
Short time operating temperature	+240 °F (+116 °C) / 10 mn
Altitude	RTCA DO-160D Section 4.6.1 Category D3
Humidity	RTCA DO-160D Section 6 Category C
Vibration	Section 2.1 per Figure 6-1 and Figure 7-17
Acceleration	Section 4.1 Zone 9 except with 8 G's In any axis
Explosive atmosphere	RTCA DO-160D Section 9 Category H
Waterproofness	RTCA DO-160D Section 10 Category S
Fluid susceptibility	Resistant to MIL-L-7808 & MIL-L-23699
Sand & Dust	RTCA DO-160D Section 12 Category D
Fungus	RTCA DO-160D Section 13 Category F
Salt spray	RTCA DO-160D Section 14 Category S
Icing	RTCA DO-160D Section 24 Category A
Material	Stainless steel including front face
Tightening torque	88 in.Lb (10 Nm) Max.
Weight	3 oz (85 g) Max.
Mtbf	400 000 Fh

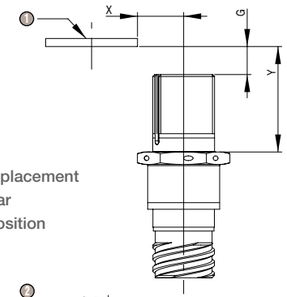
Electrical characteristics	
Supply	15 VDC ±10%
Maximum voltage	16.5 VDC
Magnetic effect	RTCA DO-160D Section 15 Category A
Voltage spike	RTCA DO-160D Section 17 Category A
Electromagnetic emmissions	Section 8 Category 4
Electromagnetic susceptibility	Section 7 Category 4
HIRF	RTCA DO-160D Category R
Lightning effects	Section 7.4 Level L2
Electrical continuity	2.5 mΩ Max. between case and connector
Leakage current	50 µA Max. at 16.5 VDC
Switching response time (Ton & Toff)	5 ms Max.
Switching frequency	100 Hz Max.
Insulation resistance	100 MΩ / 500 VDC
Dielectric strength	1 000 VAC / 50 Hz / 1 mA
Protection against	Polarity inversion and load short circuit

Principles



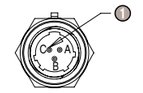
1. Guaranteed deactuation aera
2. Guaranteed actuation aera
3. Position X (inch)
4. Position Y (inch)

Max. deactuation & Min. actuation for a batch
Typical deactuation for a product
Typical actuation for a product



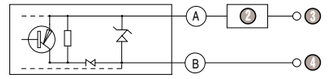
1. Target
2. Target displacement
3. Target near
4. Groove position
5. Target far

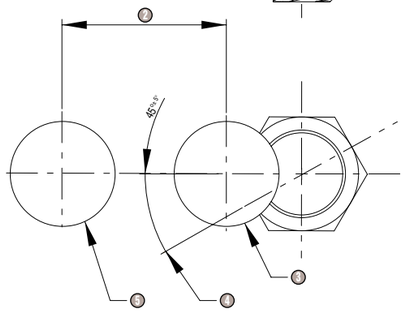
Connection



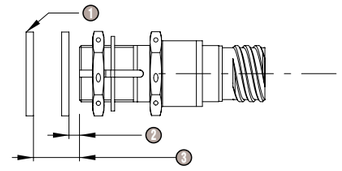
1. Pin C not connected internally
2. Load
3. Positive node
4. Negative node

Wiring diagram

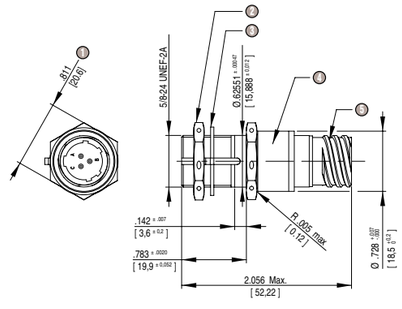




1. Target (not delivered with proximity switch)
2. Actuation
3. Deactuation



Dimensions (mm)



1. On flats
2. Stainless steel nut MS 21340-05 or equivalent
3. Stainless steel lock washer MS 25081-C6 or equivalent
4. Electrochemicaly etch or laser marking
5. Connector D38999/25YA98PN to mate with D38999-26KA98SN

CUSTOMIZED PRODUCTS

PROXIMITY SWITCH
FOR LANDING GEAR FUNCTION

Specifications

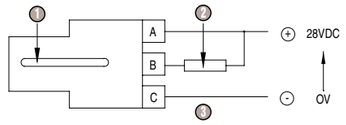
Part numbers **DPI799153**

Environment characteristics		
Condition	**RTCA/DO-160E Section**	**Category**
Temperature & altitude	4	D2 & 4.6.1
Temperature variation	5	A
Humidity	6	C
Waterproofness	10	S
Icing	24	B
Salt spray	14	T & 14.3.6.7
Sand & Dust	12	S 12.4 & 12.5
Vibration	8	R & H Curves E, E1 & P
Shocks	7	7.2
Fungus	13	F
Fluids susceptibility	11	F
Power input supply DC	16	B
Voltage spikes	17	A
Magnetic effects	15	A
Radio frequency susceptibility	20	A & F
Lightning induced transient susceptibility	22	A4G44
Conduced susceptibility audio frequency	18	Z
Induced signal susceptibility	19	ZC
Emission of radio frequency energy	21	H
Electrostatic discharge	25	A
Crash safety shock	7	7.3.1 & 7.3.3

Electrical characteristics	
Temperature operating	-55°C to +95°C
Temperature survival	-61°C to +95°C
Supply Min.	16 V
Supply Max.	32.5 V
Current consumption	10 mA Max. under 32.5 V
Leak voltage	1 VDC under 250 mA
Leakage current	50 mA Max.
Max. Load	250 mA Resistive, 125 mA Inductive, 40 mA Lamp
Electrical continuity	< 2.5 mΩ
Dielectric strenght	1 000 VDC/1 mA
Insulation resistance	100 MΩ/45 VDC
Protections	Against inversion of polarity Against permanent short circuit of the load
Switching frequency	50 Hz Max.
Power on reset time	Tp ≤ 15 ms
Weight	45 g Max. without nuts & washer
Tightening torque	20 Nm Max. (176 in.Lb)
Connector to wrenching flats torsional load	5 Nm Max. (44 in.Lb)

