

ACCESSORIES OF ANTENNAS FEEDER CABLES AND WAVEGUIDES

GENERIC REQUIREMENTS

No. GR/ACC- 14/02.JUN 2003

(SUPERSEDES GR. NO.G/ACC-14/01. DEC 99)

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TELECOMMUNICATION ENGINEERING CENTRE

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NEW DELHI – 110001

INDIA

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HISTORY SHEET OF THE GR

The GR No. G/ACC.14/01.DEC 99 along with Amendment No. 1 dated 25.2.2000 and Amendment No. 2 dated 31.8.2000 has been reviewed. As there are some changes, inclusions and deletion in the technical specifications, the reviewed GR is numbered as GR/ACC-14/02. JUN 2003. The existing Type Approval Certificate would be revalidated for remaining period of validity of TAC after conducting incremental tests.

**GOVERNMENT OF INDIA
DEPARTEMENT OF TELECOMMUNICATIONS
TELECOMMUNICATION ENGINEERING CENTRE
NEW DELHI – 110001**

**ACCESSORIES OF ANTENNAS, FEEDER CABLES
AND WAVEGUIDES
GR No. GR/ACC-14/02. JUN 2003**

1.0 General

1.1 This document contains the generic requirements of accessories of antennas, feeder cables and waveguides.

2.0 Quality requirements

2.1 The joints in the accessories shall have protection as per BIS Standard IS 12063 {Reaffirmed in 1999} "Classification of degrees of protection provided by enclosures of electrical equipment" {equivalent to IEC-60529} to meet at least the protection level of IP-65 except otherwise stated specifically in the GR.

2.2 Accessories shall be reliable and of standard type to ensure failure free operation for long periods.

2.3 The accessories shall be manufactured in accordance with either of the following mentioned quality standard:

- a) International quality standards ISO 9001 or ISO 9002 or ISO 9001 : 2000 for which the manufacturer shall be duly accredited. A quality plan describing the quality assurance system followed by the manufacturer would be required to be submitted.

(Note: ISO 9002 is valid upto December 2003 only. From January 2004 onwards, only ISO 90001 : 2000 shall be applicable)

- b) As per the latest QA guidelines of BSNL.

2.4 The accessories shall conform to the requirements of Environment specified in BSNL QA Document QM-333 { Latest issue } "Specification for environmental testing of electronic equipment for transmission and switching use". The applicable tests shall be as per environmental category 'D' of QM-333 including corrosion (salt mist) except otherwise stated specifically in the GR.

3.0 Technical requirements

3.1 Clamps/ Hangers:

3.1.1 Cable clamps/ hangers

SL. No.	Item Cable clamp holder (Hanger) Parameters	Feeder cable size			
		½"	7/8"	1½"	1⅝"
01	Cable clamp top (all sizes in mm)				
a.	Thickness of material (min)	1	1	1	1
b.	Height	61	61	90	90
c.	Bottom Width	30	30	35	35
d.	Material	-----Stainless steel*-----			
02	Cable holder bottom / Angle adapter				
a.	Thickness of material(min)	3.0	3.0	3.0	3.0
b.	Height	35	35	40	40
c.	Bottom Width	36	36	50	50
d.	Material	---Hot Galvanized Steel---			
e.	Screw material	-----Stainless steel*-----			

3.1.2 Waveguide clamps / hangers

SL.No	Item Waveguide clamp holder	Waveguide frequency in GHz				
		4	6	7	11	13
01	Cable clamp top / hanger (all sizes in min)					
a.	Thickness of material (min)	1	1	1	1	1
b.	Height	100	69	67	65	60
c.	Bottom Width	49	40	39	39	39
d.	Material	-----Stainless steel*-----				
02	Cable holder bottom / Angle adapter					
a.	Thickness of material(min)	3	3	3	3	3
b.	Height	45	41	35	35	35
c.	Bottom Width	55	51	36	36	36
d.	Material	-----Stainless steel*-----				

Note: i) Tolerance ±3 mm for dimension up to 80 mm(if not other-wise stated).

ii) Tolerance ± 4 mm for dimension beyond 80 mm(if not other-wise stated).

iii) All the accessories/fixtures should be capable to fit with the feeder cable /waveguide as applicable.

