

# Coaxial cables

## 1 RF cable portfolio

Connectors	length	cable	conn. material	kink protection
N-Male to N-Male	35 cm	RG 223/U	nickel plated brass	plastic sleeve
N-Male to N-Male	75 cm	RG 58/U	nickel plated brass	plastic sleeve
N-Male to N-Male	75 cm	RG 223/U	nickel plated brass	plastic sleeve
N-Male to N-Male	75 cm	RG 142	stainless steel	Stainless steel armored cable, glued heat shrink
N-Male to N-Male	1.25 m	RG 223/U	nickel plated brass	plastic sleeve
N-Male to N-Male	3,12 m	RG 213/U	nickel plated brass	glued heat shrink
N-Male to N-Male	3 m	RG 142	nickel plated brass	plastic sleeve
N-Male to N-Male	5 m	RG 223/U	nickel plated brass	plastic sleeve
N-Male to N-Male	5 m	RG 213/U	nickel plated brass	glued heat shrink
N-Male to N-Male	10 m	RG 142	nickel plated brass	plastic sleeve
N-Male to SMA-Male	35 cm	RG 223/U	N: nickel plated brass SMA: gold plated brass	N: plastic sleeve SMA: glued heat shrink
N-Male to SMA-Male	75 cm	RG 58	N: nickel plated brass SMA: gold plated brass	N: plastic sleeve SMA: glued heat shrink
N-Male to SMA-Male	75 cm	RG 223/U	N: nickel plated brass SMA: gold plated brass	N: plastic sleeve SMA: glued heat shrink
N-Male to SMA-Male	75 cm	RG 142	stainless steel	Stainless steel armored cable, glued heat shrink
N-Male to SMA-Male	125 cm	RG 223/U	N: nickel plated brass SMA: gold plated brass	N: plastic sleeve SMA: glued heat shrink
N-Male to BNC-Male	35 cm	RG 223/U	nickel plated brass	plastic sleeve
N-Male to BNC-Male	75 cm	RG 58/U	nickel plated brass	plastic sleeve
N-Male to BNC-Male	75 cm	RG 223/U	nickel plated brass	plastic sleeve
N-Male to BNC-Male	125 cm	RG 223/U	nickel plated brass	plastic sleeve
BNC-Male to BNC-Male	35 cm	RG 223/U	nickel plated brass	plastic sleeve
BNC-Male to BNC-Male	75 cm	RG 58/U	nickel plated brass	plastic sleeve
BNC-Male to BNC-Male	75 cm	RG 223/U	nickel plated brass	plastic sleeve
BNC-Male to BNC-Male	125 cm	RG 223/U	nickel plated brass	plastic sleeve
BNC-Male to SMA-Male	35 cm	RG 223/U	BNC: nickel plated brass SMA: gold plated brass	BNC: plastic sleeve SMA: glued heat shrink
SMA-Male to SMA-Male	25 cm	RG 316/U	gold plated brass	glued heat shrink
SMA-Male to SMA-Male	75 cm	RG 316/U	gold plated brass	glued heat shrink
SMA-Male to SMA-Male	125 cm	RG 223/U	gold plated brass	glued heat shrink
SMA-Male to SMA-Male	75 cm	RG 142	stainless steel	Stainless steel armored cable, glued heat shrink
SMA-Male to SMB-Female	75 cm	RG 316/U	gold plated brass	glued heat shrink

