

Rectangular Robotic Connectors



In the frame of Space Station Alpha program, SOURIAU has developed and qualified a series of high reliability rectangular connector for robotic operations. This hardware is used on the SSRMS (Space Station Remote Manipulator System) which is the Canadian contribution to the Space Station. These connectors feature :

- Low Insertion Force contacts
- Thermal differential (between plug and receptacle) compatibility
- Integrated misalignment catching system
- High durability (6000 operations)
- High EMI shielding efficiency
- Associated dismountable EMI backshells
- Deep space environment (Atox) compatibility
- Easy inspection, maintenance or repair after wiring.



Characteristics

Performances

Mechanical
Mass • < 105 g for plug • < 76 g for MSSP ⁽¹⁾ receptacle • < 218 g for ORU ⁽²⁾ receptacle
ORU receptacle misalignment • $\Delta\alpha = \pm 0,5^\circ$ • $\Delta Y = 1,27 \text{ mm}$ • $\Delta\beta = \pm 0,5^\circ$ • $\Delta Z = 2,03 \text{ mm}$ • $\Delta\gamma = \pm 0,5^\circ$
ORU receptacle overstroke • $\Delta X = 2,29 \text{ mm}$

- (1) MSSP : Mobile Servicing System Payload
 (2) ORU : Orbital Replacement Unit

Electrical
Contact resistance as per MIL-C 39029

Environmental conditions		
Temperatures	Operational	- 85°C to + 90°C
	Qualification	- 101°C to + 106°C
	Non functional	- 157°C to + 175°C
Differential Mating temperature	Operational	125°C
	Acceptance	135°C
	Qualification	200°C
Pressure	104,1 to 1,33.10 ⁻¹¹ Kpa	
Vacuum	10 ⁻⁵ to 10 ⁻¹⁰ Torr	
Acceleration	± 20 g	

Materials and finishes

	Material	Finish
Plug MSSP Receptacle ORU Receptacle	Aluminium alloy 7075	Chemical nickel plating
Compliance mechanism	<ul style="list-style-type: none"> • Frame, flange & beam • Helicoil & axle • Spring 	Chemical nickel plating - Thermal treatment
Insulator	3505 EPOXY	-
Backshell	Aluminium alloy 7075	Chemical nickel plating

Mating/demating forces

Shell size	Option	Contact arrangement	Mating force (N)	Demating force (N)
Large	L1	137 # 22	101	78
	L2	45 # 16	116	87
	L3	22 # 12	112	85
	L4	12 # 12, 12 # 20 & 46 # 22	108	82
	L5	12 # 12, 12 # 20 & 46 # 22 + grounding of coax lines	138	119
Medium	M1	72 # 22	53	43
	M2	41 # 20	43	37
	M3	6 # 12, 8 # 20 & 17 # 22	52	42

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Contact layouts

All arrangements are seen from male front view.

Large				Medium			
Option	Layout		Configuration	Option	Layout		Configuration
	Nb	contact size			Nb	contact size	
L1	137	# 22		M1	72	# 22	
L2	45	# 16		M2	41	# 20	
L3	22	# 12		M3	17	# 22	
					8	# 20	
					6	# 12	
L4 and L6 (1)	46	# 22					
	12	# 20					
	12	# 12					
L5 and L7 (2)	46	# 22					
	12	# 20					
	12	# 12 coax					

(1) Option 4 with Captive Hardware (+CH)

(2) Option 5 with Captive Hardware (+CH)

Crimping, Insertion & Removal tools for contacts

Contact size	Contact part number	Crimping tools	Positioner	Insertion and removal plastic tools
# 22	Pin Socket	M22520/2-01	8976-700 M22520/2-07	M81969/14-01
# 20	Pin Socket	M22520/1-01	M22520/1-04	M81969/14-10
# 16	Pin Socket			M81969/14-03
# 12	Pin Socket			M81969/14-04
# 12 coax	Inner pin Inner socket Crimping sleeve	M22520/5-01	8976-720 8976-710 8976-730	