*Stainless steel as per BIS standard No. X02 CR19(equivalent to American Iron & Steel Institute AISI -304).

3.2 Grounding kits:

3.2.1 Grounding Straps:

Grounding is recommended at tower top, bottom, middle point intervals and the entrance to the equipment shelter or as prescribed by the supplier.

3.2.2 Grounding cable

Parameter	--Cable size --- -- Waveguides --- frequency in GHz ½" 7/8" 1¼" 1⅝" 4 6 7 11 13
a) Length Of PVC sheathed cable (No. it is optional)	i) 610 mm ii) 910 mm
b) No. of strands co-wire	7 nos
c) Diameter of wire	2.5 mm±10 percent
d)Material	Copper**

3.2.3 Copper grounding strap

Parameter	Cable size ½" 7/8" 1¼" 1⅝"	Waveguides freq in GHz 4 6 7 11 13
a) Thickness of copper** Strip(min.)	0.6 0.6 0.7 0.8	0.8 0.8 0.8 0.6 0.6
b) Length of strip from hole	115 175 210 240	240 242 217 192 175
c) Width of strip	40 mm	
d) Finish	Tin plated	

3.2.4 Copper** thimble

Parameter	--Cable size -- --Waveguides --- frequency in GHz ½" 7/8" 1¼" 1⅝" 4 6 7 11 13
a) Length of thimble	60 mm
b) Length up to hole diameter center from strip end	10± 1 mm
c) Round thimble diameter	10± 1 mm

Note: i) Tolerance ±3 mm for dimension up to 80 mm (if not other-wise stated).

ii) Tolerance ± 4 mm for dimension beyond 80 mm (if not other-wise stated).

iii) All the accessories/fixtures should be capable to fit with the feeder cable /waveguide as applicable.

[** Copper as per BIS No. 1897 (1993) "Specification for copper strip for electrical purposes"
{Second revision}]

4.0 Wall gland (wall feed through) single entrance:

Parameter	Cable size	Waveguides frequency in GHz
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	$\frac{1}{2}''$ $\frac{7}{8}''$ $1\frac{1}{4}''$ $1\frac{5}{8}''$ 4 6 7 11 13
4.1 Stainless steel* (SS) plate Thickness (min)	-----2.5 mm-----
4.2 SS plate outer diameter	-----125 mm-----
4.3 SS plate inner diameter	-----70 mm-----
4.4 Boot rubber diameter (PCD) (Pitch circle diameter) (Refer diagram for clarity)	-----105 mm-----
4.5 Diameter to PCD hole (Refer diagram for clarity)	-----7 mm $\pm$ 10 percent-----
4.6 Boot rubber thickness (Boot rubber shall be Chloroprene or equivalent)	-----3 mm $\pm$ 10 percent-----
4.7 Cable hole outer diameter	-----75 mm-----
4.8 i) Cable hole inner diameter : ii) Waveguide inner hole dimension in mm Major axis Minor axis	18 $\pm$ 10% 30 41 52 85 52 49 34 30 52 32 29 22 20
4.9 Overall all diameter of the wall gland	-----125 mm-----

Note: i) Tolerance $\pm$ 3 mm for dimension up to 80 mm(if not other-wise stated).

ii) Tolerance $\pm$ 4 mm for dimension beyond 80 mm (if not other-wise stated).

iii) All the fixtures should be capable to fit in the feeder cable/waveguide as applicable.

*Stainless steel shall as per BIS standard No. X02 CR19 (equivalent to American Iron & Steel Institute AISI -304).