Table 1: RF cable variants

### Part numbering scheme:

Connector-Connector/Length[cm]/Cable type for armored test cables add Test

Examples: NM-NM/35/RG223, NM-NM/75/RG142/Test

## Coaxial cables

### 2 Connector specifications

Parameters	N-male	SMA-male	BNC-male	SMB-female
Temp. range	-65 ~ + 125°C	-65 ~ + 125°C	-65 ~ + 125°C	-65 ~ + 125°C
Vibration	MIL-STD-202, Method 213	MIL-STD-202, Method 213	MIL-STD-202, Method 213	n.a.
Impedance	50 Ω	50 Ω	50 Ω	50 Ω
Frequency range	DC ~ 11 GHz	DC ~ 18 GHz	DC ~ 4 GHz	DC ~ 4 GHz
Working voltage	1000 V	335 V	500 V	335 V
Withstand voltage	2500 V	750 V	1500 V	1000 V
Center contact resistance	≤ 2 mΩ	≤ 3 mΩ	≤ 1.5 mΩ	≤ 6 mΩ
Outer contact resistance	≤ 1 mΩ	≤ 2 mΩ	≤ 1 mΩ	≤ 1 mΩ
Insulation resistance	≥ 5000 MΩ	≥ 5000 MΩ	≥ 5000 MΩ	≥ 5000 MΩ
Insertion loss	≤ 0.15 dB @ 10 GHz	≤ 0.06 √(f(GHz)) dB	≤ 0.2 dB @ 3 GHz	≤ 0.3 dB @ 1.5 GHz
VSWR	≤ 1.3 @ 11 GHz	≤ 1.1 + 0.02f (GHz)	≤ 1.22	≤ 1.25 + 0.4f (GHz)
Durability (mating cycles)	≥ 500	≥ 500	≥ 500	≥ 500

Material	N-male	SMA-male	BNC-male	SMB-female
shell	brass, nickel plated	brass, gold plated	brass, nickel plated	brass, gold plated
contact pin	brass, silver plated	brass, gold plated	brass, silver plated	bronze, gold plated
elastic contact	n.a.	n.a.	n.a.	beryllium alloy, gold plated
socket	beryllium alloy, silver plated	beryllium alloy, gold plated	bronze, nickel plated	bronze, gold plated
insulator	PTFE	PTFE	PTFE	PTFE
Crimping sleeve	copper alloy, nickel plated	copper alloy, gold plated	copper alloy, nickel plated	copper alloy, gold plated
sealing	6146 silastic	6146 silastic	6146 silastic	6146 silastic

Table 2: connector specifications

Applicable standards: MIL-C-39012, CECC 22120, IEC 60169-8, RoHS 3

### 3 General cable specifications

Parameters	RG 58/U	RG 142	RG 213/U	RG 223/U	RG 316/U
center conductor Ø	0.9 mm	0.94 ± 0.02 mm	2.26 ± 0.09 mm	0.9 ± 0.01 mm	0.51 ± 0.03 mm
center cond. material	tinned copper	silver plated copper	plain copper	silver plated copper	silver plated copper
dielectric Ø	2.95 ± 0.1 mm	3 ± 0.05 mm	7.25 ± 0.18 mm	2.95 ± 0.1 mm	1.52 ± 0.05 mm
dielectric material	low density PTE	PTFE	low density PTE	low density PTE	PTFE
braid	Ø 0.13x112	Ø 4.15 mm, double	Ø 0.18x192	Ø 4.2mm, double	1.95 ± 0.08 mm
braid material	tinned copper	silver plated copper	plain copper	tinned copper	silver plated copper
sheath Ø	5 ± 0.1 mm	4.95 ± 0.15 mm	10.3 ± 0.18 mm	5.4 ± 0.1 mm	2.9 ± 0.1 mm
sheath material	PVC	FEP	PVC	PVC	FEP
min. bending radius	single: 25 mm repeated 50mm	single: 30 mm repeated: 50 mm	single: 50 mm repeated: 100 mm	single: 26 mm repeated: 53 mm	single: 15 mm repeated: 50 mm
impedance	50 ± 2 Ω	50 ± 2 Ω	50 ± 2 Ω	50 ± 2 Ω	50 ± 2 Ω
capacitance	100 pF / m	96 pF / m	100 pF / m	100 pF / m	96 pF / m
inductance	0.2µH / m	0.22µH / m	0.25µH / m	0.2µH / m	0.27µH / m
velocity ratio	66 %	70%	66 %	66 %	70%