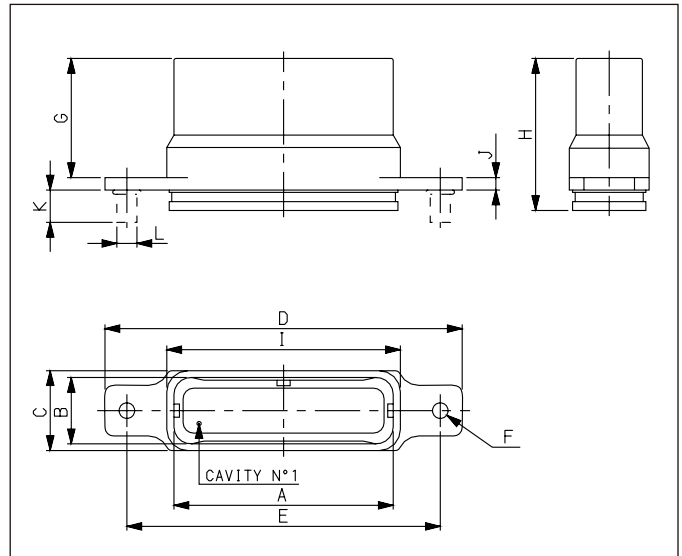


Dimensions (in mm)

Plug (Packed reference)

Shell size	Large				
Option	L1	L2	L3	L4	L5
Part number	8976-550	8976-560	8976-570	8976-580	8976-620
Mass (g)	100	104	103	102	102
Shell size	Large		Medium		
Option	L6	L7	M1	M2	M3
Part number	8976-630	8976-640	8976-590	8976-600	8976-610
Mass (g)	103	103	62	58	61

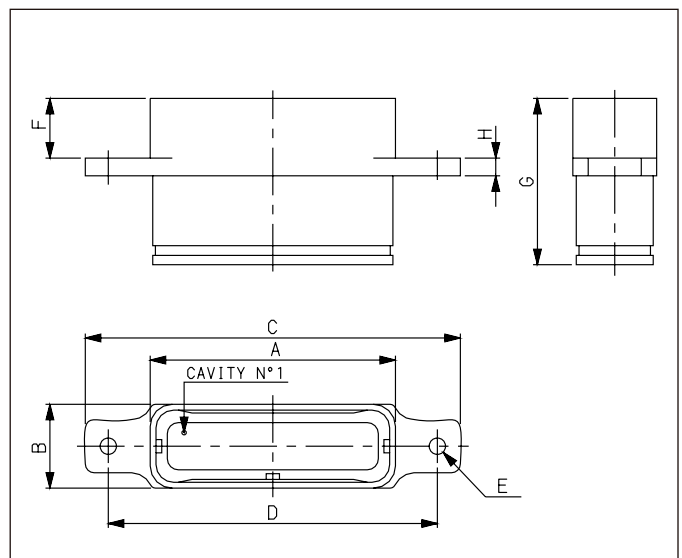
Dimensions						
Shell size	A	B	C	D	E	F*
Large	74,70 ⁰ _{-0,10}	18,80 ⁰ _{-0,1}	22,00 ⁰ _{-0,1}	107,45 ⁰ _{-0,3}	97,00	Ø 3,65 ^{+0,2}
Medium	52,10 ⁰ _{-0,10}	15,80 ⁰ _{-0,1}	19,00 ⁰ _{-0,1}	84,85 ⁰ _{-0,3}	74,40	Ø 3,65 ^{+0,2}
Shell size	G	H	I	J	K	L
Large	28,30 ⁰ _{-0,1}	36,15 ⁰ _{-0,2}	78,10 ⁰ _{-0,1}	3,00 ^{+0,1} _{-0,1}	7,67 _{maxi}	Ø 6,73 _{maxi}
Medium	28,30 ⁰ _{-0,1}	36,15 ⁰ _{-0,2}	55,50 ⁰ _{-0,1}	3,00 ^{+0,1} _{-0,1}	7,67 _{maxi}	Ø 6,73 _{maxi}



MSSP receptacle (packed reference)

Shell size	Large				
Option	L1	L2	L3	L4	L5
Part number	8976-100	8976-110	8976-120	8976-130	8976-170
Mass (g)	73	76	76	74	74
Shell size	Medium				
Option	M1	M2	M3		
Part number	8976-140	8976-150	8976-160		
Mass (g)	49	50	49		

Dimensions						
Shell size	A	B	C	D	E*	F
Large	78,10 ⁰ _{-0,10}	22,00 ⁰ _{-0,1}	107,45 ⁰ _{-0,3}	97,00	Ø 3,65 ^{+0,2}	13,50 ^{+0,30} _{-0,05}
Medium	55,50 ⁰ _{-0,10}	19,00 ⁰ _{-0,1}	84,85 ⁰ _{-0,1}	74,40	Ø 3,65 ^{+0,2}	13,50 ^{+0,30} _{-0,05}
Shell size	G	H				
Large	37,65 ⁰ _{-0,2}	4,05 ⁰ _{-0,1}				
Medium	37,65 ⁰ _{-0,2}	4,05 ⁰ _{-0,1}				