Principles

Connection

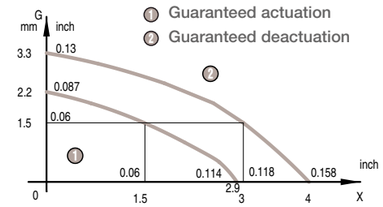


1. Proximity Switch
2. Load
3. Output: NPN type

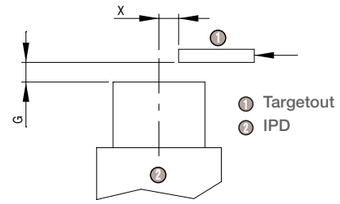
Detection characteristics

Target: ferro magnetic material
(ex: 17.4 PH annealed)
Ø 0.625 in (15.87 mm) thickness ≥ 1 mm

Frontal approach	Operating-Temperature	-55°C to +95°C
Target approaching	Minimum actuation	0.12 (3.05 mm)
Target receding	Maximum actuation	0.16 (4.06 mm)
	Maximum Hysteresis	0.015 (0.38 mm)

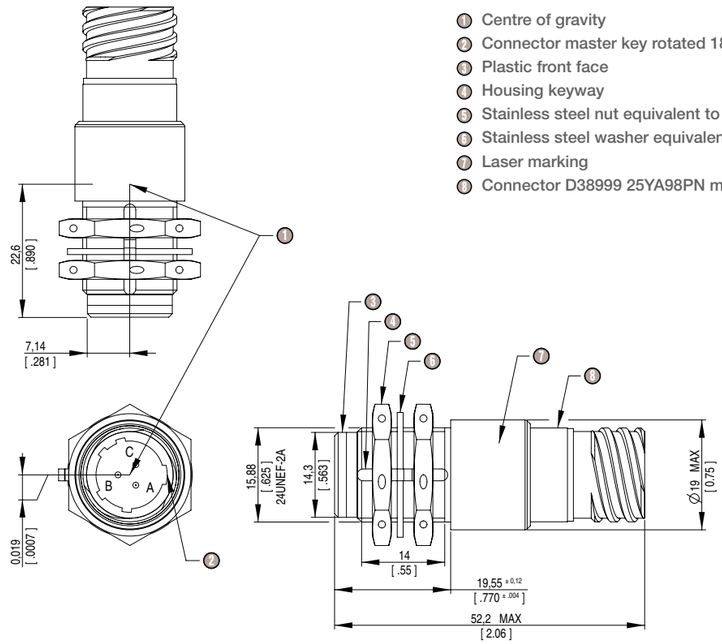


1. Guaranteed actuation
2. Guaranteed deactuation



1. Targetout
2. IPD

Dimensions (mm)



1. Centre of gravity
2. Connector master key rotated 180 ±5° from housing keyway
3. Plastic front face
4. Housing keyway
5. Stainless steel nut equivalent to MS21340-05
6. Stainless steel washer equivalent to MS25081-C6
7. Laser marking
8. Connector D38999 25YA98PN mates with D38999 26JA98SN

CUSTOMIZED PRODUCTS

PROXIMITY SWITCH
ALL METAL FOR LANDING GEAR FUNCTION

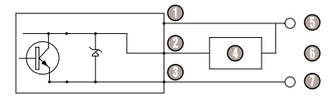
Specifications

Part numbers **DPI799118**

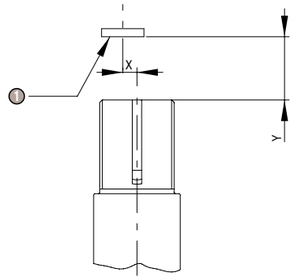
Environment characteristics	
Operating temperature	-55 °C to +75 °C
Survival temperature	-55 °C to +85 °C
Altitude	RTCA DO 160D Section 4 Category F2 (Max. Operating altitude 51 000 ft)
Overpressure	RTCA DO 160D Section 4 (absolute pressure 180 Kpa)
Temperature variation	RTCA DO 160D Section 5 Category B
Shocks & Crash safety	RTCA DO 160D Section 7 § 7.2 & § 7.3
Humidity	RTCA DO 160D Section 6 Category B
Sand and Dust	RTCA DO 160D Section 12 Category D
Fungus	RTCA DO 160D Section 13 Category F
Salt spray	RTCA DO 160D Section 14 Category S
Waterproofness	RTCA DO 160D Section 10 Category W
Vibrations	RTCA DO 160D Section 8 Category S (Curve E)
Material	Stainless steel including front face
Weight	70 g Max. (2.5 Oz)
M T B F	400 000 H

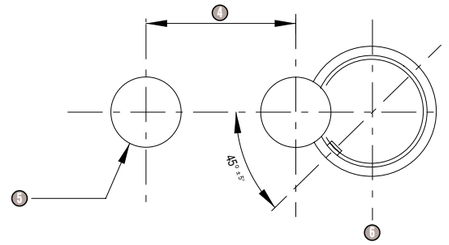
Electrical characteristics	
Supply	+28 VDC
Minimum voltage	17 VDC
Maximum voltage	32.5 VDC
Power input test	RTCA DO 160D Section 16 Category Z
Magnetic effect	RTCA DO 160D Section 15 Category A
Voltage spike	RTCA DO 160C Section 17 Category A
Audio frequency conducted susceptibility	RTCA DO 160D Section 18 Category Z
Audio frequency conducted audio frequency conducted	RTCA DO 160D Section 19 Category A
Radio frequency susceptibility (conducted & radiated)	RTCA DO 160D Section. 20 Category R
Emission of radio frequency energy	RTCA DO 160D Section. 21 Category M
Induced lightning strike protection	RTCA DO 160D Section. 22 Level 2
Current consumption	10 mA Maximum under 32.5 VDC
Leak voltage	1.5 VDC Maximum under 100 mA
Load current	100 mA Maximum
Switching response time (Ton and Toff)	2 ms Maximum
Switching frequency	100 Hz Maximum
Insulation resistance	100 MΩ /50 VDC
Dielectric strength	500 VDC/1 mn/ 1 mA
Protection against	Polarity inversion and load short circuit

