

PHASE MASTER®



PHASE STABLE CABLE ASSEMBLIES



Are you a design or test engineer looking for cable assemblies that offer an unmatched combination of phase stability, low loss, and value?

Then take a look at our **Phase Master®** cables.

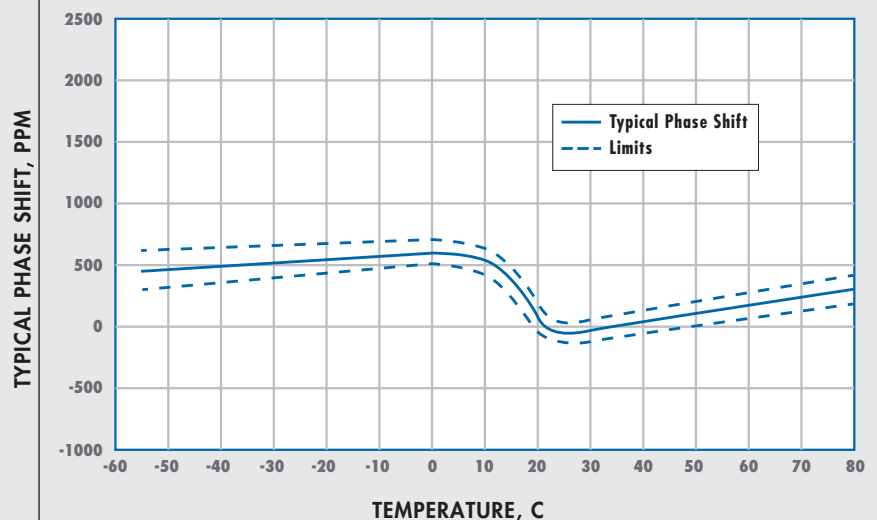
Superior phase stability vs. temperature makes this cable the ideal choice for phase-sensitive applications—particularly those **with wide operating temperature ranges**.

Phase Master's enhanced phase stability—a result of a proprietary combination of high performance, tape wrapped PTFE dielectric and helically wrapped SPC shield—offers:

- Improved system performance
- Less frequent calibration
- More precise measurements

From environmental stress screening to electronically scanned radar systems, count on Phase Master® assemblies to provide **unparalleled value and performance**.

PHASE vs. TEMPERATURE – PHASE MASTER® 210 CABLE



**TELEDYNE
STORM MICROWAVE**
Everywhereyoulook™

High value microwave and
electronic interconnect solutions

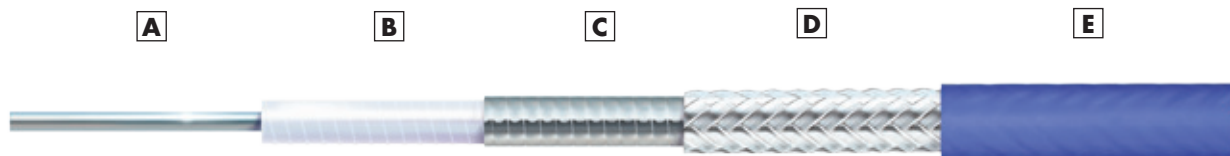
www.teledynestorm.com

SPECIFICATIONS		PHASE MASTER®			
		160	190	210	300
Cable Designator		64	63	62	61
Diameter (in./mm)		0.160/4.06	0.190/4.83	0.210/5.33	0.299/7.59
Operating Frequency (Max, GHz)		40	32	26.5	18
Attenuation–Max @ 2 GHz (dB/ft)		0.150	0.121	0.099	0.067
Attenuation–Max @ 10 GHz (dB/ft)		0.347	0.282	0.232	0.159
Attenuation–Max @ 18 GHz (dB/ft)		0.474	0.388	0.320	0.221
Attenuation–Max @ 26.5 GHz (dB/ft)		0.585	0.481	0.396	–
Attenuation–Max @ 32 GHz (dB/ft)		0.648	0.535	–	–
Attenuation–Max @ 40 GHz (dB/ft)		0.732	–	–	–
Power Handling – Avg (watts @ 1 GHz)		527	759	878	1615
Phase Stability vs. Temp – ppm (nom/tolerance)	–55°C	365/125	445/150	285/125	415/150
	+20°C	70/100	35/100	75/125	70/100
	+120°C	865/150	800/125	730/125	945/100
Phase Stability vs. Flexure† (@ 18 GHz, nom)		±3.5°	±4°	±4.5°	±8°
Shielding Effectiveness–Min‡ (dB @ 1 GHz)		> –90	> –90	> –90	> –90
Typical VSWR (2 straight connectors)		1.28 to 40 GHz	1.25 to 32 GHz	1.22 to 26.5 GHz	1.22 to 18 GHz
Min Bend Radius (in./mm)	Static	0.75/19.1	0.95/24.1	1.0/25.4	1.5/38.1
	Dynamic	1.5/38.2	1.9/48.3	2.0/50.8	3.0/76.2
Connector Retention to 18 GHz, pull (lbs/kg)		20/9.07	40/18.14	50/22.68	75/34.02
Velocity of Propagation (%)		87.0	82.4	84.0	84.6
Weight (grams/ ft/m)		12.12/39.76	16.65/54.63	19.40/63.65	39.00/127.95
Operating Temperature Range (°C)		–55 to +125	–55 to +125	–55 to +125	–55 to +125