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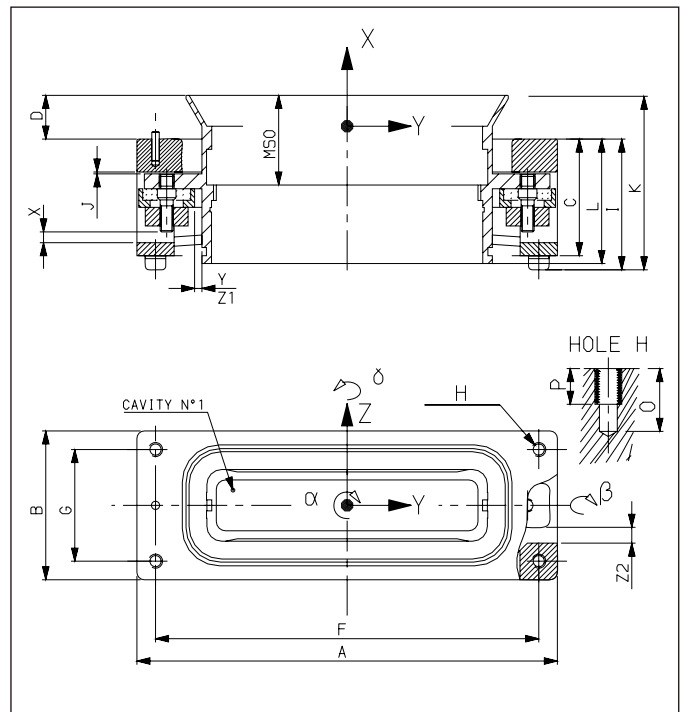
Dimensions (in mm)

ORU receptacle with compliance mechanism (Packed reference)

Part N°	Layout See Page	Shell Style
8970 - 250	L1	Large Receptacle
8970 - 260	L2	Large Receptacle
8970 - 270	L3	Large Receptacle
8970 - 280	L4	Large Receptacle
8970 - 320	L5	Large Receptacle
8970 - 290	M1	Large Receptacle
8970 - 300	M2	Large Receptacle
8970 - 310	M3	Large Receptacle

Shell size	Large				
Option	L1	L2	L3	L4	L5
Mass (g)	214	218	218	217	217
Shell size	Medium				
Option	M1	M2	M3		
Mass (g)	162	164	163		

Dimensions						
Shell size	A	B	C	D	F	G
Large	113,1 ⁰ _{-0,19}	40,1 ⁰ _{-0,19}	31,56 ^{+0,05} _{-0,25}	11,7 ^{+0,34} _{-0,1}	103,00 ⁰ _{00,10}	30,00 ⁰ _{00,10}
Medium	90,5 ⁰ _{-0,10}	37,1 ⁰ _{-0,1}	31,56 ^{+0,05} _{-0,25}	11,7 ^{+0,34} _{-0,1}	80,50 ⁰ _{00,10}	27,00 ⁰ _{00,10}
Shell size	H	I	J	K	L	O
Large	6-32 UNC class 3B	35,36 ^{+0,13} _{-0,47}	1,15 ^{+0,20} _{-0,10}	47,06 ^{+0,38} _{-0,48}	33,55 ^{+0,05} _{-0,49}	11,00 ^{mini}
Medium	6-32 UNC class 3B	35,36 ^{+0,13} _{-0,47}	1,15 ^{+0,20} _{-0,10}	47,06 ^{+0,38} _{-0,48}	33,55 ^{+0,05} _{-0,49}	11,00 ^{mini}
Shell size	P	X*	Y*	Z1*	Z2*	MSO
Large	6,00 ^{mini}	3,40 ^{+0,15} _{-0,15}	2,025 ^{mini}	2,525 ^{mini}	2,775 ^{mini}	24,10 ⁰ _{-0,05}
Medium	6,00 ^{mini}	3,40 ^{+0,15} _{-0,15}	2,025 ^{mini}	2,525 ^{mini}	2,775 ^{mini}	24,10 ⁰ _{-0,05}