Principles

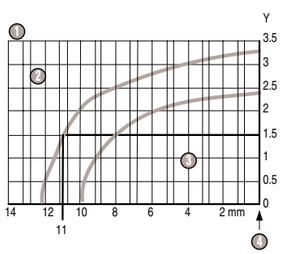


1. Red
2. White
3. Black
4. LOAD
5. Positive node
6. Power supply
7. Negative node

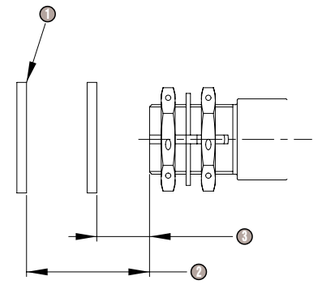




1. Target
2. Deactuation
3. Actuation
4. Target displacement
5. Target far
6. Groove position

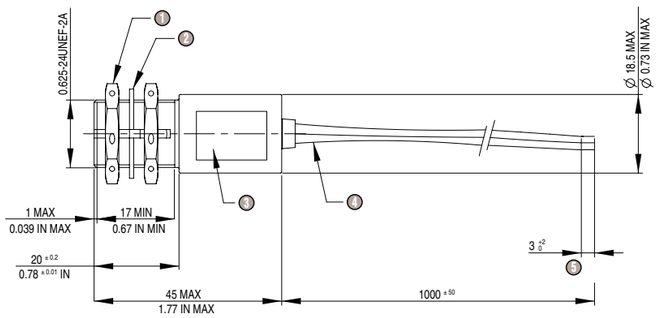


1. Slide Detection
2. Deactuation area
3. Actuation area
4. IPD axis



From -55 °C to +75 °C	
Guaranted actuation	Y= 2.30 mm mini (X=0)
Guaranted slide deactuation	X= 11 mm maxi (Y=1.5 mm)

Dimensions (mm)



1. 2 Stainless nuts MS 21340-05
2. Stainless steel lock washer interchangeable with MS 25081-C6
3. Electro etching marking
4. 3 wires MIL-W-22759/16 AWG 22
5. Stripped and tinned

CUSTOMIZED PRODUCTS

PROXIMITY SWITCH
HIGH PRESSURE FOR WIND TURBINE FUNCTION

Specifications

Part numbers **DPI799061**

Environment characteristics

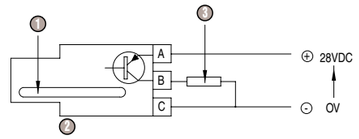
Condition	A BD 0007 Section	A BD 0007 Category	RTCA/DO-160C Section	RTCA/DO-160C Category
Temperature	3.2	A2	4	A2
Altitude	3.3	43.100 ft -1 000 ft	4	D2
Humidity	3.4	B	6	B
Waterproofness	3.5	R	10	R
Icing	3.6			
Salt spray	3.7	S	14.3.6.6	S
Sand and Dust	3.8	D	12.3	D
Vibration	3.9	3J/C	8	J/C
Shock	3.11.1		7.1/7.2	
Accelerations	3.12	Flight max. Values		
Moisture	3.13	X	13	X
Pollution	3.14	X	11	X A/H
Dielectric strenght	2-3.7			
Power input supply DC	2-3.5		16	
EMI			19	A
Fluids susceptibility	2.3.11.3 to 2.3.11.10			

Electrical characteristics

Temperature Operating	-55 °C to +90 °C
Supply Min.	14 V
Supply Max.	32.5 V
Maximum voltage drop	2 V under 150 mA 3 V under 500 mA
Maximun current	500 mA Resistive or Inductive 50 mA Lamp nominal current
Electrical continuity	Between case and connector < 8 mΩ
Dielectric test	Dielectric strenght 500 VDC Insulation resistance: 400 MΩ /50 Volts
Current consumption	10 mA Max. under 32.5 V
Protections	Against inversion of polarity Against permanent short circuit of the load
Hermeticity	NFC 20631 Test QC Method 2
Pressure on the detection face Hydraulic fluid NSA 307 110	Normal working pressure: 206 $^{+3}$ Bar Test pressure: 313 Bar

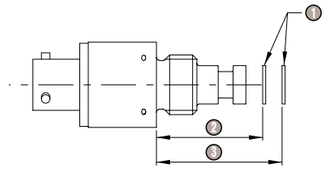
Principles

Function: normally open



1. Proximity Switch
2. Output: PNP Type
3. Load

Frontal approach

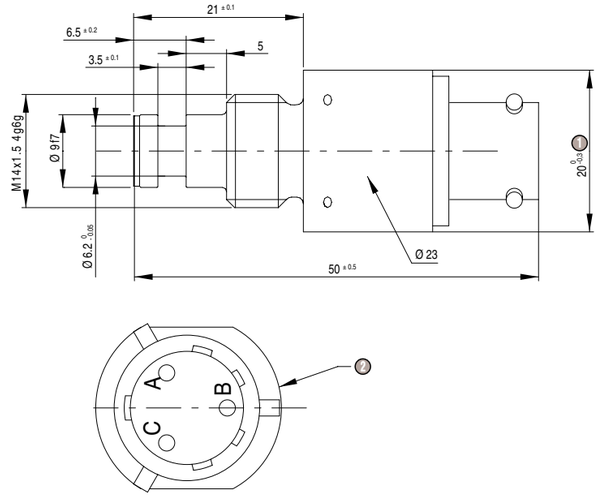


1. Target
2. Actuation
3. Deactuation

Target: 9 mm square ; 1 mm thickness
Mat 1. 4104 (AFNOR Z10CF17)
For other target material /dimension, Ga/Gd may vary.