† ± 360 degree bends around a 3" mandrel (PM 160), 3.8" mandrel (PM 190), 4" mandrel (PM 210) and 6" mandrel (PM 300)

‡ Subject to connector choice. Specifications subject to change without notice.

PHASE MASTER® CABLE CONSTRUCTION



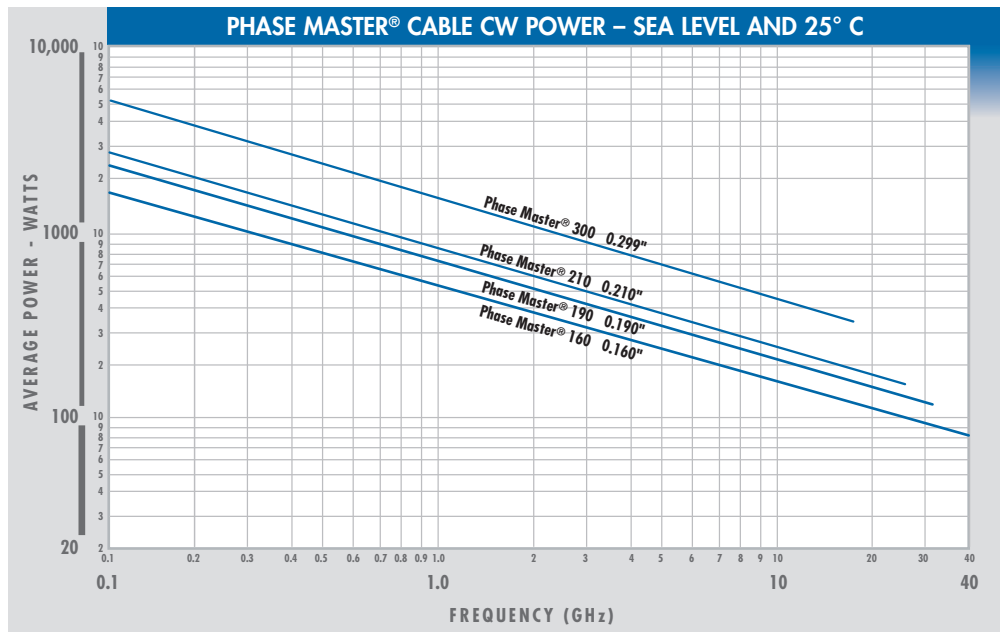
A Silver-plated copper center conductor

B Expanded PTFE dielectric

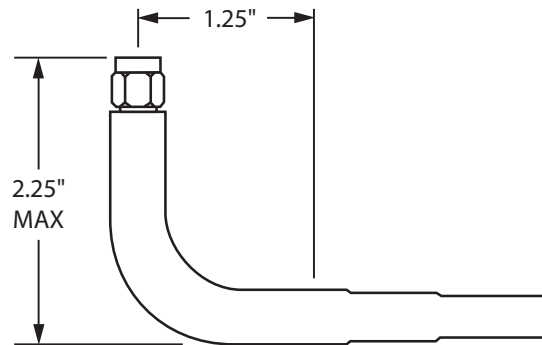
C Helically wrapped SPC flat wire shield

D Silver-plated copper braid

E Extruded blue FEP jacket



FACTORY FORMED RIGHT-ANGLE (FFRA) CONNECTORS



Designed using straight connectors and a shrink tubing-strain relief combination, FFRA connectors offer a moderate right-angle space advantage at a significant cost savings over traditional right-angle connectors.

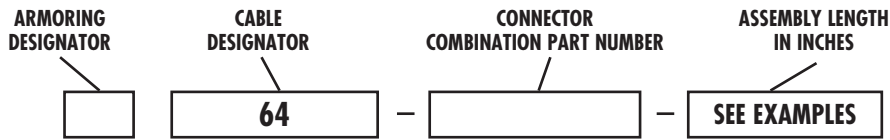
FFRA connectors are available for all Phase Master® cable sizes. See the Connector tables for specific connectors available as FFRA's.