## Coaxial cables

Parameters	RG 58/U	RG 142	RG 213/U	RG 223/U	RG 316/U
insulation resistance	5 G $\Omega$ km	35 G $\Omega$ km	10 G $\Omega$ km	5 G $\Omega$ km	1 G $\Omega$ km
center cond. res.	38 $\Omega$ / km	34 $\Omega$ / km	6 $\Omega$ / km	29 $\Omega$ / km	266 $\Omega$ / km
braid resistance	14 $\Omega$ / km	7.3 $\Omega$ / km	4.4 $\Omega$ / km	11 $\Omega$ / km	18 $\Omega$ / km
Dielectric strength	4 kV	5 kV	5.5 kV	5 kV	1 kV
shielding effectiveness	typ. -56 dB/m	typ. -80 dB/m	< -57 dB/m	< -83 dB/m	< -52 dB/m
frequency range	DC ~ 5.8 GHz	DC ~ 6 GHz	DC ~ 3 GHz	DC ~ 6 GHz	DC ~ 6 GHz
temperature range	-30°C ~ +70°C	-55°C ~ +165°C	-40°C ~ +85°C	-30°C ~ +80°C	-55°C ~ +165°C
max. power @100MHz	230 W	1250 W	1316 W	280 W	395 W
max. power @400MHz	110 W	650 W	658 W	121 W	209 W
max. power @ 1 GHz	65 W	380 W	416 W	80 W	135 W
max. power @ 3 GHz		230 W		46 W	78 W
max. power @ 6 GHz		150 W		32 W	11 W
attenuation @100MHz	0.16 dB/m	0.15 dB/m	0.06 dB/m	0.17 dB/m	0.26 dB/m
attenuation @400MHz	0.32 dB/m	0.3 dB/m	0.13 dB/m	0.33 dB/m	0.53 dB/m
attenuation @ 1 GHz	0.57 dB/m	0.49 dB/m	0.23 dB/m	0.53 dB/m	0.89 dB/m
attenuation @ 3 GHz	1.15 dB/m	0.9 dB/m	0.49 dB/m	0.98 dB/m	1.63 dB/m
attenuation @ 6 GHz	1.69 dB/m	1.37 dB/m		1.49 dB/m	2.34 dB/m

Table 2: general cable specifications

Applicable standards: IEC 60332-1, RoHS 3

## 4 Individual cable specifications

Connectors	length	cable	VSWR @ 3GHz	ins. loss @ 3GHz	ins. loss @ 6GHz
N-Male to N-Male	35 cm	RG 223/U	$\leq 1.2$	$\leq 0.7$ dB	$\leq 1.2$ dB
N-Male to N-Male	75 cm	RG 58/U	$\leq 1.2$	$\leq 1.3$ dB	$\leq 2$ dB
N-Male to N-Male	75 cm	RG 223/U	$\leq 1.2$	$\leq 1.1$ dB	$\leq 1.5$ dB
N-Male to N-Male	75 cm	RG 142	$\leq 1.12$	$\leq 0.8$ dB	$\leq 1.2$ dB
N-Male to N-Male	3 m	RG 142	$\leq 1.2$	$\leq 3.1$ dB	$\leq 4.8$ dB
N-Male to N-Male	3,12 m	RG 213	$\leq 1.25$	$\leq 2.6$ dB	$\leq 4.5$ dB
N-Male to N-Male	5 m	RG 223/U	$\leq 1.2$	$\leq 5.3$ dB	$\leq 7.5$ dB
N-Male to N-Male	5 m	RG 213/U	$\leq 1.25$	$\leq 4.7$ dB	$\leq 6.8$ dB
N-Male to N-Male	10 m	RG 142	$\leq 1.2$	$\leq 9.4$ dB	$\leq 14.8$ dB
N-Male to SMA-Male	35 cm	RG 223/U	$\leq 1.2$	$\leq 0.7$ dB	$\leq 1.2$ dB
N-Male to SMA-Male	75 cm	RG 58	$\leq 1.2$	$\leq 1.3$ dB	$\leq 2$ dB
N-Male to SMA-Male	75 cm	RG 223/U	$\leq 1.2$	$\leq 1.1$ dB	$\leq 1.5$ dB
N-Male to SMA-Male	75 cm	RG 142	$\leq 1.12$	$\leq 0.8$ dB	$\leq 1.2$ dB
N-Male to BNC-Male	35 cm	RG 223/U	$\leq 1.3$	$\leq 0.8$ dB	
N-Male to BNC-Male	75 cm	RG 58/U	$\leq 1.3$	$\leq 1.4$ dB	
N-Male to BNC-Male	75 cm	RG 223/U	$\leq 1.3$	$\leq 1.2$ dB	
BNC-Male to BNC-Male	35 cm	RG 223/U	$\leq 1.3$	$\leq 0.85$ dB	
BNC-Male to SMA-Male	35 cm	RG 223/U	$\leq 1.3$	$\leq 0.8$ dB	
SMA-Male to SMA-Male	25 cm	RG 316/U	$\leq 1.2$	$\leq 0.5$ dB	$\leq 0.9$ dB
SMA-Male to SMA-Male	75 cm	RG 142	$\leq 1.12$	$\leq 0.8$ dB	$\leq 1.2$ dB
SMA-Male to SMB-Female	75 cm	RG 316/U	$\leq 1.2$	$\leq 2.7$ dB	