Temperature	-55°C to +90°C	20 °C
Actuation distance	≥ 21.7 mm	≥ 21.87 mm
Deactuation distance	≤ 22.55 mm	≤ 22.3 mm

Dimensions (mm)



1. Flats
2. Connector type ASN-E0053N8B3PN

CUSTOMIZED PRODUCTS

PROXIMITY SWITCH
HIGH PRESSURE FOR LANDING GEAR FUNCTION

Specifications

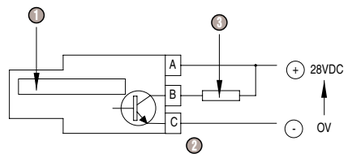
Part numbers **DPI799059**

	Norme MIL STD	Section Method	Procedure
Temperature	810E	501-3&502-3	1 and 2
Altitude-Pressure	810E	500-3	1 and 2
Solar radiation	810E	505-3	1 and 2
Rain	810E	506-3	1 and 3
Ice and Icing rain	810E	521-1	1
Sand and Dust	810E	510-3	1 and 2
Direct effects of lightning	1757A	ZONE 1B	Stationary impact
Vibrations	810E	514-4	1-4-2-2
Accelerations	810E	516-4	4
Load factors	810E	513-4	2
Shocks	810E	516-4	1
Crashes	810E	516-4	5
Fungus	810E	508-4	Cat.1
Conduced susceptibility	MIL STD 461-462	CS01/02/06/07	
Radiated susceptibility	MIL STD 461-462	RS01/02/03	
Conducted emissions	MIL STD 461-462	CE01/02/03/04	
Emitted spikes on power lines	Pr EN2282		
Radiated emission	RTCA D0 160C	15	Cat.Z
	MIL STD 461C	RE01-RE02	
HIRF Radiated susceptibility	MIL STD 462	RS03	
HIRF Conducted susceptibility	RTCA DO 160C	Section 20	Cat.Y
Electrostatic protection	RTCA DO 160D	25	A
Humidity test	810E	507-3	1
Salt atmosphere	810E	509-3	1

Electrical characteristics	
Operating temperature	-54 °C to +120 °C
Operating oil temperature	-54 °C to +135 °C during 4 hours Max.
Supply	14 V Min., 38 V Max.
Leak voltage	2 V under 100 mA
Current Max. 100 mA	Resistive or Inductive
Electrical continuity	Between case and connector < 2.5 mΩ
Dielectric test	Dielectric strenght 500 VDC - 1 mA
	Insulation resistance: 100 MΩ/500 V
Current consumption	15 mA Max. under 14 V
	15 mA Max. under 32.5 V
	15 mA Max. under 38 V
Protections	Against inversion of polarity
	Against permanent short circuit of the load
Pressure on the detection face	Hydraulic fluid MIL H 5606F and MILH 83282C
	Burst pressure: 518 Bar
	Proof pressure: 310 Bar
Connector	Type D38999 25Y A98PN
Box material	Stainless steel
Weight	120 g Max.

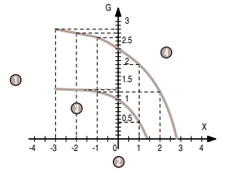
Principles

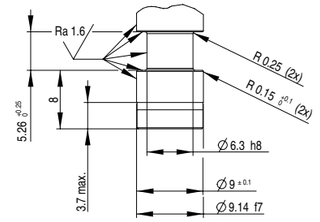
Function: normally open

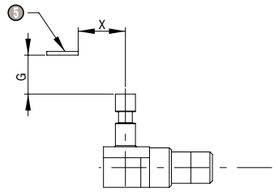


1. Proximity Switch
2. Output: NPN type
4. Load

Slide detection curve

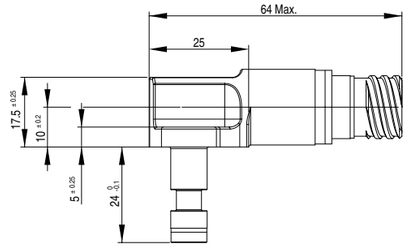


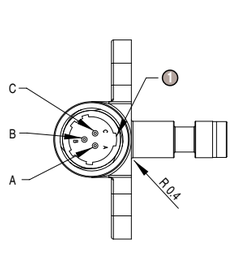


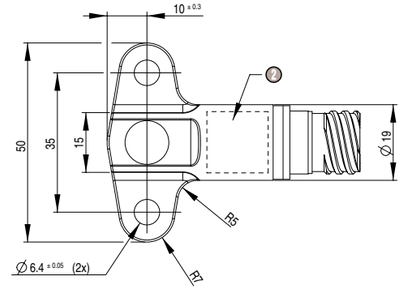


1. Distance from sensor face (mm)
2. Distance from center line (mm)
3. Guaranteed actuation
4. Guaranteed deactuation
5. Target

Dimensions (mm)