Note: The dimensions given here are for PM160 with an SMK connector. Larger cables will have proportionally larger dimensions. Contact Storm for specifics.



PHASE MASTER® ORDERING INFORMATION: Part Number Designation

PHASE MASTER® 160



Armoring Designator†

O - Unarmored **A** - Hard Armored (polyolefin jacket) **AN** - Hard Armored (no polyolefin jacket)

† Hard armoring with FFRA connectors is a custom part number; call Storm.

CONNECTOR COMBINATION PART NUMBERS*

		CONNECTOR OPERATING FREQUENCY			
		40 GHz			
40 GHz	SMK (2.92 mm†) SP	0505	0555	0506	0556
	SMK (2.92 mm†) FFRAP	0555	5555	0655	5556
	2.4 mm SP	0506	0655	0606	0656
	2.4 mm FFRAP	0556	5556	0656	5656

* Other connector styles available; consult Storm

† IEEE Standard 287

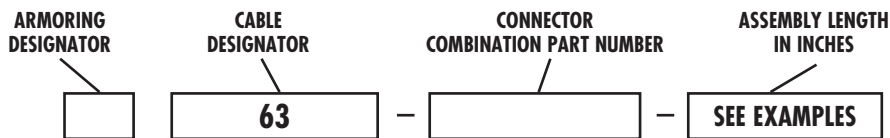
CONNECTOR CODES	
SP	Straight Plug
FFRAP	Factory Formed Right-Angle Plug

EXAMPLES:

064-0505-048 = Unarmored Phase Master® 160, SMK (2.92 mm) SP to SMK (2.92 mm) SP (assembly operates to 40 GHz), **48 inches**

AN64-0606-180 = Hard Armored (no polyolefin jacket) Phase Master® 160, 2.4 mm SP to 2.4 mm SP (assembly operates to 40 GHz), **180 inches**

PHASE MASTER® 190



Armoring Designator†

O - Unarmored **A** - Hard Armored (polyolefin jacket) **AN** - Hard Armored (no polyolefin jacket)

† Hard armoring with FFRA connectors is a custom part number; call Storm.

CONNECTOR COMBINATION PART NUMBERS*

		CONNECTOR OPERATING FREQUENCY	
		32 GHz	
32 GHz	2.92 mm SP	0505	0555
	2.92 mm FFRAP	0555	5555

* Other connector styles available; consult Storm

CONNECTOR CODES	
SP	Straight Plug
FFRAP	Factory Formed Right-Angle Plug

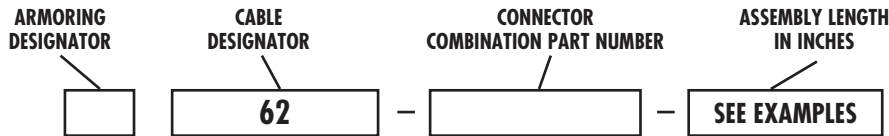
EXAMPLES:

063-5555-048 = Unarmored Phase Master® 190, 2.92 mm FFRAP to 2.92 mm FFRAP (assembly operates to 32 GHz), **48 inches**

A63-0505-180 = Hard Armored (polyolefin jacket) Phase Master® 190, 2.92 mm SP to 2.92 mm SP (assembly operates to 32 GHz), **180 inches**

PHASE MASTER® ORDERING INFORMATION: Part Number Designation

PHASE MASTER® 210



Armoring Designator†

O - Unarmored **R** - Ruggedized (polyurethane jacket)
A - Hard Armored (polyolefin jacket) **AN** - Hard Armored (no polyolefin jacket)

† Hard armoring with FFRA connectors is a custom part number; call Storm.

Ruggedizing not available with FFRA connectors.

CONNECTOR COMBINATION PART NUMBERS*

		26.5 GHz			18 GHz						
		3.5 mm SP	3.5 mm FFRA	SMA SP	SMA SP	SMA RAP	SMA FFRA	TNC SP	TNC FFRA	N SP	N FFRA
26.5 GHz	3.5 mm SP	0404	0454	0441	0104	0421	0451	0204	0452	0304	0453
	3.5 mm FFRA	0454	5454	4154	0154	2154	5154	0254	5254	0354	5354
	SMA SP	0441	4154	4141	0141	2141	4151	0241	4152	0341	4153
18 GHz	SMA SP	0104	0154	0141	0101	0121	0151	0102	0152	0103	0153
	SMA RAP	0421	2154	2141	0121	2121	2151	0221	2152	0321	2153
	SMA FFRA	0451	5154	4151	0151	2151	5151	0251	5152	0351	5153
	TNC SP	0204	0254	0241	0102	0221	0251	0202	0252	0203	0253
	TNC FFRA	0452	5254	4152	0152	2152	5152	0252	5252	0352	5253
	N SP	0304	0354	0341	0103	0321	0351	0203	0352	0303	0353
	N FFRA	0453	5354	4153	0153	2153	5153	0253	5253	0353	5353