5.0 Hoisting stocking :

Cable size	Waveguide
	frequency in GHz
$\frac{1}{2}''$ $\frac{7}{8}''$ $1\frac{1}{4}''$ $1\frac{5}{8}''$	4 6 7 11 13

5.1 Length of hoisting up to grip -----1100 mm-----

5.2	Length of grip sling	-----200 mm-----
5.3	Length of sleeve	-----40 mm-----
5.4	Diameter of grip wire	-----1.4 mm±10 percent-----
5.5	No. of strands in grip wire	----- 19 -----
5.6	No. of wires in grip wire	-----24 -----
5.7	No. of wires in loop wire	-----6-----
5.8	Raw material and finish	-----Tinned copper-----

Note: I) Tolerance ± 3 mm for dimension up to 80 mm (if not other-wise stated).

ii) Tolerance ± 4 mm for dimension beyond 80 mm (if not other-wise stated).

iii) All the accessories/fixtures should be capable to fit with the feeder cable/waveguide as applicable.

6.0 Waveguide bends

6.1	Material	:	The material used should be brass and the inside finish should be silver plated.
6.2	Outside finish	:	Olive Green

[Note :- The paint used shall be as per BIS standard IS – 168 { 1993 }

"Ready mixed paint, air drying for general purpose specification (Third Revision) and it is to be tested as per BIS Standard IS – 101 {1986}

"Methods of sampling and test for paints, varnishes and related products"

(Third revision).

6.3	Insertion Loss	:	Better than 0.25 dB
6.4	Sealing rings	:	Should of silicon rubber and to be supplied together with the PDR flanges.
7.0	Technical requirements II :		The components listed below should meet the 154 – IEC standards and be fitted with PDR flanges.

7.1 Straight section of rectangular wave guide, shown with flange PDR 70

Component max	Dimension	Flanges Frequency	VSWR
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loss	"A"	range	(Return
min)	mm	(GHz)	in dB,
(40.0)	300	PDR40 3.8 - 4.2	1.02
	300	PDR70 5.925 – 6.425	1.02
	300	PDR70 6.43 – 7.11	1.02
	s300	PDR70 7.425 – 7.725	1.02
	(40.0)		
	300	PDR100 10.7 - 11.7	1.02 (40.0)
	300	PDR120 12.75 - 13.25	1.02 (40.0)
	300	PDR220 17.7 - 19.7	1.02 (40.0)

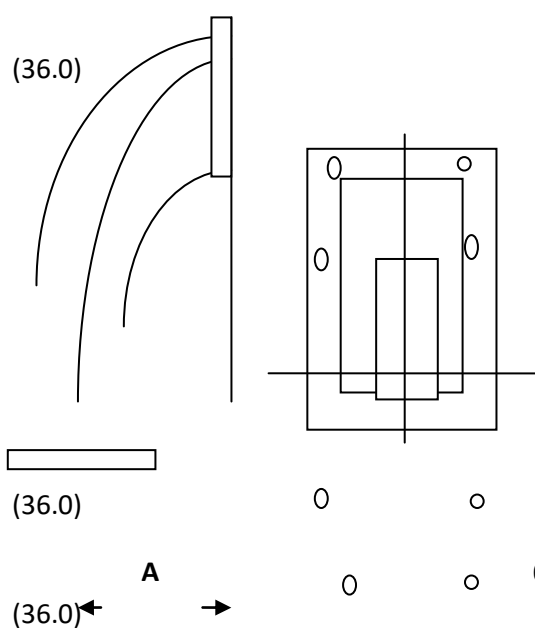
7.2 E plane elbow 90°, shown with flange PDR 70

Component max	Dimension	Flanges	Frequency	VSWR
Loss				(Return
min	"A" (mm)	range	(GHz)	in dB,
(36.0)	100	PDR40	3.8 - 4.2	1.03
	75	PDR70	5.925 – 6.425	1.03
	75	PDR70	6.43 – 7.11	1.03
	62.5	PDR70	7.425 – 7.725	1.03
	50	PDR100	10.7 - 11.7	1.03
	50	PDR120	12.75 - 13.25	1.03