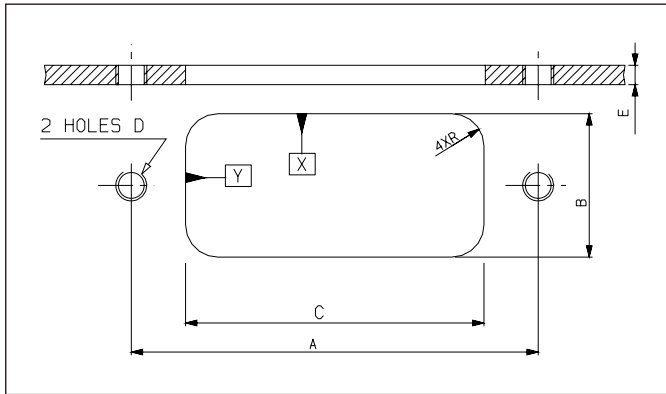


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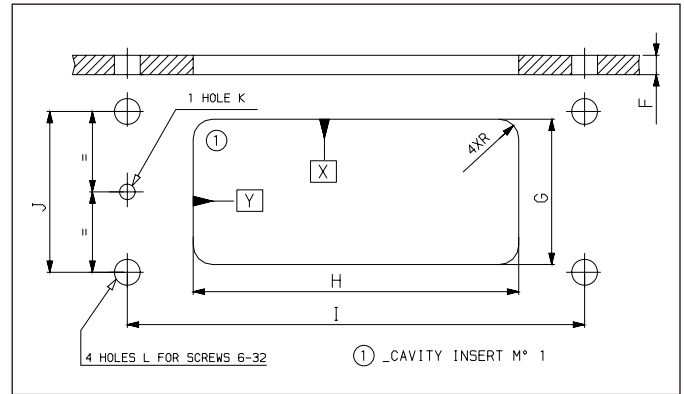


Panel cut-out

For plug and receptacle						
Shell size	A	B	C	D	E	R
Large	97	22,3	78,4	6-32 UNC-3B	3,15	4
Medium	74,4	19,3	55,8	6-32 UNC-3B	3,15	4



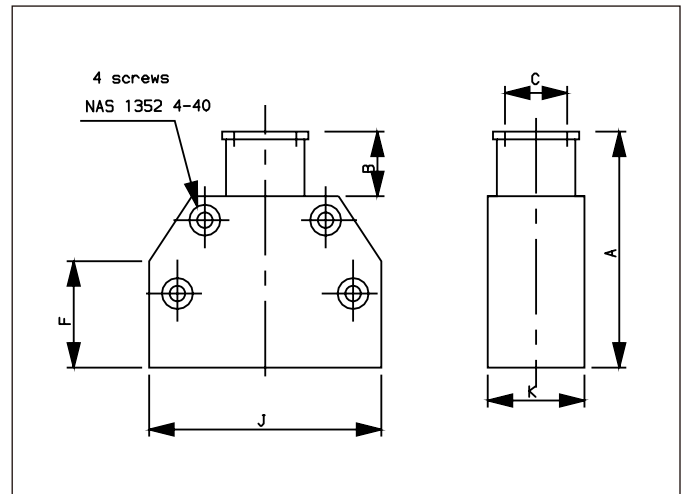
For compliance mechanism								
Shell size	F	G	H	I	J	K	L	R
Large	3,5	32	90	103	30	Ø 2,05	Ø 3,8	4
Medium	3,5	29	67,5	80,5	27	Ø 2,05	Ø 3,8	4



Backshells

Straight outlet normal profile

Dimensions							
Shell size	Part number	A	B	C	F	J	K
Large	8976-180	39,50 ^{+0,15} _{-0,25}	9,45 ^{+0,1} _{-0,1}	368 mm ²	15,05 ^{+0,3} _{-0,4}	80,05 ⁰ _{-0,2}	25,4 ⁰ _{-0,35}
Medium	8976-190	39,50 ^{+0,15} _{-0,25}	9,45 ^{+0,1} _{-0,1}	173 mm ²	15,45 ^{+0,3} _{-0,4}	57,45 ⁰ _{-0,2}	22,4 ⁰ _{-0,37}