1. Master keyway
2. Marking area

CUSTOMIZED PRODUCTS

PROXIMITY SWITCH
FOR CARGO LOADING SYSTEM FUNCTION

Specifications

Part numbers **DPI799074**

Environment characteristics

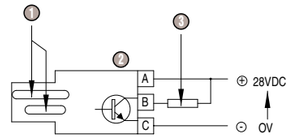
Condition	ABD 100 Section	ABD 100 Category	RTCA/DO-160D Section	RTCA/DO-160D Category
Temperature	1.2.1.1	A2	4	A2
Altitude	1.2.1.2	43 100 ft -1 000 ft	4	A2
Humidity	1.2.1.4	A	6	A
Waterproofness	1.8		10	R
Icing	1.2.1.15		24	A
Salt spray	1.2.1.12		14	S
Sand and Dust	1.2.1.10		12	D
Vibration	1.2.1.6		8	S
Shocks	1.2.1.5	operational shocks	7	A 6 G/11 ms
Accelerations	1.2.1.20	Flight max. values		
Fungus	1.2.1.11		13	F
Fire class	1.2.1.17	N/A		
Fluids susceptibility	1.2.1.9		11	F
Power input supply DC	1.9		16.5	A
Voltage spikes	1.6		17	A
Magnetic effects	1.2.1.14		15	A
Radio frequency susceptibility	1.2.3.3		20	U
Lightning induced transient susceptibility	1.2		22	C
Conducted susceptibility audio frequency	1.2.3.4.2		18	A
Induced signal susceptibility	1.2.3.4.3		19	Z
Emission of radio frequency energie	1.2.3.4.4		21	L

Electrical characteristics

Temperature	Operating: -40 °C to +70 °C
	Survival: -55 °C to +85 °C
Supply	Min.: 17 V, Max.: 32.5 V
Leak voltage (target near)	0.25 V under 250 mA
Current Max. 250 mA	Resistive or Inductive
Electrical continuity	Between case and connector < 20 mΩ
	Leakage current (target far) ≤ 500 µA under 28 V
Current consumption	8 mA Max. under 28 V
	Switching frequency ≤ 100 Hz
	Insulation resistance ≥ 100 MΩ at 45 VDC
	Dielectric strenght >500 VDC
	Momentary power interruption: <1 ms
	Power on reset: ≤ 5 ms
Protections	Against inversion of polarity
	Against permanent short circuit of the load
Vibration test	IPD is fixed by 2 screws

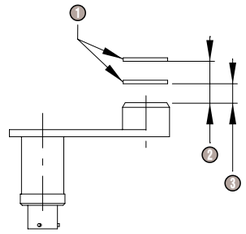
Principles

Function: normally open



① Proximity Switch
② Output: NPN type
③ Load

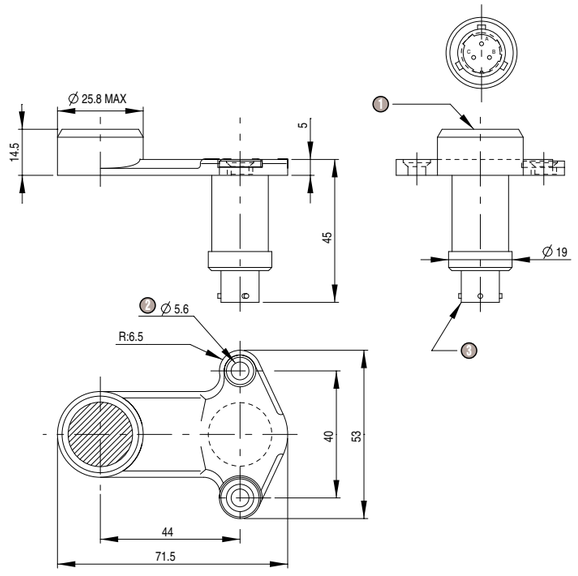
Detection characteristics



① Target
② Deactuation
③ Actuation

Temperature	-40 °C to +70 °C
Actuation distance	5 mm mini
Deactuation distance	7 mm maxi

Dimensions (mm)



① Detecting face
② 2 holes
③ Connector type ASN-E0053N8B3PN

CUSTOMIZED PRODUCTS

PROXIMITY SWITCH
FOR CARGO LOADING SYSTEM FUNCTION

Specifications

Part numbers **DPI799116**

Environment characteristics

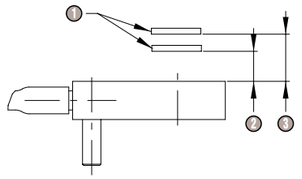
Condition	ABD 100 Section	ABD 100 Category	RTCA/DO-160D Section	RTCA/DO-160D Category
Temperature	1.2.1.1	A2	4	A2
Altitude	1.2.1.2	-1 000 ft +43 100 ft	4	A2
Humidity	1.2.1.4	A	6	A
Waterproofness	1.8		10	R
Icing	1.2.1.15		24	A
Salt spray	1.2.1.12		14	S
Sand and Dust	1.2.1.10		12	D
Vibration	1.2.1.6		8	S
Shocks	1.2.1.5	Operational shocks	7	A 6 G/11 ms
Accelerations	1.2.1.20	Flight max. values		
Fungus	1.2.1.11		13	F
Fire class	1.2.1.17	N/A		
Fluids susceptibility	1.2.1.9		11	F
Power input supply DC	1.9		16.5	A
Voltage spikes	1.6		17	A
Magnetic effects	1.2.1.14		15	A
Radio frequency susceptibility	1.2.3.3		20	U
Lightning induced transient susceptibility	1.2		22	C
Conducted susceptibility audio frequency	1.2.3.4.2		18	A
Induced signal susceptibility	1.2.3.4.3		19	Z
Emission of radio frequency energie	1.2.3.4.4		21	L

Electrical characteristics

Temperature	Operating: -40 °C to +70 °C
	Survival: -55 °C to +85 °C
Supply	Min.: 17 V, Max.: 32.5 V
Leak voltage (target near)	1 VDC Max. under 25 mA
Output max current	25 mA resistive or inductive load
Maximum Capacitor load	22 nF
Electrical continuity	Between case and connector 20 mΩ Max.
Leakage current	500 µA Max. under 28 VDC
Current consumption	10 mA Max. under 32.5 VDC
Switching frequency	100 Hz Max.
Insulation resistance	100 MΩ Min. at 45 VDC
Dielectric strenght	>500 VDC
Momentary power interruption	1 ms Max.
Power and reset	5 ms Max.
Protections	Against inversion of polarity
	Against permanent short circuit of the load
Weight	100 g Max.
Material case	Aluminium protected

Principles

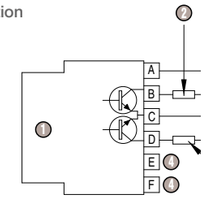
Detection characteristics



1. Target
2. Actuation
3. Deactuation

Temperature	-40 °C to +70 °C
Actuation distance	4 mm Min.
Deactuation distance	6 mm Max.