	50	PDR220	17.7 - 19.7	1.03
(36.0)				

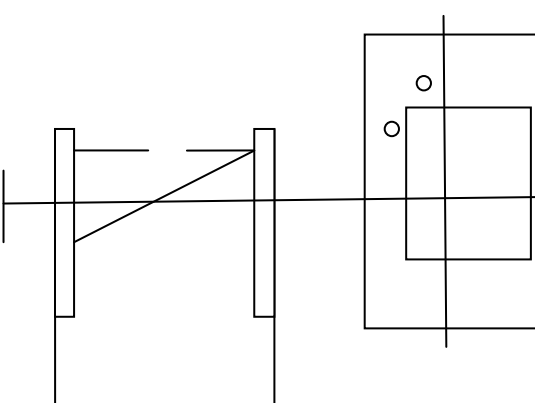
7.3 H plane elbow 90°, shown with flange PDR 70

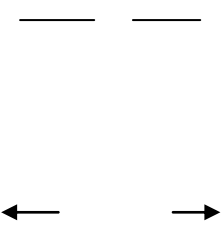
Component max loss min	Dimension "A" (mm)	Flanges	Frequency range (GHz)	VSWR (Return loss in dB,
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	150	PDR40	3.8 - 4.2	1.03
	100	PDR70	5.925 – 6.425	1.03
	100	PDR70	6.4 – 7.11	1.03
	75	PDR70	7.425 – 7.725	1.03
	62.5	PDR100	10.7 - 11.7	1.03
(36.0)	0	0		
(36.0)	0	0		
(36.0)	62.5	PDR120	12.75 - 13.25	1.03
(36.0)	50	PDR220	17.7 - 19.7	1.03

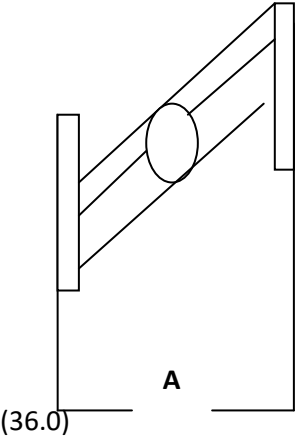
7.4 90° Twist section , shown with flange PDR 70

Component	Dimension "A" (mm)	Flanges	Frequency range (GHz)	VSWR max (Return loss in dB, min
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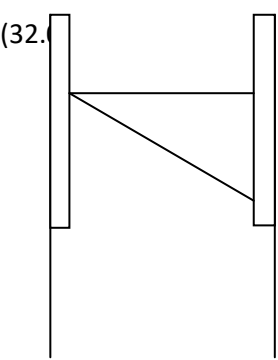
	250	PDR40	3.8 - 4.2	1.03(36.0)
	200	PDR70	5.925 – 6.425	1.03(36.0)
	200	PDR70	6.43 – 7.11	1.03(36.0)

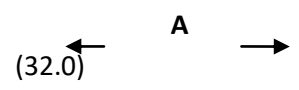
	150	PDR70	7.425 – 7.725	1.03(36.0)
	200	PDR100	10.7 - 11.7	1.03(36.0)
	150	PDR120	12.75 - 13.25	1.03(36.0)
	100	PDR220	17.7 – 19.7	1.03(36.0)