Table 4: individual cable specifications

## Coaxial cables

### 5 Kink protection

Refer to the corresponding kink protections in Table 1 and the photos below.

**Plastic sleeve:** applied for N-connectors and BNC connectors; RG 58U, RG142, RG223U



**Glued heat shrink:** applied for N-connectors, SMA and SMB connectors; RG213U, armored RG142, RG316U



## Coaxial cables

**Protection caps:** all connectors are equipped with protection caps

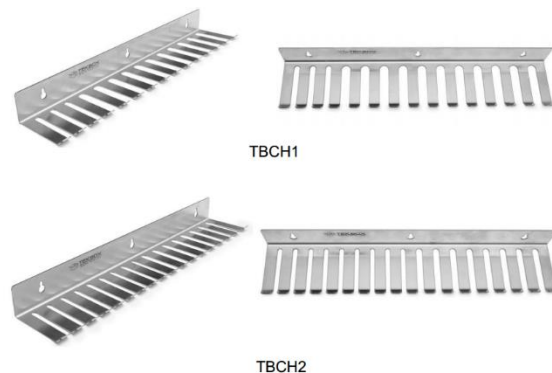


### 6 Connector & cable care

#### Handling and storage:

Do not store connectors with the contact pins or threads exposed. All cable assemblies are supplied with protection end caps. Retain these caps and place it over the connectors whenever they are not in use, in order to protect it from dust and mechanical damage.

Do not store RF cable assemblies loose in a box or a bench drawer. Use cable holders such as offered by Tekbox, part # TBCH1, TBCH2.



Cable holders will keep the cable assemblies straight, which is far superior than coiling cables for storage. If coiling cannot be avoided, due to cable length, apply a proper method to avoid twisting and tangling:

- 1) Grab the cable and start with an overhand loop
- 2) Flip the cable, and roll it underhand to create the second loop
- 3) Repeat overhand and underhand until the cable coils entirely in a circle

Unroll coiled cable assemblies with above steps in reverse order. Ignoring proper coiling procedure will deform the cable cross section and distort the impedance.

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### Inspection:

Before every use, visually inspect the connectors for obvious defects such as deformed threads or bent center conductors. Connector nuts should move smoothly and be free of burrs and loose metal particles. Mating surfaces should be clean.

### Cleaning:

Dust, loose dirt or metal particles can usually be removed with a quick blast of compressed air. Use only oil-free compressed air. Resilient dirt should preferentially be removed dry, using cotton swabs or microfiber cloth. If wet cleaning is necessary, use no other detergent, but pure isopropanol. After cleaning, dry the connector immediately with a stream of compressed air.

### Mating:

Align connectors carefully and do not rotate the connector body, when mating RF connectors. Rotating the body would twist the cable and rotate the center pin in its female counterpart. This would wear out the connection prematurely. The body shall be kept fixed, while only rotating the connector nut. Don't force the connector nut, if you feel a resistance. Rotate half a turn counterclockwise and try again.