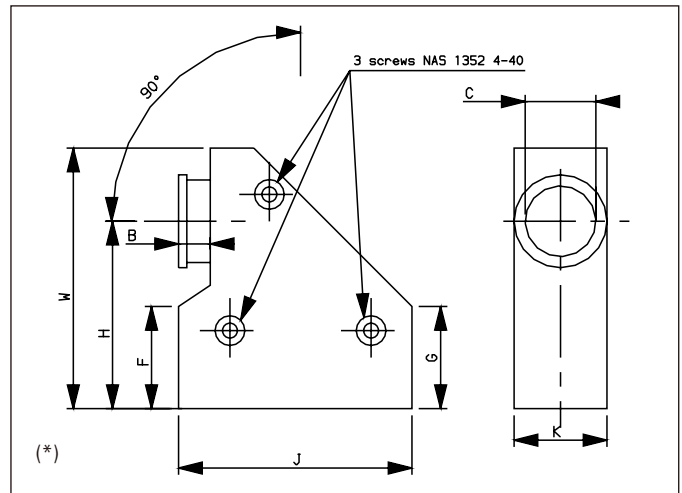




Backshells

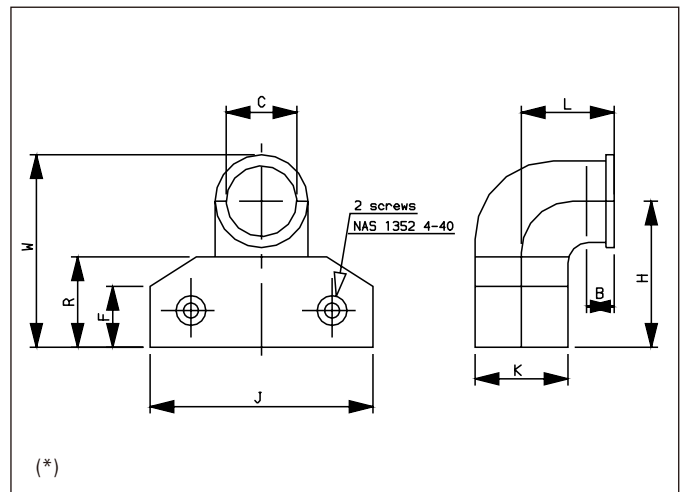
90° longitudinal outlet normal profile

Dimensions					
Shell size	Part number	F	G	H	W
Large	8976-200	16,85 ^{+0,25} _{-0,15}	22,2 ^{+0,1} _{-0,1}	36,35 ^{+0,05} _{-0,05}	54,85 ^{+0,10} _{-0,20}
Medium	8976-210	16,00 ^{+0,1} _{-0,1}	22,2 ^{+0,1} _{-0,1}	38,10 ^{+0,05} _{-0,05}	54,85 ^{+0,10} _{-0,20}



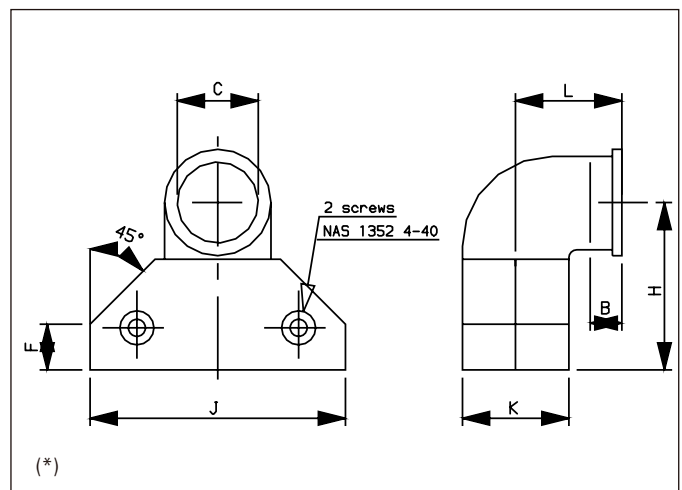
90° transverse outlet normal profile

Dimensions				
Shell size	Part number	L	W	R
Large	8976-220	26,50 ^{+0,50} _{-0,50}	51,00 ^{+0,40} _{-0,40}	24,45 ^{+0,35} _{-0,35}
Medium	8976-230	25,40 ^{+0,50} _{-0,50}	48,90 ^{+0,40} _{-0,40}	24,45 ^{+0,35} _{-0,35}



90° transverse outlet low profile

Dimensions					
Shell size	Part number	C	F	H	L
Large	8976-400	17,60 ^{+0,2} _{-0,2}	9,5 ⁰ _{-0,2}	49,2 ⁰ _{-0,35}	26,8 ⁰ _{-0,5}



(*) For other dimensions see page 89