7.5 Rectangular wave guide, flexible, not twist able, shown with flange PDR 70

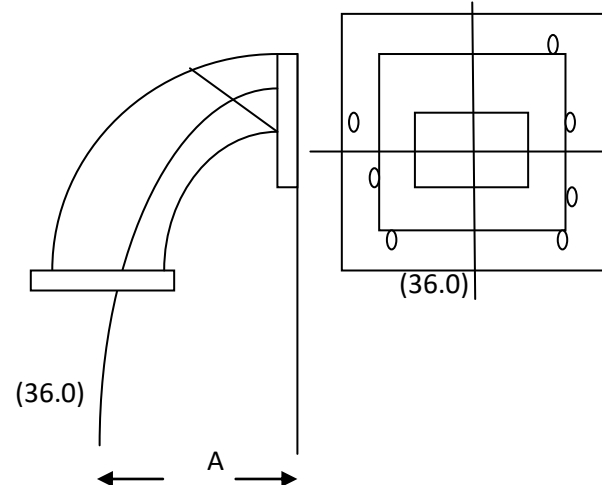
Component	Dimension “A” (mm)	Flanges	Frequency range (GHz)	VSWR max (Return loss in dB, min
	600	PDR40	3.8 - 4.2	1.03 (36.0)
	400	PDR70	5.925 – 6.425	1.03 (36.0)
	400	PDR70	6.43 – 7.11	1.03 (36.0)
	300	PDR70	7.425 – 7.725	1.03 (36.0)
	150	PDR100	10.7 - 11.7	1.03 (36.0)
	150	PDR120	12.75 - 13.2	1.03
	150	PDR220	17.7 – 19.7	1.03(36.0)

7.6 Rectangular wave guide, flexible, twistable, shown with flange PDR 70

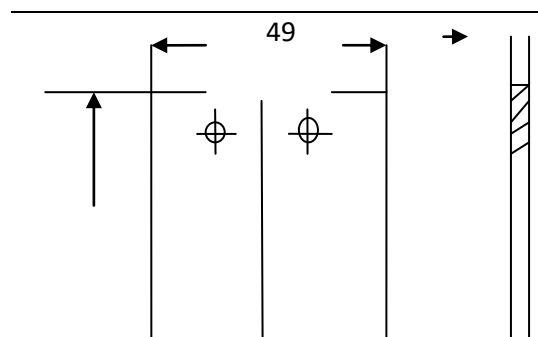
Component	Dimension “A” (mm)	Flanges	Frequency range (GHz)	VSWR max (Return loss in dB min)
	800	PDR40	3.6 - 4.2	1.04
	500	PDR70	5.925 – 6.425	1.04

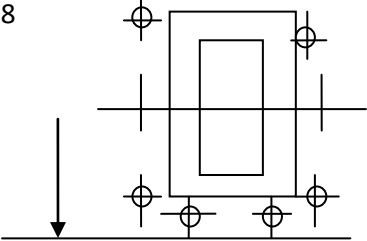
	500	PDR70	6.43 – 7.11	1.04
	(34.0)			
	0 0	400	PDR70	7.425 – 7.725 1.04
	0 (32.0) 0			
		300	PDR100	10.7 - 11.7 1.04
1.04(30.0)		300	PDR120	12.75 - 13.25
1.04(30.0)		300	PDR220	17.7 – 19.7

7.7 H plane elbow 90° / Twist 90° , shown with flange PDR 70

Component	Dimension "A" (mm)	Flanges	Frequency range (GHz)	VSWR max (Return loss in dB, min
	250	PDR70	5.925 – 6.425	1.03 (36.0)
	250	PDR70	6.43 – 7.11	1.03 (36.0)
	250	PDR70	7.425 – 7.725	1.03(36.0)
	200	PDR100	10.7 – 11.7	1.03
	150	PDR120	12.75 - 13.25	1.03
	100	PDR220	17.7 – 19.7	1.03(36.0)

7.8 Pressure window, light type, shown without gas inlet and flange PDR 70

Component	Flanges	Frequency range (GHz)	VSWR max (Return loss in dB, min
	PDR70	3.6 – 4.2	1.02 (40.0)

68			PDR70	5.925 – 6.425	1.02 (40.0)
			PDR70	6.435 – 7.11	1.02 (40.0)
			PDR100	7.425 – 7.725	1.02 (40.0)
			PDR120	12.75 - 13.25	1.02 (40.0)
			PDR220	17.7 – 19.7	
1.02(40.0)					