Connection

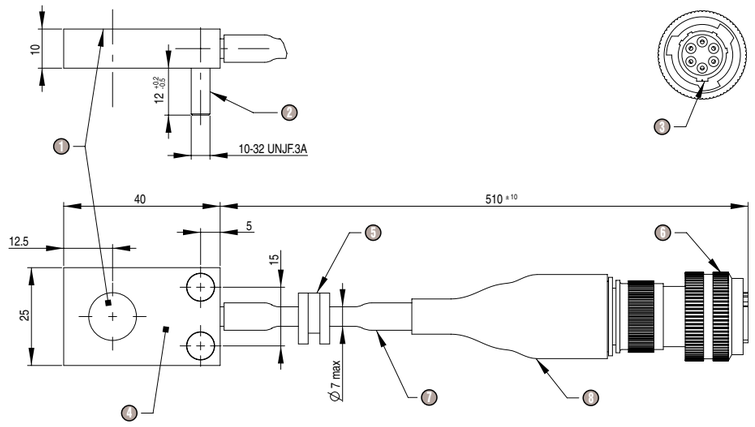


1. Proximity Switch
2. Load 1
3. Load 2

Situation	Output 1 Pin B	Output 2 Pin D
Target detected	High	Low
Target not detected	Low	High
Incorrect	Low	Low
Incorrect	High	High

Proximity switch must be connected with AWG24 minimum shielded twisted wires (EMI).

Dimensions (mm)



1. Sensing face
2. Nickel plated steel
3. Master key
4. Marking
5. Moveable grommet
6. Plug ASN-E0052010B6PN
7. Shielded cable
8. Protected boot

CUSTOMIZED PRODUCTS

PROXIMITY SWITCH
FOR LANDING GEAR FUNCTION

Specifications

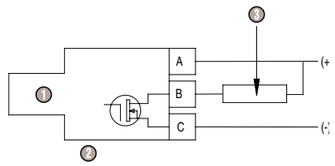
Part numbers **DPI799238**

Mechanical characteristics	
Weight	145 ±10 g
Housing	Stainless steel Front face: peek (Arlon 1000)

Electrical characteristics	
Hysteresis ≤ 1.5 mm	for D ≤ 1.6 mm: the detector will always be in detection mode
	for D ≥ 3.1 mm: the detector will always be in non detection mode

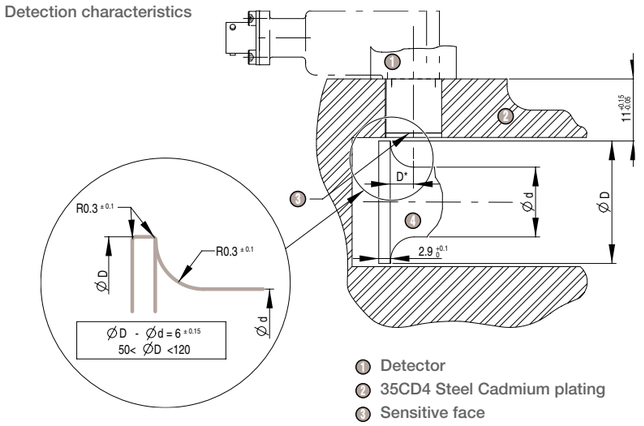
Principles

Detection characteristics



1. Detector
2. Output type: NPN
3. Load

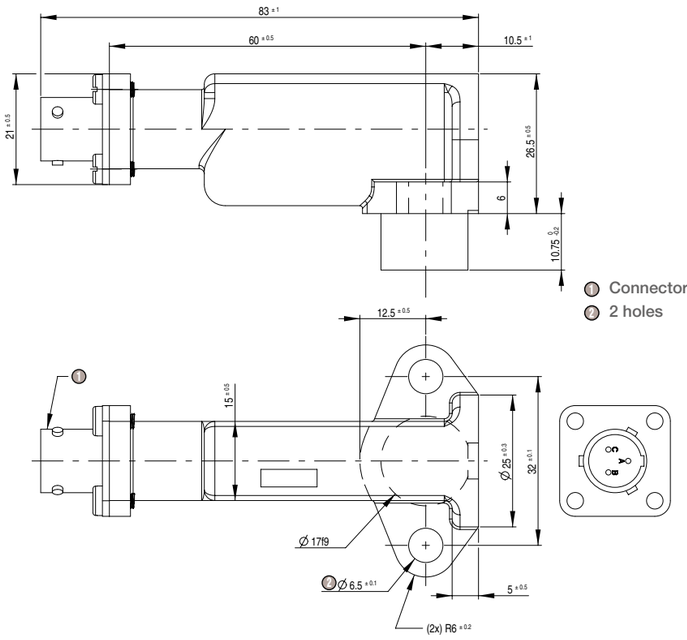
Detection characteristics



1. Detector
2. 35CD4 Steel Cadmium plating
3. Sensitive face
4. 35CD4 Cadmium plating

* Please refer to Electrical characteristics & Hysteresis P.76

Dimensions (mm)