* Other connector styles available; consult Storm

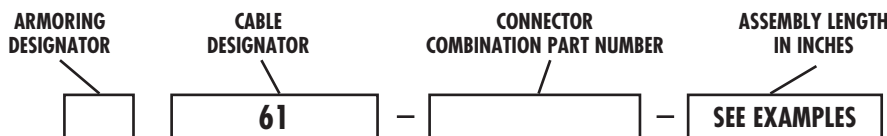
CONNECTOR CODES	
SP	Straight Plug
RAP	Right-Angle Plug
FFRA	Factory Formed Right-Angle Plug

EXAMPLES:

062-0404-048 = Unarmored Phase Master® 210, 3.5 mm SP to 3.5 mm SP (assembly operates to 26.5 GHz), 48 inches

R62-4141-120 = Ruggedized Phase Master® 210, SMA SP to SMA SP (assembly operates to 26.5 GHz), 120 inches

PHASE MASTER® 300



Armoring Designator†

O - Unarmored **A** - Hard Armored (polyolefin jacket) **AN** - Hard Armored (no polyolefin jacket)

† Hard armoring with FFRA connectors is a custom part number; call Storm.

CONNECTOR COMBINATION PART NUMBERS*

		18 GHz					
		SMA SP	SMA FFRA	TNC SP	TNC FFRA	N SP	N FFRA
18 GHz	SMA SP	0101	0151	0102	0152	0103	0153
	SMA FFRA	0151	5151	0251	5152	0351	5153
	TNC SP	0102	0251	0202	0252	0203	0253
	TNC FFRA	0152	5152	0252	5252	0352	5253
	N SP	0103	0351	0203	0352	0303	0353
	N FFRA	0153	5153	0253	5253	0353	5353

* Other connector styles available; consult Storm

CONNECTOR CODES	
SP	Straight Plug
FFRA	Factory Formed Right-Angle Plug

EXAMPLES:

061-0303-036 = Unarmored Phase Master® 300, N SP to N SP (assembly operates to 18 GHz), 36 inches

AN61-0101-108 = Hard Armored (no polyolefin jacket) Phase Master® 300, SMA SP to SMA SP (assembly operates to 18 GHz), 108 inches

ARMORING & RUGGEDIZING OPTIONS

The Hard Armored option (with and without polyolefin jacket) is available for all Phase Master® cables. However, when specifying FFRAP connectors, custom part numbering must be used. Call Storm for details.

The Ruggedized option (with polyurethane jacket) is available only for Phase Master® 210 cable, but not with FFRAP connectors.

HARD ARMORED – Polyolefin jacket

Armoring Designator: **A**



Designed for both inside and outside environments where flexibility and weight are not as critical, but where the application requires the ultimate in cut and crush resistance (500 lbs/in). The cable is covered with a stainless steel interlocked armor and a cross-linked polyolefin jacket.

Temperature: -54° C thru +125° C

Diameter: Phase Master® 160 – 0.300"/7.62 mm
Phase Master® 190 – 0.430"/10.92 mm
Phase Master® 210 – 0.430"/10.92 mm
Phase Master® 300 – 0.525"/13.34 mm

HARD ARMORED – No polyolefin jacket

Armoring Designator: **AN**



Designed for both inside and outside environments where flexibility and weight are not as critical, but where the application requires the ultimate in cut and crush resistance (500 lbs/in). The cable is covered with a stainless steel interlocked armor.

Temperature: -54° C thru +125° C

Diameter: Phase Master® 160 – 0.265"/6.73 mm
Phase Master® 190 – 0.395"/10.03 mm
Phase Master® 210 – 0.395"/10.03 mm
Phase Master® 300 – 0.475"/12.07 mm

RUGGEDIZED – Polyurethane jacket

Armoring Designator: **R**



For applications similar to the above, where weight, flexibility, and moderate compression resistance (300 lbs/in) are important, but where abrasion resistance is also critical. The cable is covered with a flexible wound helix of passivated stainless steel wire and an extruded polyurethane jacket.

Temperature: -54° C thru +100° C

Diameter: Phase Master® 210 – 0.360"/9.14 mm