8.0 Type of Connectors : 1) N male/female 2) SMA male/female

3) 7/16 DIN male/female

8.1 ELECTRICAL CHARACTERISTICS

8.2	Type of Connector	:	N	SMA	7/16 DIN
			male/female	male/female	male/female

8.3	Impedance	:	50Ω	50Ω	50Ω
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8.4	Frequency range	:	1 MHz – 10GHz	DC – 18 GHz	1 MHz-6GHz
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8.5 Return loss dB

(frequency GHz) with
feet assembly or by

using standard test Jig:

N	SMA	7/16 DIN
male/female	male/female	male/female

26 dB (1 MHz – 10GHz)	20 dB (1 MHz – 3GHz)	26 dB (1 MHz-3GHz)
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20 dB (3 – 10 GHz)	17 dB (3 – 18 GHz)	20 dB (3 – 6 GHz)
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8.6	Insertion loss	:	Less than 0.15 dB at 10 GHz
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8.7	Insulation resistance	:	500 Mega ohms (M Ω) minimum
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8.8	Contact resistance	:	Initial
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center contact (milli ohms)	:	1.0
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outer conductor (milli ohms)	:	0.2
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8.9	Voltage rating maximum (max.) VRMS	:	707	
8.10	Dielectric withstanding voltage, VDC	:	2000 V	
8.11	RF high potential max. VRMS	:	990 V	
8.12	Peak power , max . kw @ 900 MHz	:	10	
8.13	Power handling at 25° C	:	100 MHz : 1000 MHz to : 3000 MHz	1000 W 300 W

[Note :- Application standards IEC 169 – 16]

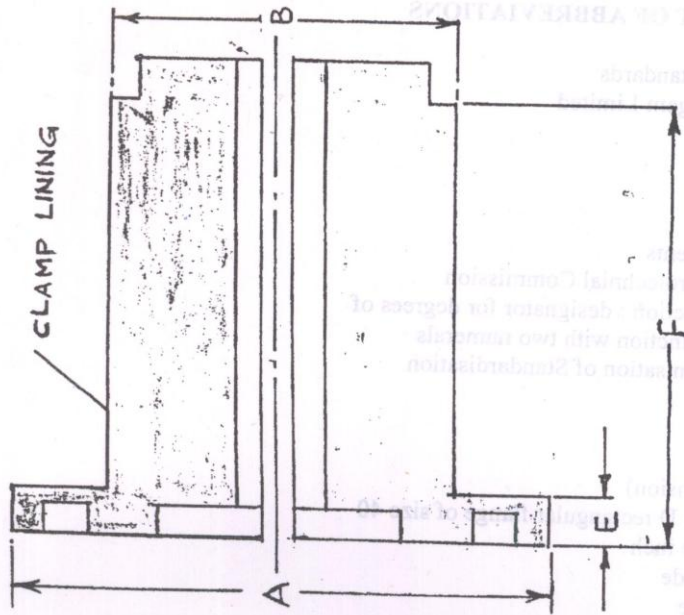
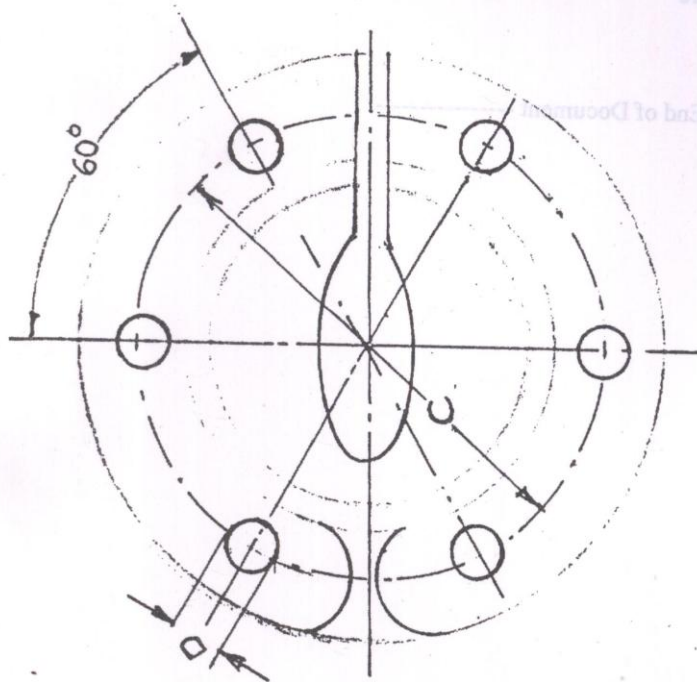
9.0 Mechanical characteristics