1. Connector MS3112E 8-33P following MIL-C-26482 I Serie
2. 2 holes

CUSTOMIZED PRODUCTS

PROXIMITY SWITCH
FOR THRUST REVERSER ACTUATOR FUNCTION

Specifications

Part numbers **DPI799079**

Environment characteristics

Condition	RTCA/DO-160D Section	Category
Temperature	4	F3
Temperature variation	5	A
Altitude	4	F3
Humidity	6	B
Waterproofness	10	R
Salt spray	14.0	S
Sand and Dust		N/A
Vibration	8	H2 Curve D and P
Operation shock and Crash safety	7.2/7.3	B
Hermeticity MILPRF8805E watertight		
Supply voltage	16	A
Voltage spike	17	A
EMI – Conducted susceptibility	18	Z
EMI – Induced signal susceptibility	19	Z
EMI – Radio frequency susceptibility	20	Conducted W
EMI – Emission of radio frequency energy	21	H
Explosion proof	9.0	E1
Fluid susceptibility	11.0	F
Fungus	13.0	F
Magnetic effects		N/A
Lighting indirect effect	22	Waveform Set A Level 4
Icing	24	C
Lighting direct effect		N/A
Electrostatic discharge	25	15 kV

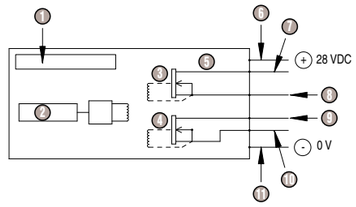
Electrical characteristics

Temperature	Operating storage and survival: -55 °C to +121 °C
Supply voltage	16 V Min., 32.5 V Max.
Max. Consumption current	15 mA Max. under 32.5 V
Output voltage	8 VDC Min., 32.5 VDC Max.
Output leakage voltage (On)	1 V Max. under 50 mA
Output leakage current (Off)	100 µA Max.
Output current Max. 100 mA	Resistive or Inductive
Maximum switching frequency	50 Hz
Protections	Against inversion supply polarity and output polarity with load
	Against permanent short circuit of the load
Shock resistance	100 G/11 ms
Dielectric test ISO 2678 Categorie C	Dielectric strenght: 1 000 VAC - 1 Min. - 500 µA
	Insulation resistance: 100 MΩ/500 VDC
MTBF	= 115 000 flight hours

Principles

Function: normally open

- when target is far , the output is not conductive
- when target is near , the output is conductive

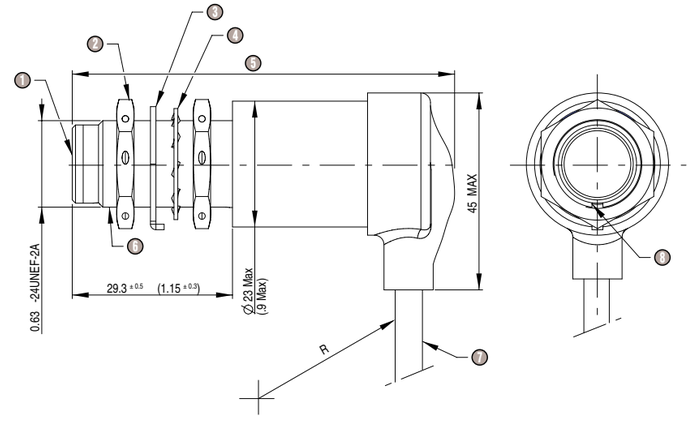


1. Proximity switch
2. Detection
3. Out 1
4. Out 2
5. MOS N
6. White
7. Orange
8. Green
9. Red
10. Black
11. Blue

Detection characteristics

- From -55 °C to +121 °C (-65 °F to +250 °F)
- Frontal approach
- Target: 15.87 mm (0.625 in) square; 1 mm (0.04 in) thickness material 15-5 PH
- Actuation distance 0.1 < Ad < 0.14 in or 2.5 < Ad < 3.55 mm
- Deactuation distance 0.145 < Dad < 0.18 in or 3.68 < Dad < 4.57 mm

Dimensions (mm)



1. Sensing face material flush and plastic
2. Nut MS21340-05
3. Lock washer MS25081-C5
4. Lock washer MS35333-138
5. 80 Max. in the Proximity Switch axis
6. Keyway
7. Shielded cable
8. Keyway

CUSTOMIZED PRODUCTS

PROXIMITY SWITCH
FOR THRUST REVERSER ACTUATOR FUNCTION

Specifications

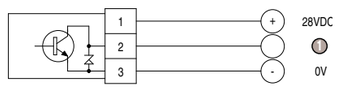
Part numbers **DPI799339**

Environment characteristics	
Temperature	RTCA DO 160C
Operating temperature	-65 °F to +250 °F
Survival temperature	-80 °F to +250 °F
Materials	AISI 303 (Z10 CNF 18 09)
Humidity and Ice	MIL std 810E Method 507-2 procedure III
Salt spray	MIL std 810E Method 509-2
Fungus	MIL Std 810E Method 508-3
Sand and Dust	MIL Std 810E Method 510-2 Procedure I
Structural vibration	0.036 in D.A. 10-52 Hz 10 G Constant 52-1 400 Hz 20 G Constant 1 400-2 000 Hz
Shocks	MIL Std 810E Method 516-4 Procedure I 20 G/10 ms
Weight	0.19 Lb Max. (85 g Max. without nut)
Tightening torque	22.7 Nm Max. (200 inch/Pd)
Connector to wrenching flats torsional load	13 Nm Max. (115 inch/Pd)

Electrical characteristics	
Supply	MIL Std 704D
Minimum voltage	16 V DC
Maximum voltage	32.5 V DC
Voltage transients	MIL Std 704D
Anti interference	MIL Std 704D
Max. Short circuit resistance (Output On)	40 Ω under 10 mA
Switching current	20 mA Max.
Open circuit voltage	6 V Max.
Open circuit leakage current	< 25 µA under 5 V DC
Electrical continuity	< 10 mΩ between case and connector
Consumption	< 10 mA without load under 32 V < 5 mA without load under 16 V
Switching frequency	≤ 250 Hz
Insulation resistance	≥ 40 MΩ at 500 V DC
Insulation voltage	>1 500 V AC/1 min.
Lightning protection	PS 966903 Fig. 4-3-12 V Peak 600 V/6 Ω
Protections	Overload and load short circuit