Do not overtighten connector nuts with a standard wrench. In case of SMA, tighten the nut manually and then use a torque wrench to make the final connection. Apply a torque of 0.6 Nm for brass and 1 Nm for stainless steel SMA connectors. N connectors are typically connected finger tight. If a torque wrench is used, apply 1.3 Nm.

## 7 Ordering Information

Connectors	length	cable	conn. material	Part #
N-Male to N-Male	35 cm	RG 223/U	nickel plated brass	NM-NM/35/RG223
N-Male to N-Male	75 cm	RG 58/U	nickel plated brass	NM-NM/75/RG58
N-Male to N-Male	75 cm	RG 223/U	nickel plated brass	NM-NM/75/RG223
N-Male to N-Male	75 cm	RG 142 arm.	stainless steel	NM-NM/75/RG142/Test
N-Male to N-Male	1.25 m	RG 223/U	nickel plated brass	NM-NM/125/RG223
N-Male to N-Male	3,12 m	RG 213/U	nickel plated brass	NM-NM/312/RG213
N-Male to N-Male	3 m	RG 142	nickel plated brass	NM-NM/300/RG142
N-Male to N-Male	5 m	RG 223/U	nickel plated brass	NM-NM/500/RG223
N-Male to N-Male	5 m	RG 213/U	nickel plated brass	NM-NM/500/RG213
N-Male to N-Male	10 m	RG 142	nickel plated brass	NM-NM/1000/RG142
N-Male to SMA-Male	35 cm	RG 223/U	N: nickel plated brass SMA: gold plated brass	NM-SMAM/35/RG223
N-Male to SMA-Male	75 cm	RG 58	N: nickel plated brass SMA: gold plated brass	NM-SMAM/75/RG58
N-Male to SMA-Male	75 cm	RG 223/U	N: nickel plated brass SMA: gold plated brass	NM-SMAM/75/RG223
N-Male to SMA-Male	75 cm	RG 142 armored	stainless steel	NM-SMAM/75/RG142/Test
N-Male to SMA-Male	125 cm	RG 223/U	nickel plated brass	NM-SMAM/75/RG223
N-Male to BNC-Male	35 cm	RG 223/U	nickel plated brass	NM-BNCM/35/RG223
N-Male to BNC-Male	75 cm	RG 58/U	nickel plated brass	NM-BNCM/75/RG58
N-Male to BNC-Male	75 cm	RG 223/U	nickel plated brass	NM-BNCM/75/RG223
N-Male to BNC-Male	125 cm	RG 223/U	nickel plated brass	NM-BNCM/125/RG223
BNC-Male to BNC-Male	35 cm	RG 223/U	nickel plated brass	BNCM-BNCM/35/RG223
BNC-Male to BNC-Male	75 cm	RG 58/U	nickel plated brass	BNCM-BNCM/75/RG58
BNC-Male to BNC-Male	75 cm	RG 223/U	nickel plated brass	BNCM-BNCM/75/RG223
BNC-Male to BNC-Male	125 cm	RG 223/U	nickel plated brass	BNCM-BNCM/125/RG223

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BNC-Male to SMA-Male	35 cm	RG 223/U	BNC: nickel plated brass SMA: gold plated brass	BNCM-SMAM/35/RG223
SMA-Male to SMA-Male	25 cm	RG 316/U	gold plated brass	SMAM-SMAM/25/RG316
SMA-Male to SMA-Male	75 cm	RG 316/U	gold plated brass	SMAM-SMAM/75/RG316
SMA-Male to SMA-Male	125 cm	RG 223/U	gold plated brass	SMAM-SMAM/125/RG223
SMA-Male to SMA-Male	75 cm	RG 142 armored	stainless steel	SMAM-SMAM/75/RG142/Test
SMA-Male to SMB-Female	75 cm	RG 316/U	gold plated brass	SMAM-SMBF/75/RG316

*Table 5: ordering information*

## 8 History

Version	Date	Author	Changes
V1.0	17.8.2021	Mayerhofer	Creation of the document