9.1	Life	Over 500 matings
9.2	Force to engage and disengage	0.68 N. cm
9.3	Coupling mechanism	453 N

10.0 Environmental characteristics

	Parameter	Value	Method / Standard
10.1	Operating temperature		-40° C to 100° C
10.2	Storage temperature		-55° C to 100° C
10.3	Thermal shock test	: Pass	MIL - STD – 202F, Method 107 G, Test Cond. A – 1
10.4	Moisture resistance test	: pass	MIL - STD – 202F, Method 106F,
10.5	Impression test	: pass	IEC – 60529 : 1989. IP - 68
10.6	Corrosion test	: pass	MIL – STD – 1344 A.

				Method 1001.1, Test Cond. A
10.7	Vibration test	:	pass	MIL – STD – 202F Method 204D, Test Cond. B
11.0	Material			
11.1	Body and center pin contact equivalent	:	Brass as per BIS standard No. or (e.g. ASTM B 16 or BS 2874)	
11.2	Center socket contact	:	Beryllium copper as per BIS standard No. or ASTM B 196	
11.3	Ferrules	:	Brass	
11.4	Insulators	:	PTFE resin , ASTM D 1457 , Type I Grade I	
11.5	Gaskets	:	Silicon rubber , ZZ – R – 765 , class 2 B Duro 40 ± 5	
11.6	Plating	:		
11.6.1	Body	:	Nickel Plated	
11.6.2	Center contacts	:	Gold Plated	
11.6.3	Connectors dimensions	:	Dimensions to be supplied by the Manufacturer.	
12.0	Documentation			
12.1	Documentation shall include technical literature in English with detailed assembly and installation procedure.			



A	=	OVERALL DIA. OF THE WALL GLAND	=	125 mm
B	=	CABLE HOLE OUTER DIAMETER	=	75 mm
C	=	PITCH CIRCLE DIAMETER (PCD)	=	105 mm
D	=	DIAMETER OF (PCD) HOLE	=	7 mm
E	=	RUBBER BOOT THICKNESS	=	3 mm
F	=	HEIGHT OF RUBBER BOOT	=	60 mm

FIG. 1 WALL FEED THROUGH

LIST OF ABBREVIATIONS

BIS	Bureau of Indian Standards
BSNL	Bharat Sanchar Nigam Limited
C	Celsius
dB	Decibel
GHz	Giga Hertz
GI	Galvanised Iron
GR	Generic Requirements
IEC	International Electrotechnical Commission
IP	International Protection : designator for degrees of protection in conjunction with two numerals
ISO	International Organisation of Standardisation
MHz	Mega Hertz
MIL	Military
mm	Millimetre
N	Newton (force/ tension)
PDR40	Pressurisable type D rectangular flange of size 40
psi	Pounds per square inch
PVC	Poly Vinyl Chloride
QA	Quality Assurance
QM	Quality Manual
RF	Radio Frequency
STD	Standard
TEC	Telecommunication Engineering Center
VDC	Voltage Direct Current
VRMS	Voltage Root Mean Square

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