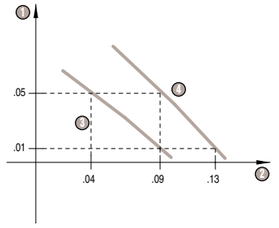
Principles

Function: normally open

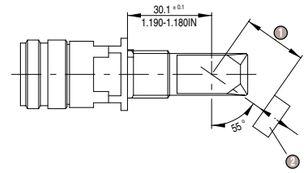


① Out

Slide detection curve
For a gap between target and front face (metal body) = 0.01 to 0.05 inch

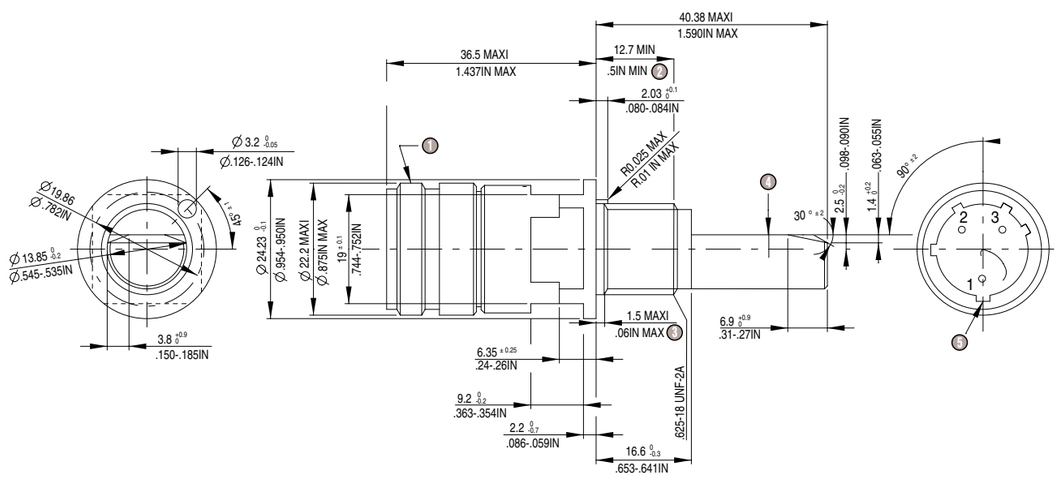


Hysteresis: < 0.015 in (0.381 mm)
Derating: ≤ 0.025 in (0,63 mm)



① Gap (inch)
② SDD (inch)
③ Guaranted deactuation
④ Guaranted actuation

Dimensions (mm)

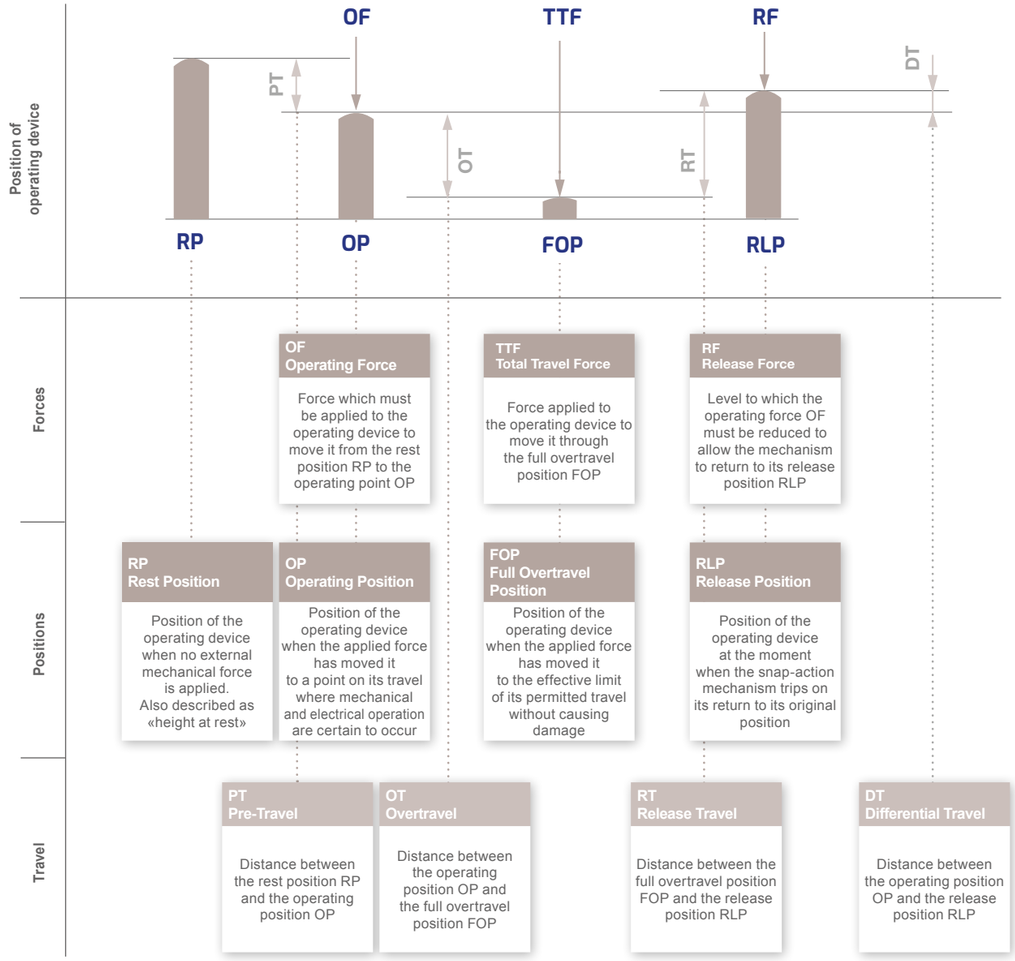


① Connector MS24264R 12T03 PN-2
② THD
③ Imperfect THD
④ Sensor head, always below the metal body
⑤ Master keyway

CUSTOMIZED PRODUCTS

TERMINOLOGY

FORCES - POSITIONS - TRAVEL



NOTES